

# **RUNGTA MINES LIMITED**

Rungta House, Chaibasa, District West Singhbhum,  
Jharkhand - 833 201

**DRAFT**  
**ENVIRONMENTAL IMPACT ASSESSMENT**  
**AND**  
**ENVIRONMENTAL MANAGEMENT PLAN**  
**OF**  
**EXPANSION OF DHENKANAL STEEL PLANT**  
**AT**

**VILLAGES: JHARBANDH, GALPADA &  
TARKABEDA, KOTHALU, BERUANPAL, KANKALU,  
BENIPATHAR, KADALA AND BADAMUNDA  
DISTRICT: DHENKANAL IN ODISHA  
(3.0 MTPA TO 3.55 MTPA STEEL AND POWER PLANT FROM  
385 MW TO 695 MW, AREA 674.765 TO 1769 ACRES)**

**OCTOBER, 2020**

*Prepared by:*



Estb. 1983

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An ISO 9001:2015  
approved company

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| I         | Terms of References (TOR) issued by MoEF&CC, New Delhi vide letter no. J-11011/309/2018-IA.II(I) dated 19.09.2020                                                                                                 |
| II(a)     | EC vide letter no J-11011/241/2009-IA.II(I) dated 02.08.2010 for integrated steel plant 1.9 MTPA steel and 385 MW power plant                                                                                     |
| II(b)     | EC vide letter no. J-11011/241/2009-IA.II(I) dated 25.01.2011 (written as 2010 in letter) for amendments to add lime plant, dolo plant, oxygen plant and vacuum degassing                                         |
| II(c)     | EC vide letter no. J-11011/241/2009-IA.II(I) dated 27.08.2015 for validity extension (i.e. within 5 years) but due to MOEF's Notification dated, the validity was extended by default to 7 years. Nearing 7 years |
| II(d)     | EC vide letter no. J-11011/241/2009-IA.II(I) 07.07.2017 for extension of validity of EC                                                                                                                           |
| II(e)     | EC vide letter no. J-11011/241/2009-IA.II(I) dated 20.09.2018 for change in configuration of power plant                                                                                                          |
| II(f)     | EC vide letter no. J-11011/309/2018-IA.II(I) dated 11.09.2019 for Integrated Steel Plant (2.85 MTPA Steel)                                                                                                        |
| II(g)     | EC vide letter no. J-11011/309/2018-IA.II(I) dated 13.04.2020 for change in configuration of pellet plant from 2x1.47 MTPA to 1x2.948 MTPA                                                                        |
| II(h)     | EC vide letter no. J-11011/309/2018-IA.II(I) dated 04.06.2020 for expansion to 3.0 MTPA under clause 7(ii) of EIA Notification 2006                                                                               |
| III       | Environmental Clearance for Sanindpur Iron & Bauxite Mine vide letter no. J-11015/107/2018-IA.II(M) dated 11 September 2019                                                                                       |
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| VIII      | National ambient air quality standards (NAAQS)                                                                                                                                                                    |
| IX        | Water quality test results                                                                                                                                                                                        |
| X         | Test characteristics for drinking water (IS 10500 : 2012)                                                                                                                                                         |
| XI        | Noise level monitoring data                                                                                                                                                                                       |
| XII       | Ambient air quality standards in respect of noise                                                                                                                                                                 |
| XIII      | Damage risk criteria for hearing loss, occupational safety and health administration                                                                                                                              |

| Annex. No | Particulars                                                                                                                                                                                                                                                                                                                           |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| XIV       | Traffic volume monitoring results                                                                                                                                                                                                                                                                                                     |
| XV        | Land use pattern within the study area (as per Census 2011)                                                                                                                                                                                                                                                                           |
| XVI       | Authentication List of flora & fauna in the core zone & study area                                                                                                                                                                                                                                                                    |
| XVII      | Village wise population and literacy within the study area (Census 2011)                                                                                                                                                                                                                                                              |
| XVIII     | Village wise employment pattern in the study area (Census 2011)                                                                                                                                                                                                                                                                       |
| XIX       | Village wise amenities in the study area (Census 2011)                                                                                                                                                                                                                                                                                |
| XX        | Air quality prediction modelling for anticipating the ground level concentration (GLC's) of air pollutants due stack emissions<br>(a) ISCST3 model for proposed 3.55 MTPA steel plant at Jharbandh<br>(b) ISCST3 model for 3.0 MTPA steel plant at Jharbandh (with revised stacks for capacity sanctioned as per EC dated 04/06/2020) |
| XXI       | MOEF & NABL certificates for laboratory                                                                                                                                                                                                                                                                                               |
| XXII      | Delhi High Court order permission to consultant for preparation of EIA/EMP report                                                                                                                                                                                                                                                     |
| XXIII     | Consent to Establish, issued by Orisha, SPCB                                                                                                                                                                                                                                                                                          |
| XXIV      | IPICOL for allotment of land in favour of RML vide letter no. CGM/SLNA/RML-225/20 dt. 02.07.2020                                                                                                                                                                                                                                      |
| XXV       | Corporate Environment Policy                                                                                                                                                                                                                                                                                                          |
| XXVI      | MOEF&CC RO letter dt. 11.06.2020 regarding observation during monitoring of 2.85 MTPA plant sanctioned vide EC dated 11.09.2019                                                                                                                                                                                                       |
| XXVII     | Soil test results                                                                                                                                                                                                                                                                                                                     |
| XXVIII    | Occupational health monitoring format prescribed by government                                                                                                                                                                                                                                                                        |
| XXIX      | Summary of OHS monitoring of Dhenkanal Plant, RML employees                                                                                                                                                                                                                                                                           |
| XXX       | Approval letter of WLCP and Site Specific Wildlife Conservation                                                                                                                                                                                                                                                                       |

## LIST OF ABBREVIATIONS

|         |   |                                      |
|---------|---|--------------------------------------|
| AFBC    | - | Atmospheric Fluidised Bed Combustion |
| AMSL    | - | Above mean sea level                 |
| BDL     | - | Below Detectable Limit               |
| BF      | - | Blast Furnace                        |
| BGL     | - | Below Ground Level                   |
| CFBC    | - | Circulating Fluidized Bed Combustion |
| CGWB    | - | Central Ground Water Board           |
| cm      | - | Centi meter                          |
| CPCB    | - | Central Pollution Control Board      |
| CPP     | - | Captive power plant                  |
| CTE     | - | Consent to establish                 |
| Cum/day | - | Cubic metres per day                 |
| Cum/hr  | - | Cubic metres per hour                |
| DG      | - | Diesel Generator                     |
| Dia     | - | Diameter                             |
| DM      | - | Demineralisation                     |
| DRI     | - | Direct Reduction Iron                |
| E       | - | East                                 |
| EC      | - | Environmental clearance              |
| EMD     | - | Environment Management Department    |
| EMP     | - | Environmental Management Plan        |
| ETP     | - | Effluent Treatment Plant             |
| FES     | - | Fume Extraction System               |
| G       | - | Gram                                 |
| Ha      | - | Hectare                              |
| IF      | - | Induction Furnace                    |
| ISP     | - | Integrated Steel Plant               |
| Kcal    | - | Kilo calorie                         |
| Kg      | - | Kilogram                             |
| KL      | - | Kilo litre                           |
| KLD     | - | Kilo litre/day                       |
| KLH     | - | Kilo litres per hour                 |
| KVA     | - | Kilo Volt Ampere                     |
| KW      | - | Kilo Watt                            |
| KWH     | - | Kilo Watt Hour                       |
| LRF     | - | Ladle Refining Furnace               |
| L       | - | Litres                               |

|                |   |                                                     |
|----------------|---|-----------------------------------------------------|
| Lpd            | - | Litres per day                                      |
| M              | - | Meter                                               |
| m <sup>2</sup> | - | Square meter                                        |
| m <sup>3</sup> | - | Cubic meter                                         |
| MBF            | - | Mini Blast Furnace                                  |
| MCM            | - | Million Cubic Meter                                 |
| MoEF&CC        | - | Ministry of Environment, Forests and Climate Change |
| MOU            | - | Memorandum of Understanding                         |
| MT             | - | Million Tonnes                                      |
| MTPA           | - | Million Tonnes Per Annum                            |
| MVA            | - | Mega Volt Ampere                                    |
| MW             | - | Mega watt                                           |
| N              | - | North                                               |
| NOC            | - | No objection certificate                            |
| NH             | - | National Highway                                    |
| Nos.           | - | Numbers                                             |
| OSPCB          | - | Odisha State Pollution Control Board                |
| PFBC           | - | Pressurised Fluidised Bed Combustion                |
| REIA           | - | Rapid Environmental Impact Assessment               |
| RML            | - | Rungta Mines Limited                                |
| RPM            | - | Respirable Particulate Matter                       |
| S              | - | South                                               |
| SMS            | - | Steel Melt Shop                                     |
| SPM            | - | Suspended Particulate Matter                        |
| Sq.m           | - | Square metre                                        |
| T              | - | Tonnes                                              |
| TOR            | - | Terms of reference                                  |
| TPY            | - | Tonnes Per Year                                     |
| TPA            | - | Tonnes Per Annum                                    |
| TPD            | - | Tonnes Per Day                                      |
| TPM            | - | Tonnes Per Month                                    |
| W              | - | West                                                |
| WHR            | - | Waste Heat Recovery                                 |
| WHRB           | - | Waste Heat Recovery Boiler                          |

## CHAPTER 1

### INTRODUCTION

#### 1.1 PURPOSE OF THE EIA REPORT

##### ***Background***

Company had obtained following Environmental Clearances from Ministry of Environment, Forests and Climate Change vide letter numbers

- (i) J-11011/241/2009-IA.II(I) dated 02.08.2010 for integrated steel plant 1.9 MTPA steel and 385 MW power plant
- (ii) J-11011/241/2009-IA.II(I) dated 25.01.2011 for amendments in the environmental clearance to add lime plant, dolo plant, oxygen plant and vacuum degassing.
- (iii) J-11011/241/2009-IA.II(I) dated 27.08.2015 for validity extension (i.e. within 5 years) but due to MOEF's Notification dated, the validity was extended by default to 7 years. Nearing 7 years from date of environmental clearance
- (iv) J-11011/241/2009-IA.II(I) 07.07.2017 for extension of validity of EC
- (v) J-11011/241/2009-IA.II(I) dated 20.09.2018 for change in configuration of power plant
- (vi) J-11011/309/2018-IA.II(I) dated 11.09.2019 for expansion to 2.85 MTPA steel with public hearing on 07.03.2019
- (vii) J-11011/309/2018-IA.II(I) dated 13.04.2020 for change in configuration of pellet plant from 2x1.47 MTPA to 1x2.948 MTPA
- (viii) J-11011/309/2018-IA.II(I) dated 04.06.2020 for expansion to 3.0 MTPA under clause 7(ii) of EIA Notification 2006

Now Rungta Mines Limited (Dhenkanal Steel Plant) proposes to enhance production capacity from 3.0 MTPA to 3.55 MTPA steel by expansion of facilities such as pelletisation plant (from 2.948 to 28.75 MTPA), coal washery (from 4.141 to 5.029 MTPA), sponge iron plant (from 1.613 to 2.247 MTPA), mini blast furnace (from 1.559 to 1.934 MTPA), sinter plant (from 1.663 to 2.827 MTPA), steel melting shop (from 2.618 to 3.22 MTPA), finished product facilities (from 3.0 to 3.55 MTPA), producer gas plant (from 480 to 5387 million Nm<sup>3</sup>/annum), oxygen plant (from 0.098 to 0.294 MTPA), and captive power plant (from 385 to 695 MW). The capacity of beneficiation plant (5.4 MTPA), lime plant (0.3045 MTPA) and cement plant (1.686 MTPA) shall remain same. Coke oven plant will reduce from 1.12 to 1.07 MTPA.

### Need for study

This Environmental Impact Assessment report has been prepared for the expansion of the 3.00 to 3.55 MTPA steel. As per procedure laid down in the EIA Notification dated 14th September 2006 and its amendments, Form-I, proposed terms of reference (TOR) for the EIA along with the pre-feasibility report was submitted to Ministry of Environment, Forest & Climate Change (MoEF&CC) vide online application no. IA/OR/IND/172347/2020 dated 11.09.2020. MOEF&CC granted standard TOR vide letter no J-11011/309/2018.IA.II.(I) dated 19.09.2020 (for 3.55 MTPA) (copy given in **Annexure I**). Based on the ToR, this Environmental Impact Assessment (EIA)/ Environment Management Plan (EMP) is being prepared to conduct public hearing and obtain environmental clearance.

Environmental clearance is a statutory requirement as per EIA Notification dated 14<sup>th</sup> September 2006 and its amendments till date. Serial number and category of the proposed units in the plant as per the Schedule of the EIA Notification S.O. 1533 will be as follows:

| Sub-Project                      | Existing | Proposed | Item No. | Category |
|----------------------------------|----------|----------|----------|----------|
| Pellet Plant                     | ✓        | ✓        | 2(b)     | A        |
| DRI, MBF, SMS, Ferro Alloy Plant | ✓        | ✓        | 3(a)     | A        |
| Coal washery                     | ✓        | ✓        | 2(a)     | A        |
| Coke oven plant                  | ✓        | ✓        | 4(b)     | B        |
| Captive Power Plant              | ✓        | ✓        | 1(d)     | B        |
| Cement Plant                     | X        | ✓        | 3(b)     | A        |
| Colony                           | X        | ✓        | 8(b)     | B        |

## 1.2 IDENTIFICATION OF THE PROJECT

The facilities of Dhenkanal Steel plant under implementation as per previously granted environmental clearances are given in **Table 1.1**.

**TABLE 1.1: STATUS OF FACILITIES UNDER CONSTRUCTION  
AS ON 31.08.2020**

| Sl. No. | Facilities                    | Production | Status             |
|---------|-------------------------------|------------|--------------------|
| 1       | Sponge Iron plant (2x500 TPD) | 0.455 MTPA | Under construction |
| 2       | Steel Melting Shop IF 4x20 T  | 0.308 MTPA | Under construction |
| 3       | Captive power plant           | 50 MW      | Under construction |
|         | (a) WHRB                      | 25 MW      |                    |
|         | (b) AFBC/CFCB                 | 25 MW      |                    |

Present sanctioned capacity and additional capacities of facilities, as per TOR dated 19.09.2020, are given in **Table 1.2**.

**TABLE 1.2: EXISTING FACILITIES AS PER EC AND PROPOSED FACILITIES & PRODUCTION**

| Sl. No. | Proposed Plant facilities              | Unit        | Capacity as per the EC dated 04.06.2020 | Proposed Additional/ change     | Total After Expansion                 |
|---------|----------------------------------------|-------------|-----------------------------------------|---------------------------------|---------------------------------------|
|         | <b>Overall finished steel capacity</b> | <b>MTPA</b> | <b>3.0</b>                              | <b>0.55</b>                     | <b>3.55</b>                           |
| 1       | Beneficiation Plant                    | MTPA        | 5.4<br>(2X2.69 MTPA)                    | -                               | 5.4<br>(2X2.69 MTPA)                  |
| 2       | Pelletisation Plant                    |             |                                         |                                 |                                       |
|         | Pellet Plant (I)                       | MTPA        | 2.948<br>(1X2.948 MTPA)                 | 0.802<br>(Config revised)       | 3.75<br>(1X 3.75 MTPA)                |
|         | Pellet Plant (II)                      | MTPA        | -                                       | 25.0<br>(4X3.75 +10x1 MTPA)     | 25.0<br>(4X3.75 MTPA +10x1 MTPA)      |
|         | <b>Total</b>                           | <b>MTPA</b> | <b>2.948</b>                            | <b>25.802</b>                   | <b>28.75</b>                          |
| 3       | Coal Washery<br>(1X400TPH+1X235 TPH)   | MTPA        | 4.141                                   | 0.888                           | 5.029                                 |
| 4       | DRI Plant                              |             |                                         |                                 |                                       |
| 4.1     | DRI (I) (2X500 TPD)                    | MTPA        | 0.4745                                  | 0.0473                          | 0.5218                                |
| 4.2     | DRI (II) (3X600 TPD)                   | MTPA        | 1.1387<br>(4X600 TPD)                   | -0.2761<br>(reduced 1 X600 TPD) | 0.8626<br>(3X600 TPD)                 |
| 4.3     | DRI (III) (2X900 TPD)                  | MTPA        | -                                       | 0.8626<br>(2X900TPD)            | 0.8626<br>(2X900TPD)                  |
|         | <b>Total</b>                           | <b>MTPA</b> | <b>1.6132</b>                           | <b>0.6338</b>                   | <b>2.247</b>                          |
| 5       | Mini Blast Furnace                     | MTPA        |                                         |                                 |                                       |
| 5.1     | MBF I (1X600 cum.)                     | MTPA        | 0.567                                   | 0.210                           | 0.777                                 |
| 5.2     | MBF II (2X450 cum.)                    | MTPA        | 0.992<br>(1X1050 cum.)                  | 0.174<br>(Config revised)       | 1.166<br>(2X450 cum.)                 |
|         | <b>Total</b>                           |             | <b>1.559</b>                            | <b>0.384</b>                    | <b>1.943</b>                          |
| 6       | Sinter Plant                           |             |                                         |                                 |                                       |
| 6.1     | Sinter Plant (I) (2X80 sq.m.)          | MTPA        | 0.612<br>(1X64 sq.m.)                   | 0.908<br>(config revised)       | 1.520<br>(2X80 sq.m.)                 |
| 6.2     | Sinter Plant (II) 1X110                | MTPA        | 1.051                                   | 0.256                           | 1.307                                 |
|         | <b>Total</b>                           | <b>MTPA</b> | <b>1.663<br/>(1X64 + 1X110 sq.m.)</b>   | <b>1.164</b>                    | <b>2.827<br/>(2X80 + 1X110 sq.m.)</b> |
| 7       | Coke Oven Plant                        | MTPA        | 1.12<br>(16 batteriesX                  | -0.05<br>(Config                | 1.07<br>(6 batteries x 70,000         |

| Sl. No. | Proposed Plant facilities                                                                  | Unit                            | Capacity as per the EC dated 04.06.2020                       | Proposed Additional/ change                                | Total After Expansion                                                     |
|---------|--------------------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------|
|         |                                                                                            |                                 | 70,000 TPA)                                                   | revised)                                                   | TPA + 1 battery x 250,000TPA + 1 battery x 400,000 TPA)                   |
| 8       | Steel Melting Shop                                                                         | MTPA                            | <b>2.618</b>                                                  | <b>0.602</b>                                               | <b>3.22</b>                                                               |
| 8.1     | Steel Melting via Induction Furnace Route                                                  | MTPA                            | 0.693<br>(7X 20 T IF + 4X25 T LRF)                            | 0.847<br>(8 X20T IF + 3x45T LRF)                           | 1.54<br>(15 X20 T IF + 4x25T LRF + 3x45 T LRF)                            |
| 8.2     | Steel Melting via Electric Arc Furnace-Vacuum Degassing-Argon Oxygen Decarburization Route | MTPA                            | 1.925 MTPA<br>(1X90 T + 1X160 T EAF and 1X90 T + 1X160 T LRF) | -0.245<br>(Config revised)                                 | 1.680<br>(1X90 T+1X110 T and 1x90 T LRF+1x110T LRF)                       |
| 8.3     | Continuous Casting Machine (Billets/ Bloom Caster/ Slab)                                   | MTPA                            | 2.566 MTPA<br>(3 nos. X 4 strands)                            | 0.59<br>(8 nos. X 4 Strand)                                | 3.156<br>(11 nos. X 4 Strand)                                             |
| 9       | Finished Product Facilities                                                                | MTPA                            | 3.0                                                           | 0.55                                                       | 3.55                                                                      |
| 9.1     | Rolling Mill (TMT/ Flat/ Round/ Wire Rod/ Structural Mill/ others)                         | MTPA                            | 1.75<br>(5 nos.X0.2 + 1 no.X0.3 + 1 no.X0.45 MTPA)            | 0.8<br>(Config revised)                                    | 2.55<br>(2 nos.X0.2 + 4 nos.X0.3 + 1 no. X0.45 + 1 nos. X0.5 MTPA)        |
| 9.2     | Strip Mill/ Sheet/ Coil/ Wire & Bar Mill/ Wire Rope                                        | MTPA                            | 0.85<br>(1 no.X0.45 + 1no. X0.4 MTPA)                         | -0.35<br>(Config revised)                                  | 0.5<br>(1 no.X0.2 + 1no.X0.3 MTPA)                                        |
| 9.3     | Ductile Pipe Plant                                                                         | MTPA                            | 0.400<br>(2 nos.X0.2 MTPA)                                    | 0.1<br>(Config revised)                                    | 0.5<br>(2 nos.X0.25 MTPA)                                                 |
| 10      | Producer Gas Plant                                                                         | Million Nm <sup>3</sup> / Annum | 480<br>(20 nos.X3000 Nm <sup>3</sup> /hr)                     | 4907<br>(32 nos.X12500 + 28 nos.X7500 Nm <sup>3</sup> /hr) | 5387<br>(20 nos.X3000 + 32 nos.X12500 + 28 nos.x7500 Nm <sup>3</sup> /hr) |
| 11      | Oxygen Plant                                                                               | MTPA                            | 0.098<br>(1 no.X100 + 1 no.X180 TPD)                          | 0.196<br>(Config revised & added)                          | 0.294<br>(2 nos.X180 TPD + 1 no.X220 TPD + 2 nos.X130TPD)                 |
| 12      | Lime Plant                                                                                 | MTPA                            | 0.3045 MTPA<br>(1 no.X 300 + 1 no.X 570 TPD)                  | 0<br>(Config revised)                                      | 0.3045 MTPA<br>(1 no.X390 + 1 no.X 480 TPD)                               |
| 13      | Cement Plant                                                                               | MTPA                            | 1.686<br>(1 no.X2600 + 1 no.X2300 TPD)                        | -                                                          | 1.686<br>(1 no.X2600 + 1 no.X2300 TPD)                                    |
| 14      | Captive Power Plant                                                                        | MW                              | 385                                                           | 310                                                        | 695                                                                       |



| Sl. No. | Proposed Plant facilities                                         | Unit  | Capacity as per the EC dated 04.06.2020 | Proposed Additional/ change     | Total After Expansion                               |
|---------|-------------------------------------------------------------------|-------|-----------------------------------------|---------------------------------|-----------------------------------------------------|
| 14.1    | Waste Heat Recovery Boiler (WHRB) based Captive Power Plant (CPP) | MW    | 135                                     | 100                             | 235                                                 |
| (a)     | DRI Kiln exit gas based                                           | MW    | 68<br>(2X50+2#X60 TPH)                  | 82<br>(Config revised & added)  | 150<br>(2 nos.X50 + 3 nos.X85 TPH + 2 nos.X120 TPH) |
| (b)     | MBF Gas based                                                     | MW    | 31<br>(1 no.X50 + 1 no.X90 TPH)         | 4<br>(Config revised)           | 35<br>(1 no.X50 + 2 nos.X45 TPH)                    |
| (c)     | Coke Oven Gas based                                               | MW    | 36<br>(1 no.X 60+1 no. X100 TPH)        | 4                               | 40<br>(2 no.X60 + 1no.X40TPH)                       |
| (d)     | TRT                                                               | MW    | -                                       | 10                              | 10                                                  |
| 14.2    | AFBC/CFBC based CPP                                               | MW    | 250<br>(2 nos.X125 + 4nos.X250 TPH)     | 210<br>(Config revised & added) | 460<br>(10 nos.x125 + 1 nos.X130 + 3nos.X250 TPH)   |
| 15      | Colony                                                            | Acres | -                                       | -                               | 34                                                  |

Salient features of the proposed project is given in **Table 1.3**.

**TABLE 1.3: SALIENT FEATURES OF THE EXISTING & PROPOSED PROJECT**

|                                    |                                                                                                                                                |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Location                           | Jharbandh, Galpada, Tarkabeda, Kothalu, Beruanpal, Kankalu, Benipathar, Kadala and Badamunda, District Dhenkanal, Odisha                       |
| Latitude                           | Plant area : 20° 45' 05" to 20° 46' 23" N<br>Colony area : 20° 45' 51" to 20° 46' 03" N<br>Water Reservoir area : 20° 46' 14" to 20° 46' 33" N |
| Longitude                          | Plant area : 85° 15' 42' to 85° 18' 39' E<br>Colony area : 85° 18' 39'to 85° 18' 55' E<br>Water Reservoir area : 85° 18' 58' to 85° 19' 13' E  |
| Total Area                         | Existing : 674.765 acres<br>Proposed : 1094.235 acres<br><b>Total</b> : 1769.00 acres                                                          |
| Status of land                     | 608.495 acres land is already allotted to Rungta Mines Ltd. and the remaining 1160.505 acres has been recommended for allotment.               |
| Product                            | Steel, Power, Pellet, Cement & Clinker                                                                                                         |
| Rated capacity existing & proposed | 1. Beneficiation Plant 5.4 MTPA, no change<br>2. Pelletisation Plant from 2.948 to 28.75 MTPA                                                  |

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                              | 3. Coal Washery from 4.141 to 5.029 MTPA<br>4. DRI from 1.613 to 2.247 MTPA<br>5. Mini Blast furnace from 1.559 to 1.943 MTPA<br>6. Sinter Plant from 1.663 to 2.827 MTPA<br>7. Coke Oven Plant 1.12 to 1.07 MTPA<br>8. Steel Melting Shop from 2.618 to 3.22 MTPA<br>9. Finished Product Facilities from 3.0 to 3.55 MTPA<br>10. Producer Gas Plant from 480 to 5,867 Million Nm <sup>3</sup> /annum<br>11. Oxygen Plant from 0.098 to 0.284 MTPA<br>12. Lime Plant 0.3045 MTPA, no increase<br>13. Cement Plant 1.686 MTPA, no increase<br>14. Captive Power Plant from 385 to 695 MW<br>15. A colony is proposed over 34 acres |
| Status of Construction       | Plant has recently started construction of following units, construction of which is still underway:<br>1. DRI (2x500 TPD)<br>2. SMS (4x20 T IF)<br>3. CPP (25 MW WHRB and 25 MW AFBC/CFBC)                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Working Days                 | Existing : 355<br>Proposed : 355                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Manpower                     | Existing : 2650<br>Proposed Additional : 2200<br>Total : 4850                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Expected cost of the project | Existing : 7,886.9 Crores<br>Proposed Additional : 5500 Crores<br>Total : 13,386.9 crores                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Water Requirement            | Existing : 2,981 KLH<br>Proposed additional : 771 KLH<br>Total : 3,752 KLH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Source of water              | Brahmani River                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Power Description            | Existing : 394 MW<br>Proposed Additional: 300 MW<br>Total : 694 MW                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Power Source                 | Captive Power Plant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Implementation Schedule      | 84 months from the date of EC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

### 1.3 PROJECT PROPONENT

M/s Rungta Mines Limited (RML), is one of the leading and the oldest mining company of the mineral rich belt of Odisha and Jharkhand. The company is engaged in these activities for the past six decades. The company's owns and successfully operates iron ore and manganese ore mines, steel plants and power plants in Odisha and Jharkhand.

The Corporate office of Rungta Mines Limited is located at Chaibasa, Jharkhand. The company's vision and mission is to utilise its core values and strengths, complemented with the vast experience gained, to help it keep pace with the changing times and respond to domestic & international market forces by maintaining consistent quality and dispatch schedules, making RML synonymous with reliability.

## 1.4 BRIEF DESCRIPTION OF THE PROJECT

### 1.4.1 Nature of project

The proposed project is an Integrated Steel Plant of 3.55 million tonnes per annum finished steel production. It is an expansion from 3.0 million tonnes steel production, which was sanctioned vide environmental clearance dtd 04.06.2020. Details of sanctioned and proposed manufacturing facilities have already been given in **Table 1.1**.

### 1.4.2 Size

Dhenkanal Steel Plant proposes to enhance steel production capacity from 3.0 MTPA to 3.55 MTPA steel. The total area of existing plant is 674.765 acres and expansion area shall be in an additional 1094.235 acres. The total plant area after expansion shall be 1769.00 acres.

### 1.4.3 Location

The existing & proposed site for plant is located in villages Jharbandh, Galpada, Tarkabeda, Kothalu, Beruanpal, Kankalu, Benipathar, Kadala and Badamunda in District Dhenkanal, Odisha and is shown in **Fig 1.1**. The location of plant and study area can be seen in Survey of India Open Series No. F45T1, F45T2, F45T5 & F45T6. The co-ordinates of the site as per google earth are as given in **Table 1.4**.

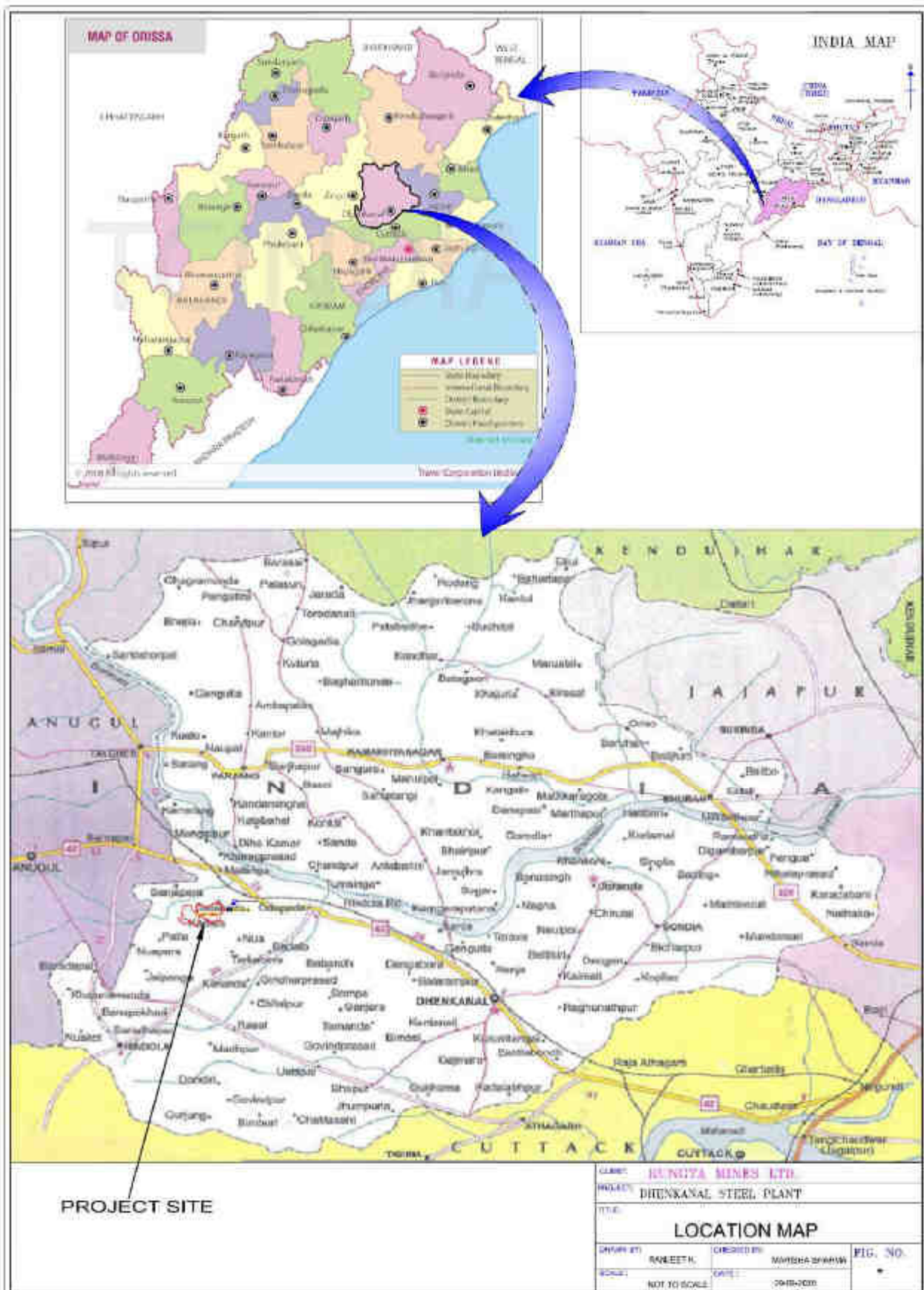
**TABLE 1.4: CO-ORDINATES OF THE SITE**

| Point      | Plant Area  |             | Colony Area |             | Water Reservoir Area |             |
|------------|-------------|-------------|-------------|-------------|----------------------|-------------|
|            | Latitude    | Longitude   | Latitude    | Longitude   | Latitude             | Longitude   |
| North most | 20° 46' 23" | 85° 16' 57' | 20° 46' 03" | 85° 18' 54' | 20° 46' 33"          | 85° 19' 04' |
| East most  | 20° 46' 00" | 85° 18' 39' | 20° 45' 52" | 85° 18' 55' | 20° 46' 32"          | 85° 19' 13' |
| South most | 20° 45' 05" | 85° 16' 45' | 20° 45' 51" | 85° 18' 39' | 20° 46' 14"          | 85° 18' 58' |
| West most  | 20° 45' 30" | 85° 15' 42' | 20° 45' 56" | 85° 18' 39' | 20° 46' 14"          | 85° 18' 58' |

### 1.4.4 Communication

The plant is accessible by all weather road from the district headquarter Dhenkanal (32 km) and town Angul (18.2 km). The site is located near NH-55 (1.3 km aerially from it), which connects Bhubaneswar to Angul. The nearest railway station is Meramandali at a distance of 3.4 km. The nearest airport is at Bhubaneswar, which is approximately 77 km from the site.

FIG 1.1: LOCATION MAP



#### **1.4.5 Importance to country & region**

As per the National Steel Policy, the objective is to build a globally competitive industry. It is anticipated that a crude steel capacity of 300 Million Tonnes will be required by 2030 based upon the demand projections.

Thus, achieving crude steel capacity of upto 300 Million Tonnes will require extensive mobilization of natural resources, finances, manpower and infrastructure including land.

The proposed expansion of the existing steel plant will assist in our endeavour to meet the projected demand of steel in the country.

This projection shows that there is good scope for creation of additional capacities for value added wire rods, i.e. Wire Rods in Medium Carbon, High Carbon and Alloy Steel Grades.

#### ***Production & National Steel Policy 2017***

- The Indian steel industry has entered into a new development stage, post de-regulation, riding high on the resurgent economy and rising demand for steel.
- Rapid rise in production has resulted in India becoming the 3<sup>rd</sup> largest producer of crude steel in 2015 as well as in 2016. The country was the largest producer of sponge iron or DRI in the world during the period 2003-2015 and emerged as the 2<sup>nd</sup> largest global producer of DRI in 2016 (after Iran). India is also the 3<sup>rd</sup> largest finished steel consumer in the world and maintained this status in 2016. Such rankings are based on provisional data released by the World Steel Association for the above year.
- In a de-regulated, liberalized economic/ market scenario like India, the Government's role is that of a facilitator which lays down the policy guidelines and establishes the institutional mechanism/ structure for creating conducive environment for improving efficiency and performance of the steel sector.
- In this role, the Government has released the National Steel Policy 2017, which has laid down the broad road map for encouraging long term growth for the Indian steel industry, both on demand and supply sides, by 2030-31.
- The Government has also announced a policy for providing preference to domestically manufactured Iron & Steel products in Government procurement. This policy seeks to accomplish PM's vision of 'Make in India' with objective of nation building and encourage domestic manufacturing and is applicable on all government tenders where price bid is yet to be opened. Further, the Policy provides a minimum value

addition of 15% in notified steel products which are covered under preferential procurement. In order to provide flexibility, Ministry of Steel may review specified steel products and the minimum value addition criterion.

TMT Rebars and Wire Rods are global commodities. Depending on urgent requirement and price difference in different countries, imports and exports do take place regularly. Import figures are published by Joint Plant Committee (JPC).

As per the latest publication (April 2019) available from JPC, import data for Bars & Rods for April 2018 to March 2019 is given in **Table 1.5**.

**TABLE 1.5: IMPORT DATA FOR BARS & RODS**

| Sl. No. | Description                                                            | Gross Production (tonnes) | Imports (tonnes) |
|---------|------------------------------------------------------------------------|---------------------------|------------------|
| i)      | Bars & Wire Rods MS Grade                                              | 38,057,000                | 349,000          |
| ii)     | Non-Flat Products, i.e., Wire Rods, Plain Bars etc. Value Added Grades | 7,338,000                 | 591,000          |
|         | <b>Total</b>                                                           | <b>45,395,000</b>         | <b>940,000</b>   |

*Source: Pre-feasibility report, October 2019 by KORUS Engineering Solutions Pvt. Ltd.*

- The above figures show that imports are small quantity for MS Grade but substantial for Value Added Grades.
- Imports are not expected to impose a significant threat to domestic players in future. There is no proposal.

### **State scenario**

Occupying an important position on the country's map, Odisha's rich mineral reserves constitute 28% iron ore, 24% coal, 59% bauxite and 98% chromite of India's total deposits. The state's comparative advantage on this account has attracted the attention of many mining and metallurgical companies. In Odisha, industrialization started shortly after independence. The oldest mines in the state were coal mines at Talcher and Ib valley. After nationalization of coal in 1975 and the national policy on energy sector, many power plants have come up in the state.

Iron ore is abundantly available in the districts of Mayurbhanj, Sundargarh, Keonjhar and Jajpur. While chromite is confined to Jajpur, Dhenkanal and Keonjhar districts. Manganese deposits are available in Sundargarh, Keonjhar, Rayagada and Balangir districts and Dolomite is available plenty only in the district of Sundargarh. There are two major coal bearing areas in

the state which are currently being exploited namely Talcher and the Ib valley.<sup>1</sup>

The Government of Odisha holds out a plethora of possibilities adopting therewith a pragmatic approach to usher in balanced socio-economic growth in the State through industrialization, appropriate harnessing of natural resources and maximizing the employment potential of the local workforce.<sup>2</sup>

## **1.5 LEGAL ASPECTS**

The requisite NOCs and environmental clearance for under implementation plant have been obtained from the OSPCB and MOEF&CC respectively. The same will be obtained for expansion also. Company will adhere to the statutory provisions, as applicable, for the following:

1. The Factories Act, 1948
2. The Explosive Act, 1884 and the Explosive Rules 1983
3. Air (Prevention and Control of Pollution) Act, 1981
4. Water (Prevention and Control of Pollution) Act, 1974
5. Environment (Protection) Act, 1986 and Rules thereunder
6. Environmental (Protection) Rules, 1986 (and its Amendments till date)
7. Manufacture, Storage and Import of Hazardous Chemical Rules 1989 amended in 1994 and 2000. Hazardous Waste Management Rules, 2016
8. Solid Waste Management Rules, 2016
9. Construction and Demolition Waste Management Rules 2016
10. Plastic Waste Management Rules 2016 and amendment 2018
11. Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and amendments 2016, 2017, 2018
12. Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996
13. Ozone Depleting Substances (Regulation and Control) Rules, 2000
14. Environment Impact Assessment Notification 2006 and its amendments

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<sup>1</sup> Source: <http://www.Odishaminerals.gov.in/website/MineralProc.aspx?GL=mines&PL=2>

<sup>2</sup> Source: [http://www.Odishaminerals.gov.in/website/Govt\\_steel.aspx?GL=sip&PL=4](http://www.Odishaminerals.gov.in/website/Govt_steel.aspx?GL=sip&PL=4)

15. Batteries (Management and Handling) Rules, 2001 and amendment 2010
16. E-Waste Management Rules, 2016 and amendment 2018
17. Fly ash in construction activities, Responsibilities of Thermal Power Plants and Specifications for use of ash-based products/responsibility of other agencies, Notification, 1999 and amendment 2003, 2009, 2016
18. GSR 94(E): Mandatory Implementation of Dust Mitigation Measures for all Construction and Demolition Activities
19. Public Liability Insurance Act, 1991 and amendments till date
20. Motor Vehicles Act 1988 and the amendments thereunder
21. Noise Pollution (Regulation and Control) Rules 2000 and amendment 2000, 2002, 2017
22. Wildlife Protection Act, 1972 and amendments 2002, 2006
23. Forest (Conservation )Act, 1980
24. Wetland Rules, 2017
25. The Petroleum Act, 1934 and amendments thereunder

Compliance to State Rules and Notifications is being and will also be ensured along with the environmental clearance being sought for expansion to 3.55 MTPA under EIA Notification 2006 from MOEF&CC Government of India.

## **1.6 SCOPE OF STUDY- DETAILS OF REGULATORY SCOPING CARRIED OUT AS PER TERMS OF REFERENCE**

The Environmental Impact Assessment and Environment Management Plan for the steel plant addressing the environment related issues are prepared in accordance with the requirements of Terms of Reference (TOR) prescribed by Ministry of Environment, Forest and Climate Change, Govt. of India.

The study evaluates the prevailing environmental conditions. The adverse impacts have been identified and possible mitigation measures have been drawn in order to protect the environment. In order to carry out the study, the baseline environmental scenario has been established.

The main objectives of the present EIA study area:

- To record the proposed project details
- To establish the baseline environmental scenario.



- To identify, predict and assess the impacts of proposed future project on the environment.
- To prepare a detailed action plan for implementation of mitigation measures.
- To suggest preventive measures to minimize adverse impacts and to maximize beneficial impacts.
- To prepare a detailed action plan for implementation of mitigative measures
- To suggest a monitoring programme to evaluate the effectiveness of mitigation measures.
- To suggest the formation of a core group responsible for implementation of the EMP.
- To prepare a capital cost estimate for environment management plan.
- To address the concerns of disaster management and social development.

Any industrial project is expected to cause environmental impacts near the project site during its operation phase. The type and intensity of impacts on various components of the environment vary depending upon the nature and size of the project as well as its geographical location. The net impacts from individual project can be quantified through Environmental Impact Assessment studies of various components of environment such as noise, air, water, land, biological and socio- economic aspects. EIA studies form a basis for preparing an Environment Management Plan (EMP) to conserve the environment of the area. The total EIA study for a particular project site can be divided into three phases. The first is identification of significant environmental parameters and then assessing the existing (pre-project) status within the impact zone with respect to environmental descriptors. The second phase is prediction of impacts from proposed project on identified environmental parameters based on experience of other projects. The third phase includes the evaluation of total impacts after superimposing the predicted impacts over baseline data. This helps in incorporating proper mitigation measures wherever necessary for preventing deterioration in environmental quality.

The scope of the present study is to conduct EIA covering all the disciplines of environment and field monitoring in relevant disciplines over one full season of 3 (three) months (excluding monsoon months). The draft EIA report is prepared as per the MoEF&CC Notification dated 14.09.2006. After completion of the Public Consultation, all the environmental concerns expressed during the Public Consultation process have to be addressed and appropriate changes in the draft EIA Report are made accordingly to formulate the Final EIA Report. The final EIA Report is then presented to

the Expert Appraisal Committee (EAC) of MoEF&CC. Any queries raised will be clarified and replies will be submitted to them.

The project area is termed as "core zone". The area within 10 km radius around the periphery of the project boundary has been considered as the "buffer zone" for identifying and assessing impact with respect to air, water, noise, land use, ecology and socio-economic environment. The core zone and buffer zone together comprise the "study area". The studies covering all individual components of environment are described in detail in subsequent chapters.

Baseline environmental data was generated by Min Mec R&D Laboratory (NABL accredited &MOEF&CC recognised) as given in **Table 1.6**.

**TABLE 1.6: BASELINE DATA GENERATED**

| Description                                                                                                                                                                           | No. of locations                             | Total No of samples               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------------|
| <b>Air</b><br>Ambient air monitoring (24 hourly samples), twice a week for 3 months for one season<br>Parameters : PM10, PM2.5, SO <sub>2</sub> , NO <sub>2</sub> , CO                | 8<br>(one in core zone and 7 in buffer zone) | 192                               |
| Benzene, NH <sub>3</sub> , BaP, Arsenic, Selenium and Lead                                                                                                                            | 1 core zone                                  | 24                                |
|                                                                                                                                                                                       | 7 Buffer zone                                | 7                                 |
| <b>Meteorological parameters</b> measured at hourly duration simultaneously at one air monitoring station for 3 months for Wind speed, direction, relative humidity, temperature, etc | 1<br>(Core Zone)                             | 90 days                           |
| <b>Water</b><br>Water sample from various surface, ground & supply water sources in core and buffer zone (10 km radius) and tested for physical, chemical & biological parameters     | 16<br>(Surface-11)<br>(Ground-10)            | 16<br>(Surface-11)<br>(Ground-10) |
| <b>Soil</b>                                                                                                                                                                           | 9                                            | 9                                 |
| <b>Noise</b><br>Hourly readings taken for 24 hours (Leq)                                                                                                                              | 10                                           | 10                                |
| <b>Traffic volume survey</b>                                                                                                                                                          | 2                                            | 2                                 |

Secondary and primary data collection was done comprising of, but not restricted to the following:

- ❖ Long Term Climatic data from Indian Meteorological Department (IMD)

- ❖ Geo-hydrological aspects based on available data from various secondary sources
- ❖ Identification of water bodies, hills, roads etc. within 10 km radius from toposheet and google earth
- ❖ Details of fauna, flora, information in forests, major habitats, sanctuaries, sensitive places within a distance of 10 km from the project site (including forest details).
- ❖ Major industries within 10 km radius.
- ❖ Historical monuments and places of public importance within 10 km radius.
- ❖ Land use pattern within core zone and buffer zone (10 km radius around the core zone), Cropping pattern.
- ❖ Demography and Socio-economic based on last available Census data for entire study area

The preparation of the EIA/EMP has been done as per the generic structure prescribed in EIA Notification dated 14th September 2006 and its amendments, as follows:

❖ **Chapter 1: Introduction**

Covers purpose of the report, identification of project & project proponent, brief description of nature, size, location of the project and its importance to the country, region and scope of the study – details of regulatory scoping carried out (As per Terms of Reference)

❖ **Chapter 2: Project Description**

(Based on study of the reports like Pre-feasibility Report or Techno-economic Feasibility Report)

This includes Condensed description of those aspects of the project (based on project feasibility study), likely to cause environmental effects. Details such as type of project, project boundary & project site layout, size or magnitude of operation (including associated activities required by or for the project), project implementation schedule, technology and process description.

❖ **Chapter 3: Present Baseline Scenario**

The base line data generated and collected will be used to establish the present environmental scenario. This will cover the study area, period, components & methodology, establishment of baseline for valued environmental components, as identified in the scope and base maps of applicable environmental components.

**❖ Chapter 4: Environmental Impacts & Mitigation**

(Identification, prediction and evaluation of Anticipated Environmental Impacts due to the proposed plant and related facilities)

The impact assessment and mitigation is proposed for:

- \* Ambient air quality
- \* Surface and ground water quality & resources
- \* Noise levels
- \* Soil quality
- \* Topography
- \* Ecology
- \* Land use
- \* Socio-economic conditions
- \* Traffic density
- \* Occupational health and safety
- \* Sensitive Places/Historical Monuments etc.

Environmental management plan suggesting the environmental safeguards, abatement technology and pollution control measures as follows:

- Air, water, noise pollution control measures
- Solid waste management
- Traffic management
- Land use changes and mitigation
- Pronounce the improvement in socio-economic conditions and benefits the people will get on implementation of the project. Outlining corporate social responsibility.
- Green belt development plan & reclamation plan.
- Environmental monitoring, implementation organization and feedback mechanism to effect mid course corrections.
- Cost for Environmental Protection measure

**❖ Chapter 5: Analysis of Alternatives (Technology & Site).**

In case, the scoping exercise results in need for alternatives then description of each alternative, summary of adverse impacts of each alternative, mitigation measures proposed for each alternative and selection of alternative is done.

### ❖ Chapter 6: Environmental Monitoring Program

Technical aspects of monitoring the effectiveness of mitigation measures including measurement methodologies, frequency, location, data analysis, reporting schedules, detailed budget & procurement schedules.

### ❖ Chapter 7: Additional Studies

This shall comprise of public consultation, risk assessment, social impact assessment and R&R action plans or any other studies specified by MoEF&CC.

### ❖ Chapter 8 : Project benefits

This comprises of the improvements in the physical infrastructure, improvements in the social infrastructure, employment potential –skilled; semi-skilled and unskilled and other tangible benefits.

### ❖ Chapter 9: Environmental Cost Benefit Analysis

If recommended at the Scoping stage. In this case, it has not been prescribed.

### ❖ Chapter 10: Environmental Management Plan

Description of the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored, after approval of the EIA.

### ❖ Chapter 11: Executive Summary of EIA/EMP

This will constitute the summary of the EIA Report.

### ❖ Chapter 12: Disclosure of Consultants engaged

The names of the Consultants engaged with their brief resume and nature of Consultancy rendered.

## 1.7 STATUS OF LITIGATIONS

There are no litigations/ court cases pending against the project as on 31.09.2020.

## 1.8 COMPLIANCE OF TERMS OF REFERENCE (TOR)

The Standard Terms of Reference were prescribed online vide MoEF&CC letter no. J-11011/309/2018-IA.II(I) dated 19.09.2020. The copy of said letter is given in Annexure -1. **Table 1.7, 1.8, 1.9 & 1.10** gives the compliance of received Terms of Reference for expansion of Dhenkanal Steel Plant to 3.55 MTPA.

**TABLE 1.7: (2B) COMPLIANCE TO STANDARD TERMS OF REFERENCE  
FOR MINERAL BENEFICIATION PLANT ISSUED BY MOEF&CC**

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                  | <b>Compliance</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1              | The alternate sites considered, the relative merits and demerits and the reasons for selecting the proposed site for the Beneficiation Plant should be indicated  | It is a expansion project. Beneficiation plant is proposed inside proposed plant area, hence no alternate site were evaluated. Advantages of site are discussed in section 5.1 of Chapter 5.                                                                                                                                                                                                                                                                                       |
| 2              | Details of the technology and process involved for beneficiation should be given.                                                                                 | Technology selected after assessing the alternatives for beneficiation plant is given in section 5.2.1 of Chapter 5.<br>The beneficiation process is given in detail with technology, specification and other parameters in Section 2.3.1, Chapter 2.                                                                                                                                                                                                                              |
| 3              | Location of the proposed Plant w.r.t. the source of raw material and mode of transportations of the ore from mines to the beneficiation plant should be justified | The source of the Iron ore fines will be from companys mines/ OMC/other private mines from wherever it can become available. The transportation distance will vary according to the mines from which raw material has got available at any point of time. The ore will be transported to the plant through road and may come up to the nearest rail head Meramandli.                                                                                                               |
| 4              | Treatment of run of mine (ROM) and or of the fines/waste dump should be spelt out.                                                                                | Washery- ROM coal will be washed in three stream washery. The washed coal will be used in process, the middlings in power plant and the rejects will be temporarily stored till they can be sent back for backfilling in mine.<br>Pelletisation plant - ROM iron ore fines/ blue dust will be agglomerated and utilised in process. The waste dusts collected in the air pollution control systems shall be sent back to the mixing unit of the pelletisation plant for 100% reuse |
| 5              | Estimation of the fines going into the washings should be made and its management described                                                                       | In the coal washery no fines will be washed. Only ROM coal will be washed. The raw material for the                                                                                                                                                                                                                                                                                                                                                                                |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                   | <b>Compliance</b>                                                                                                                                                                                                                                                                                                                        |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                |                                                                                                                                                                                                                    | pellet plant will be 100% iron ore fines or blue dust (fines).                                                                                                                                                                                                                                                                           |
| 6              | Details of the equipment, settling pond etc. should be furnished.                                                                                                                                                  | In washery- there will be five stage clarification system which will have settling ponds and 100% reutilisation<br><br>In pellet plant, only agglomeration of fines shall be taking place and washing is required, hence, no settling pond shall be there.                                                                               |
| 7              | Detailed material balance should be provided                                                                                                                                                                       | Refer Table 2.4 of Chapter 2.                                                                                                                                                                                                                                                                                                            |
| 8              | Sources of raw material and its transportation should be indicated. Steps proposed to be taken to protect the ore from getting air borne should be brought out.                                                    | The source of the Iron ore fines will be from companys mines/ OMC/other private mines from wherever it can become available. The ore will be transported to the plant through road and may come up to the nearest rail head Meramandli.<br><br>Refer 4.4.2, Chapter 4 for mitigation measures proposed for control of fugitive emission. |
| 9              | Management and disposal of tailings and closure plan of the tailing pond, if any after the project is over, should be detailed in a quantified manner.                                                             | Tailings will be collected in small tailing pond, dewatered and dredged for 100% reutilisation as sand substitute in infrastructure/ fine concrete aggregate/ cement manufacture                                                                                                                                                         |
| 10             | The water requirement for the project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the project should also be indicated         | Refer section 2.12 of chapter 2. Water balance diagram is given in Fig 2.16 of chapter 2.                                                                                                                                                                                                                                                |
| 11             | A copy of the document in support of the fact that the Proponent is the rightful lessee of the unit should be given                                                                                                | A copy of EC letter in support of the fact that the proponent is the rightful is given in <b>Annexure II</b>                                                                                                                                                                                                                             |
| 12             | All documents including EIA and public hearing should be compatible with one another in terms of the production levels, waste generation and its management and technology and should be in the name of the lessee | All documents are compatible with one another as required.                                                                                                                                                                                                                                                                               |
| 13             | All corner coordinates of the Unit, superimposed on a High Resolution                                                                                                                                              | Coordinates are given in section 1.4.3.                                                                                                                                                                                                                                                                                                  |

| ToR No. | ToR Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Compliance                                                                                                                                                                                                                                                                |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | Imagery/Toposheet should be provided. Such an Imagery of the proposed Unit should clearly show the land use and other ecological features of the study area (core and buffer zone).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | The boundary is superimposed on google earth image and given in Fig 2.3, Chapter 2 and on satellite image in Fig 3.9, Chapter 3.                                                                                                                                          |
| 14      | It should be clearly indicated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report | Company has Environment Policy approved by Board of Director. The Environmental Policy is given in <b>Annexure XXV</b> and the salient features and infringement/ deviation/ violation reporting procedure with hierarchical system is given in section 6.5 of Chapter 6. |
| 15      | Issues relating to Safety should be detailed. The proposed safeguard measures in each case should also be provided. Disaster management plan shall be prepared and included in the EIA/EMP Report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Risk associated with the plant have been identified and given in section 7.1 of chapter 7.<br>Disaster Management Plan have been prepared and the same is given in Chapter 7 itself.                                                                                      |
| 16      | The study area will comprise of 10 km zone around the Plant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | EIA studies has been done for the study area of 10 km zone around the plant. Study area map is shown in Fig 3.1 of Chapter 3.                                                                                                                                             |
| 17      | Cumulative impact study of both Beneficiation Plant with suggested mitigation measures as per the study should be described                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Cummulative impact study have been done and furnished along with mitigation measures in the EIA report. Refer section 4.4.1 & 4.4.2, Chapter 4.                                                                                                                           |
| 18      | Location of Railway siding with its handling capacity and safety measures should be indicated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Not applicale as raw material required will be transported through road.                                                                                                                                                                                                  |
| 19      | Option to provide only silo for storage of minerals instead of open stacking to avoid fugitive dust should be explored and arrangements finalized justified                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | No silo arrangement has been proposed.                                                                                                                                                                                                                                    |



| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Compliance</b>                                                                                                                                                                                                                                                                                  |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20             | Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.                                                                                                                                                                                              | Land use pattern of the study area are given in Table 3.16, chapter 3 and interpretation of landuse as per recent satellite imagery have been presented in section 3.9.3, chapter 3.                                                                                                               |
| 21             | Details of the land for any Over Burden Dumps outside the lease, such as extent of land area, distance from lease, its land use, R&R issues, if any, should be given                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Area for storage of solid waste is 116 acres (after expansion). No R&R is required in expansion phase. There is displacement of 54 families which have been rehabilitated & resettled as per R&R Policy, Government of Odisha. Compensation has already been paid through IDCO as per previous EC. |
| 22             | A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the Project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees | 7.8 acres of Forest land is present within existing plant area. Stage II forest clearance has been obtained from MOEF&C vide letter no. 5-ORB207/2014-BHU dated 02.07.2015.                                                                                                                        |
| 23             | Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished                                                                                                                                                                                                                                                                                                                                                             | Refer point above.                                                                                                                                                                                                                                                                                 |
| 24             | Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.                                                                                                                                                                                                                                                                                                                                                                                                                                             | Not Applicable                                                                                                                                                                                                                                                                                     |

| ToR No. | ToR Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Compliance                                                                                                                                                                                                                                                                                                                                                                                    |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 25      | The vegetation in the RF / PF areas in the study area, with necessary details, should be given                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Refer section 3.11.2, Chapter 3.                                                                                                                                                                                                                                                                                                                                                              |
| 26      | A study shall be got done to ascertain the impact of the Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted                                                                                                                                                                                                                                                                                                                                                                                                       | A "Site Specific Conservation Plan" has been approved with respect to Dhenkanal Steel Plant by PCCF (WL) vide letter no. 3188/1 WL-SSP-10/2015 dated Bhubaneswar the 9 <sup>th</sup> April, 2015 Copy of the letter is enclosed as <b>Annexure XXX</b>                                                                                                                                        |
| 27      | Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished                                                                                                                                                                                                          | Not applicable as no National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animal is present within 10 km radius of plant.                                                                                                                                                                                                                                             |
| 28      | A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled I fauna found in the study area, the necessary plan alongwith budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost. | No Schedule I animals observed in the study area.<br>Authenticated lists of flora & fauna are attached in <b>Annexure XVI</b> .<br><br>A "Site Specific Conservation Plan" has been approved with respect to Dhenkanal Steel Plant by PCCF (WL) vide letter no. 3188/1 WL-SSP-10/2015 dated Bhubaneswar the 9 <sup>th</sup> April, 2015 Copy of the letter is enclosed as <b>Annexure XXX</b> |
| 29      | Proximity to Areas declared as 'Critically Polluted' shall also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB/CPCB shall be secured and furnished to the effect that the proposed activities could                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Nearest 'Critically Polluted' area is Angul-Talcher at 21.8 km, NW, aerially from plant                                                                                                                                                                                                                                                                                                       |

| ToR No. | ToR Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Compliance                                                                                                                                                                                                                                                                                 |
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|         | be considered                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                            |
| 30      | Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the unit w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority)                                                                                                                                                                                                                                                                                                                                                                                                                    | Plant does not lie in coastal area.                                                                                                                                                                                                                                                        |
| 31      | R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects, should be discussed in the report | There is no habitation in the project area. No displacement is involved in expansion phase<br>There was displacement of 54 families which have been rehabilitated & resettled as per R&R Policy, Government of Odisha. Compensation has already been paid through IDCO as per previous EC. |
| 32      | One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Sitespecific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the unit in the pre-dominant                                 | Monitoring period from March 2019 to May 2019 and the same have been complied in EIA/EMP report.<br>The Air sampling stations and justification for selecting the stations are tabulated in Table 3.5 of Chapter 3.                                                                        |

| ToR No. | ToR Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Compliance                                                                                                                                                                                                           |
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|         | downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                      |
| 33      | Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map. | Refer <b>Annexure XX</b>                                                                                                                                                                                             |
| 34      | The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.                                                                                                                                                                                                                                                                                                                                                                | Refer section 2.12 of chapter 2.                                                                                                                                                                                     |
| 35      | Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be secured and copy furnished.                                                                                                                                                                                                                                                                                                                                                                                                                       | Water withdrawal permission & recommendation letter are given in <b>Annexure IV</b> .                                                                                                                                |
| 36      | Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.                                                                                                                                                                                                                                                                                                                                                                                | Methods to be adopted for water conservation are:<br>1. Rain water harvesting, details given in section 4.6.6 of Chapter 4<br>2. Recycling of treated waste, as per water balance seen in section 2.12.1, Chapter 2. |
| 37      | Impact of the project on the water quality, both surface and groundwater should be assessed and necessary safeguard measures, if any required, should be provided.                                                                                                                                                                                                                                                                                                                                                                                                    | Impact of the project on the water quality both surface and ground water and its mitigation is given in section 4.6 of Chapter 4.                                                                                    |
| 38      | Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.                                                                                                                                                                                                                                                                                                                                                                        | Refer Section 4.2.2 of Chapter 4                                                                                                                                                                                     |
| 39      | A time bound Progressive Greenbelt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Refer Section 4.10.2 of Chapter 4                                                                                                                                                                                    |

| ToR No. | ToR Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Compliance                                              |
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|         | Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the project. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to the pollution |                                                         |
| 40      | Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered                | The impact has been assessed in Section 4.9, Chapter 4. |
| 41      | Details of the onsite shelter and facilities to be provided to the workers should be included in the EIA report                                                                                                                                                                                                                                                                                                                                                                          | Refer section 4.12.6 chapter 4                          |
| 42      | Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area should be detailed                                                                                             | Please refer section 4.12, Chapter 4                    |
| 43      | Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations                                                                                                                                                                                                                                                         | Please refer section 4.12, Chapter 4                    |
| 44      | Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be                                                                                                                                                                                                                                                                                    | Please refer section 4.11, Chapter 4                    |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                               | <b>Compliance</b>                                                                                                                                                                          |
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|                | given with time frames for implementation                                                                                                                                                                                                      |                                                                                                                                                                                            |
| 45             | Public hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project                   | Public Hearing is yet to be held                                                                                                                                                           |
| 46             | Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the project should be given                                                                                                | No litigation pending against the project till date                                                                                                                                        |
| 47             | The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.                                                                                                       | Please refer section 6.4, Table 6.2 and 6.3, Chapter 6                                                                                                                                     |
| 48             | A brief background of the Project, its financial position, Group Companies and legal issues etc should be provided with past and current important litigations if any                                                                          | Please refer Section 1.3, chapter 1                                                                                                                                                        |
| 49             | Benefits of the Project, if the project is implemented should be outlined. The benefits of the projects shall clearly indicate environmental, social, economic, employment potential, etc.                                                     | Refer Chapter 8                                                                                                                                                                            |
| 50             | Besides the above, the below mentioned general points are also to be followed:-                                                                                                                                                                |                                                                                                                                                                                            |
| a              | Executive Summary of the EIA/EMP Report                                                                                                                                                                                                        | Executive Summary of the project is given in chapter 11 of the EIA/EMP report.                                                                                                             |
| b              | All documents to be properly referenced with index and continuous page numbering                                                                                                                                                               | All documents to be properly referenced with index and page number.                                                                                                                        |
| c              | Where data are presented in the report especially in Tables, the period in which the data were collected and the sources should be indicated                                                                                                   | Complied                                                                                                                                                                                   |
| d              | Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the project | Water, Air, Soil Noise etc. data has been collected by Min Mec R & D Laboratory, New Delhi (NABL accredited lab) and the same has been enclosed as various annexures with this EIA report. |
| e              | Where the documents provided are in a                                                                                                                                                                                                          | complied                                                                                                                                                                                   |

| ToR No. | ToR Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Compliance |
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|         | language other than English, an English translation should be provided                                                                                                                                                                                                                                                                                                                                                                                                                |            |
| f       | The Questionnaire for environmental appraisal of project as devised earlier by the Ministry shall also be filled and submitted.                                                                                                                                                                                                                                                                                                                                                       | complied   |
| g       | While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should also be followed                                                                                                                                                                                                                | complied   |
| h       | Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation | Agreed     |
| i       | As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified Report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project by the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.                                                                                                                                                              | Complied   |

**TABLE 1.8: (3A) COMPLIANCE TO STANDARD TERMS OF REFERENCE FOR METALLURGICAL INDUSTRIES (FERROUS & NON FERROUS) ISSUED BY MOEF&CC**

| ToR No.                                           | ToR Point                                                    | Compliance                                                                     |
|---------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------|
| <b>Generic ToRs in respect of Industry Sector</b> |                                                              |                                                                                |
| <b>1.</b>                                         | <b>Executive Summary</b>                                     | Executive Summary of the project is given in chapter 11 of the EIA/EMP report. |
| <b>2</b>                                          | <b>Introduction</b>                                          |                                                                                |
| i)                                                | Details of the EIA Consultant including NABET accreditation. | Refer chapter 12.                                                              |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                             | <b>Compliance</b>                                                                                                                                                                                             |
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| ii)            | Information about the project proponent                                                                                                                      | Information about the project proponent is given in section 1.3 of Chapter 1.                                                                                                                                 |
| iii)           | Importance and benefits of the project                                                                                                                       | For importance of the project refer section 1.4.5 of Chapter 1.<br>Benefits of project is given in Chapter 8                                                                                                  |
| <b>3.</b>      | <b>Project Description</b>                                                                                                                                   |                                                                                                                                                                                                               |
| i)             | Cost of project and time of completion.                                                                                                                      | Cost of the expansion project will be Rs. 5500 crores. Proposed time schedule for implementation of project shall be 84 months from date of receipt of EC                                                     |
| ii)            | Products with capacities for the proposed project                                                                                                            | Please refer section 2.1 of Chapter 2.                                                                                                                                                                        |
| iii)           | If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.     | Please refer Table 1.2 of chapter 1                                                                                                                                                                           |
| iv)            | List of raw materials required and their source along with mode of transportation                                                                            | Refer section 2.9, of Chapter 2                                                                                                                                                                               |
| v)             | Other chemicals and materials required with quantities and storage capacities                                                                                | Please refer section 2.9 of Chapter 2 for consolidated list of raw materials                                                                                                                                  |
| vi)            | Details of Emission, effluents, hazardous waste generation and their management.                                                                             | Please refer Chapter 4<br>Section 4.4.1, Table 4.1 for emissions;<br>Section 4.6.2, Table 4.10 for effluents;<br>Section 4.7.1 Table 4.12 for solid waste                                                     |
| vii)           | Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)                  | Please refer the following of Chapter 2:<br>Water : Section 2.12, Fig. 2.16<br>Power: Section 2.11 and Table 2.42<br>Manpower : Section 2.13<br>Agreement of source of water is given in <b>Annexure IV</b> . |
| viii)          | The project proponent shall furnish the requisite documents from the competent authority in support of drawl of ground water and surface water and supply of | The estimated sanctioned make-up water requirement for the Complete Steel Plant is 2981 cum per hour. Water withdrawal permission of                                                                          |



| ToR No. | ToR Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Compliance                                                                                                                                                                                                                                                                                                             |
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|         | electricity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2950 cum/hr from Bramhani River has been obtained from the Water Resource Department, Govt. Of Odisha. Additional 771 KLH water will be required for the proposed expansion, for which IPOCOL recommended dated 02.07.2020 Copy given in <b>Annexure IV</b> .                                                          |
| ix)     | Process description along with major equipment and machineries, process flow sheet (quantitative) from raw material to products to be provided                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Please refer section 2.3 of Chapter 2 for flow sheet of manufacturing process in proposed steel plant                                                                                                                                                                                                                  |
| X)      | Hazard identification and details of proposed safety systems                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Please refer Chapter 7.                                                                                                                                                                                                                                                                                                |
| xi      | <b>Expansion/modernization proposals</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                        |
| a)      | Copy of all the Environmental Clearance(s) including Amendments there to obtain for the project from MOEF/SEIAA shall be attached as an Annexure.<br><br>A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30 <sup>th</sup> May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing/ existing operation of the project from SPCB shall be attached with the EIAEMP report. | EC is granted by MOEF&CC have been listed in section 1.1 of chapter 1. Copy of ECs are given in <b>Annexure II</b> )<br><br>A certified report of the latest monitoring of the Regional office Bhubaneswar is enclosed as <b>Annexure XXVI</b> .<br><br>Consent to Establish (CTE) is given in <b>Annexure XXIII</b> . |
| b)      | In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and /or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005 - 2006) obtained from the SPCB shall be                                                                                                                                                                                                                         | For existing capacity, EC has been obtained and given as <b>Annexure II</b> .                                                                                                                                                                                                                                          |

| ToR No.  | ToR Point                                                                                                                                                                                                                                                                        | Compliance                                                                                     |
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|          | submitted. Further, Compliance report to the conditions of consents from the SPCB shall be submitted                                                                                                                                                                             |                                                                                                |
| <b>4</b> | <b>Site Details</b>                                                                                                                                                                                                                                                              |                                                                                                |
| i)       | Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.                                                                                                                     | Project location is shown in Fig. 1.1, of Chapter 1                                            |
| ii)      | A topo-sheet of the study area of radius of 10 km and site location on 1:50,000/ 1:25,000 scale on an A3/A2 sheet (including all eco-sensitive areas and environmentally sensitive places).                                                                                      | Please refer Fig 3.1 of Chapter 3                                                              |
| iii)     | Co-ordinates (lat-long) of all four corners of the site.                                                                                                                                                                                                                         | Refer section 1.4.3 of chapter 1.                                                              |
| iv)      | Google map-Earth downloaded of the project site.                                                                                                                                                                                                                                 | Please refer Fig. 2.2 of Chapter 2.                                                            |
| v)       | Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, green belt area, utilities etc. If located within an industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate. | Please refer Fig 2.1 of Chapter 2                                                              |
| vi)      | Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/ greenbelt, in particular.                                                                                                                                      | Please refer Fig 2.2 of Chapter 2.                                                             |
| vii)     | Land use break-up of total land of the project site (identified and acquired), government / private- agriculture, forest, wasteland, water bodies, settlements, etc. shall be included (not required for industrial area).                                                       | Please refer section 3.9.1 of Chapter 3.                                                       |
| viii)    | A list of major industries with name and type within study area (10 km radius) shall be incorporated. Land use details of the study area.                                                                                                                                        | List of industries in 10 km radius is given in Table 3.25 and shown in fig. 3.16 of Chapter 3. |
| ix)      | Geological features and Geo-hydrological status of the study area shall be included                                                                                                                                                                                              | Geological features and Geo hydrological status is given in section 3.6.2 of Chapter 3.        |
| x)       | Details of Drainage of the project up to 5 km radius of study area. If the site is                                                                                                                                                                                               | Refer section 3.2.2 of Chapter 3                                                               |

| ToR No.   | ToR Point                                                                                                                                                                                                                                                                                                                                                    | Compliance                                                                                                                                                                                                       |
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|           | within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided (mega green field projects).                                                      |                                                                                                                                                                                                                  |
| xi)       | Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.                                                                                                                                                                                                        | Please refer section 3.9.1 of Chapter 3                                                                                                                                                                          |
| xii)      | R & R details in respect of land in line with State Government policy                                                                                                                                                                                                                                                                                        | There is displacement of 54 families which have been rehabilitated & resettled as per R&R Policy, Government of Odisha. Compensation has already been paid through IDCO. No R&R is proposed for expansion phase. |
| <b>5.</b> | <b>Forest and Wildlife related issues (if applicable)</b>                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                  |
| i)        | Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department (if applicable)                                                                                                                                                                                                          | Stage II forest clearance has been obtained from MOEF&C vide letter no. 5-ORB207/2014-BHU dated 02.07.2015                                                                                                       |
| ii)       | Land use map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)                                                                                                                                                                                    | Land use map based on High resolution satellite imagery (GPS) is given in Fig 3.9 of Chapter 3.                                                                                                                  |
| iii)      | Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.                                                                                                                                                                                                                                    | Stage II forest clearance has already been obtained from MOEF&C vide letter no. 5-ORB207/2014-BHU dated 02.07.2015                                                                                               |
| iv)       | The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animal; the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-a-vis the project location and the recommendations or comments of the Chief Wildlife Warden - thereon. | No National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animal is present within 10 km radius of plant                                                                                   |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                                                                                                                                                              | <b>Compliance</b>                                                                                                                                                                                                                                        |
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| v)             | Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the state government for conservation of schedule I fauna, if any exists in the study area.                                                                                                                                                                                                     | A “Site Specific Conservation Plan” has been approved with respect to Dhenkanal Steel Plant by PCCF (WL) vide letter no. 3188/1 WL-SSP-10/2015 dated Bhubaneswar the 9 <sup>th</sup> April, 2015 Copy of the letter is enclosed as <b>Annexure XXX</b> . |
| vi)            | Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife.                                                                                                                                                                                                                          | Not applicable as no National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animal is present within 10 km radius of plant.                                                                                                        |
| <b>6.</b>      | <b>Environmental Status</b>                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |
| i)             | Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.                                                                                                                                                                              | The site specific micro-meteorological data has been collected from the site during March to May 2019. Micrometeorology data is given in <b>Annexure VI</b> and is summarized in section 3.4 of Chapter 3                                                |
| ii)            | AAQ data (except monsoon) at 8 locations for PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>x</sub> , CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests. | The AAQ data has been collected from the site during March to May 2019. AAQ data is given in <b>Annexure VII</b> and is summarized in Table 3.8 of Chapter 3. Location of sampling stations is given in Table 3.6 and shown in Fig. 3.6 of Chapter 3.    |
| iii)           | Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQPM Notification of Nov. 2009 along with min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.                                                                                    | AAQ data is given in <b>Annexure VII</b> and is summarized in Table 3.8 of Chapter 3.                                                                                                                                                                    |
| iv)            | Surface water quality of nearby River (60m upstream and downstream) and other surface drains at eight locations as per CPCB/MoEF& CC guidelines.                                                                                                                                                                                                                              | The analysis results of surface water quality of the study area are presented in <b>Annexure IX</b> Locations of sampling stations are shown in Fig. 3.6 of Chapter 3.                                                                                   |
| v)             | Whether the site falls near to polluted stretch of river identified by the CPCB /                                                                                                                                                                                                                                                                                             | The site does not falls near to polluted stretch of river identified by                                                                                                                                                                                  |

| ToR No.   | ToR Point                                                                                                                                                                                                                                                                                      | Compliance                                                                                                                                                                                                                                                                                                                                                                                   |
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|           | MoEF& CC.                                                                                                                                                                                                                                                                                      | the CPCB / MoEF& CC.                                                                                                                                                                                                                                                                                                                                                                         |
| vi)       | Ground water monitoring minimum at 8 locations shall be included                                                                                                                                                                                                                               | The analysis results of ground water and surface water quality of the study area are presented in <b>Annexure IX</b> and Surface & ground water summarized results is given in Table 3.10 and 3.11 of Chapter 3. Locations of sampling stations are given in Table 3.9 and shown in Fig. 3.6 of Chapter 3.                                                                                   |
| vii)      | Noise levels monitoring at 8 locations within the study area.                                                                                                                                                                                                                                  | Results of ambient noise measurements are presented in <b>Annexure XI</b>                                                                                                                                                                                                                                                                                                                    |
| viii)     | Soil Characteristics as per CPCB guidelines.                                                                                                                                                                                                                                                   | Soil Characteristics as per CPCB guidelines is given in Table 3.18 of Chapter -3. Test report is enclosed as <b>Annexure XXVII</b> .                                                                                                                                                                                                                                                         |
| ix)       | Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.                                                                                                                       | Traffic density is monitored at 1 location and shown in Fig. 3.6 of Chapter 3. The details are given in <b>Annexure XIV</b> .                                                                                                                                                                                                                                                                |
| x)        | Detailed description on flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished. | The details of flora and fauna are given in section 3.11 of Chapter 3. List of flora and fauna is given in <b>Annexure XVI</b> .<br>A "Site Specific Conservation Plan" has been approved with respect to Dhenkanal Steel Plant by PCCF (WL) vide letter no. 3188/1 WL-SSP-10/2015 dated Bhubaneswar the 9 <sup>th</sup> April, 2015 Copy of the letter is enclosed as <b>Annexure XXX</b> . |
| xi)       | Socio-economic status of the study area.                                                                                                                                                                                                                                                       | Socio-economic status of the study area as per census 2011 is given in <b>Annexure XVIII</b> and summarized in section 3.12 of Chapter 3.                                                                                                                                                                                                                                                    |
| <b>7.</b> | <b>Impact Assessment and Environment Management Plan</b>                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                              |
| i)        | Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on hilly terrain                                                                                                                 | Please refer section 4.4.1.1, Chapter 4 and <b>Annexure XXI</b> .                                                                                                                                                                                                                                                                                                                            |

| ToR No. | ToR Point                                                                                                                                                                                                                                                                                                                                                                                                                                         | Compliance                                                                                                                                                                                                                                                                                                              |
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|         | characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be well assessed. Details of the model used and the input data used for modeling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any. |                                                                                                                                                                                                                                                                                                                         |
| ii)     | Water Quality modeling- in case, if the effluent is proposed to be discharged in to the local drain, then Water Quality Modeling study should be conducted for the drain water taking into consideration the upstream and downstream quality of water of the drain.                                                                                                                                                                               | The project will not discharge any effluent in any natural local drain. All the effluent will be treated and reused within as well as outside plant. The reused water will get evaporated or trans-evaporated and, therefore, no seepage to ground water will occur. Hence, no water modelling study has been conducted |
| iii)    | Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.                                                                                                                      | Impact of transportation is given in section 4.9.1 of chapter 4.                                                                                                                                                                                                                                                        |
| iv)     | A note on treatment of waste water from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.                                                                                                                                                 | Refer section 4.6.3 of Chapter 4                                                                                                                                                                                                                                                                                        |
| v)      | Details of stack emission and action plan for control of emissions to meet standards.                                                                                                                                                                                                                                                                                                                                                             | The prediction modeling for Ground Level Concentration of pollutants from the stack emissions is given in section 4.4.1.1 of Chapter 4 and the detailed study is given in <b>Annexure XX</b> .                                                                                                                          |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                                                                                                                                    | <b>Compliance</b>                                                                                                                                                                                                  |
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| vi)            | Measures for fugitive emission control                                                                                                                                                                                                                                                                                                              | Measures for fugitive emission control is given in section 4.4.1.2 of chapter 4                                                                                                                                    |
| vii)           | Details of hazardous waste generation, and their storage, utilization and disposal. Copies of MOU regarding utilization of solid and hazardous waste shall also be included. EMP shall include the concept of waste minimization, recycle/ reuse/ recover techniques, Energy conservation, and natural resource conservation                        | Please Refer Section 4.7.2, Chapter 4                                                                                                                                                                              |
| viii)          | Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.                                                                                                                                                                                                                      | Ash utilization is given in Section 4.7.2.4 of Chapter 4                                                                                                                                                           |
| ix)            | Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated. | The green belt area kept in the proposed setup is about 33% i.e. 90.11 ha of total plant area and it will be maintained. Details are given in section 4.10.2 of Chapter 4 and can be seen in Fig 2.1 of Chapter 2. |
| x)             | Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.                              | Rain water harvesting measures will be practised proposed project. The details are given in section 4.6.6 of Chapter 4.                                                                                            |
| xi)            | Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.                                                                                                                                                                                                                                         | Total capital and recurring cost per annum for environmental pollution control measures is given in section 6.4 of Chapter 6.                                                                                      |
| xii)           | Action plan for post-project environmental monitoring shall be submitted.                                                                                                                                                                                                                                                                           | Refer section 6.3 of Chapter 6.                                                                                                                                                                                    |
| xiii)          | Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be                                                                                                                                                                      | Please refer Chapter 7                                                                                                                                                                                             |

| ToR No.   | ToR Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Compliance                                                                                                                                                                                                                                                                                       |
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|           | linked with District Disaster Management Plan                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                  |
| <b>8.</b> | <b>Occupational health:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                  |
| i)        | Details of existing Occupational & Safety Hazards. What are the exposure levels of above mentioned hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved.                                                                                                                                                           | Refer section 4.12 of Chapter 4.<br>The exposure levels will be maintained within the prescribed limits of the Second Schedule of the Factories Act, 1948 and its amendments till date, for CO (<55 mg/m <sup>3</sup> for 8 hours) and iron oxide fumes (<5 mg/m <sup>3</sup> for 8 hours).      |
| ii)       | Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre-placement and periodical examinations give the details of the same. Details regarding last month analyzed data of abovementioned parameters as per age, sex, duration of exposure and department wise. | It is a new plant, data shall be collected on commencement of operation. Proposed plan of OHS management is given in section 4.12 of Chapter 4.                                                                                                                                                  |
| iii)      | Annual report of health status of workers with special reference to Occupational Health and Safety.                                                                                                                                                                                                                                                                                                                                                                           | Annual health data shall be collected on commencement of operation. Proposed plan of OHS management is given in section 4.12 of Chapter 4. Format for monitoring is given in <b>Annexure XXVIII</b> . Summary of OHS monitoring of workers of Dhenkanal Plant is given in <b>Annexure XXIX</b> . |
| iv)       | Plan and fund allocation to ensure the occupational health and safety of all contract and casual workers.                                                                                                                                                                                                                                                                                                                                                                     | Refer section 10.3 & Table 10.3 of Chapter 10                                                                                                                                                                                                                                                    |
| <b>9.</b> | <b>Corporate Environment Policy:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                  |
| i)        | Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.                                                                                                                                                                                                                                                                                                                                    | The Company has formulated a Corporate Environment Policy and it has been duly approved by the Board of Directors vide agenda item no. 6 of minutes of meeting/ resolution dated 10.12.2018 (copy enclosed as <b>Annexure XXV</b> ).                                                             |



| ToR No. | ToR Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Compliance                                                                                                                          |
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| ii)     | Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.                                                                                                                                                                                                                                                                                                                                                                                                                         | Yes, refer section 6.5 of Chapter 6.                                                                                                |
| iii)    | What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.                                                                                                                                                                                                                                                                                                                                                                                                                                      | Refer section 6.5 of Chapter 6                                                                                                      |
| iv)     | Does the company have system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report.                                                                                                                                                                                                                                                                                                                                                                                                         | Refer section 6.5 of Chapter 6                                                                                                      |
| 10      | Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.                                                                                                                                                                                                                                                                                                                                                                                                                                     | During the construction of proposed project, all facilities will be arranged for the labour force. Refer section 2.13 of Chapter 2. |
| 11      | <b>Enterprise Environment Responsibility (CER)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                     |
| i       | To address the Public Hearing issues, an amount as specified under Ministry's Office Memorandum vide F. No. 22-65/2017-IA.III dated 1 <sup>st</sup> May 2018 amounting to Rs..... crores, shall be earmarked by the project proponent, towards Corporate Environment Responsibility (CER). Distinct CER projects shall be carved out based on the local public hearing issues. Project estimate shall be prepared based on PWD schedule of rates for each distinct Item and schedule for time bound action plan shall be prepared. These CER projects as indicated by the project proponent shall be implemented along with the main project. Implementation of | Refer section 8.5 of chapter 8                                                                                                      |

| ToR No.  | ToR Point                                                                                                                                                                                                                                                                                                                                          | Compliance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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|          | such program shall be ensured by constituting a Committee comprising of the project proponent, representatives of village Panchayat & District Administration. Action taken report in this regard shall be submitted to the Ministry's Regional Office. No free distribution/donations and or free camps shall be included in the above CER budget |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 12       | Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water                                              | No litigation has arisen or pending against and/ or any direction/ order passed by any Court of Law against the plant till date.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 13       | A tabular chart with index for point wise compliance of above TORs.                                                                                                                                                                                                                                                                                | Please refer Table 1.7 to 1.10, Chapter 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>B</b> | <b>Specific terms of reference for EIA studies for metallurgical Industries (Ferrous &amp; Non Ferrous)</b>                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 1)       | Complete process flow diagram describing each unit, its processes and operations, along with material and energy inputs & outputs (material and energy balance).                                                                                                                                                                                   | Refer following sections, figures and Tables of Chapter 2 for Process description, flow sheet and material balance<br>Beneficiation plant- Section 2.3.1, Table 2.4<br>Pelletisation Plant- Section 2.3.2, Fig. 2.4, Table 2.6<br>Coal washery-Section 2.3.3, Fig. 2.5, Table 2.9<br>DRI Plant -Section 2.3.4, Fig. 2.6, Table 2.11<br>Mini Blast furnace - section 2.3.5, Fig. 2.7 and Table 2.13<br>Sinter Plant-Section 2.3.6, Fig. 2.8, Table 2.15<br>Coke Oven Plant -Section 2.3.7, Fig. 2.9 & Table 2.17<br>SMS through IF-LRF-CCM route-Section 2.3.8.1, Fig. 2.10, Table 2.19 |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                   | <b>Compliance</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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|                |                                                                                                                    | <p>SMS through EAC-LRF-CCM route- Section 2.3.8.2, Fig. 2.11, Table 2.21</p> <p>CCM- section 2.3.8.3, Table 2.22</p> <p>Rolling Mill- section 2.3.9.1, Table 2.24 &amp; Fig 2.12.</p> <p>Strip Mill- section 2.3.9.2, Table 2.26.</p> <p>DIP- section 2.3.9.3, Table 2.28 &amp; Fig. 2.13.</p> <p>Producer gas plant- section 2.4, Table 2.30.</p> <p>Oxygen plant- section 2.5, Table 2.32.</p> <p>Lime Plant- section 2.6, Table 2.34.</p> <p>Cement Plant- section 2.7, Table 2.36 &amp; Fig 2.14.</p> <p>CPP-WHRB- section 2.8.1</p> <p>CPP-AFBC/CFBC- section 2.8.2, Table 2.39.</p> |
| 2)             | Details on blast furnace/ open hearth furnace/ basic oxygen furnace/ladle refining, casting and rolling plants etc | Please refer section 2.3.5, Chapter 2 For other processes please refer point 2 above                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 3)             | Details on installation/activation of opacity meters with recording with proper calibration system                 | Online stack monitoring systems will be installed which will be connected to OSPCB/ CPCB and monitor the pollutants emitted.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4)             | Details on toxic metals including mercury, arsenic and fluoride emissions                                          | The heavy metals have been measured in the raw materials and the results have been given in Chapter 3, Table 3.26.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 5)             | Details on stack height requirement for integrated steel                                                           | Please refer table 4.4.1.1, Chapter 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 6)             | Details on ash disposal and management -Non-ferrous metal                                                          | Please refer table 4.7, Chapter 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 7)             | Complete process flow diagram describing production of lead/zinc/copper/ aluminium, etc.                           | Process flow diagrams of various units are given in their respective sections of Chapter 2. For all processes please refer point 2 above                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 8)             | Raw materials substitution or elimination                                                                          | Please refer the material balances and processes described in section 2.3, Chapter 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                     | <b>Compliance</b>                                                                                                                                                                                                                               |
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| 9)             | Details on smelting, thermal refining, melting, slag fuming, and Waelz kiln operation                                                                                | Please refer the processes described in section 2.3, Chapter 2                                                                                                                                                                                  |
| 10)            | Details on Holding and de-gassing of molten metal from primary and secondary aluminum, materials pre-treatment, and from melting and smelting of secondary aluminium | Not applicable as no melting or smelting of aluminum is proposed.                                                                                                                                                                               |
| 11)            | Details on solvent recycling                                                                                                                                         | No solvent generation is anticipated in any of the proposed processes, hence, not applicable                                                                                                                                                    |
| 12)            | Details on precious metals recovery                                                                                                                                  | No precious metals usage is envisaged, hence, no precious metals recovery is proposed                                                                                                                                                           |
| 13)            | Details on composition, generation and utilization of waste/fuel gases from coke oven plant and their utilization.                                                   | Please refer section 2.3.7, Chapter 2 for process details, table 2.17 for material balance and fig 2.9 for process flow sheet. Refer section 4.4.3.8 for emission and table 4.14 for solid waste generation and utilization from various units. |
| 14)            | Details on toxic metal content in the waste material and its composition and end use (particularly of slag).                                                         | Please refer table 3.27, Chapter 3                                                                                                                                                                                                              |
| 15 )           | Trace metal mercury, arsenic and fluoride emissions in the raw materials                                                                                             | The heavy metals have been measured in the raw materials and the results have been given in Chapter 3, Table 3.26                                                                                                                               |
| 16)            | Trace metal in waste material especially slag                                                                                                                        | The heavy metals in slag have been measured and the results have been given in Chapter 3, Table 3.27                                                                                                                                            |
| 17)            | Plan for trace metal recovery                                                                                                                                        | 100% of the SMS (from IF & EAF) slag will be given for metal recovery, converted to aggregates (special balls) and used in road making. The BF slag will be ground and used for cement making in the proposed cement plant within the project.  |
| 18             | Trace metals in water                                                                                                                                                | Please refer <b>Annexure IX</b> and Table 3.10 and 3.11, Chapter 3                                                                                                                                                                              |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                                                                     | <b>Compliance</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| <b>C</b>       | <b>Additional TORs for Integrated Steel Plant</b>                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 1              | Iron ore/ coal linkage documents along with the status of environmental clearance for limestone and coal mines                                                                                                                                                                       | <p><b>Iron ore:</b> It shall be source from Sanindpur Iron ore Mines of M/s Rungta Sons Private Limited/ OMC/ Other private Mines. EC letter is enclosed as <b>Annexure III</b></p> <p><b>Coal:</b> Company shall be participating in the proposed e-Auction of Coal Block to cater the coal requirement of the project. It is proposed to import coal (from South Africa, Indonesia, etc) and also use domestic coal procured through e-auction or from commercial suppliers.</p> |
| 2              | Quantum of generation of coal and limestone from coal & limestone mines and the projects they cater to.                                                                                                                                                                              | Since these will be procured from open market and different sources, information about their production can be obtained when the plant becomes operational.                                                                                                                                                                                                                                                                                                                        |
| 3              | For large ISPs, a 3-D view i.e.DEM (Digital Elevation Model) for the area in 10 km radius from the proposal site.                                                                                                                                                                    | A Digital Elevation Model for the 10 km radius is given in Fig 3.2 of Chapter 3.                                                                                                                                                                                                                                                                                                                                                                                                   |
| 4              | Recent land use based on satellite imagery. High resolution satellite image data having 1m-5m spatial resolution like quickbird, Ikonos, IRS P-6 pan sharpened etc. for the 10 Km radius area from proposed site. The same shall be used for land use/land-cover mapping of the area | The Satellite Imagery is given in Fig 3.9 of Chapter 3.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 5              | PM (PM 10 and PM 2.5 ) present in the ambient Air must be analyzed for source analysis – Natural dust/RSPM generated from Plant (trace elements) of PM <sub>10</sub> to be carried out.                                                                                              | Please refer Table 3.8, of chapter 3 for trace elements of PM <sub>10</sub> .                                                                                                                                                                                                                                                                                                                                                                                                      |
| 6              | All Stock piles will have to be on top of a stable liner to avoid leaching of materials to ground water                                                                                                                                                                              | Details given in section 4.5.2 and 4.7.2, of Chapter 4.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 7              | Plan for the implementation of the recommendations made for the steel plants in the CREP guidelines.                                                                                                                                                                                 | CREP guidelines will be implemented in the proposed project. Refer section 10.3 of                                                                                                                                                                                                                                                                                                                                                                                                 |

| <b>ToR No.</b> | <b>ToR Point</b>                                                         | <b>Compliance</b>                                                                                                                               |
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|                |                                                                          | Chapter 10.                                                                                                                                     |
| 8              | Plan for slag utilization                                                | Plan for slag utilization from various unit of plant is given in section 4.7.2 of Chapter 4                                                     |
| 9              | Plan for utilization of energy on off gases ( coke oven, Blast furnace ) | Gases release from coke oven plant and Blast furnace shall be utilized for power generation (WHRB) and thereafter used as fuel within the plant |
| 10             | Systems for coke quenching adopted with justification                    | Refer section 5.2.4 of chapter 5.                                                                                                               |

**TABLE 1.9 : (3B) COMPLIANCE TO STANDARD TERMS OF REFERENCE FOR CEMENT PLANT ISSUED BY MOEF&CC**

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                         | <b>Compliance</b>                                                                                                                                         |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1.</b>      | <b>Executive Summary</b>                                                                                                                                 | Executive Summary of the project is given in chapter 11 of the EIA/EMP report.                                                                            |
| <b>2.</b>      | <b>Introduction</b>                                                                                                                                      |                                                                                                                                                           |
| i)             | Details of the EIA Consultant including NABET accreditation.                                                                                             | Refer chapter 12.                                                                                                                                         |
| ii)            | Information about the project proponent                                                                                                                  | Information about the project proponent is given in section 1.3 of Chapter 1.                                                                             |
| iii)           | Importance and benefits of the project                                                                                                                   | For importance of the project refer section 1.4.5 of Chapter 1.<br>Benefits of project is given in Chapter 8                                              |
| <b>3.</b>      | <b>Project Description</b>                                                                                                                               |                                                                                                                                                           |
| i)             | Cost of project and time of completion.                                                                                                                  | Cost of the expansion project will be Rs. 5500 crores. Proposed time schedule for implementation of project shall be 84 months from date of receipt of EC |
| ii)            | Products with capacities for the proposed project                                                                                                        | Please refer section 2.1 of Chapter 2.                                                                                                                    |
| iii)           | If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any. | Please refer Table 1.2 of chapter 1                                                                                                                       |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Compliance</b>                                                                                                                                                                                                                                                                                                      |
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| iv)            | List of raw materials required and their source along with mode of transportation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Refer section 2.9, of Chapter 2                                                                                                                                                                                                                                                                                        |
| v)             | Other chemicals and materials required with quantities and storage capacities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Please refer section 2.9 of Chapter 2 for consolidated list of raw materials                                                                                                                                                                                                                                           |
| vi)            | Details of Emission, effluents, hazardous waste generation and their management.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Please refer Chapter 4<br>Section 4.4.1, Table 4.1 for emissions;<br>Section 4.6.2, Table 4.10 for effluents;<br>Section 4.7.1 Table 4.12 for solid waste                                                                                                                                                              |
| vii)           | Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Please refer the following of Chapter 2:<br>Water : Section 2.12, Fig. 2.16<br>Power: Section 2.11 and Table 2.42<br>Manpower : Section 2.13<br>Agreement of source of water is given in <b>Annexure IV</b> .                                                                                                          |
| viii)          | Process description along with major equipment and machineries, process flow sheet (quantitative) from raw material to products to be provided                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Please refer section 2.3 of Chapter 2 for flow sheet of manufacturing process in proposed steel plant                                                                                                                                                                                                                  |
| ix)            | Hazard identification and details of proposed safety systems                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Please refer Chapter 7                                                                                                                                                                                                                                                                                                 |
| x              | Expansion / Modernization proposal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                        |
| a)             | Copy of all the Environmental Clearance(s) including Amendments there to obtain for the project from MOEF/SEIAA shall be attached as an Annexure.<br><br>A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30 <sup>th</sup> May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing/ existing operation of the project from SPCB shall be attached with the EIAEMP report. | EC is granted by MOEF&CC have been listed in section 1.1 of chapter 1. Copy of ECs are given in <b>Annexure II</b> )<br><br>A certified report of the latest monitoring of the Regional office Bhubaneswar is enclosed as <b>Annexure XXVI</b> .<br><br>Consent to Establish (CTE) is given in <b>Annexure XXIII</b> . |

| ToR No.  | ToR Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Compliance                                                                                                                          |
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| b)       | In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and /or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005 - 2006) obtained from the SPCB shall be submitted. Further, Compliance report to the conditions of consents from the SPCB shall be submitted | For existing capacity, EC has been obtained and given as <b>Annexure II</b> .                                                       |
| <b>4</b> | <b>Site Details</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                     |
| i)       | Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.                                                                                                                                                                                                                                                                                                                                                       | Project location is shown in Fig. 1.1, of Chapter 1.<br>Justification for selecting the site, refer refer section 5.1 of Chapter 5. |
| ii)      | A topo-sheet of the study area of radius of 10 km and site location on 1:50,000/ 1:25,000 scale on an A3/A2 sheet (including all eco-sensitive areas and environmentally sensitive places).                                                                                                                                                                                                                                                                                                                        | Please refer Fig 3.1 of Chapter 3                                                                                                   |
| iii)     | Details w.r.t option analysis for selection of site                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Justification for selecting the site, refer refer section 5.1 of Chapter 5.                                                         |
| iv)      | Co-ordinates (lat-long) of all four corners of the site.                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Refer section 1.4.3 of chapter 1.                                                                                                   |
| v)       | Google map-Earth downloaded of the project site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Please refer Fig. 2.2 of Chapter 2.                                                                                                 |
| vi)      | Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, green belt area, utilities etc. If located within an industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.                                                                                                                                                                                                                                   | Please refer Fig 2.1 of Chapter 2                                                                                                   |
| vii)     | Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/ greenbelt, in particular.                                                                                                                                                                                                                                                                                                                                                                        | Please refer Fig 2.2 of Chapter 2.                                                                                                  |
| viii)    | Land use break-up of total land of the project site (identified and acquired), government / private- agriculture, forest, wasteland, water bodies, settlements, etc. shall be included (not required for industrial                                                                                                                                                                                                                                                                                                | Please refer section 3.9.1 of Chapter 3.                                                                                            |



| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                                                                                                                                                                           | <b>Compliance</b>                                                                                                                                                                                                |
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|                | area).                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                  |
| ix)            | A list of major industries with name and type within study area (10 km radius) shall be incorporated. Land use details of the study area.                                                                                                                                                                                                                                                  | List of industries in 10 km radius is given in Table 3.25 and shown in Fig. 3.16 of Chapter 3.                                                                                                                   |
| x)             | Geological features and Geo- hydrological status of the study area shall be included                                                                                                                                                                                                                                                                                                       | Geological features and Geo hydrological status is given in section 3.6.2 of Chapter 3.                                                                                                                          |
| xi)            | Details of Drainage of the project up to 5 km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided (mega green field projects). | Refer section 3.2.2 of Chapter 3                                                                                                                                                                                 |
| xii)           | Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.                                                                                                                                                                                                                                      | Please refer section 3.9.1 of Chapter 3                                                                                                                                                                          |
| xiii)          | R & R details in respect of land in line with state Government policy                                                                                                                                                                                                                                                                                                                      | There is displacement of 54 families which have been rehabilitated & resettled as per R&R Policy, Government of Odisha. Compensation has already been paid through IDCO. No R&R is proposed for expansion phase. |
| <b>5.</b>      | <b>Forest and Wildlife related issues (if applicable)</b>                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                  |
| i)             | Permission and approval; for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department (if applicable)                                                                                                                                                                                                                                       | Stage II forest clearance has been obtained from MOEF&C vide letter no. 5-ORB207/2014-BHU dated 02.07.2015                                                                                                       |
| ii)            | Land use map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)                                                                                                                                                                                                                  | Land use map based on High resolution satellite imagery (GPS) is given in Fig 3.9 of Chapter 3.                                                                                                                  |
| iii)           | Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.                                                                                                                                                                                                                                                                  | Stage II forest clearance has already been obtained from MOEF&C vide letter no. 5-ORB207/2014-BHU dated                                                                                                          |

| ToR No.   | ToR Point                                                                                                                                                                                                                                                                                                                                                                     | Compliance                                                                                                                                                                                                                                               |
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|           |                                                                                                                                                                                                                                                                                                                                                                               | 02.07.2015                                                                                                                                                                                                                                               |
| iv)       | The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animal; the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-a-vis the project location and the recommendations or comments of the Chief Wildlife Warden - thereon.                  | No National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animal is present within 10 km radius of plant                                                                                                                           |
| v)        | Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the state government for conservation of schedule I fauna, if any exists in the study area.                                                                                                                                                                                                     | A "Site Specific Conservation Plan" has been approved with respect to Dhenkanal Steel Plant by PCCF (WL) vide letter no. 3188/1 WL-SSP-10/2015 dated Bhubaneswar the 9 <sup>th</sup> April, 2015 Copy of the letter is enclosed as <b>Annexure XXX</b> . |
| vi)       | Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife.                                                                                                                                                                                                                          | Not applicable as no National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animal is present within 10 km radius of plant.                                                                                                        |
| <b>6.</b> | <b>Environmental Status</b>                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |
| i)        | Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.                                                                                                                                                                              | The site specific micro-meteorological data has been collected from the site during March to May 2019. Micrometeorology data is given in <b>Annexure VI</b> and is summarized in section 3.4 of Chapter 3                                                |
| ii)       | AAQ data (except monsoon) at 8 locations for PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>x</sub> , CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests. | The AAQ data has been collected from the site during March to May 2019. AAQ data is given in <b>Annexure VII</b> and is summarized in Table 3.8 of Chapter 3. Location of sampling stations is given in Table 3.6 and shown in Fig. 3.6 of Chapter 3.    |
| iii)      | Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided                                                                                                                      | AAQ data is given in <b>Annexure VII</b> and is summarized in Table 3.8 of Chapter 3.                                                                                                                                                                    |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                                                                               | <b>Compliance</b>                                                                                                                                                                                                                                                                                                                                                                            |
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|                | as an annexure to the EIA Report.                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                              |
| iv)            | Surface water quality of nearby River (60m upstream and downstream) and other surface drains at eight locations as per CPCB/MoEF& CC guidelines.                                                                                                                                               | The analysis results of surface water quality of the study area are presented in <b>Annexure IX</b> Locations of sampling stations are shown in Fig. 3.6 of Chapter 3.                                                                                                                                                                                                                       |
| v)             | Whether the site falls near to polluted stretch of river identified by the CPCB / MoEF& CC.                                                                                                                                                                                                    | The site does not falls near to polluted stretch of river identified by the CPCB / MoEF& CC.                                                                                                                                                                                                                                                                                                 |
| vi)            | Ground water monitoring minimum at 8 locations shall be included                                                                                                                                                                                                                               | The analysis results of ground water and surface water quality of the study area are presented in <b>Annexure IX</b> and Surface & ground water summarized results is given in Table 3.10 and 3.11 of Chapter 3. Locations of sampling stations are given in Table 3.9 and shown in Fig. 3.6 of Chapter 3.                                                                                   |
| vii)           | Noise levels monitoring at 8 locations within the study area.                                                                                                                                                                                                                                  | Results of ambient noise measurements are presented in <b>Annexure XI</b>                                                                                                                                                                                                                                                                                                                    |
| viii)          | Soil Characteristics as per CPCB guidelines.                                                                                                                                                                                                                                                   | Soil Characteristics as per CPCB guidelines is given in Table 3.18 of Chapter -3. Test report is enclosed as <b>Annexure XXVII</b> .                                                                                                                                                                                                                                                         |
| ix)            | Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.                                                                                                                       | Traffic density is monitored at 1 location and shown in Fig. 3.6 of Chapter 3. The details are given in <b>Annexure XIV</b> .                                                                                                                                                                                                                                                                |
| x)             | Detailed description on flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished. | The details of flora and fauna are given in section 3.11 of Chapter 3. List of flora and fauna is given in <b>Annexure XVI</b> .<br>A "Site Specific Conservation Plan" has been approved with respect to Dhenkanal Steel Plant by PCCF (WL) vide letter no. 3188/1 WL-SSP-10/2015 dated Bhubaneswar the 9 <sup>th</sup> April, 2015 Copy of the letter is enclosed as <b>Annexure XXX</b> . |
| xi)            | Socio-economic status of the study area.                                                                                                                                                                                                                                                       | Socio-economic status of the study area as per census 2011 is given in <b>Annexure XVIII</b> and                                                                                                                                                                                                                                                                                             |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Compliance</b>                                                                                                                                                                                                                          |
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|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | summarized in section 3.12 of Chapter 3.                                                                                                                                                                                                   |
| <b>7.</b>      | <b>Impact Assessment and Environment Management Plan</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                            |
| i)             | Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on hilly terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be well assessed. Details of the model used and the input data used for modeling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any. | The prediction modeling for Ground Level Concentration of pollutants from the stack emissions is given in section 4.4.1.1 to 4.4.1.4, page 4-5 to 4-13 of Chapter 4 and the detailed study is given in <b>Annexure XX(a) &amp; XX(b)</b> . |
| ii)            | Water Quality modeling- in case of discharge in water body                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | The expansion project is a Zero Liquid Discharge hence no water shall be discharged outside the unit. Hence, no water modelling study has been conducted                                                                                   |
| iii)           | Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.                                                                                                                                                                                                                                                                                                     | Discussed in section 4.9, page 4-38 of chapter 4.                                                                                                                                                                                          |
| iv)            | A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E (P) Rules.                                                                                                                                                                                                                                                                                                                                | Refer section 4.6.3, page 4-24 of Chapter 4                                                                                                                                                                                                |
| v)             | Details of stack emission and action plan for control of emissions to meet standards.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Details of stack emission is given in Tabe 4.1, page 4-6 of Chapter 4 a. Action plan to control emissions is given in section 4.4.2, page 4-13 of chapter 4                                                                                |
| vi)            | Measures for fugitive emission control                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Measures for fugitive emission                                                                                                                                                                                                             |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                                                                                                                                    | <b>Compliance</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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|                |                                                                                                                                                                                                                                                                                                                                                     | control is given in section 4.4.2, page 4- 13 of chapter 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| vii)           | Details of hazardous waste generation, and their storage, utilization and disposal. Copies of MOU regarding utilization of solid and hazardous waste shall also be included. EMP shall include the concept of waste minimization, recycle/ reuse/ recover techniques, Energy conservation, and natural resource conservation                        | Refer Table 4.14, page 4-30 of Chapter 4.<br>Most of the solid waste generated from the plant shall be utilized in plant itself. This will reuse, recycle and minimise waste. Technology used in various process of steel plant are modern in order to aid in recycle /reuse/ recover. For natural conservation of resources, the rainwater runoff in the plant premises will be collected through storm water drainage and harvested in the surface water reservoirs/pond and used. Treated effluents will also be 100% reused throughout the year.<br>For energy conservation, wherever possible natural light LED lights shall be used for administrative buildings, thereby reducing energy consumption. Technology and process interventions such pre-heating, WHRB, etc also conserve energy. |
| viii)          | Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.                                                                                                                                                                                                                      | Refer Table 4.15, page 4-34 of Chapter 4.<br>Fly ash Notification 2009 shall be followed as per requirement and use.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| ix)            | Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated. | The green belt area kept in the existing setup is about 33% i.e. 584 acre of total plant area and it will be maintained after proposed expansion project. Details are given in section 4.10.2, page 4-46 of Chapter 4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| x)             | Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground                                                                                                                                                                                | Rain water harvesting measures will be taken as given in section 4.6.6, page 4-26 of Chapter 4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| ToR No.   | ToR Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Compliance                                                                                                                                                                                                                                                                                                                                   |
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|           | water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                              |
| xi)       | Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.                                                                                                                                                                                                                                                                                                                                                                   | Total capital and recurring cost per annum for environmental pollution control measures is given in Chapter 10, Section 10.4, page 10-12                                                                                                                                                                                                     |
| xii)      | Action plan for post-project environmental monitoring shall be submitted.                                                                                                                                                                                                                                                                                                                                                                                                     | Refer section 6.4, page 6-4 of Chapter 6.                                                                                                                                                                                                                                                                                                    |
| xiii)     | Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan                                                                                                                                                                                                                                                  | Please refer Chapter 7                                                                                                                                                                                                                                                                                                                       |
| <b>8.</b> | <b>Occupational health:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                              |
| i)        | plan and fund allocation to ensure the occupational health & safety of all contract and casual workers                                                                                                                                                                                                                                                                                                                                                                        | Refer section 4.12.6, page 4-52 & 4-53 of Chapter 4.                                                                                                                                                                                                                                                                                         |
| ii        | Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre-placement and periodical examinations give the details of the same. Details regarding last month analyzed data of abovementioned parameters as per age, sex, duration of exposure and department wise. | The plant is still under construction but the OHS monitoring has started and the format of evaluation is given in Annexure XXVIII and the health data has been summarised in Annexure XXIX.                                                                                                                                                  |
| iii)      | Details of existing Occupational & Safety Hazards. What are the exposure levels of above mentioned hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved.                                                                                                                                                           | Refer section 4.12, page 4-48 of Chapter 4.<br><br>The permissible exposure levels are prescribed in the Second Schedule of the Factories Act, 1948 and its amendments till date. Of those listed in the Schedule, CO and iron oxide fumes are relevant to the steel plant and will be complied to when the steel plant becomes operational. |

| ToR No.   | ToR Point                                                                                                                                                                                                                                                                                   | Compliance                                                                                                                                                                                                                                                                   |
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| iv)       | Annual report of health status of workers with special reference to Occupational Health and Safety.                                                                                                                                                                                         | Refer section 4.12.6, page 4-52 of Chapter 4. Health Record of some employees is given in <b>Annexure XXIX</b> .                                                                                                                                                             |
| <b>9.</b> | <b>Corporate Environment Policy:</b>                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                              |
| i)        | Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.                                                                                                                                                  | Covered under section 6.5, page 6-5 of Chapter 6                                                                                                                                                                                                                             |
| ii)       | Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.                                                     | Covered under section 6.5, page 6-5 of Chapter 6                                                                                                                                                                                                                             |
| iii)      | What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.                                                                  | Covered under section 6.5, page 6-5 of Chapter 6                                                                                                                                                                                                                             |
| iv)       | Does the company have system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report.                                     | Covered under section 6.5, page 6-5 of Chapter 6                                                                                                                                                                                                                             |
| 10        | Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.                                                                 | In the existing factory, infrastructure facilities are provided to casual workers including truck drivers. During the construction of proposed expansion project, all facilities will be provided/ arranged for the labour force. Refer section 2.13 page 2-55 of Chapter 2. |
| <b>11</b> | <b>Enterprise Social Commitment (ESC)</b>                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                              |
| i         | Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon. | Corporate Environment Responsibility has been provided for in section 8.5 of chapter 8                                                                                                                                                                                       |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                                                                                         | <b>Compliance</b>                                                                                                                                                                                                                                        |
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| 12             | Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water    | No litigation has arisen or pending against and/ or any direction/ order passed by any Court of Law against the Existing Plant/ Proposed Expansion Project till date under Environment (Protection) Act.                                                 |
| 13             | A tabular chart with index for point wise compliance of above TORs.                                                                                                                                                                                                                                      | Given in Table 1.7 to 1.10.                                                                                                                                                                                                                              |
| <b>B</b>       | <b>Specific Terms of Reference for EIA studies for cement plant</b>                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                          |
| 1)             | Limestone and coal linkage documents along with the status of environmental clearance of limestone and coal mines                                                                                                                                                                                        | Limestone will be purchased from the open market from nearby sources. Coal will be from domestic sources (procured from - auction or commercial sellers) and imported.                                                                                   |
| 2)             | Quantum of production of coal and limestone from coal & limestone mines and the projects they cater to;                                                                                                                                                                                                  | Since these will be procured from open market and different sources, information about their production can be obtained when the plant becomes operational.                                                                                              |
| 3)             | For large Cement Units, a 3-D view i.e. DEM (Digital Elevation Model) for the area in 10 km radius from the proposal site.                                                                                                                                                                               | Digital Elevation Model has been provided in Fig 3.2, page 3-3 of Chapter 3.                                                                                                                                                                             |
| 4)             | Present land use shall be prepared based on satellite imagery. High-resolution satellite image data having 1m-5m spatial resolution like quickbird, Ikonos, IRS P-6 pan sharpened etc. for the 10 Km radius area from proposed site. The same shall be used for land used/land-cover mapping of the area | Land use map based on High resolution satellite imagery (GPS) will be given in Fig 3.9, page 3-32 of Chapter 3.                                                                                                                                          |
| 5)             | If the raw materials used have trace elements, an environment management plan shall also be included                                                                                                                                                                                                     | The raw material will be used in processes which will have air pollution control systems as discussed in section 4.4.2. In cement plant, there will be no solid waste disposal, thus, no contamination due to leaching of solid waste shall be possible. |
| 6)             | Plan for the implementation of the recommendations made for the cement plants in the CREP guidelines must be                                                                                                                                                                                             | The made for the cement plants in the CREP guidelines will be implemented.                                                                                                                                                                               |



| <b>ToR No.</b> | <b>ToR Point</b>                                          | <b>Compliance</b>                                                                                                                                                         |
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|                | prepared.                                                 |                                                                                                                                                                           |
| <b>7)</b>      | Energy consumption per ton of clinker and cement grinding | 60 KW per tonne                                                                                                                                                           |
| <b>8)</b>      | Provision of waste heat recovery boiler                   | The exhaust gases from the cement plant will be used for pre-heating. Waste heat recovery boilers are proposed based on exhaust gases of DRI, coke oven and blast furnace |
| <b>9)</b>      | Arrangement for use of hazardous waste *                  | No hazardous waste is envisaged from the cement plant except used oil, which will be given to authorised recyclers.                                                       |

**TABLE 1.10 : (4B) COMPLIANCE TO STANDARD TERMS OF REFERENCE FOR COKE OVEN PLANT ISSUED BY MOEF&CC**

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                         | <b>Compliance</b>                                                                                                                                         |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1.</b>      | <b>Executive Summary</b>                                                                                                                                 | Executive Summary of the project is given in chapter 11 of the EIA/EMP report.                                                                            |
| <b>2.</b>      | <b>Introduction</b>                                                                                                                                      |                                                                                                                                                           |
| i)             | Details of the EIA Consultant including NABET accreditation.                                                                                             | Refer chapter 12.                                                                                                                                         |
| ii)            | Information about the project proponent                                                                                                                  | Information about the project proponent is given in section 1.3 of Chapter 1.                                                                             |
| iii)           | Importance and benefits of the project                                                                                                                   | For importance of the project refer section 1.4.5 of Chapter 1.<br>Benefits of project is given in Chapter 8                                              |
| <b>3.</b>      | <b>Project Description</b>                                                                                                                               |                                                                                                                                                           |
| i)             | Cost of project and time of completion.                                                                                                                  | Cost of the expansion project will be Rs. 5500 crores. Proposed time schedule for implementation of project shall be 84 months from date of receipt of EC |
| ii)            | Products with capacities for the proposed project                                                                                                        | Please refer section 2.1 of Chapter 2.                                                                                                                    |
| iii)           | If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any. | Please refer Table 1.2 of chapter 1                                                                                                                       |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Compliance</b>                                                                                                                                                                                                                                                                                                      |
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| iv)            | List of raw materials required and their source along with mode of transportation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Refer section 2.9, of Chapter 2                                                                                                                                                                                                                                                                                        |
| v)             | Other chemicals and materials required with quantities and storage capacities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Please refer section 2.9 of Chapter 2 for consolidated list of raw materials                                                                                                                                                                                                                                           |
| vi)            | Details of Emission, effluents, hazardous waste generation and their management.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Please refer Chapter 4<br>Section 4.4.1, Table 4.1 for emissions;<br>Section 4.6.2, Table 4.10 for effluents;<br>Section 4.7.1 Table 4.12 for solid waste                                                                                                                                                              |
| vii)           | Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Please refer the following of Chapter 2:<br>Water : Section 2.12, Fig. 2.16<br>Power: Section 2.11 and Table 2.42<br>Manpower : Section 2.13<br>Agreement of source of water is given in <b>Annexure IV</b> .                                                                                                          |
| viii)          | Process description along with major equipment and machineries, process flow sheet (quantitative) from raw material to products to be provided                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Please refer section 2.3 of Chapter 2 for flow sheet of manufacturing process in proposed steel plant                                                                                                                                                                                                                  |
| ix)            | Hazard identification and details of proposed safety systems                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Please refer Chapter 7.                                                                                                                                                                                                                                                                                                |
| x              | expansion / Modernization proposal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                        |
| a)             | Copy of all the Environmental Clearance(s) including Amendments there to obtain for the project from MOEF/SEIAA shall be attached as an Annexure.<br>A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30 <sup>th</sup> May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing/ existing operation of the project from SPCB shall be attached with the EIAEMP report. | EC is granted by MOEF&CC have been listed in section 1.1 of chapter 1. Copy of ECs are given in <b>Annexure II</b> )<br><br>A certified report of the latest monitoring of the Regional office Bhubaneswar is enclosed as <b>Annexure XXVI</b> .<br><br>Consent to Establish (CTE) is given in <b>Annexure XXIII</b> . |
| b)             | In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and /or EIA Notification                                                                                                                                                                                                                                                                                                                                                                                                                                                       | For existing capacity, EC has been obtained and given as <b>Annexure II</b> .                                                                                                                                                                                                                                          |

| ToR No.  | ToR Point                                                                                                                                                                                                                                                                                                                              | Compliance                                                                            |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|          | 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005 - 2006) obtained from the SPCB shall be submitted. Further, Compliance report to the conditions of consents from the SPCB shall be submitted |                                                                                       |
| <b>4</b> | <b>Site Details</b>                                                                                                                                                                                                                                                                                                                    |                                                                                       |
| i)       | Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.                                                                                                                                                                           | Project location is shown in Fig. 1.1, of Chapter 1.                                  |
| ii)      | A topo-sheet of the study area of radius of 10 km and site location on 1:50,000/ 1:25,000 scale on an A3/A2 sheet (including all eco-sensitive areas and environmentally sensitive places).                                                                                                                                            | Please refer Fig 3.1 of Chapter 3                                                     |
| iii)     | Details w.r.t option analysis for selection of site                                                                                                                                                                                                                                                                                    | Refer section 5.1 of Chapter 5.                                                       |
| iv)      | Co-ordinates (lat-long) of all four corners of the site.                                                                                                                                                                                                                                                                               | Refer section 1.4.3 of chapter 1.                                                     |
| v)       | Google map-Earth downloaded of the project site.                                                                                                                                                                                                                                                                                       | Please refer Fig. 2.2 of Chapter 2.                                                   |
| vi)      | Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, green belt area, utilities etc. If located within an industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.                                                       | Please refer Fig 2.1 of Chapter 2                                                     |
| vii)     | Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/ greenbelt, in particular.                                                                                                                                                                                            | Please refer Fig 2.2 of Chapter 2.                                                    |
| viii)    | Land use break-up of total land of the project site (identified and acquired), government / private- agriculture, forest, wasteland, water bodies, settlements, etc. shall be included (not required for industrial area).                                                                                                             | Please refer section 3.9.1 of Chapter 3.                                              |
| ix)      | A list of major industries with name and type within study area (10 km radius) shall be incorporated. Land use details of the study area.                                                                                                                                                                                              | List of industries in 10 km radius is given in section 3.13, page 3- 43 of Chapter 3. |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                                                                                                                                                                           | <b>Compliance</b>                                                                                                                                                                                                                                                                                                                                                               |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x)             | Geological features and Geo- hydrological status of the study area shall be included                                                                                                                                                                                                                                                                                                       | Geological features and Geo hydrological status is given in section 3.6.2, page 3-18 of Chapter 3.                                                                                                                                                                                                                                                                              |
| xi)            | Details of Drainage of the project up to 5 km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided (mega green field projects). | Drainage details in 5 km radius is given in Fig. 3.1, page 3-2 of Chapter 3<br><br>There is no major river within 1 km radius. Only Nigra or Lingra Nadi is present, which is a small tributary of the major river Brahmani, located at 4.9 km. The information of Brahmani river is given in section 4.2.2, page 4-2 & 4-3 of Chapter 4.                                       |
| xii)           | Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.                                                                                                                                                                                                                                      | Please refer section 3.9.1, page 3-29 of Chapter 3                                                                                                                                                                                                                                                                                                                              |
| xiii)          | R & R details in respect of land in line with state Government policy                                                                                                                                                                                                                                                                                                                      | There were 54 families within the project boundary at the time the project was conceived prior to the year 2010. After the environmental clearance on 02.08.2010, these families have been resettled & rehabilitated in village Nimabahali at an aerial distance of 2.4 km. As in Dec 2018, there were no inhabitants within the plant boundary or the proposed expansion area. |
| <b>5.</b>      | <b>Forest and Wildlife related issues (if applicable)</b>                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                 |
| i)             | Permission and approval; for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department (if applicable)                                                                                                                                                                                                                                       | The total project area has 7.8 acres forest land, which has already received stage II forest clearance from MOEF&C vide letter No. 5-ORB207/2014-BHU dated 02/07/2015.                                                                                                                                                                                                          |
| ii)            | Land use map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)                                                                                                                                                                                                                  | Land use map based on High resolution satellite imagery (GPS) will be given in Fig 3.9, page 3-32 of Chapter 3.                                                                                                                                                                                                                                                                 |
| iii)           | Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.                                                                                                                                                                                                                                                                  | The total project area has 7.8 acres forest land, which has already received stage II forest clearance                                                                                                                                                                                                                                                                          |

| ToR No.   | ToR Point                                                                                                                                                                                                                                                                                                                                                                     | Compliance                                                                                                                                                                                                                                                                                             |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |                                                                                                                                                                                                                                                                                                                                                                               | from MOEF&C vide letter No. 5-ORB207/2014-BHU dated 02/07/2015.                                                                                                                                                                                                                                        |
| iv)       | The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animal; the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-a-vis the project location and the recommendations or comments of the Chief Wildlife Warden - thereon.                  | No National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animal is present within 10 km radius of plant<br>However, Wildlife Conservation Plan has been prepared and got approved from Chief Wildlife Warden. The copy of the approval letter is given in <b>Annexure XXX</b> . |
| v)        | Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the state government for conservation of schedule I fauna, if any exists in the study area.                                                                                                                                                                                                     | Wildlife Conservation Plan has been prepared and got approved from Chief Wildlife Warden of the state government. The copy of the approval letter is given in <b>Annexure XXX</b> .                                                                                                                    |
| vi)       | Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife.                                                                                                                                                                                                                          | No National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animal is present within 10 km radius of plant. Hence, not applicable.                                                                                                                                                 |
| <b>6.</b> | <b>Environmental Status</b>                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                        |
| i)        | Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.                                                                                                                                                                              | The site specific micro-meteorological data has been collected from the site during March 2019 to May 2019. Micrometeorology data is given in <b>Annexure VI</b> and is summarized in section 3.4, page 3-9 of Chapter 3                                                                               |
| ii)       | AAQ data (except monsoon) at 8 locations for PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>x</sub> , CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests. | The AAQ data has been collected from the site during March 2019 to May 2019. AAQ data is given in <b>Annexure VII</b> and is summarized in Table 3.8, page 3-17 of Chapter 3. Locations of sampling stations are given in Table 3.9, page 3-23 and shown in Fig. 3.6, page 3-13 of Chapter 3.          |
| iii)      | Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAAQM Notification of Nov. 2009 along with min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided                                                                                                                      | AAQ data is given in <b>Annexure VII</b> and is summarized in Table 3.8, page 3-17 of Chapter 3.                                                                                                                                                                                                       |

| ToR No. | ToR Point                                                                                                                                                                                                                                                                                      | Compliance                                                                                                                                                                                                                                                                                    |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | as an annexure to the EIA Report.                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                               |
| iv)     | Surface water quality of nearby River (60m upstream and downstream) and other surface drains at eight locations as per CPCB/MoEF& CC guidelines.                                                                                                                                               | The analysis results of surface water quality of the study area are presented in <b>Annexure IX</b> and summarized results is given in section 3.6.3, page 3-23 of Chapter 3. Locations of sampling stations are given in Table 3.9, page 3-23 and shown in Fig. 3.6, page 3-13 of Chapter 3. |
| v)      | Whether the site falls near to polluted stretch of river identified by the CPCB / MoEF& CC.                                                                                                                                                                                                    | The site does not falls near to polluted stretch of river identified by the CPCB / MoEF& CC.                                                                                                                                                                                                  |
| vi)     | Ground water monitoring minimum at 8 locations shall be included                                                                                                                                                                                                                               | The analysis results of ground water quality of the study area are presented in <b>Annexure IX</b> and summarized results is given in section 3.6.3, page 3-23 of Chapter 3. Locations of sampling stations are given in Table 3.9, page 3-23 and shown in Fig. 3.6, page 3-13 of Chapter 3.  |
| vii)    | Noise levels monitoring at 8 locations within the study area.                                                                                                                                                                                                                                  | Results of ambient noise measurements are presented in <b>Annexure XI</b> and summarized in section 3.7, page 3-27 of Chapter 3.                                                                                                                                                              |
| viii)   | Soil Characteristics as per CPCB guidelines.                                                                                                                                                                                                                                                   | Soil Characteristics is given in <b>Annexure XXVII</b> .                                                                                                                                                                                                                                      |
| ix)     | Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.                                                                                                                       | Monitored traffic volume data is given in section 3.8, page 3-28 of Chapter 3. The projected traffic has been included in section 4.9, page 4-38 of chapter 4.                                                                                                                                |
| x)      | Detailed description on flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished. | The details of flora and fauna are given in section 3.11, page 3-34 of Chapter 3. List of flora and fauna is given in <b>Annexure XVI</b> . Wildlife conservation Plan has been prepared and its approval letter and relevant extract is enclosed in <b>Annexure XXX</b> .                    |
| xi)     | Socio-economic status of the study area.                                                                                                                                                                                                                                                       | Socio-economic status of the study area as per Census 2011 is given in <b>Annexure XVII &amp; XVIII</b> and summarized in section 3.12, page 3-                                                                                                                                               |

| ToR No.   | ToR Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Compliance                                                                                                                                                                                                                                 |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 38 of Chapter 3.                                                                                                                                                                                                                           |
| <b>7.</b> | <b>Impact Assessment and Environment Management Plan</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                            |
| i)        | Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on hilly terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be well assessed. Details of the model used and the input data used for modeling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any. | The prediction modeling for Ground Level Concentration of pollutants from the stack emissions is given in section 4.4.1.1 to 4.4.1.4, page 4-5 to 4-13 of Chapter 4 and the detailed study is given in <b>Annexure XX(a) &amp; XX(b)</b> . |
| ii)       | Water Quality modeling- in case of discharge in water body                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | The expansion project is a Zero Liquid Discharge hence no water shall be discharged outside the unit. Hence, no water modelling study has been conducted                                                                                   |
| iii)      | Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.                                                                                                                                                                                                                                                                                                     | Discussed in section 4.9, page 4-38 of chapter 4.                                                                                                                                                                                          |
| iv)       | A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E (P) Rules.                                                                                                                                                                                                                                                                                                                                | Refer section 4.6.3, page 4-24 of Chapter 4                                                                                                                                                                                                |
| v)        | Details of stack emission and action plan for control of emissions to meet standards.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Details of stack emission is given in Tab 4.1, page 4-6 of Chapter 4 a. Action plan to control emissions is given in section 4.4.2, page 4- 13 of chapter 4                                                                                |
| vi)       | Measures for fugitive emission control                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Measures for fugitive emission control is given in section 4.4.2, page 4- 13 of chapter 4                                                                                                                                                  |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                                                                                                                                    | <b>Compliance</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| vii)           | Details of hazardous waste generation, and their storage, utilization and disposal. Copies of MOU regarding utilization of solid and hazardous waste shall also be included. EMP shall include the concept of waste minimization, recycle/ reuse/ recover techniques, Energy conservation, and natural resource conservation                        | <p>Refer Table 4.14, page 4-30 of Chapter 4.</p> <p>Most of the solid waste generated from the plant shall be utilized in plant itself. This will reuse, recycle and minimise waste. Technology used in various process of steel plant are modern in order to aid in recycle /reuse/ recover. For natural conservation of resources, the rainwater runoff in the plant premises will be collected through storm water drainage and harvested in the surface water reservoirs/pond and used. Treated effluents will also be 100% reused throughout the year.</p> <p>For energy conservation, wherever possible natural light LED lights shall be used for administrative buildings, thereby reducing energy consumption. Technology and process interventions such pre-heating, WHRB, etc also conserve energy.</p> |
| viii)          | Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.                                                                                                                                                                                                                      | <p>Refer Table 4.15, page 4-34 of Chapter 4.</p> <p>Fly ash Notification 2009 shall be followed as per requirement and use.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| ix)            | Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated. | The green belt area kept in the existing setup is about 33% i.e. 584 acre of total plant area and it will be maintained after proposed expansion project. Details are given in section 4.10.2, page 4-46 of Chapter 4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| x)             | Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh                                                                                         | Rain water harvesting measures will be taken as given in section 4.6.6, page 4-26 of Chapter 4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |



| ToR No.   | ToR Point                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Compliance                                                                                                                                                                                                                                                                                                                                   |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | water and reduce the water requirement from other sources.                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                              |
| xi)       | Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.                                                                                                                                                                                                                                                                                                                                                                   | Total capital and recurring cost per annum for environmental pollution control measures is given in Chapter 10, Section 10.4, page 10-12                                                                                                                                                                                                     |
| xii)      | Action plan for post-project environmental monitoring shall be submitted.                                                                                                                                                                                                                                                                                                                                                                                                     | Refer section 6.4, page 6-4 of Chapter 6.                                                                                                                                                                                                                                                                                                    |
| xiii)     | Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan                                                                                                                                                                                                                                                  | Please refer Chapter 7                                                                                                                                                                                                                                                                                                                       |
| <b>8.</b> | <b>Occupational health:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                              |
| i)        | plan and fund allocation to ensure the occupational health & safety of all contract and casual workers                                                                                                                                                                                                                                                                                                                                                                        | Refer section 4.12.6, page 4-52 & 4-53 of Chapter 4.                                                                                                                                                                                                                                                                                         |
| ii        | Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre-placement and periodical examinations give the details of the same. Details regarding last month analyzed data of abovementioned parameters as per age, sex, duration of exposure and department wise. | The plant is still under construction but the OHS monitoring has started and the format of evaluation is given in Annexure XXVIII and the health data has been summarised in Annexure XXIX.                                                                                                                                                  |
| iii)      | Details of existing Occupational & Safety Hazards. What are the exposure levels of above mentioned hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved.                                                                                                                                                           | Refer section 4.12, page 4-48 of Chapter 4.<br><br>The permissible exposure levels are prescribed in the Second Schedule of the Factories Act, 1948 and its amendments till date. Of those listed in the Schedule, CO and iron oxide fumes are relevant to the steel plant and will be complied to when the steel plant becomes operational. |
| iv)       | Annual report of health status of workers with special reference to Occupational Health and Safety.                                                                                                                                                                                                                                                                                                                                                                           | Refer section 4.12.6, page 4-52 of Chapter 4. Health Record of some employees is given in <b>Annexure XXIX.</b>                                                                                                                                                                                                                              |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                                                                                                                                                            | <b>Compliance</b>                                                                                                                                                                                                                                                            |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>9.</b>      | <b>Corporate Environment Policy:</b>                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                              |
| i)             | Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.                                                                                                                                                  | Covered under section 6.5, page 6-5 of Chapter 6                                                                                                                                                                                                                             |
| ii)            | Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.                                                     | Covered under section 6.5, page 6-5 of Chapter 6                                                                                                                                                                                                                             |
| iii)           | What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.                                                                  | Covered under section 6.5, page 6-5 of Chapter 6                                                                                                                                                                                                                             |
| iv)            | Does the company have system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report.                                     | Covered under section 6.5, page 6-5 of Chapter 6                                                                                                                                                                                                                             |
| 10             | Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.                                                                 | In the existing factory, infrastructure facilities are provided to casual workers including truck drivers. During the construction of proposed expansion project, all facilities will be provided/ arranged for the labour force. Refer section 2.13 page 2-55 of Chapter 2. |
| <b>11</b>      | <b>Enterprise Social Commitment (ESC)</b>                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                              |
| i              | Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon. | Corporate Environment Responsibility has been provided for in section 8.5 of chapter 8                                                                                                                                                                                       |
| 12             | Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act,                                  | No litigation has arisen or pending against and/ or any direction/ order passed by any Court of Law against the Existing Plant/ Proposed Expansion Project till date under                                                                                                   |

| <b>ToR No.</b> | <b>ToR Point</b>                                                                                                                                      | <b>Compliance</b>                                                                                                                |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
|                | 1986 or relevant Sections of Air and Water                                                                                                            | Environment (Protection) Act.                                                                                                    |
| 13             | A tabular chart with index for point wise compliance of above TORs.                                                                                   | Given in Table 1.7 to 1.10.                                                                                                      |
| <b>B</b>       | <b>Specific TOR for Coke oven plant</b>                                                                                                               |                                                                                                                                  |
| <b>1)</b>      | Justification for selecting recovery/non-recovery (beehive) type batteries with the proposed unit size.                                               | Choice of technology justified in section 5.2.4, page 5-4. The size of the batteries is based on the coke requirement for MBF as |
| <b>2)</b>      | Details of proposed layout clearly demarcating various facilities such as coal storages, coke making, by-product recovery area, etc within the plant. | Refer Fig 2.1, page 2-5                                                                                                          |
| <b>3)</b>      | Details of coke oven plant (recovery/non-recovery type) including coal handling, coke oven battery operations, coke handling and preparation.         | Section 2.3.7, page 2-25                                                                                                         |

## CHAPTER 2

### PROJECT DESCRIPTION

#### 2.1 PRODUCTS AND CAPACITY

Rungta Mines Limited (Dhenkanal Steel Plant) proposes for expansion of the existing plant facilities for manufacture of downstream and associated products from 3.0 MTPA to 3.55 MTPA steel and adding new facilities. The production capacity and the plant facilities granted by MOEF& CC and proposed for expansion is listed in **Table 2.1**

**TABLE 2.1: EXISTING FACILITIES AS PER EC AND PROPOSED FACILITIES & PRODUCTION**

| Sl. No. | Proposed Plant facilities              | Unit        | Capacity as per the EC dated 04.06.2020 | Proposed Additional/ change     | Total After Expansion            |
|---------|----------------------------------------|-------------|-----------------------------------------|---------------------------------|----------------------------------|
|         | <b>Overall finished steel capacity</b> | <b>MTPA</b> | <b>3.0</b>                              | <b>0.55</b>                     | <b>3.55</b>                      |
| 1       | Beneficiation Plant                    | MTPA        | 5.4<br>(2X2.69 MTPA)                    | -                               | 5.4<br>(2X2.69 MTPA)             |
| 2       | Pelletisation Plant                    |             |                                         |                                 |                                  |
|         | Pellet Plant (I)                       | MTPA        | 2.948<br>(1X2.948 MTPA)                 | 0.802<br>(Config revised)       | 3.75<br>(1X 3.75 MTPA)           |
|         | Pellet Plant (II)                      | MTPA        | -                                       | 25.0<br>(4X3.75 +10x1 MTPA)     | 25.0<br>(4X3.75 MTPA +10x1 MTPA) |
|         | <b>Total</b>                           | <b>MTPA</b> | <b>2.948</b>                            | <b>25.802</b>                   | <b>28.75</b>                     |
| 3       | Coal Washery<br>(1X400TPH+1X235 TPH)   | MTPA        | 4.141                                   | 0.888                           | 5.029                            |
| 4       | DRI Plant                              |             |                                         |                                 |                                  |
| 4.1     | DRI (I) (2X500 TPD)                    | MTPA        | 0.4745                                  | 0.0473                          | 0.5218                           |
| 4.2     | DRI (II) (3X600 TPD)                   | MTPA        | 1.1387<br>(4X600 TPD)                   | -0.2761<br>(reduced 1 X600 TPD) | 0.8626<br>(3X600 TPD)            |
| 4.3     | DRI (III) (2X900 TPD)                  | MTPA        | -                                       | 0.8626<br>(2X900TPD)            | 0.8626<br>(2X900TPD)             |
|         | <b>Total</b>                           | <b>MTPA</b> | <b>1.6132</b>                           | <b>0.6338</b>                   | <b>2.247</b>                     |

| <b>Sl. No.</b> | <b>Proposed Plant facilities</b>                                                           | <b>Unit</b> | <b>Capacity as per the EC dated 04.06.2020</b>                | <b>Proposed Additional/ change</b> | <b>Total After Expansion</b>                                                          |
|----------------|--------------------------------------------------------------------------------------------|-------------|---------------------------------------------------------------|------------------------------------|---------------------------------------------------------------------------------------|
| 5              | Mini Blast Furnace                                                                         | MTPA        |                                                               |                                    |                                                                                       |
| 5.1            | MBF I (1X600 cum.)                                                                         | MTPA        | 0.567                                                         | 0.210                              | 0.777                                                                                 |
| 5.2            | MBF II (2X450 cum.)                                                                        | MTPA        | 0.992<br>(1X1050 cum.)                                        | 0.174<br>(Config revised)          | 1.166<br>(2X450 cum.)                                                                 |
|                | <b>Total</b>                                                                               |             | <b>1.559</b>                                                  | <b>0.384</b>                       | <b>1.943</b>                                                                          |
| 6              | Sinter Plant                                                                               |             |                                                               |                                    |                                                                                       |
| 6.1            | Sinter Plant (I) (2X80 sq.m.)                                                              | MTPA        | 0.612<br>(1X64 sq.m.)                                         | 0.908<br>(config revised)          | 1.520<br>(2X80 sq.m.)                                                                 |
| 6.2            | Sinter Plant (II) 1X110                                                                    | MTPA        | 1.051                                                         | 0.256                              | 1.307                                                                                 |
|                | <b>Total</b>                                                                               | <b>MTPA</b> | <b>1.663<br/>(1X64 + 1X110 sq.m.)</b>                         | <b>1.164</b>                       | <b>2.827<br/>(2X80 + 1X110 sq.m.)</b>                                                 |
| 7              | Coke Oven Plant                                                                            | MTPA        | 1.12<br>(16 batteriesX 70,000 TPA)                            | -0.05<br>(Config revised)          | 1.07<br>(6 batteries x 70,000 TPA + 1 battery x 250,000TPA + 1 battery x 400,000 TPA) |
| 8              | Steel Melting Shop                                                                         | MTPA        | 2.618                                                         | 0.602                              | 3.22                                                                                  |
| 8.1            | Steel Melting via Induction Furnace Route                                                  | MTPA        | 0.693<br>(7X 20 T IF + 4X25 T LRF)                            | 0.847<br>(8 X20T IF + 3x45T LRF)   | 1.54<br>(15 X20 T IF + 4x25T LRF + 3x45 T LRF)                                        |
| 8.2            | Steel Melting via Electric Arc Furnace-Vacuum Degassing-Argon Oxygen Decarburization Route | MTPA        | 1.925 MTPA<br>(1X90 T + 1X160 T EAF and 1X90 T + 1X160 T LRF) | -0.245<br>(Config revised)         | 1.680<br>(1X90 T+1X110 T and 1x90 T LRF+1x110T LRF)                                   |
| 8.3            | Continuous Casting Machine (Billets/ Bloom Caster/ Slab)                                   | MTPA        | 2.566 MTPA<br>(3 nos. X 4 strands)                            | 0.59<br>(8 nos. X 4 Strand)        | 3.156<br>(11 nos. X 4 Strand)                                                         |
| 9              | Finished Product Facilities                                                                | MTPA        | 3.0                                                           | 0.55                               | 3.55                                                                                  |
| 9.1            | Rolling Mill (TMT/ Flat/ Round/ Wire Rod/ Structural Mill/ others)                         | MTPA        | 1.75<br>(5 nos.X0.2 + 1 no.X0.3 + 1 no.X0.45 MTPA)            | 0.8<br>(Config revised)            | 2.55<br>(2 nos.X0.2 + 4 nos.X0.3 + 1 no. X0.45 + 1 nos. X0.5 MTPA)                    |
| 9.2            | Strip Mill/ Sheet/ Coil/ Wire & Bar Mill/ Wire Rope                                        | MTPA        | 0.85<br>(1 no.X0.45 + 1no. X0.4 MTPA)                         | -0.35<br>(Config revised)          | 0.5<br>(1 no.X0.2 + 1no.X0.3 MTPA)                                                    |

| Sl. No. | Proposed Plant facilities                                         | Unit                           | Capacity as per the EC dated 04.06.2020      | Proposed Additional/ change                                | Total After Expansion                                                     |
|---------|-------------------------------------------------------------------|--------------------------------|----------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------|
| 9.3     | Ductile Pipe Plant                                                | MTPA                           | 0.400<br>(2 nos.X0.2 MTPA)                   | 0.1<br>(Config revised)                                    | 0.5<br>(2 nos.X0.25 MTPA)                                                 |
| 10      | Producer Gas Plant                                                | Million Nm <sup>3</sup> /Annum | 480<br>(20 nos.X3000 Nm <sup>3</sup> /hr)    | 4907<br>(32 nos.X12500 + 28 nos.X7500 Nm <sup>3</sup> /hr) | 5387<br>(20 nos.X3000 + 32 nos.X12500 + 28 nos.X7500 Nm <sup>3</sup> /hr) |
| 11      | Oxygen Plant                                                      | MTPA                           | 0.098<br>(1 no.X100 + 1 no.X180 TPD)         | 0.196<br>(Config revised & added)                          | 0.294<br>(2 nos.X180 TPD + 1 no.X220 TPD + 2 nos.X130TPD)                 |
| 12      | Lime Plant                                                        | MTPA                           | 0.3045 MTPA<br>(1 no.X 300 + 1 no.X 570 TPD) | 0<br>(Config revised)                                      | 0.3045 MTPA<br>(1 no.X390 + 1 no.X 480 TPD)                               |
| 13      | Cement Plant                                                      | MTPA                           | 1.686<br>(1 no.X2600 + 1 no.X2300 TPD)       | -                                                          | 1.686<br>(1 no.X2600 + 1 no.X2300 TPD)                                    |
| 14      | Captive Power Plant                                               | MW                             | 385                                          | 310                                                        | 695                                                                       |
| 14.1    | Waste Heat Recovery Boiler (WHRB) based Captive Power Plant (CPP) | MW                             | 135                                          | 100                                                        | 235                                                                       |
| (a)     | DRI Kiln exit gas based                                           | MW                             | 68<br>(2X50+2#X60 TPH)                       | 82<br>(Config revised & added)                             | 150<br>(2 nos.X50 + 3 nos.X85 TPH + 2 nos.X120 TPH)                       |
| (b)     | MBF Gas based                                                     | MW                             | 31<br>(1 no.X50 + 1 no.X90 TPH)              | 4<br>(Config revised)                                      | 35<br>(1 no.X50 + 2 nos.X45 TPH)                                          |
| (c)     | Coke Oven Gas based                                               | MW                             | 36<br>(1 no.X 60+1 no. X100 TPH)             | 4                                                          | 40<br>(2 no.X60 + 1no.X40TPH)                                             |
| (d)     | TRT                                                               | MW                             | -                                            | 10                                                         | 10                                                                        |
| 14.2    | AFBC/CFBC based CPP                                               | MW                             | 250<br>(2 nos.X125 + 4nos.X250 TPH)          | 210<br>(Config revised & added)                            | 460<br>(10 nos.x125 + 1 nos.X130 + 3nos.X250 TPH)                         |
| 15      | Colony                                                            | Acres                          | -                                            | -                                                          | 34                                                                        |

*\*typographical error, should read 4X60 TPH*

## 2.2 PLANT LAYOUT

Total land required for the project is 1769 acres for factory, colony, greenbelt, raw material stock yard, water reservoir, amenities, temporary solid waste storage, etc. Company has acquired 608.495 acres (comprising 540.705 acres private land+67.790 acres Government land). Balance 1160.55 acres land under acquisition through IDCO (initial approval letter given in **Annexure XXIV**). The proposed layout map is shown in **Fig 2.1**.

The breakup of area under major units is given in **Table 2.2**. 33% of plot area is proposed for development of green belt and plantation. Sufficient road and parking space has been provisioned for easy movement.

**TABLE 2.2: BREAK UP OF TOTAL PLOT AREA IN ACRES**

| Sl. No. | Description                                       | Sanctioned as per EC |            | Proposed Additional | Total after Expansion |              |
|---------|---------------------------------------------------|----------------------|------------|---------------------|-----------------------|--------------|
|         |                                                   | Area                 | %          | Area                | Area                  | %            |
| 1.      | Plants, facilities                                | 273.685              | 40.56      | 442.715             | 716.4                 | 40.50        |
| 2.      | Stock yards, raw material complex, railway siding | 51.81                | 7.68       | 76.19               | 128                   | 7.24         |
| 3.      | Area for solid waste                              | 55.2                 | 8.18       | 60.8                | 116                   | 6.56         |
| 4.      | Green belt & plantation                           | 222.67               | 33.00      | 361.33              | 584                   | 33.01        |
| 5.      | Administration & other buildings                  | 1.4                  | 0.21       | 28.6                | 30                    | 1.70         |
| 6.      | Water reservoir                                   | 30                   | 4.45       | 30                  | 60                    | 3.39         |
| 7.      | Roads                                             | 40                   | 5.93       | 60.6                | 100.6                 | 5.69         |
| 8.      | Colony                                            | 0                    | 0          | 34.0                | 34.0                  | 1.92         |
|         | <b>Total</b>                                      | <b>674.765</b>       | <b>100</b> | <b>1094.235</b>     | <b>1769</b>           | <b>100.0</b> |

Site Photographs showing plant area are shown in **Fig 2.2**. The Google image of project site is shown in **Fig 2.3**.

**FIG 2.1: PLANT LAYOUT MAP**

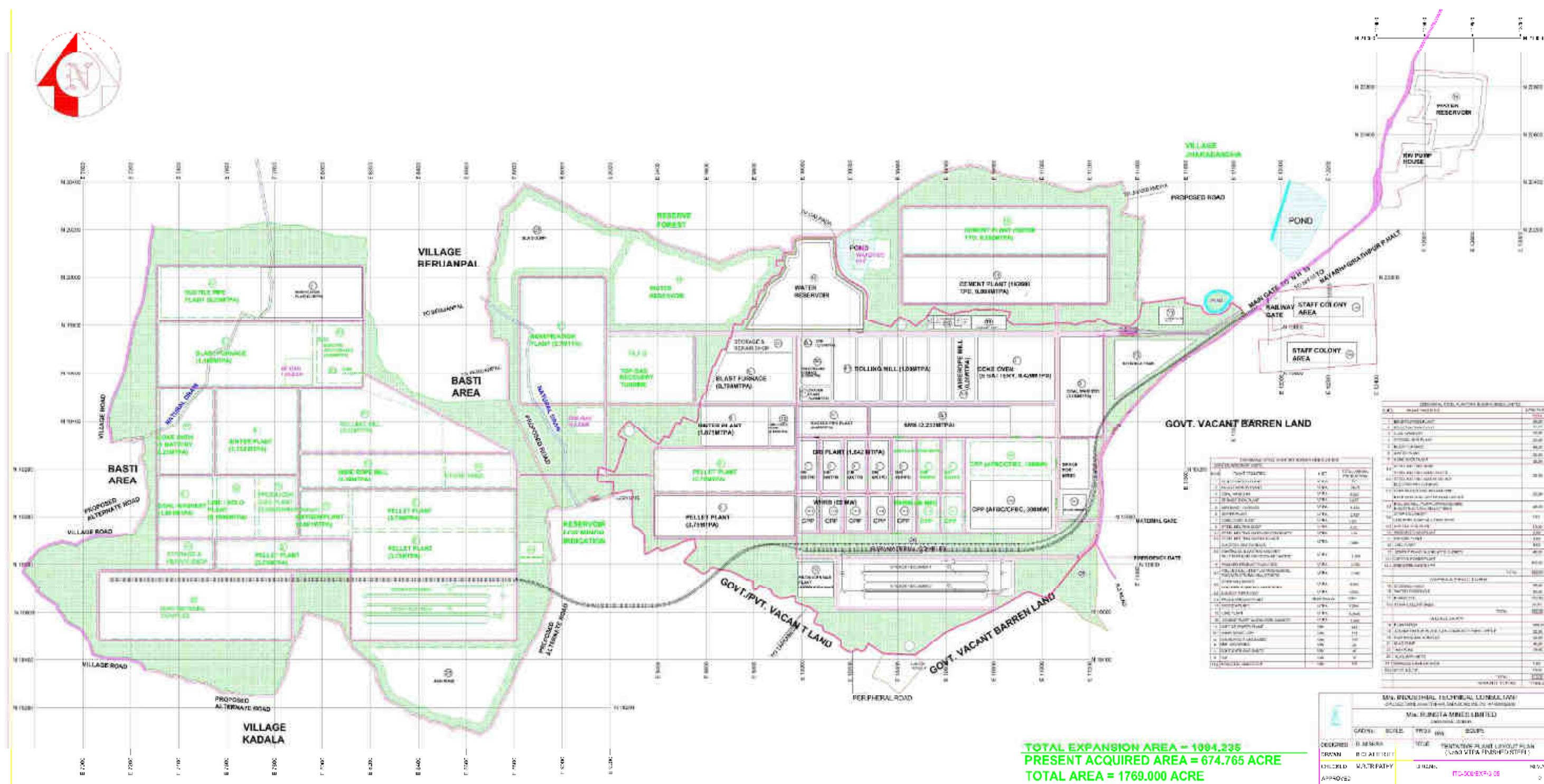




**FIG 2.2: PLANT SITE PHOTOGRAPHS**



**CONSTRUCTION OF DUCTING ACC**



**CONSTRUCTION OF HP & LP HEATER**



**SMS B ROW COLUMN BRACING  
ERECTION**



**SMS FURNACE**



**DRI-I MCC BUILDING**



**132 KV STRINGING**

FIG 2.3: GOOGLE IMAGE OF PROJECT SITE



## 2.3 PROCESS DESCRIPTION

Dhenkanal Seel plant had obtained Environmental Clearance from Ministry of Environment, Forest and Climate Change, Government of India vide letter no. J-11011/309/2018.IA.II.(I) dated 11.09.2019 (for 2.85 MTPA), amendment dated 13.04.2020 (for change in configuration of Pellet plant) and expansion dated 04.06.2020 (for 3.0 MTPA) for Integrated Steel Plant.

The proposed project is being further expanded. It is now proposed to expand the sanctioned facilities from 3.0 MTPA to 3.55 MTPA. Details of the plant configuration and proposed production is given in Table 2.1 earlier. Expansion will be established in 1094.235 acre as land adjacent and near to the existing land (674.765 Acres). Total land after expansion will be 1769 acres. Facilities such as 2x500 TPD DRI, 4x20T IF and 50 MW CPP (25 MW WHRB+25MW CFBC) is under construction on the land in possession of the company.

The plant configuration for 3.55 MTPA steel is such that it includes the under construction units. The configuration of the units in the proposed plant have already been listed in **Table 2.1** and their processes are described in subsequent sections.

### 2.3.1 Iron Ore Beneficiation Plant

The configuration of beneficiation plant is given in **Table 2.3**. No change or expansion has been proposed.

**TABLE 2.3: CONFIGURATION OF BENEFICIATION PLANT**

| <b>Description</b>                      | <b>Quantity</b> |
|-----------------------------------------|-----------------|
| Nos.                                    | 2               |
| Throughput Capacity, MTPA               | 5.4             |
| No. of working days/ anum               | 330             |
| No. of working hours/ day               | 24              |
| Beneficiated ore production, Output TPA | 3,233,956       |

***Process Description***

Beneficiation Plant mainly involves grinding of iron-ore fines and separation of gangue to the extent possible, within the required operational limits.

Beneficiation process mainly consists of

- Primary Grinding
- Hydro cycloning
- Two stage spiral classification
- Single stage high gradient magnetic separation
- Regrinding & thickening of concentrate received from both spirals & magnetic separators

Iron-ore fines will be brought from the mine. The fines will be stockpiled in the raw material yard. Iron-ore fines will be reclaimed through pay-loaders and tippers and transported to silos through shuttle conveyor. Vibrating feeders are provided below each of the silo. The output from the vibro feeder will feed the grinding mill feed conveyors.

Thereafter, primary grinding in wet grinding mill shall be carried out.

The mill feed conveyors will feed primary ball mill. The primary ball mill's discharge is collected in pump sump for pumping to hydro cyclone clusters. The overflow from the cyclone is sent to slime thickener. The cyclone under flow is fed to a bank of rougher spirals. The concentrate from the rougher spirals will be processed in cleaner spirals. The tailings from the rougher & cleaner spirals are fed to intermediate slime thickener. The concentrate from cleaner spiral are pumped to secondary hydro cyclone. The under flow from cyclone are fed to regrinding mills for further grinding to required product size. The overflow from the cyclone is fed to concentrate thickener. The under flow from the concentrate thickener is pumped to slurry storage tanks. The thickened concentrate at approximately 65-66% solids by weight will be pumped into the pellet plant by single stage pumping to the slurry storage tank fitted with agitation mechanism.

The under size from the screens is fed to High Gradient Magnetic Separator (HGMS) for recovery of concentrate from slimes. The concentrate from HGMS is further ground in the same regrinding mill, which is close circulated with secondary hydro cyclone. The concentrate over flow from

hydro cyclone is thickened in concentrate thickener before pumping to slurry storage tanks provided with agitators. The tailing from HGMS is fed to a tailing thickener. The tailing thickener underflow is pumped to a tailing dam in the beneficiation plant site. The overflow from the tailing thickener is sent to process water tank for re-circulation in the process. The major quantity of water of tailing dam shall be lost in evaporation and seepage.

The slurry from this storage tank is fed to pressure filters to obtain filter cakes. When wet grinding process is adopted, the preparation of flux materials and binders (if bentonite is used) is done in dry state and separate grinding equipment is to be installed.

Material balance for the iron ore beneficiation plant is given in **Table 2.4**.

**TABLE 2.4: MATERIAL BALANCE FOR SANCTIONED IRON ORE BENEFICIATION PLANT (NO CHANGE IN EXPANSION PHASE)**

| Raw Material Inputs                       | Specific Consumption or generation T/T of Product | Total Quantity (TPA) | Total %     |
|-------------------------------------------|---------------------------------------------------|----------------------|-------------|
| Low Grade Iron Ore Fines (0 to 5 mm)      | 1.00                                              | 5389927              | 99.995%     |
| Flocculant                                | 0.00005                                           | 269                  | 0.005%      |
| <b>Total</b>                              | <b>1.00005</b>                                    | <b>5390196</b>       | <b>100%</b> |
| <b>Outputs</b>                            |                                                   |                      |             |
| Beneficiated Iron Ore (product)           | 0.60000                                           | 3233956              | 60%         |
| Tailing (0.4) & emission losses (0.00005) | 0.40005                                           | 2156240              | 40%         |
| <b>Total</b>                              | <b>1.00005</b>                                    | <b>5390196</b>       | <b>100%</b> |

100% of the beneficiated iron ore will be used in pellet plant. Likely composition of beneficiated iron ore will be :

|                                |   |              |
|--------------------------------|---|--------------|
| Fe content                     | - | 63 - 64 %    |
| Al <sub>2</sub> O <sub>3</sub> | - | 2.5 - 3% max |
| SiO <sub>2</sub>               | - | 2.5 - 3% max |
| L.O.I.                         | - | 2% max       |

### 2.3.2 Pelletisation Plant

The pellet plant is designed to produce iron oxide pellets suitable for use in DRI and Blast Furnace. The sanctioned and proposed configuration of the pellet plant is given in **Table 2.5**. The configuration of the existing sanctioned plant will be changed from 1X2.948 to 1X3.75 MTPA. The

existing sanctioned plant has started construction on 31.09.2020 as per CTE obtained from OSPCB.

**TABLE 2.5: CONFIGURATION OF SANCTIONED & PROPOSED PELLETISATION PLANT**

| Description                                          | Sanctioned as per EC | Enhancement of Sanctioned | Proposed Additional as per TOR | Total                             |
|------------------------------------------------------|----------------------|---------------------------|--------------------------------|-----------------------------------|
| (a)                                                  | (b)                  | (c)                       | (d)                            | (e)=(b)+(c)+(d) except days & hrs |
| No. of Units                                         | 1                    | -                         | 4                              | 5                                 |
| Actual number of days per year likely to be operated | 335                  | 335                       | 335                            | 335                               |
| No. of working hours/day                             | 24                   | 24                        | 24                             | 24                                |
| <b>Total Capacity (Based on output), TPA</b>         | <b>2,948,000</b>     | <b>802,000</b>            | <b>25,000,000</b>              | <b>28,750,000</b>                 |
| <b>Configuration</b>                                 | <b>1X2.948 MTPA</b>  |                           | <b>4X3.75 + 10X1 MTPA</b>      | <b>5X3.75 + 10X1 MTPA</b>         |

### ***Process Description***

The pellet plant will produce oxide pellets suitable for use in DRI kiln. Pellets are heat hardened balls produced from concentrates and natural iron ores of different mineralogical and chemical composition. The pellets have improved properties for iron making. Pelletization process involves feed preparation, green ball formation, pellet induration and product dispatch.

Steps involved in pelletisation process are as follows:

- Lime stone is ground together with coke breeze in a ball mill. A hot gas generator using fuel oil is attached to the ball mill to dry the additives. The ground coke/limestone mix is sent to the day bins in the mixing area.
- Bentonite is ground in a roller mill separately. It is equipped with a hot gas generator for the simultaneous drying of the ground product, bag filter and fan. Ground products are stored in silos and transported pneumatically to bin/ mixing building.
- Iron ore concentrate from beneficiation plant is passed through pressure filters to obtain filter cakes. They are collected on a belt conveyor and fed into filter cake bin.
- Pre-weighed portions of filter cake, coke breeze/limestone mix and bentonite are mixed in EIRICH mixer, enabling intensive mixing of above materials.

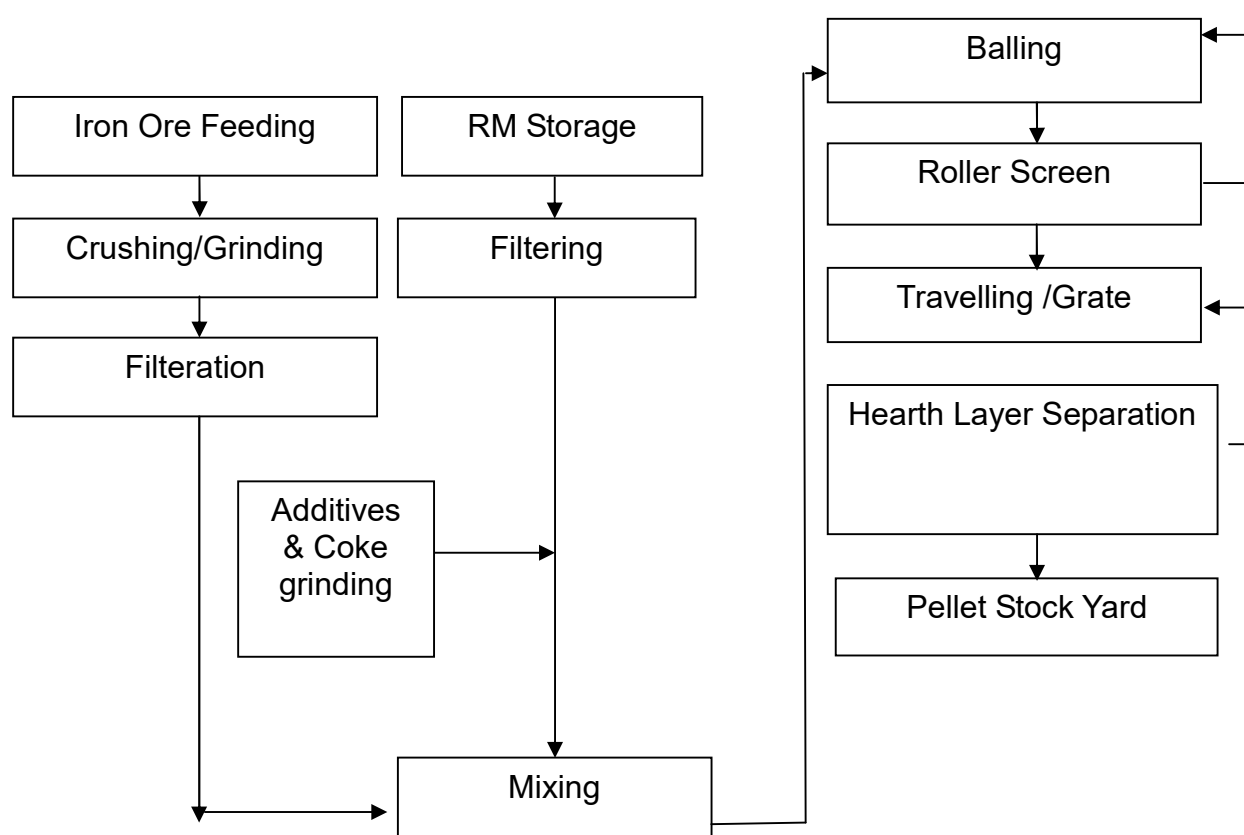
- The above mixture is conveyed to a bin directly above pelletizing discs.
- The green ball formation is done through disc pelletizers (6 working & 1 standby).
- The green balls are fed to an indurating machine wherein pellets are produced. Green balls (green pellets) will be indurated on a traveling grate which consists of an endless chain of pellet cars moving on tracks.
- To avoid thermal shocks to grate bars, green pellets are charges over a layer of indurated pellets, called 'hearth layer'. Pellet sidewalls (both sided) are also protected from excessive heat, with indurated pellets called 'side layers'.
- A storage bin for hearth and side layers having three outlet chutes is provided at the feed end of the travelling grate. First, hearth layer is fed onto the indurating machine followed by simultaneous feeding of side layers (both sides) and green balls onto the process of induration.
- The indurated and cooled pellets are discharged from the indurating machine on to a product conveyor through a product discharge bin. This belt conveyor discharges product pellets into a hearth layer separation bin, having two outlets. From one bottom outlet, the amount of pellets required as hearth & side layer are discharged, controlled by the level of hearth layer bin mentioned above. Hearth layer shall be transported by a series of belt conveyors to hearth layer bin while product pellets are discharged for transportation to the pellet stock pile. Material balance of the pelletisation plant is given in **Table 2.6**. Process flow sheet is given in **Fig 2.4**.

**TABLE 2.6: MATERIAL BALANCE OF SANCTIONED & PROPOSED PELLETISATION PLANT**

|                                       | Sanctioned as per EC        |                                            | Proposed additional as per TOR | Total after expansion       |                                            |
|---------------------------------------|-----------------------------|--------------------------------------------|--------------------------------|-----------------------------|--------------------------------------------|
| <b>Total Production (TPA)</b>         | <b>2,948,000</b>            |                                            | <b>25,802,000</b>              | <b>28,750,000</b>           |                                            |
| <b>Raw Material &amp; Fuel Inputs</b> | <b>Total Quantity (TPA)</b> | <b>Specific Consumption T/T of Product</b> | <b>Total Quantity (TPA)</b>    | <b>Total Quantity (TPA)</b> | <b>Specific Consumption T/T of Product</b> |
| Iron Ore/ Fines/ concentrate          | 3,233,956                   | 1.097                                      | 28,304,794                     | 31,538,750                  | 1.097                                      |
| Dolomite (Flux)                       | 41,272                      | 0.014                                      | 361,228                        | 402,500                     | 0.014                                      |
| Bentonite                             | 44,220                      | 0.015                                      | 387,030                        | 431,250                     | 0.015                                      |
| Coke Breeze                           | 50,116                      | 0.017                                      | 438,634                        | 488,750                     | 0.017                                      |
| Coal >= 5500 Kcal /kg (emergency use) | 98,463                      | 0.033                                      | 861,787                        | 960,250                     | 0.0334                                     |
| <b>Sub-Total (solids)</b>             | <b>3,468,027</b>            | <b>1.176</b>                               | <b>30,353,473</b>              | <b>33,821,500</b>           | <b>1.176</b>                               |

|                                      | Sanctioned as per EC    |                                          | Proposed additional<br>as per TOR | Total after expansion      |                                          |
|--------------------------------------|-------------------------|------------------------------------------|-----------------------------------|----------------------------|------------------------------------------|
| Producer Gas (Nm <sup>3</sup> )/year | 479,050,000             | 162.5                                    | 4,902,950,000                     | 5,382,000,000              | 187.2                                    |
| <b>Sub-Total (gas)</b>               | <b>479,050,000</b>      | <b>162.5</b>                             | <b>4,902,950,000</b>              | <b>5,382,000,000</b>       | <b>187.2</b>                             |
| Outputs                              | Total Quantity<br>(TPA) | Specific<br>generation T/T<br>of Product | Total Quantity<br>(TPA)           | Total<br>Quantity<br>(TPA) | Specific<br>generation T/T<br>of Product |
| Pellets                              | 2,948,000               | 1.0                                      | 25,802,000                        | 28,750,000                 | 1                                        |
| Dust (Iron Ore, Coke, Coal<br>Fines) | 240,772                 | 0.082                                    | 2,107,325                         | 2,348,097                  | 0.082                                    |
| Losses                               | 279,255                 | 0.095                                    | 2,444,148                         | 2,723,403                  | 0.095                                    |
| <b>Sub-Total (Solids)</b>            | <b>3,468,027</b>        | <b>1.176</b>                             | <b>30,353,473</b>                 | <b>33,821,500</b>          | <b>1.176</b>                             |
| Combustion Gases (Nm <sup>3</sup> )  | 479,050,000             | 162.5                                    | 4,902,950,000                     | 5,382,000,000              | 187.2                                    |
| <b>Sub-Total (gas)</b>               | <b>479,050,000</b>      | <b>162.5</b>                             | <b>4,902,950,000</b>              | <b>5,382,000,000</b>       | <b>187.2</b>                             |

**FIG 2.4: PROCESS FLOW OF PELLETISATION PROCESS**



### Quality of pellets DR Grade

The expected chemical composition of DR grade pellets and their chemical, physical & metallurgical properties are given in **Table 2.7**.

The properties of the finished pellets will vary depending on actual physical and chemical characteristics of input raw materials.

**TABLE 2.7: CHEMICAL, PHYSICAL & METALLURGICAL PROPERTIES OF DR PELLETS**

| Chemical Properties                               | Specification     | Chemical Properties                                      | Specification                          |
|---------------------------------------------------|-------------------|----------------------------------------------------------|----------------------------------------|
| Fe (t)                                            | 66.50% min        | Mn                                                       | 0.10% max                              |
| SiO <sub>2</sub> + Al <sub>2</sub> O <sub>3</sub> | 3.10% max         | P                                                        | 0.04% max                              |
| Na <sub>2</sub> O                                 | 0.05% max         | S                                                        | 0.02% max                              |
| K <sub>2</sub> O                                  | 0.05% max         | V                                                        | ----                                   |
| TiO <sub>2</sub>                                  | 0.10% max         | Basicity (CaO/SiO <sub>2</sub> )                         | 0.5                                    |
|                                                   |                   | Moisture (free moisture loss at 105 degree centigrade) : | 4% max (fair season), 6% max (monsoon) |
| Metallurgical Properties                          | Specification     | Physical Properties                                      | Specification                          |
| Swelling (JIS)                                    | 20% max           | +19mm                                                    | 5% max                                 |
| Compression strength                              | 250 kg/pellet min | -16 mm, +9mm                                             | 85% max                                |
| Porosity                                          | 18-25% min        | -9mm, +5mm                                               | 5% min                                 |
| Reducibility (JIS)                                | 70% min           | -5mm                                                     | 3% max                                 |
|                                                   |                   | Tumbler test (ASTM)                                      |                                        |
|                                                   |                   | Tumble Index (+6.35mm)                                   | 94% min                                |

Source:- IS : 11092-2001

### 2.3.3 Coal washery

The availability of E and F grade coal mines in India is in abundance. E and F grade coal have 40% ash, which reduces the output of DRI plant. Hence, it is proposed to install a suitable three-Product Coal Washery. The capacity of Coal Washery has been derived on the basis of the requirement for DRI. The capacity of the washery will be enhanced to 5.029 MTPA throughput. The configuration of the units will be in **Table 2.8** and material balance is given in **Table 2.9**.



**TABLE 2.8: CONFIGURATION OF SANCTIONED & PROPOSED COAL WASHERY**

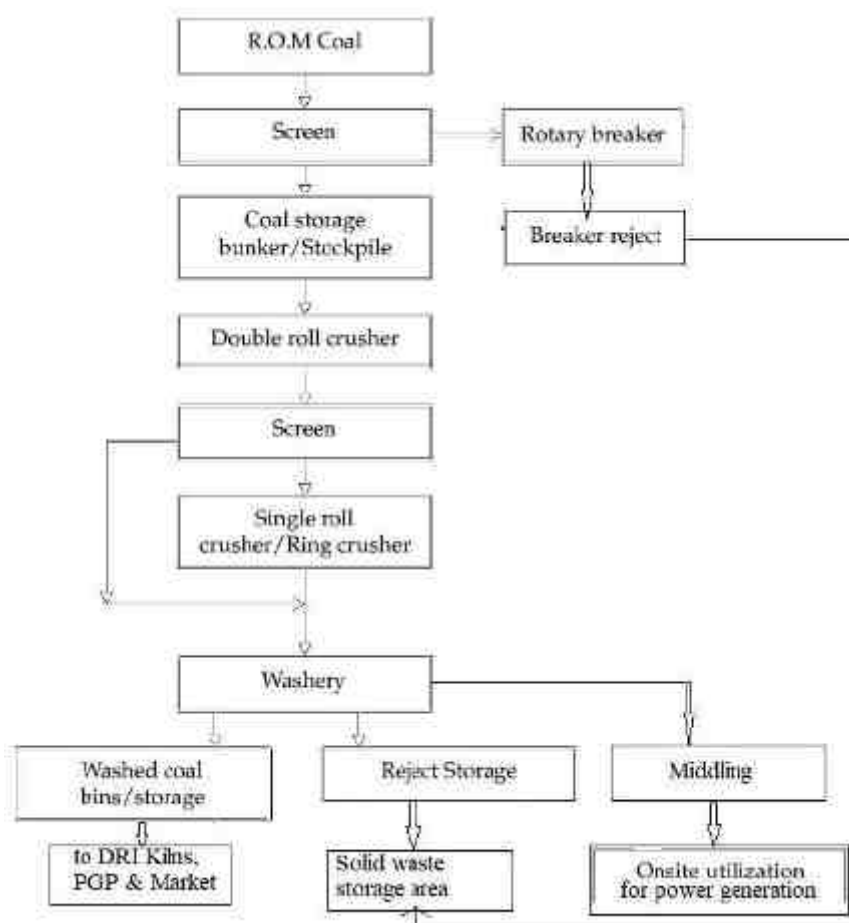
| Description          | Unit       | Sanctioned as per EC | Proposed Additional as per TOR | Total     |
|----------------------|------------|----------------------|--------------------------------|-----------|
| Coal Washery         | Nos.       | 2                    | -                              | 2         |
| Capacity             | TPH        | 400 & 235            | -                              | 400 & 235 |
| No. of working days  | per/ annum | 325-326              | 4-5                            | 330       |
| No. of working hours | hours/ day | 19-20                | 4-5                            | 24        |
| ROM throughput       | TPA        | 4,140,960            | 888,240                        | 5,029,200 |
| Washed coal          |            | 2,070,480            | 444,120                        | 2,514,600 |

**Process Description**

The beneficiation consists of cleaning of raw coal by separation of mineral matter (ash) from the coal. The cleaning of coal is mainly based on separation of the impurities by physicochemical methods based on the differences in the specific gravity of coal constituents and on the differences in surface properties of the coal and its mineral matter required. The cleaning process that will be followed will be the wet process, where water is the main medium for washing and jigging. The washery will include:

- Primary crushing- to receive ROM coal and reduce it to a top size of 2-8"
- Scalping screen – for separating refuse and fines prior to size reduction
- Raw coal sizing screen- for separating the raw coal into coarse and fine size for further processing
- Pre-wet screen- to remove fines prior to the mechanical cleaning
- Secondary crushing-to reduce the size (to a top size of 1 ¾") of the middling fraction from jigs or the middling fraction from heavy – medium trough separators, and, in turn these fractions would be rewashed.
- Desliming screens-to remove extreme fines; and
- Dewatering screens-to remove water

The process flow sheet of washery is given in **Fig 2.5**.

**FIG 2.5: COAL WASHERY PROCESS****TABLE 2.9: MATERIAL BALANCE FOR SANCTIONED & PROPOSED COAL WASHERY**

|                     | Sanctioned as per EC |                                     | Proposed additional as per TOR | Total after expansion |                                     |
|---------------------|----------------------|-------------------------------------|--------------------------------|-----------------------|-------------------------------------|
| Raw Material Inputs | Total Quantity (TPA) | Specific Consumption T/T of Product | Total Quantity (TPA)           | Total Quantity (TPA)  | Specific Consumption T/T of Product |
| ROM Coal            | 4,140,960            |                                     | 888,240                        | 5,029,200             |                                     |
| <b>Total</b>        | <b>4,140,960</b>     |                                     | <b>888,240</b>                 | <b>5,029,200</b>      |                                     |
| Outputs             | Total Quantity (TPA) | Specific generation T/T of Product  | Total Quantity (TPA)           | Total Quantity (TPA)  | Specific generation T/T of Product  |
| Washed Coal         | 2,070,480            | 0.5                                 | 444,120                        | 2,514,600             | 0.5                                 |
| Middlings           | 1,759,908            | 0.425                               | 377,502                        | 2,137,410             | 0.425                               |
| Reject              | 310,572              | 0.075                               | 66,618                         | 377,190               | 0.075                               |
| <b>Total</b>        | <b>4,140,960</b>     | <b>1</b>                            | <b>888,240</b>                 | <b>5,029,200</b>      | <b>1</b>                            |

### 2.3.4 DRI Plant

A 2x500 TPD DRI plant is under construction. The existing & the proposed configuration & capacity is given in **Table 2.10**.

**TABLE 2.10: CONFIGURATION OF SANCTIONED AND PROPOSED DRI PLANT**

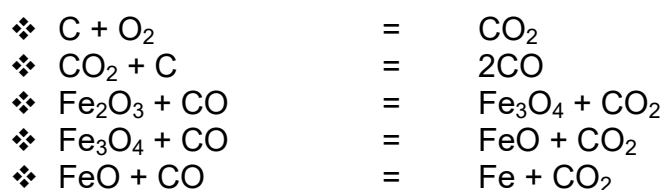
| Description             | Unit        | Sanctioned as per EC      | Proposed as per TOR             |
|-------------------------|-------------|---------------------------|---------------------------------|
| DRI Kilns               |             | 2 X 500 TPD + 4 X 600 TPD | 2 X 500 TPD + 3X600 + 2X900 TPD |
| No. of working days     | Days/Annum  | 350                       | 355                             |
| No. of working hours    | Hours/Day   | 24                        | 24                              |
| <b>Total Production</b> | <b>MTPA</b> | <b>1.613</b>              | <b>2.247</b>                    |

#### **Process Description**

Iron ore (lumps or pellets) is reduced by heating with solid carbonaceous material, such as coal, in a rotary kiln to temperature of about 1000°C. After reduction, products are cooled in a drum type rotary cooler and then separated into sponge iron and char by magnetic separation. The magnetic and non-magnetic material are stored in fully closed hoppers. The product house consists of silo for sponge iron lumps, sponge iron fines and char. The char shall be used as fuel in the proposed power plant.

High degree of reduction and thermal efficiency can be obtained by controlling process parameters such as reduction temperature, rate of feed, size of feed, grade of feed etc.

The basic reactions in this process are as given below:



#### **Raw material handling system**

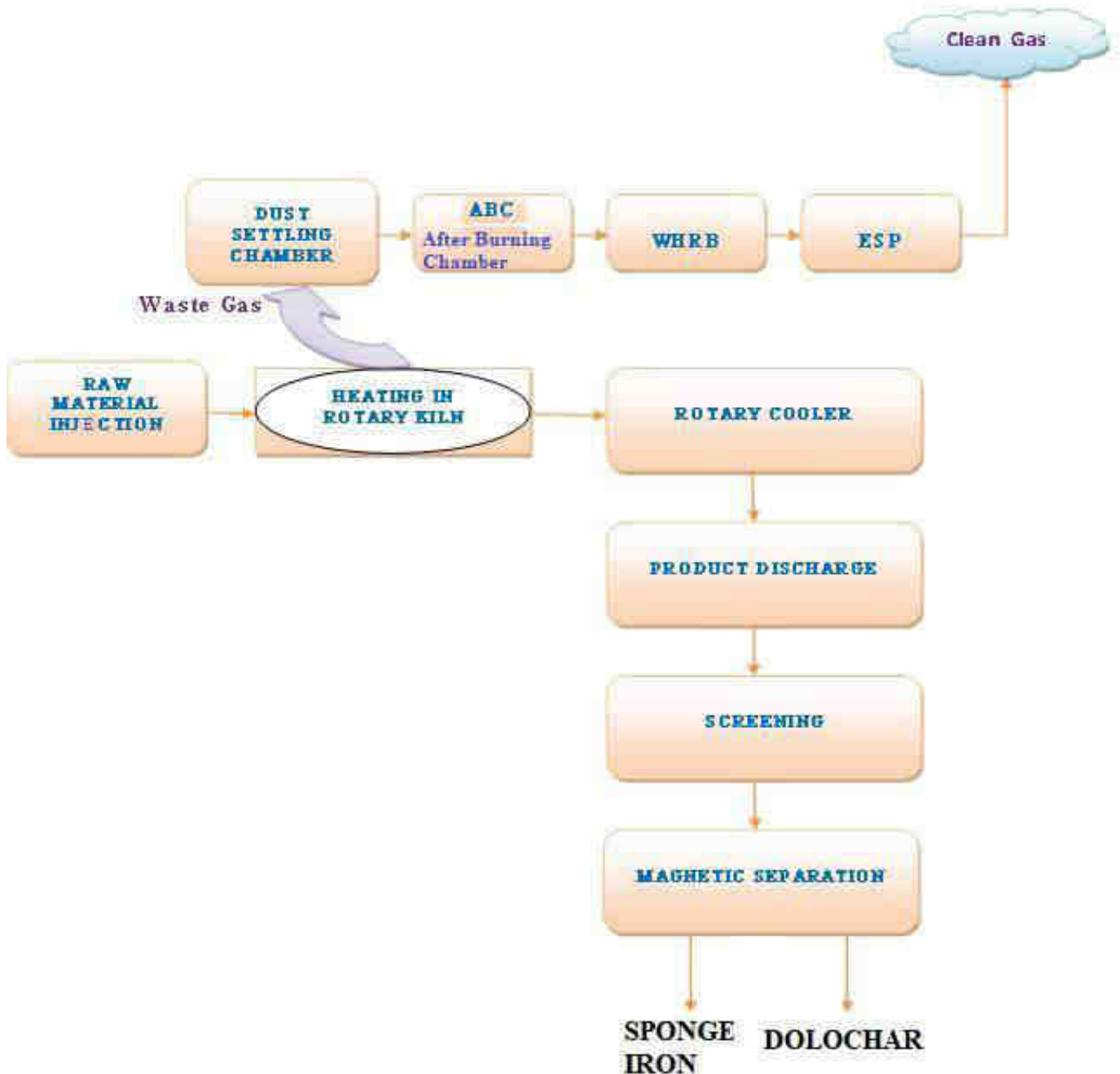
Main raw materials- iron ore pellets, coal & dolomite are being fed to the ground hoppers with the help of pay loaders and tippers and carried by belt conveyors to the crusher house. Screened and crushed material will be carried out by belt conveyors to the stock house, having 5 days storage bins. Crushers for coal & limestone, will be provisioned.

#### **Raw material feed system**

The stored raw material are weighed individually and fed to the kiln through a rotary airlock feeder. The injection coal system injects coal at the discharge end of rotary kiln to avoid coal starvation with 1 bar pressure at

which leakages are not possible. There will be a burner system, which is used for initial heating of the kiln up to 400°C. The calibrated quantity of combustion air is also fed through the same opening. Process flow sheet for proposed DRI plant is shown in Fig 2.6.

**FIG 2.6: FLOW SHEET DRI PLANT**



Proposed material balance is given in **Table 2.11**.

**TABLE 2.11: MATERIAL BALANCE FOR SANCTIONED AND PROPOSED DRI**

|                            | Sanctioned as per EC  |                                   | Proposed Additional as per TOR | Total after Expansion |                                   |
|----------------------------|-----------------------|-----------------------------------|--------------------------------|-----------------------|-----------------------------------|
| <b>Capacity (TPA)</b>      | <b>1,613,140</b>      |                                   | <b>634,010</b>                 | <b>2,247,150</b>      |                                   |
| <b>Raw Material Inputs</b> | <b>Quantity (TPA)</b> | <b>Specific consumption (T/T)</b> | <b>Quantity (TPA)</b>          | <b>Quantity (TPA)</b> | <b>Specific consumption (T/T)</b> |
| Iron Ore/Iron Oxide        | 2,419,710             | 1.500                             | 951,015                        | 3,370,725             | 1.500                             |
| Coal                       | 1,290,512             | 0.800                             | 684,733                        | 1,975,245             | 0.879                             |
| Dolomite                   | 48,394                | 0.030                             | 41,492                         | 89,886                | 0.040                             |
| <b>Total</b>               | <b>3,758,616</b>      | <b>2.330</b>                      | <b>1,677,240</b>               | <b>5,435,856</b>      | <b>2.419</b>                      |
| <b>Outputs</b>             | <b>Quantity (TPA)</b> | <b>Specific Generation (T/T)</b>  | <b>Quantity (TPA)</b>          | <b>Quantity (TPA)</b> | <b>Specific Generation (T/T)</b>  |
| Sponge Iron (DRI)          | 1,613,140             | 1.000                             | 634,010                        | 2,247,150             | 1.000                             |
| Char                       | 289,759               | 0.180                             | 124,588                        | 414,347               | 0.184                             |
| ESP, Bag Filter Dust       | 200,000               | 0.124                             | -58,553                        | 141,447               | 0.063                             |
| Kiln Accretion             | 68,474                | 0.042                             | -28,060                        | 40,414                | 0.018                             |
| Losses                     | 1,587,243             | 0.984                             | 1,005,255                      | 2,592,498             | 1.154                             |
| <b>Total</b>               | <b>3,758,616</b>      | <b>2.330</b>                      | <b>1,677,240</b>               | <b>5,435,856</b>      | <b>2.419</b>                      |

### 2.3.5 Mini blast furnace

An EC has been obtained dated 04.06.2020 for 1x600 cum and 1x1050 cum to produce 1,559,250 TPA. 1x600 cum and 2x450 cum will be installed in future to produce 1,942,500 TPA. The sanctioned and proposed configuration of Mini Blast Furnaces will be as shown in **Table 2.12**.

**TABLE 2.12: CONFIGURATION OF SANCTIONED AND PROPOSED MINI BLAST FURNACE**

| Description  | Unit       | Sanctioned as per EC | Proposed additional or change as per TOR | Total after expansion |
|--------------|------------|----------------------|------------------------------------------|-----------------------|
| MBF          | Nos.       | 2                    | 3                                        | 3                     |
| Capacity     | CUM        | 600 & 1050           | 600 & 2 X 450                            | 600 & 2 X 450         |
| Working days | days/Annum | 350                  | -                                        | 350                   |

| Description   | Unit       | Sanctioned as per EC | Proposed additional or change as per TOR | Total after expansion |
|---------------|------------|----------------------|------------------------------------------|-----------------------|
| Working hours | Hours /Day | 24                   | -                                        | 24                    |
| Productivity  | T/Cum      | 2.7                  | 1.0                                      | 3.7                   |
| Production    | TPA        | <b>1,559,250</b>     | <b>383,250</b>                           | <b>1,942,500</b>      |

By using superior quality raw material, the blast furnace charge mix can comprise of upto 85% Sinter & balance blast Furnace Grade Iron-Ore/ pellet. Furthermore, use of coke with low ash content and by using best operation & maintenance practice, the productivity of Blast Furnace will increase upto 3.7 T/cum/day.

### ***Manufacturing Process and facilities***

The purpose of a blast furnace is to chemically reduce and physically convert iron oxides into liquid iron called "hot metal". The blast furnace is a huge, steel lined with refractory brick, where iron ore, coke and limestone are dumped into the top, and preheated air is blown into the bottom. The raw materials require 6 to 8 hours to descend to the bottom of the furnace where they become the final product of liquid iron and reject of liquid slag. Both of these are drained from the furnace at regular intervals.

The hot air that was blown into the bottom of the furnace ascends to the top in 6 to 8 seconds after going through numerous chemical reactions. The air is blown through tuyers in the bottom portion and liquid iron is tapped from the tap hole.

The blast furnace complex will consist of two blast furnaces and two pig casting machines along with the requisite support facilities, namely the stock house, coal injection system, cast house, gas cleaning plant, dedusting facilities, slag granulation unit, etc.

The blast furnace flue gas will be passed through Waste Heat Recovery Boiler and power generated from heat recovery. Thereafter, gas is cleaned in Gas Cleaning Plant and utilized for stove of blast furnace and other plant uses such as reheating furnaces. Unutilised gas shall be flared.

### ***Stock House***

The sized ore, fluxes, coke, etc., from the raw material storage yard, are transferred to the stock house and placed in respective bins by shuttle conveyors. The raw material will be screened before charging into the blast furnace.

The stock house will be provided with a dedusting system (bag filters) for collection of dust arising from all material transfer points, vibratory feeder screens, weigh hoppers, etc.

### ***Furnace***

The blast furnace will be self-supporting free standing design complete with shell, refractory, cooling system, top charging equipment, bustle main, tuyeres/tuyere stocks etc. The blast furnace top equipment and the platform at various levels around the furnace are supported by an independent tower structure.

### ***Hot Blast Stoves***

The furnaces will be provided with stoves for supply of hot blast up to a maximum of 1100°C. The stoves will be of regenerative type and fired with blast furnace gas. Two fans, one working and one stand by will be provided for supply of combustion air to the stove burners. A chimney will be provided for the stoves. The different zones of the stoves will be lined with suitable quality of Alumina/Fireclay refractories depending on the temperature prevailing in the respective zones.

The stove valves will be electrically/hydraulically actuated, and the stove-changing operations will be automatic and remotely controlled from the control room.

### ***Cast House***

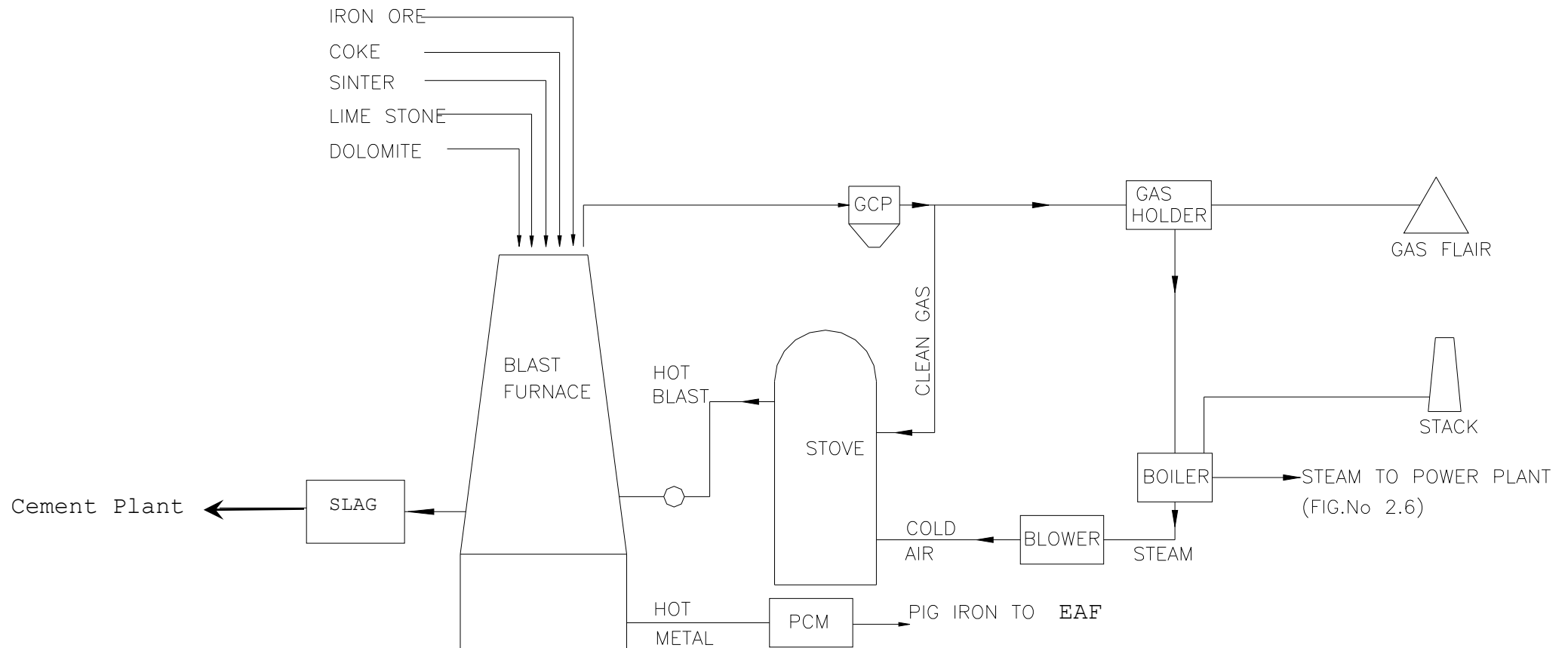
The furnace will have one tap hole. A cast house will be provided for handling the tapping operations and the hot metal/ slag. The main hot metal trough will be fixed type fabricated steel construction. The hot metal runner from each trough will discharge the metal into hot metal ladle kept on cast house floor. For opening and closing of the tap-hole, a hydraulically operated mud gun and a pneumatically operated tap-hole drilling machine will be provided. The skimmed slag from the main trough will normally be led to the slag granulation trough. Under emergency conditions, the slag can also be diverted to the dry slag pit. The cast house will be served by an EOT crane in the hot metal bay, for transferring the filled up hot metal ladle on to a ladle car for transfer to the steel melt shop. The crane will be used also for handling hot metal ladles to and from Pig Casting Machine (PCM) and ladle maintenance.

### ***Slag granulation***

The cast house will be served by a slag granulation unit. The slag / water slurry after granulation will be led to storage area and the water will be allowed to drain off. The granulated slag will be reclaimed by a pay loader and sent to the storage yard. From the storage yard, trucks will transport the granulated slag. The water for granulation will be routed through a water re-circulation system. The granulation units will be designed to granulate 100% of slag production. The granulated slag will be use in the cement plant proposed in the project.

Process flow sheet of the blast furnaces is given in **Fig 2.7**.

**FIG 2.7: PROCESS FLOW SHEET OF MINI BLAST FURNACE**





The material balance of the MBF is given in **Table 2.13**.

**TABLE 2.13: MATERIAL BALANCE OF SANCTIONED & PROPOSED BLAST FURNACE**

|                                     | Sanctioned as per EC |                            | Proposed additional as per TOR | Total after expansion |                            |
|-------------------------------------|----------------------|----------------------------|--------------------------------|-----------------------|----------------------------|
| Total Production (TPA)              | 1,559,250            |                            | 383,250                        | 1,942,500             |                            |
| Raw Material Inputs                 | Quantity (TPA)       | Specific consumption (T/T) | Quantity (TPA)                 | Quantity (TPA)        | Specific consumption (T/T) |
| Iron Ore                            | 657,195              | 0.421                      | -492,083                       | 165,113               | 0.085                      |
| Sinter                              | 1,662,570            | 1.066                      | 1,144,343                      | 2,806,913             | 1.445                      |
| Pellet                              |                      |                            | 330,225                        | 330,225               | 0.17                       |
| Coke                                | 951,143              | 0.61                       | -115,868                       | 835,275               | 0.43                       |
| Coal dust                           | 77,963               | 0.05                       | 213,412                        | 291,375               | 0.15                       |
| Dolomite                            | 218,295              | 0.14                       | 53,655                         | 271,950               | 0.14                       |
| Quartz                              | 81,081               | 0.052                      | 19,929                         | 101,010               | 0.052                      |
| <b>Total</b>                        | <b>3,648,247</b>     | <b>2.34</b>                | <b>1,153,613</b>               | <b>4,801,860</b>      | <b>2.472</b>               |
| Outputs                             | Quantity (TPA)       | Specific Generation (T/T)  | Quantity (TPA)                 | Quantity (TPA)        | Specific Generation (T/T)  |
| Hot Metal/ Pig Iron                 | 1,559,250            | 1                          | 383,250                        | 1,942,500             | 1                          |
| BF Slag                             | 467,775              | 0.3                        | 114,975                        | 582,750               | 0.3                        |
| Dust (Iron Ore, Coke, Sinter Fines) | 77,963               | 0.05                       | 19,162                         | 97,125                | 0.05                       |
| Sludge from GCP                     | 7,796                | 0.005                      | -7,796                         | 0                     |                            |
| Losses                              | 1,535,463            | 0.985                      | 644,022                        | 2,179,485             | 1.122                      |
| <b>Total</b>                        | <b>3,648,247</b>     | <b>2.34</b>                | <b>1,153,613</b>               | <b>4,801,860</b>      | <b>2.472</b>               |

### 2.3.6 Sinter plant

Sinter Plant plays a very important role in increasing the productivity of Blast Furnace and also in utilizing huge reserves of iron ore fines generated from crushing of ROM. The sanctioned and proposed configuration of sinter plant is as given in **Table 2.14**. The sinter plant construction is yet to start, hence, configuration change is proposed for approval in expansion phase.

**TABLE 2.14: CONFIGURATION OF SANCTIONED AND PROPOSED SINTER PLANT**

| Description  | Unit       | Sanctioned as per EC | Proposed additional or change as per TOR | Total After expansion |
|--------------|------------|----------------------|------------------------------------------|-----------------------|
| Sinter Plant | Nos.       | 2                    | 1                                        | 3                     |
| Capacity     | SQM        | 64 & 110             | 110 & 2 X 80                             | 110 & 2 X 80          |
| working days | days/Annum | 325                  | 5                                        | 330                   |

| Description       | Unit       | Sanctioned as per EC | Proposed additional or change as per TOR | Total After expansion |
|-------------------|------------|----------------------|------------------------------------------|-----------------------|
| working hours     | Hours /Day | 21                   |                                          | 24 & 20               |
| Productivity      | Ton/SQM    | 1.4                  |                                          | 1.5 & 1.44            |
| <b>Production</b> | <b>TPA</b> | <b>1,662,570</b>     | <b>1,164,870</b>                         | <b>2,827,440</b>      |

### ***Process description***

#### ***Flux and fuel crushing & screening section***

Limestone, dolomite, coke will be stored in storage bins of adequate capacity. The materials will be crushed in crushing and grinding section and will be screened and transported by conveyor to proportioning bins.

#### ***Proportioning system***

For various types of input materials, adequate number of proportioning bins mounted on load cells to ascertain material level in each bin and electronic weigh feeders under each bin shall be provided to draw materials of required proportions.

#### ***Mixing & Nodulising Drum***

A combined mixing and nodulising drum with water proportioning system and calcined lime addition facilities will be provided for the sinter machine.

The drum will facilitate stage-wise intimate mixing and rolling of sinter mix where approximate amount of water and required calcined lime will be added.

#### ***Sinter machine section***

Sinter machine will be complete with hearth layer feeding system, raw mix feeding system comprising anti segregation filling method at the top of raw mix feed bin and drum feeder, ignition furnace, sinter breaker, crash deck, segregation chute and the sinter strand proper comprising lifting wheel assembly, support structure, sliding bars, thermal compensation device, wind boxes with compensators, spillage chute, SG iron pallet assembly with spring loaded sealing and high chrome grate bar, lubrication system etc. Sintering will be performed during the movement of the bed from ignition furnace to the discharge end.

Suitable sinter breaker will break hot sinter cake to about 200 mm size. One elevator will be provided in sinter machine building.

#### ***Sinter cooler section***

A suitable forced draft type circular cooler comprising of adequate number of fans, drives, cooler troughs, sealing etc will be installed so that

temperature of the sinter at discharge point is 1000°C (maximum). The cooler discharge hopper shall be load cell mounted. One magnet shall be provided on the product sinter conveyor after cooler to remove iron bearing material.

Waste heat recovery system from cooler for ignition furnace combustion system will be optional for sinter machine.

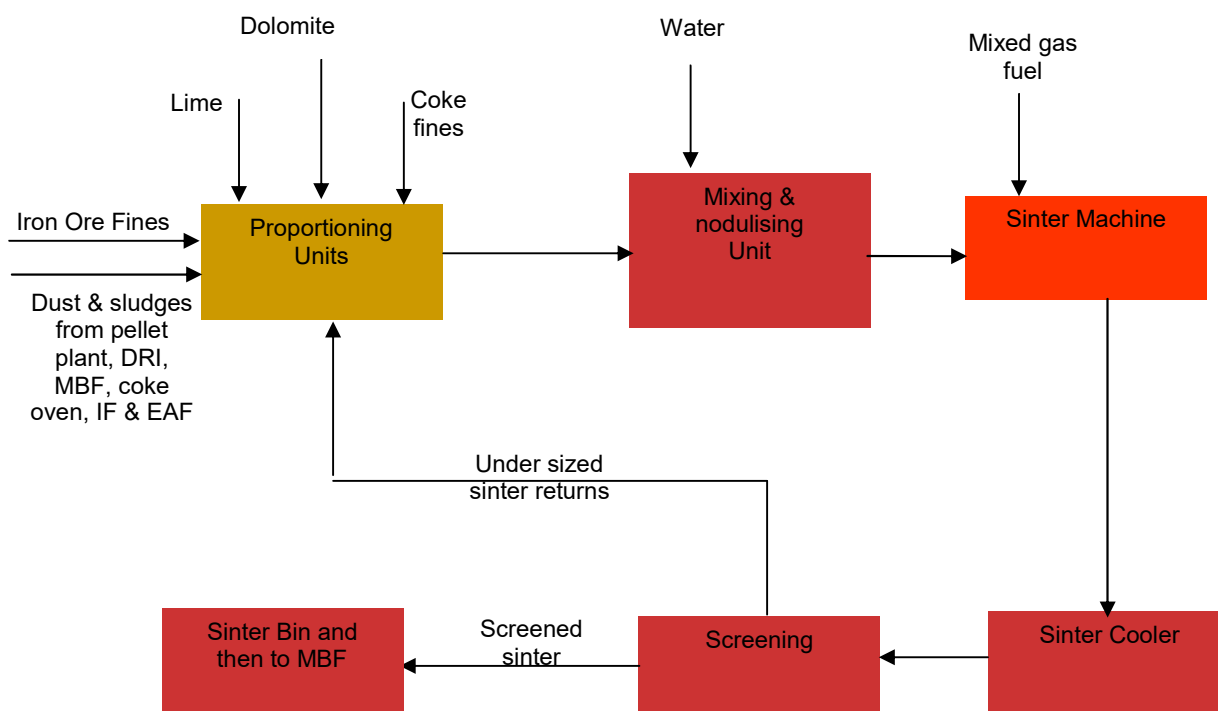
### ***Sinter stabilizing section***

Cooled sinter from sinter machine will be fed to a double roll crusher via a suitably designed separation chute. Crushed sinter of minus 50 mm size will be screened for separation of hearth layer material and plant return fines.

The process flow of sinter plant is shown in **Fig 2.8**. The material balance is shown in **Table 2.15**.

**TABLE 2.15: MATERIAL BALANCE OF SANCTIONED AND PROPOSED SINTER PLANT**

|                                              | Sanctioned as per EC  |                                   | Proposed additional as per TOR | Total after expansion |                                   |
|----------------------------------------------|-----------------------|-----------------------------------|--------------------------------|-----------------------|-----------------------------------|
| <b>Total Production (TPA)</b>                | <b>1,662,570</b>      |                                   | <b>1,164,870</b>               | <b>2,827,440</b>      |                                   |
| <b>Raw Material Inputs</b>                   | <b>Quantity (TPA)</b> | <b>Specific consumption (T/T)</b> | <b>Quantity (TPA)</b>          | <b>Quantity (TPA)</b> | <b>Specific consumption (T/T)</b> |
| Iron Ore Fines                               | 1,579,442             | 0.95                              | 965,254                        | 2,544,696             | 0.900                             |
| Coke Fines                                   | 166,257               | 0.1                               | 68,443                         | 234,700               | 0.083                             |
| Lime Stone                                   | 216,134               | 0.13                              | 151,433                        | 367,567               | 0.130                             |
| Dolomite                                     | 216,134               | 0.13                              | 151,433                        | 367,567               | 0.130                             |
| From Pellet plant (iron ore fines)           | 240,772               | 0.145                             | 2,107,325                      | 2,348,097             | 0.830                             |
| ESP, BF dust, etc. from DRI                  | 97,376                | 0.059                             | 44,071                         | 141,447               | 0.050                             |
| Dust (Iron Ore, Coke, Sinter Fines) from MBF | 77,963                | 0.047                             | 19,162                         | 97,125                | 0.034                             |
| Sludge from GCP from MBF                     | 7,796                 | 0.005                             | -7,796                         | 0                     | -                                 |
| Bag Filter Dust from coke oven plant         | 50,736                | 0.031                             | -2,265                         | 48,471                | 0.017                             |
| BF dust from IF                              | 13,123                | 0.008                             | 24,373                         | 37,496                | 0.013                             |
| BF dust from EAF                             | 42,989                | 0.026                             | -4,895                         | 38,094                | 0.013                             |
| Sinter Return Fines                          | 581,900               | 0.35                              | -157,784                       | 424,116               | 0.150                             |
| <b>Total</b>                                 | <b>3,290,622</b>      | <b>1.979</b>                      | <b>3,358,755</b>               | <b>6,649,377</b>      | <b>2.352</b>                      |
| <b>Outputs</b>                               | <b>Quantity (TPA)</b> | <b>Specific Generation (T/T)</b>  | <b>Quantity (TPA)</b>          | <b>Quantity (TPA)</b> | <b>Specific Generation (T/T)</b>  |
| Sinter                                       | 1,662,570             | 1                                 | 1,164,870                      | 2,827,440             | 1.000                             |
| Sinter Return Fines                          | 581,900               | 0.350                             | -157,784                       | 424,116               | 0.150                             |
| LOI & losses                                 | 1,046,152             | 0.629                             | 2,35,1669                      | 3,397,821             | 1.202                             |
| <b>Total</b>                                 | <b>3,290,622</b>      | <b>1.979</b>                      | <b>3,358,755</b>               | <b>6,649,377</b>      | <b>2.352</b>                      |

**FIG 2.8: PROCESS FLOW OF SINTER PLANT**

### 2.3.7 Coke oven plant (1,120,000 TPA 1,070,000 TPA)

Rungta Mines Limited (Dhenkanal Steel Plant) obtained EC for 16x70,000 TPA for Coke oven plant. Based on requirement, Rungta Mines Limited (Dhenkanal Steel Plant) proposes to installed 6 batteries of 70,000 TPA, 1 batteries of 250000 TPA and one batteries of 400000TPA. The sanctioned and proposed configuration of coke oven plant is given in **Table 2.16**.

**TABLE 2.16: CONFIGURATION OF SANCTIONED AND PROPOSED COKE OVEN PLANT**

| Description         | Unit       | Sanctioned as per EC | Proposed additional as per TOR | Total After expansion                      |
|---------------------|------------|----------------------|--------------------------------|--------------------------------------------|
| Coke Oven Batteries | Nos.       | 16                   | -8                             | 8                                          |
| Configuration       |            | 16 X 70,000 TPA      |                                | 6 X 70,000 + 1 X 250,000 + 1 X 400,000 TPA |
| Working days        | days/Annum | 350                  | -                              | 350                                        |
| Working hours       | Hours /Day | 24                   | -                              | 24                                         |
| <b>Production</b>   | <b>TPA</b> | <b>1,120,000</b>     | <b>-50,000</b>                 | <b>1,070,000</b>                           |

#### **Manufacturing process**

Raw coal will be crushed in a crusher into powdered form and charged in the oven for carbonisation. The volatile matter in raw coal gets released in the form of gas and gets burnt in the oven as well as in the flues. After the completion of the carbonization process, raw coal get converted to coke

within 36 to 38 hours. The coke is then pushed out from the oven and quenched by water. Coke will be utilised in MBF and sinter plant.

The hot quenching water is continuously collected into a settling tank & the coke particles are also being carried out upto the settling tank with water. These particles are allowed to be settled below the settling tank and then the water almost free from suspended is allowed to be again used for the purpose of quenching of hot coke mass. Time to time the settled particles are reclaimed and these have the large demand in mini cement plants, briquetting plants etc.

### **Non-recovery type coke ovens**

The proposed non-recovery coke ovens have been specially developed based on the imported coking coal with a volatile matter content in the range of 20%-24%. Moisture control of coal is important as it has direct bearing on the carbonization rate & bulk density of coal.

Non-recovery coke ovens are capable of producing coke of large size, strong, dense & abrasion resistant. The coarse mosaic micro-structure, low porosity during carbonization and development of minor crack result in low reactivity, strength in high temperature, stability and superior post reaction strength.

The ovens are unique in that, no external heat source is required. All the energy in carbonization is supplied by burning the gaseous volatile products released from the coal charge during carbonization.

### **Raw material for Coke Oven Plant**

The required quantity of coking coal will be met through import from countries like Australia, China or equivalent from elsewhere. Company also will make efforts to procure from the domestic market to the maximum extent possible. For flexibility in operation, blending provisions in the plant may be incorporated to operate the plant with Indian coal or more of Indian medium coking coal and prime coking coal from suitable sources, in admixture with imported low ash coking coal. The material balance is given in **Table 2.17**.

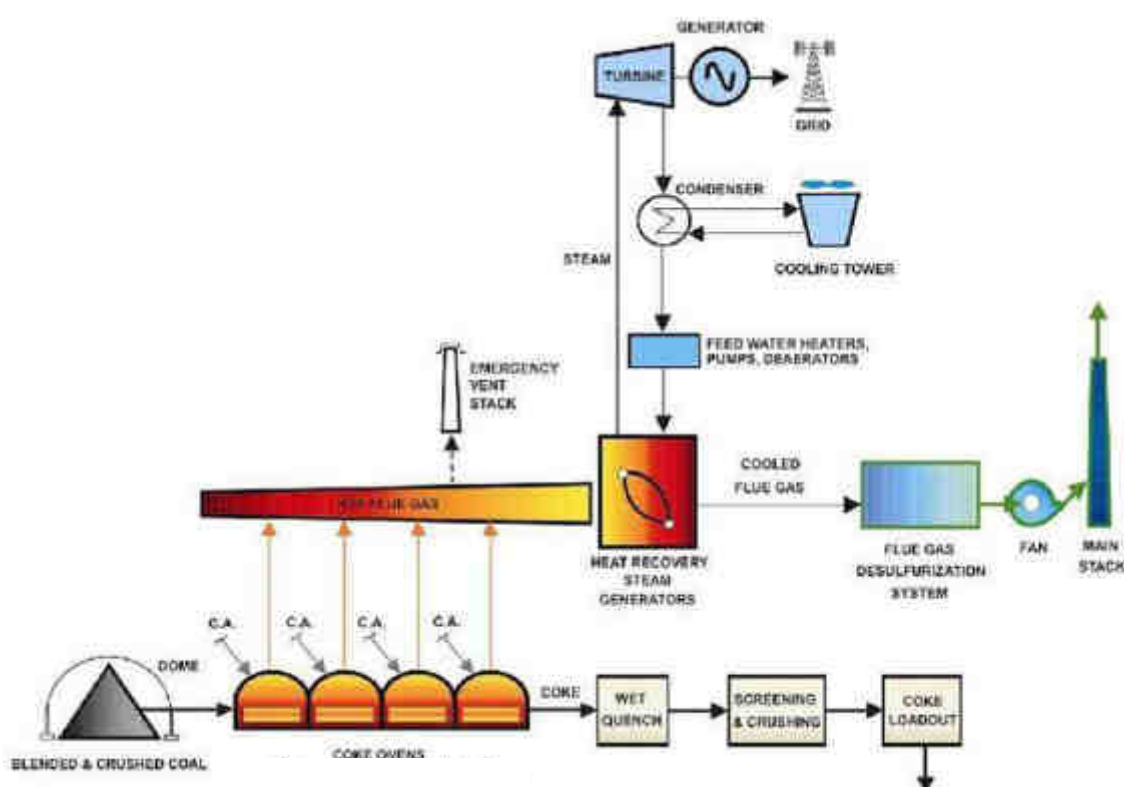
**TABLE 2.17: MATERIAL BALANCE OF SANCTIONED AND PROPOSED COKE OVEN**

|                               | Sanctioned as per EC  |                                   | Proposed additional as per TOR | Total after expansion |                                   |
|-------------------------------|-----------------------|-----------------------------------|--------------------------------|-----------------------|-----------------------------------|
| <b>Total Production (TPA)</b> | <b>1,120,000</b>      |                                   | <b>-50,000</b>                 | <b>1,070,000</b>      |                                   |
| <b>Raw Material Inputs</b>    | <b>Quantity (TPA)</b> | <b>Specific consumption (T/T)</b> | <b>Quantity (TPA)</b>          | <b>Quantity (TPA)</b> | <b>Specific consumption (T/T)</b> |
| Coking Coal                   | 1,691,200             | 1.51                              | -75,500                        | 1,615,700             | 1.51                              |
| <b>Total</b>                  | <b>1,691,200</b>      | <b>1.51</b>                       | <b>-75,500</b>                 | <b>1,615,700</b>      | <b>1.51</b>                       |

|                 | Sanctioned as per EC |                           | Proposed additional as per TOR | Total after expansion |                           |
|-----------------|----------------------|---------------------------|--------------------------------|-----------------------|---------------------------|
| Outputs         | Quantity (TPA)       | Specific Generation (T/T) | Quantity (TPA)                 | Quantity (TPA)        | Specific Generation (T/T) |
| Coke            | 1,120,000            | 1                         | -50,000                        | 1,070,000             | 1                         |
| Bag Filter Dust | 50736                | 0.0453                    | -2,265                         | 48,471                | 0.0453                    |
| Losses & COG    | 520,464              | 0.4647                    | -23,235                        | 497,229               | 0.4647                    |
| <b>Total</b>    | <b>1,691,200</b>     | <b>1.51</b>               | <b>-75,500</b>                 | <b>1,615,700</b>      | <b>1.51</b>               |

The process flow of coke oven is shown in **Fig 2.9**.

**FIG 2.9: COKE OVEN PLANT**



### 2.3.8 Steel melting shop

The Steel Melt Shop will comprise of Induction Furnaces and Electric Arc furnace. Details are described in subsequent paragraph

#### 2.3.8.1 Induction Furnace- LRF-CCM Route (0.693 MTPA to 1.54 MTPA)

Presently Dhenkanal Steel plant is under construction 0.308 MTPA Steel via IF Route is underway. It is proposed to expand the steel melting shop by enhancing the capacity of the induction furnace as well as added new Induction furnace. The sanctioned and proposed configuration of steel melting shop is given in **Table 2.18**. A brief description of the manufacturing process is given in subsequent paragraphs.

**TABLE 2.18: CONFIGURATION OF SANCTIONED AND PROPOSED SMS VIA IF-LRF-CCM ROUTE**

| Description          | Unit           | Sanctioned as per EC | Proposed additional as per TOR | Total after expansion |
|----------------------|----------------|----------------------|--------------------------------|-----------------------|
| Induction Furnace    | Nos.           | 7                    | 8                              | 15                    |
| Capacity             | Tonnes         | 20                   | 20                             | 20                    |
| LRF configuration    | Tonnes         | 4 X 25 T             | 4 X 35 T                       | 4 X 25 + 4 X 35 T     |
| No. of working days  | Days/<br>Annum | 350                  | -                              | 350                   |
| No. of working hours | Hours/<br>Day  | 24                   | -                              | 24                    |
| No. of Heats         | Heats          | 11                   | -                              | 11                    |
| <b>Production</b>    | <b>MTPA</b>    | <b>0.693</b>         | <b>0.847</b>                   | <b>1.54</b>           |

Induction furnace works on the principle of induction melting of scrap/ sponge iron with the help of electric power. An alternating electromagnetic field induces eddy current in the metal so that the electrical energy converts into heat, whose quantity depends on the resistivity of the charge. Induction furnaces operate on current of commercial frequencies (50Hz) or on current of higher frequencies from 500 to 2000 Hz. These furnaces are beneficial in steel making for low melting loss.

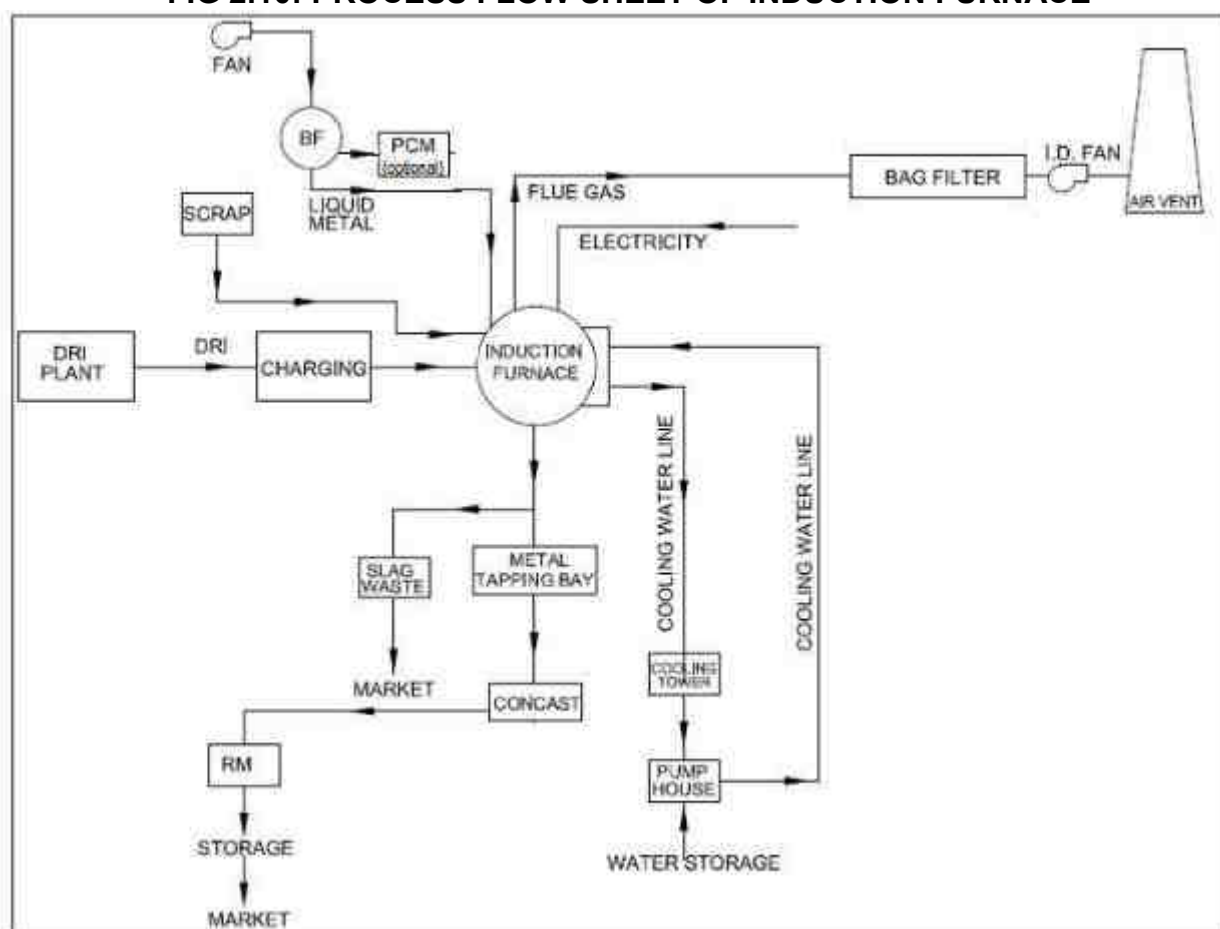
An induction furnace constitutes a single larger primary coil made of water-cooled copper tube. The working voltage is impressed across the terminals of the coil. The furnace has a rammed lining. The ramming material silica mass contains should more than 96% silica and minimum of  $Al_2O_3$  &  $Fe_2O_3$ . Before ramming the material, a steel template is kept inside the furnace and the material is rammed between the template and the insulated coil of the induction heater. To minimize the consumption of electric power and cut down the melting period, the crucible wall must be as thin as possible. The inside of crucible lining is in contact with liquid metal while it's outside surface contacts the water-cooled induction.

The LF will be complete with the transformer, ladle stirring system, aluminum wire feeder, carbon injecting device, additives storage and addition system, sampling and temperature measuring device. A fume extraction and cleaning system consisting of bag filters, ID fan and chimney with the related duct work will be provided.

**Charging:** The scrap pieces/ sponge iron/ hot metal should be small in size to provide good compaction, without leaving spacing between the charge and crucible wall. This offer an advantage of quick melting of the charge with a minimum power spent in the stage for the heat. Large and high melting pieces should stand parallel and close to the crucible while low melting components should be in the middle of the crucible. Small capacity furnaces are loaded manually and the large capacity furnaces with the aid of buckets. Process flow sheet of SMS is given in **Fig 2.10**. Material balance is given in **Table 2.19**.

**TABLE 2.19: MATERIAL BALANCE FOR SANCTIONED AND PROPOSED SMS VIA IF-RF-CCM ROUTE**

|                        | Sanctioned as per EC |                            | Proposed additional as per TOR | Total after expansion |                            |
|------------------------|----------------------|----------------------------|--------------------------------|-----------------------|----------------------------|
| Total Production (TPA) | 693,000              |                            | 847,000                        | 1,540,000             |                            |
| Raw Material Inputs    | Quantity (TPA)       | Specific consumption (T/T) | Quantity (TPA)                 | Quantity (TPA)        | Specific consumption (T/T) |
| DRI                    | 604,360              | 0.872                      | 935,640                        | 1,540,000             | 1.000                      |
| Pig Iron / Hot Metal   | 111,774              | 0.161                      | 139,313                        | 251,087               | 0.163                      |
| Steel Scrap            | 74,516               | 0.108                      | 9,180                          | 83,696                | 0.054                      |
| <b>Total</b>           | <b>790,650</b>       | <b>1.141</b>               | <b>1,084,133</b>               | <b>1,874,783</b>      | <b>1.217</b>               |
| Outputs                | Quantity (TPA)       | Specific Generation (T/T)  | Quantity (TPA)                 | Quantity (TPA)        | Specific Generation (T/T)  |
| Liquid metal to CCM    | 693,000              | 1.000                      | 847,000                        | 1,540,000             | 1.000                      |
| Losses                 | 74,140               | 0.107                      | -36,644                        | 37,496                | 0.024                      |
| Slag                   | 23,510               | 0.034                      | 273,777                        | 297,287               | 0.193                      |
| <b>Total</b>           | <b>790,650</b>       | <b>1.141</b>               | <b>1,084,133</b>               | <b>1,874,783</b>      | <b>1.217</b>               |

**FIG 2.10: PROCESS FLOW SHEET OF INDUCTION FURNACE**



### 2.3.8.2 Electric arc furnace-LRF-CCM Route (1,925,000 TPA to 1,680,000 TPA)

The sanctioned and proposed configuration are given in **Table 2.20**. A brief description of the manufacturing process is given in subsequent paragraphs.

**TABLE 2.20: CONFIGURATION OF SANCTIONED AND PROPOSED SMS VIA EAF ROUTE**

| Description          | Unit       | Sanctioned as per EC | Proposed additional or change as per TOR | Total after expansion |
|----------------------|------------|----------------------|------------------------------------------|-----------------------|
| Electric Arc Furnace | Nos.       | 2                    | -                                        | 2                     |
| Capacity             | Ton        | 90 & 160             | 90 & 110                                 | 90 & 110              |
| Ladle Furnace        | Nos.       | 2                    | -                                        | 2                     |
| Capacity             | Ton        | 90&160               | 90 & 110                                 | 90 & 110              |
| working days         | days/Annum | 350                  | -                                        | 350                   |
| working hours        | Hours /Day | 24                   | -                                        | 24                    |
| No. of Heats         | Heats      | 22                   | -                                        | 22                    |
| <b>Production</b>    | <b>TPA</b> | <b>1,925,000</b>     | <b>- 245,000</b>                         | <b>1,680,000</b>      |

Electric arc is generated between electrodes which heats the metallic charge. In both furnaces, the melted contents separate into liquid metal and slag. The slag is removed and considered as waste. The liquid metal is sent to the continuous casting machine (CCM) where semi-finished product is made. The electric arc furnace (EAF) is thus particularly well suited to the production of the full range of alloy steel grades. In the case of the basic oxygen steel making processes, on the other hand, the danger arises that the expensive alloying elements will be absorbed at least in part by the slag.

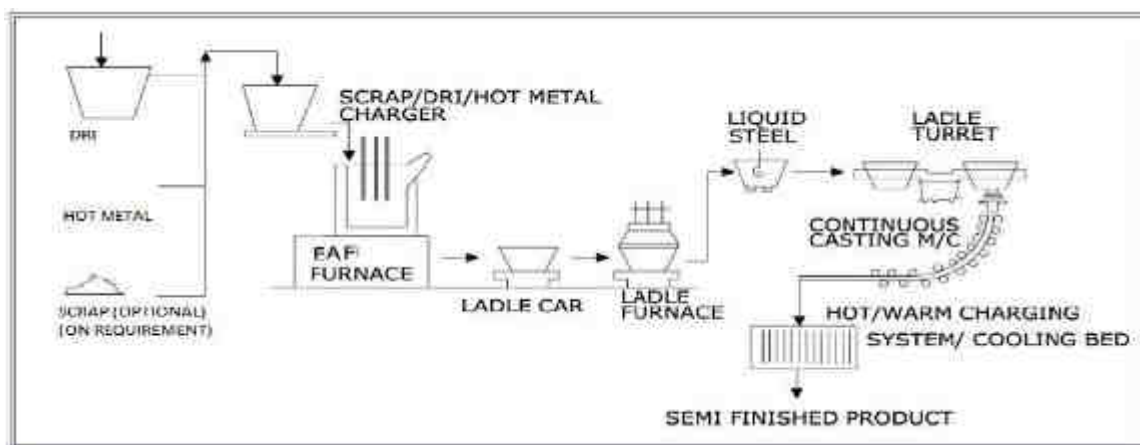
The charge mix being considered for Electric Arc Furnaces can be seen in the material balance given in **Table 2.21**. Electric Arc Furnaces Process flow sheet of the EAF is given in **Fig 2.11**.

**TABLE 2.21: MATERIAL BALANCE OF SANCTIONED AND PROPOSED SMS (EAF)**

|                               | Sanctioned as per EC |                            | Proposed additional as per TOR | Total after expansion |                            |
|-------------------------------|----------------------|----------------------------|--------------------------------|-----------------------|----------------------------|
| <b>Total Production (TPA)</b> | <b>1,925,000</b>     |                            | <b>-245,000</b>                | <b>1,680,000</b>      |                            |
| Raw Material Inputs           | Quantity (TPA)       | Specific consumption (T/T) | Quantity (TPA)                 | Quantity (TPA)        | Specific consumption (T/T) |
| DRI                           | 1,008,000            | 0.524                      | -300,850                       | 707,150               | 0.421                      |
| Hot Metal/Pig Iron from MBF   | 1,063,206            | 0.552                      | 134,344                        | 1,197,550             | 0.713                      |
| Lime                          | 289,800              | 0.151                      | 14,700                         | 304,500               | 0.181                      |
| Pig Iron from Outside         | 78,222               | 0.041                      | -78,222                        | 0                     | 0.000                      |
| <b>Total</b>                  | <b>2,439,228</b>     | <b>1.267</b>               | <b>-230,028</b>                | <b>2,209,200</b>      | <b>1.315</b>               |

| Outputs             | Quantity (TPA)   | Specific Generation (T/T) | Quantity (TPA)  | Quantity (TPA)   | Specific Generation (T/T) |
|---------------------|------------------|---------------------------|-----------------|------------------|---------------------------|
| Liquid metal to CCM | 1,925,000        | 1.000                     | -245,000        | 1,680,000        | 1.000                     |
| BF dust             | 42,988           | 0.022                     | -4,894          | 38,094           | 0.023                     |
| Losses              | 57,960           | 0.030                     | 2,940           | 60,900           | 0.036                     |
| Slag                | 413,280          | 0.215                     | 16,926          | 430,206          | 0.256                     |
| <b>Total</b>        | <b>2,439,228</b> | <b>1.267</b>              | <b>-230,028</b> | <b>2,209,200</b> | <b>1.315</b>              |

FIG 2.11: PROCESS FLOW SHEET OF ELECTRIC ARC FURNACE



### 2.3.8.3 Continuous Casting Machine (CCM)

The sanctioned and proposed configuration and production of the continuous casting machine is given in **Table 2.22**.

**TABLE 2.22: SANCTIONED & PROPOSED CONFIGURATION & PRODUCTION OF CCM**

| Plant facilities                                                | Units | Sanctioned as per EC | Proposed Additional | Total capacity after Expansion |
|-----------------------------------------------------------------|-------|----------------------|---------------------|--------------------------------|
| Continuous Casting Machine (Billets/ Bloom Caster/ Slab caster) | MTPA  | 2.566                | 0.59                | 3.156                          |
| Configuration                                                   |       | 3 nos X 4 strand     | 8 nos X 4 strand    | 11 nos X 4 strand              |

### 2.3.9 Finished product facilities

It includes the Rolling Mill (TMT/Flat/Round/ Wire Rod/ Structural Mill / Others), Strip Mill (Strip/Sheet/ Coil/ Wire & Bar, Wire Rope) and Ductile Pipe Plant. The total sanctioned finished product is 3.0 MTPA and additional 0.55 MTPA will be produced. The total finished product after expansion will be 3.55 MTPA.

It includes the Rolling Mill (TMT/Flat/Round/ Wire Rod/ Structural Mill / Others), Strip Mill (Strip/Sheet/ Coil/ Wire & Bar, Wire Rope) and Ductile

Pipe Plant. The proposed Finished Product Facilities configuration is given in **Table 2.23**.

**TABLE 2.23: SANCTIONED & PROPOSED CONFIGURATION & PRODUCTION OF ROLLING MILL**

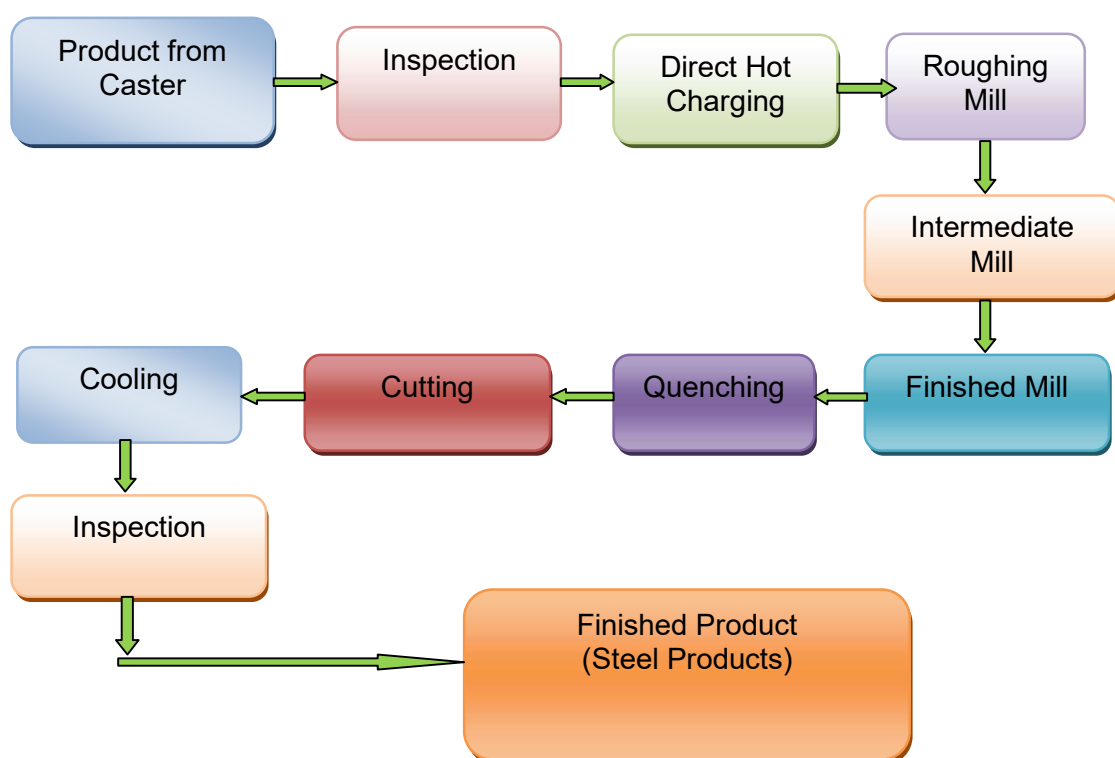
| Plant facilities | Units | Total capacity | Proposed Additional as per TOR | Total after expansion |
|------------------|-------|----------------|--------------------------------|-----------------------|
| Rolling mill     | MTPA  | 1.75           | 0.8                            | 2.55                  |
| Configuration    |       | 5 X 0.2 MTPA   | - 3 X 0.2 MTPA                 | 2 X 0.2 MTPA          |
|                  |       | 1 X 0.3 MTPA   | 3 X 0.3 MTPA                   | 4 X 0.3 MTPA          |
|                  |       | 1 x 0.45 MTPA  | -                              | 1 X 0.45 MTPA         |
|                  |       |                | 1 X 0.5 MTPA                   | 1 X 0.5 MTPA          |

### 2.3.9.1 Rolling Mill (TMT/ Round / Wire ROD / Structural/ Flat/ Others)

Semi-finished product from the CCMs of IF and EAFs converted into finished products such as TMT, Flat, Round, Wire Rod, Structural and others products. The Material balance for Rolling Mill is given in the **Table 2.24**.

**TABLE 2.24: MATERIAL BALANCE FOR SANCTIONED AND PROPOSED ROLLING MILL**

|                                      |       | Sanctioned as per EC |                            | Proposed additional as per TOR | Total after expansion |                            |
|--------------------------------------|-------|----------------------|----------------------------|--------------------------------|-----------------------|----------------------------|
| Total Production (TPA)               |       | 1,925,000            |                            | 625,000                        | 2,550,000             |                            |
| Raw Material Inputs                  | Yield | Quantity (TPA)       | Specific consumption (T/T) | Quantity (TPA)                 | Quantity (TPA)        | Specific consumption (T/T) |
| Semi Finished Product from EAF-CCM   | 98    | 1,019,153            | 0.529                      | 490,047                        | 1,509,200             | 0.592                      |
| Semi Finished Product from IF-CCM    | 98    | 679,140              | 0.353                      | 440,526                        | 1,119,666             | 0.439                      |
| Semi finished purchased from outside | 98    | 85,280               | 0.044                      | -85,280                        | 0                     | 0.000                      |
| <b>Total</b>                         |       | <b>1,783,573</b>     | <b>0.927</b>               | <b>845,293</b>                 | <b>2,628,866</b>      | <b>1.031</b>               |
| Outputs                              |       | Quantity (TPA)       | Specific Generation (T/T)  | Quantity (TPA)                 | Quantity (TPA)        | Specific Generation (T/T)  |
| Finished Product                     |       | 1,750,000            | 0.909                      | 800,000                        | 2,550,000             | 1.000                      |
| Reject                               |       | 14,428               | 0.007                      | 21,062                         | 35,490                | 0.014                      |
| Mill Scale                           |       | 19,145               | 0.010                      | 24,231                         | 43,376                | 0.017                      |
| <b>Total</b>                         |       | <b>1,783,573</b>     | <b>0.927</b>               | <b>845,293</b>                 | <b>2,628,866</b>      | <b>1.031</b>               |

**FIG 2.12: PROCESS FLOW SHEET OF ROLLING MILL**

### 2.3.9.2 Strip mill (Strip/Sheet/ Coil/ Wire & Bar, Wire Rope)

Semi finished product from the CCMs of EAF will be converted into finished products such as Strip, Sheet, Coil, Wire, Bar and Wire Rope. Configuration of Strip mill is given in **Table 2.25**.

**TABLE 2.25: CONFIGURATION OF SANCTIONED AND PROPOSED STRIP MILL**

| Description       | Unit       | Sanctioned as per EC | Proposed additional or change as per TOR | Total after expansion |
|-------------------|------------|----------------------|------------------------------------------|-----------------------|
| Strip Mill        | Nos.       | 2                    | -                                        | 2                     |
| Configuration     | MTPA       | 0.45 & 0.4           | 0.2 & 0.3                                | 0.2 & 0.3             |
| working days      | days/Annum | 350                  | -                                        | 350                   |
| working hours     | Hours /Day | 20                   | -                                        | -                     |
| <b>Production</b> | <b>TPA</b> | <b>850,000</b>       | <b>350,000</b>                           | <b>500,000</b>        |

The Material balance for Strip Mill is given in the **Table 2.26**.

**TABLE 2.26: MATERIAL BALANCE OF SANCTIONED AND PROPOSED STRIP MILL**

|                                | Sanctioned as per EC |                            | Proposed additional | Total after expansion |                            |
|--------------------------------|----------------------|----------------------------|---------------------|-----------------------|----------------------------|
| Total Production (TPA)         | 850,000              |                            | -350,000            | 500,000               |                            |
| Raw Material Inputs            | Quantity (TPA)       | Specific consumption (T/T) | Quantity (TPA)      | Quantity (TPA)        | Specific consumption (T/T) |
| Semi Finished Product from CCM | 867,347              | 1.020                      | -357,143            | 510,204               | 1.020                      |
| <b>Total</b>                   | <b>867,347</b>       | <b>1.020</b>               | <b>-357,143</b>     | <b>510,204</b>        | <b>1.020</b>               |
| Outputs                        | Quantity (TPA)       | Specific Generation (T/T)  | Quantity (TPA)      | Quantity (TPA)        | Specific Generation (T/T)  |
| Finished Product               | 850,000              | 1.000                      | -350,000            | 500,000               | 1.000                      |
| Reject                         | 7,806                | 0.009                      | -3,214              | 4,592                 | 0.009                      |
| Mill Scale                     | 9,541                | 0.011                      | -3,929              | 5,612                 | 0.011                      |
| <b>Total</b>                   | <b>867,347</b>       | <b>1.020</b>               | <b>-357,143</b>     | <b>510,204</b>        | <b>1.020</b>               |

**2.3.9.3 Ductile Pipe Plant (400,000 TPA to 500,000 TPA)**

Ductile pipe plant will receive hot metal directly from the MBF and manufacture finished product comprising of ductile pipes. Configuration of ductile pipe is given in **Table 2.27**.

**TABLE 2.27: CONFIGURATION OF SANCTIONED AND PROPOSED DUCTILE PIPE PLANT**

| Description        | Unit       | Sanctioned as per EC | Proposed Additional as per TOR | Total after Expansion |
|--------------------|------------|----------------------|--------------------------------|-----------------------|
| Ductile Pipe Plant | Nos.       | 2                    | -                              | 2                     |
| Capacity           | MTPA       | 0.2                  | 0.05                           | 0.25                  |
| working days       | Days/Annum | 350                  | -                              | 350                   |
| working hours      | Hours /Day | 20                   | -                              | 20                    |
| <b>Production</b>  | <b>TPA</b> | <b>400,000</b>       | <b>100,000</b>                 | <b>500,000</b>        |

**Manufacturing process**

Ductile pipe plant will receive hot metal directly from the MBF and manufacture finished product comprising of ductile pipes. After receiving hot metal, it is heated in holding furnace. Magnesium addition is done in

magnesium converter. Once this process is completed, melted metal is fed and spun in the mould. With the rotation of mould body, centrifugal force distributes the liquid metal uniformly and pipe wall is formed.

Ductile iron pipe are heat treated in an annealing furnace to give ductility. Annealing is a four stage process involving heating, soaking, rapid cooling and slow cooling. After annealing, mechanical tests are carried out to check the ductility and tensile strength of the pipes.

Annealed pipes will be passed through zinc coating machine for zinc coating at outer surface to provide protection from corrosion. This will be achieved by using a zinc spraying machine. Zinc shall be heated to a molten state and sprayed by spray on the outer surface of the pipes.

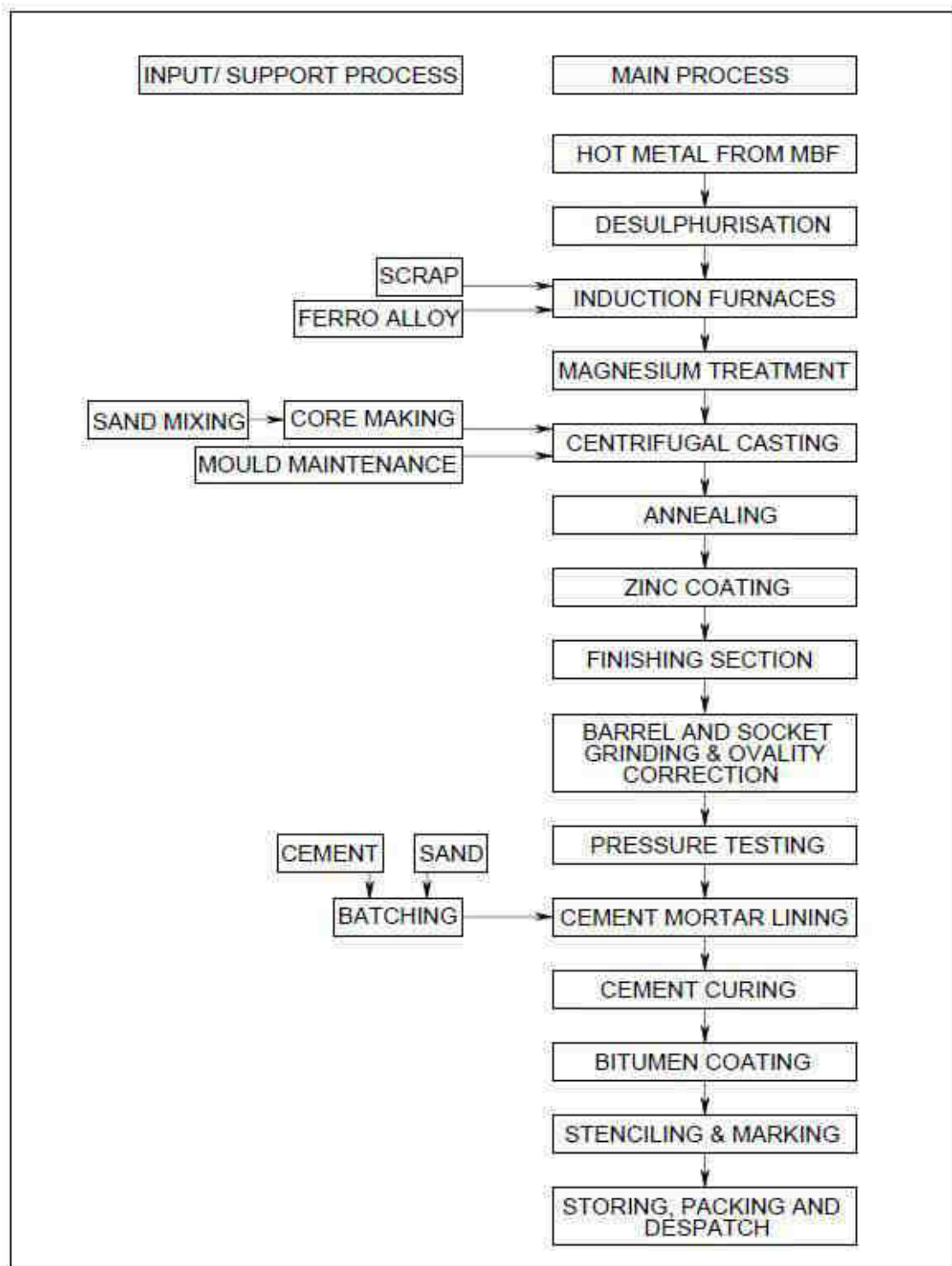
In standard quality for ductile pipes, cement lining will be provided. Generally 1:3.5 part cement and sand is used as a cement lining inside the ductile pipes and pipes will be rolled with slow speed and cement mortar will be sprayed. Then the pipes will be rolled high speed to remove the excess water and deposited cement. After cement lining, the pipes passes through a curing chamber. After curing, pipes will be taken to bitumen coating line and are ready for despatch after stenciling and marking.

The Material balance for Ductile Pipe Plant is given in the **Table 2.28** and flow sheet is given in **Fig 2.13**.

**TABLE 2.28: MATERIAL BALANCE OF SANCTIONED AND PROPOSED DUCTILE PIPE PLANT**

|                               | Sanctioned as per EC  |                                   | Proposed additional   | Total after expansion |                                   |
|-------------------------------|-----------------------|-----------------------------------|-----------------------|-----------------------|-----------------------------------|
| <b>Total Production (TPA)</b> | <b>400,000</b>        |                                   | <b>100,000</b>        | <b>500,000</b>        |                                   |
| <b>Raw Material Inputs</b>    | <b>Quantity (TPA)</b> | <b>Specific consumption (T/T)</b> | <b>Quantity (TPA)</b> | <b>Quantity (TPA)</b> | <b>Specific consumption (T/T)</b> |
| Hot Metal from Blast Furnace  | 408,163               | 1.020                             | 102,041               | 510,204               | 1.020                             |
| <b>Total</b>                  | <b>408,163</b>        | <b>1.020</b>                      | <b>102,041</b>        | <b>510,204</b>        | <b>1.020</b>                      |
| <b>Outputs</b>                | <b>Quantity (TPA)</b> | <b>Specific Generation (T/T)</b>  | <b>Quantity (TPA)</b> | <b>Quantity (TPA)</b> | <b>Specific Generation (T/T)</b>  |
| Finished Product              | 400,000               | 1.000                             | 100,000               | 500,000               | 1.000                             |
| Reject                        | 3,673                 | 0.009                             | 919                   | 4,592                 | 0.009                             |
| Mill Scale                    | 4,490                 | 0.011                             | 1,122                 | 5,612                 | 0.011                             |
| <b>Total</b>                  | <b>408,163</b>        | <b>1.020</b>                      | <b>102,041</b>        | <b>510,204</b>        | <b>1.020</b>                      |

FIG 2.13: MANUFACTURING PROCESS OF DUCTILE PIPE



## 2.4 PRODUCER GAS PLANT

A PGP of 480 million Nm<sup>3</sup>/hr has been sanctioned in EC dated 04.06.2020 which will be expanded to 5387 million Nm<sup>3</sup>/hr. The existing and proposed capacity and configuration of the producer gas plant has been arrived at as shown in **Table 2.29**.

**TABLE 2.29: CONFIGURATION OF SANCTIONED AND PROPOSED PRODUCER GAS PLANT FACILITIES**

|                                     |                       | Sanctioned as per EC    | Proposed Additional as per TOR | Total after Expansion                        |
|-------------------------------------|-----------------------|-------------------------|--------------------------------|----------------------------------------------|
| Heat required for one ton of Pellet | KCal/Ton              | 220,000                 | 220,000                        | 220,000                                      |
| Total Pellet Production             | TPA                   | 2,948,000               | 25,802,000                     | 28,750,00                                    |
| Total Heat Required                 | KCal/Year             | $64.856 \times 10^{10}$ | $567.644 \times 10^{10}$       | $632.5 \times 10^{10}$                       |
| CV of Producer Gas                  | KCal/Nm <sup>3</sup>  | 1250-1375               | 1250-1375                      | 1100-1200                                    |
| Design CV of Producer Gas           | KCal/Nm <sup>3</sup>  | 1353.78                 | 1157                           | 1157-1353.78                                 |
| Producer Gas Requirement            | Nm <sup>3</sup> /Year | $480.0 \times 10^6$     | $4906.8 \times 10^6$           | $5386.8 \times 10^6$                         |
| Operational Day per Annum           | Days                  | 335                     | -                              | 335                                          |
| Operational Hours per Day           | Hours                 | 24                      | -                              | 24                                           |
| Per Hour Requirement                | Nm <sup>3</sup> /Hr   | 59,577.1                | 610199                         | 669525                                       |
| Per Unit Capacity                   | Nm <sup>3</sup> /Hr   | 3,000                   | 12,500 & 7,500                 | 3,000 & 12,500 & 7,500                       |
| No. of Units                        | Nos.                  | 19.86                   |                                |                                              |
| Say                                 | Nos.                  | 20<br>(20x3,000)        | 60<br>(32x12,500 & 28x7,500)   | 80<br>(20x3,000) +<br>(32x12,500 & 28x7,500) |

**Process Description**

The process stages for Producer Gas are as follows:

1. Crushed coal of the specified quality and size is carried to the top of the bunker by means of Bucket Elevator and is put to the bunker. The screen between the bunker and the Bucket Elevator separates out fines from the feed stock of Coal which is taken down through a chute.
2. Coal from the bunker is fed into the Extended Shaft of the Gasifier through a Sector Gate and two Bell Cones operated by pneumatic power cylinders which open out the Sector Gate and Bell Cones sequentially after getting signal from the LTC temperature whenever it touches the set temperature of 140°C or so.
3. Fed coal travels downwards and gets dried first and then gradually preheated up to a distillation temperature of about 450°C by the product gas moving upwards which itself gets gradually cooled down and picks up the volatile matter of coal and gets auto-carbureted to a much higher calorific value before it comes out to the L.T.C off take pipes. The coal, on the other hand, gets carbonized to nearly coke stage and its reactivity increases for a faster gassification.



4. When the coal enters through the generator bottom shaft, reaction between coal and (air + steam) occurs and following reactions take place from bottom oxidation zone to top reduction zones

**a) Oxidation zones:**

Reaction is:  $C + O_2 \rightleftharpoons CO_2 + 42643 \text{ K. Cal}$

**b) Primary Reduction zone :**

Reactions are:  $C + H_2O \rightleftharpoons CO + H_2. 19000 \text{ K. Cal}$

$C + 2H_2O \rightleftharpoons CO_2 + 2H_2. 19307 \text{ K. Cal}$

$C + CO_2 \rightleftharpoons 2CO. 18689 \text{ K. Cal}$

(Within 300 mm from Oxidation zone)

**c) Secondary Reduction zone :**

Reactions are:  $CO + H_2O \rightleftharpoons CO_2 + H_2. 326 \text{ K. Cal}$

$C + CO_2 \rightleftharpoons 2CO$

Besides above reaction zones, there is an ash zone under the oxidation zone through which calculated quantity of air saturated with steam enters and receives heat from the ash, gets preheated and proceeds upwards to the oxidation zone. The ash on the other hand gets cooled down before it comes out to the ash pan.

5. The distillation zone starts from the top of Secondary Reduction Zone and extends upward to about 2500 mm or so in which considerable quantity of volatile matter (about more than 75%) gets stripped and picked up by gas.
6. At the top, there is preheating zone and above all there is drying zone.

Material balance is given in **Table 2.30**.

**TABLE 2.30: MATERIAL BALANCE OF SANCTIONED AND PROPOSED PRODUCER GAS PLANT**

|                               | Sanctioned as per EC  |                                                | Proposed additional as per TOR | Total after expansion |                                                |
|-------------------------------|-----------------------|------------------------------------------------|--------------------------------|-----------------------|------------------------------------------------|
| <b>Total Production (TPA)</b> | <b>480,000,000</b>    |                                                | <b>4,906,800,000</b>           | <b>5,386,800,000</b>  |                                                |
| <b>Raw Material Inputs</b>    | <b>Quantity (TPA)</b> | <b>Specific consumption (T/Nm<sup>3</sup>)</b> | <b>Quantity (TPA)</b>          | <b>Quantity (TPA)</b> | <b>Specific consumption (T/Nm<sup>3</sup>)</b> |
| Coal                          | 214,080               | 0.00045                                        | 1,418,284                      | 1,632,364             | 0.00030                                        |
| <b>Total</b>                  | <b>214,080</b>        | <b>0.00045</b>                                 | <b>1,418,284</b>               | <b>1,632,364</b>      | <b>0.00030</b>                                 |

|                          | Sanctioned as per EC |                                          | Proposed additional as per TOR | Total after expansion |                                          |
|--------------------------|----------------------|------------------------------------------|--------------------------------|-----------------------|------------------------------------------|
| Outputs                  | Quantity (TPA)       | Specific Generation (T/Nm <sup>3</sup> ) | Quantity (TPA)                 | Quantity (TPA)        | Specific Generation (T/Nm <sup>3</sup> ) |
| Coal Ash                 | 55,661               | 0.00012                                  | 303,459                        | 359,120               | 0.00007                                  |
| Coal Tar                 | 0                    | 0.00000                                  | 65,295                         | 65,295                | 0.00001                                  |
| Losses on ignition & gas | 158,419              | 0.00033                                  | 1,049,530                      | 1,207,949             | 0.00022                                  |
| <b>Total</b>             | <b>214,080</b>       | <b>0.00045</b>                           | <b>1,418,284</b>               | <b>1,632,364</b>      | <b>0.00030</b>                           |

## 2.5 OXYGEN PLANT

The Oxygen Plant will provide oxygen for MBF & Electric Arc Furnace to improve lance, which reduces the electricity consumption and also reduces considerable tap to tap time of Electric Arc Furnace besides increasing productivity. To meet the oxygen and argon requirement of the EAF and MBF, tonnage oxygen plants of capacity 2x180 TPD, 1x220 TPD and 2x130 TPD will be set up for integrated steel complex. Occasional purging need of the steel plant will be met by nitrogen, which will also be generated from the oxygen plant. Material balance of oxygen plant is given in **Table 2.31**. Configuration of oxygen plant is given in **Table 2.32**.

**TABLE 2.31: CONFIGURATION OF SANCTIONED AND PROPOSED OXYGEN PLANT**

| Description                            | Unit        | Sanctioned as per EC | Revised existing      |                     | Proposed additional as per TOR |            |            | Total after expansion                       |
|----------------------------------------|-------------|----------------------|-----------------------|---------------------|--------------------------------|------------|------------|---------------------------------------------|
|                                        |             |                      | EAF 1x90              | EAF 1x110           | MBF 1x600                      | MBF 1x450  | MBF 1x450  |                                             |
| (a)                                    | (b)         | (c)                  | (d)<br>(rev. wrt c)   | (e)<br>(rev. wrt c) | (f)                            | (g)        | (h)        | (i)= d+e+f+g+h                              |
| Capacity of EAF                        | TPA         | 1,925,000            | 756,000               | 924,000             | 777,000                        | 582,750    | 58,2750    | -                                           |
| Oxygen required for 1 Ton Liquid Steel | cum/T       | 35                   | 52                    | 52                  | 60                             | 60         | 60         | 52-60                                       |
| Total oxygen required                  | cum/annum   | 67,375,000           | 39,312,000            | 48,048,000          | 46,620,000                     | 34,965,000 | 3,4965,000 | 203,910,000                                 |
| Working Days                           | Days/annum  | 350                  | 350                   | 350                 | 350                            | 350        | 350        | 350 max.                                    |
| Working Hours                          | Hours/day   | 24                   | 24                    | 24                  | 24                             | 24         | 24         | 24 max.                                     |
| Daily requirement of Oxygen            | cum / day   | 192,500              | 112,320               | 137,280             | 133,200                        | 99,900     | 99,900     | 582,600                                     |
| Oxygen Volume                          | cum / tonne | 716.8                | 700                   | 700                 | 700                            | 700        | 700        | 700                                         |
| Daily requirement of Oxygen in Ton     | TPD         | 268.62               | 161                   | 196                 | 190                            | 143        | 143        | 833                                         |
| <b>Proposed Plant Capacity</b>         | <b>TPD</b>  | <b>1X100 + 1X180</b> | <b>2X180TPD = 360</b> |                     | <b>1x220TPD+2x130TPD = 480</b> |            |            | <b>2x180TPD + 1x220TPD + 2x130TPD = 840</b> |

**TABLE 2.32: MATERIAL BALANCE OF SANCTIONED AND PROPOSED OXYGEN PLANT**

| Raw Material Inputs | Specific Requirement per cum of Product | Constituent | Sanctioned as per EC, TPA | Proposed Additional as per TOR, TPA | Total after Expansion, TPA |
|---------------------|-----------------------------------------|-------------|---------------------------|-------------------------------------|----------------------------|
| Air                 | 4.762                                   | 100%        | 466,676                   | 933,352                             | 1,400,028                  |
| <b>Total</b>        | <b>4.762</b>                            | <b>100%</b> | <b>466,676</b>            | 933,352                             | 1,400,028                  |
| Outputs             | Specific Generation per cum of Product  |             |                           |                                     |                            |
| Oxygen              | 1.000                                   | 21.00%      | 98,002                    | 196,004                             | 294,006                    |
| Nitrogen            | 3.714                                   | 78.00%      | 364,007                   | 728,015                             | 1,092,022                  |
| Argon               | 0.048                                   | 1.00%       | 4,667                     | 9,334                               | 14,000                     |
| <b>Total</b>        | <b>4.762</b>                            | <b>100%</b> | <b>466,676</b>            | <b>933,352</b>                      | <b>1,400,028</b>           |

## 2.6 LIME PLANT

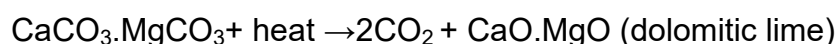
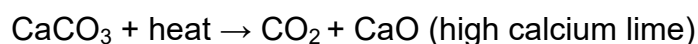
Lime and dolomite are commonly used in converters and electric arc furnaces, where they help to form slag which draws off harmful impurities such as silicon and phosphorus. Lime is also used to improve productivity in the ore agglomeration process. More recently, new products and services have been introduced in various steps of the steel making process. These have led to major quality improvements in processes such as hot metal desulphurization and in effluent handling, to name but two. Steel making industry also requires large quantities of water for all its processes. Configuration of Lime Plant are given in **Table 2.33**.

**TABLE 2.33: CONFIGURATION OF REVISED LIME PLANT**

| Description                                                        | Unit       | Quantity as per EC*                               | Revised as per present proposal as per TOR      |
|--------------------------------------------------------------------|------------|---------------------------------------------------|-------------------------------------------------|
| Capacity of EAFs                                                   | TPA        | 693,000 (1X90T) + 1,232,000 (1X160 T) = 1,925,000 | 756,000 (1X90T) + 924,000 (1X110 T) = 1,680,000 |
| Lime required for 1 Ton Liquid Steel                               | T/T        | 0.15                                              | 0.17                                            |
| Annual Requirement                                                 | TPA        | 288750                                            | 285,600                                         |
| Working Days                                                       | Days/annum | 350                                               | 350                                             |
| Working Hours                                                      | Hours      | 24                                                | 24                                              |
| Daily requirement of Lime                                          | TPD        | 300 + 528                                         | 367+449                                         |
| % of Extra Lime required as of Big Furnace (considering Safe side) |            | 7.6% for 528                                      | 6%                                              |
| Plant Capacity required                                            | TPD        | 300 + 568                                         | 389 + 476                                       |
| Plant Capacity provided                                            | TPD        | 300 & 570                                         | 390 & 480                                       |
| <b>Lime Production</b>                                             | <b>TPA</b> | 304,500                                           | 304,500                                         |

### Process Description

Lime is the high-temperature product of the calcinations of limestone. Although limestone deposits are found in many states, only a small portion is pure enough for industrial lime manufacturing. To be classified as limestone, the rock must contain at least 50% calcium carbonate. When the rock contains 30-40% magnesium carbonate, it is referred to as dolomitic limestone. Lime can also be produced from aragonite, chalk, marble & sea shells. Lime is manufactured in various kinds of kilns by one of the following reactions:



Material balance of Lime plant is given in **Table 2.34**.

**TABLE 2.34: MATERIAL BALANCE OF REVISED LIME PLANT**

| Raw Material Inputs | Specific Consumption T/T of Product | Total Quantity (TPA) as per EC* | Revised as per present proposal as per TOR | Total %     |
|---------------------|-------------------------------------|---------------------------------|--------------------------------------------|-------------|
| Lime Stone          | 1.8                                 | 521,640                         | 548,100                                    | 90.00%      |
| Fuel Oil            | 0.2                                 | 57960                           | 60,900                                     | 10.00%      |
| <b>Total</b>        | <b>2.0</b>                          | <b>579600</b>                   | <b>609,000</b>                             | <b>100%</b> |
| Outputs             | Specific Generation T/T of Product  |                                 |                                            |             |
| Lime                | 1.0                                 | 289,800                         | 304,500                                    | 50.00%      |
| LOI & others        | 1.0                                 | 289,800                         | 304,500                                    | 50.00%      |
| <b>Total</b>        | <b>2.0</b>                          | <b>579,600</b>                  | <b>609,000</b>                             | <b>100%</b> |

## 2.7 CEMENT PLANT

The sanctioned configuration of Cement Plant is given in **Table 2.35**. No change or expansion has been proposed.

**TABLE 2.35: CONFIGURATION OF CEMENT PLANT (NO CHANGE IN EXPANSION PHASE)**

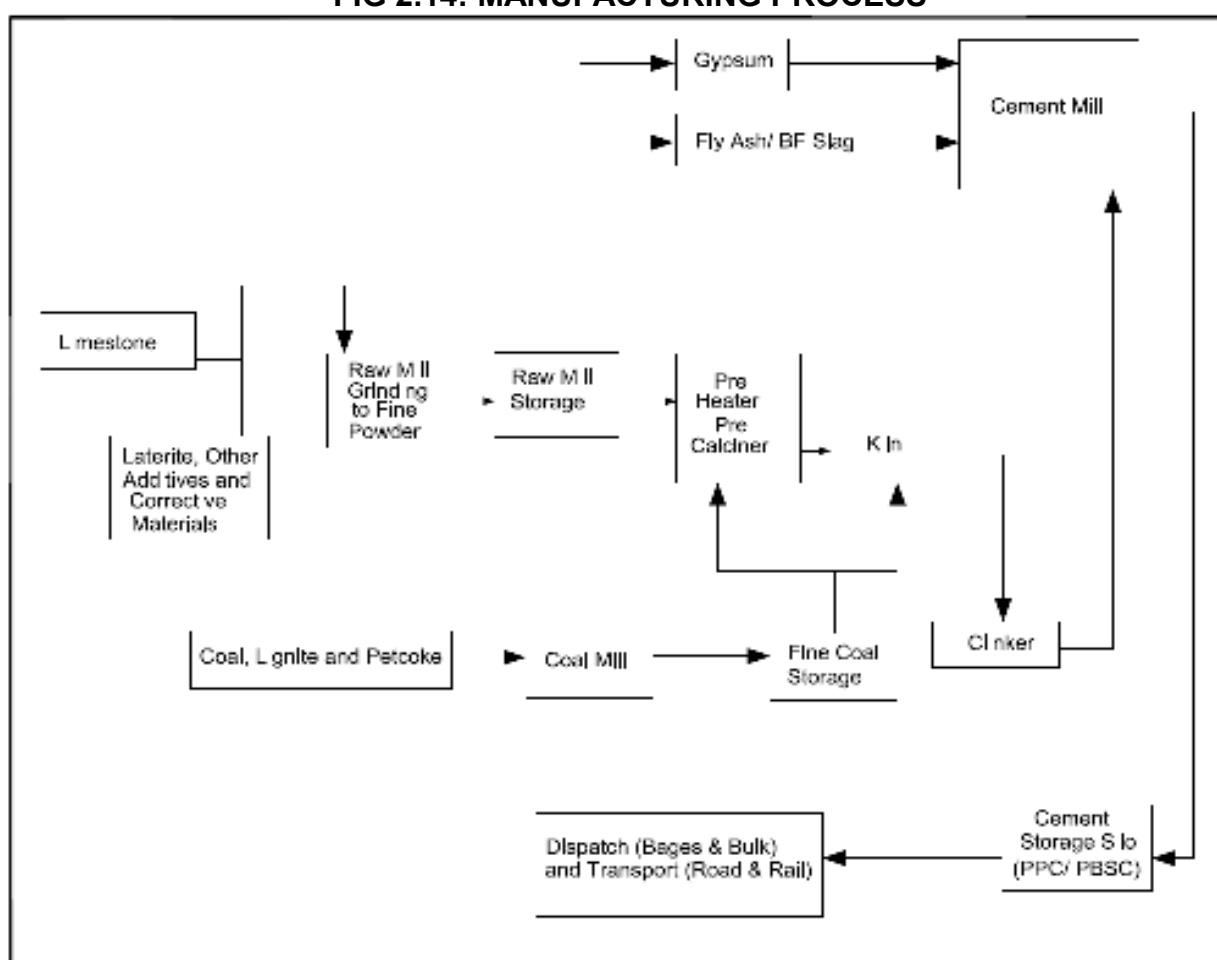
| Description   | Unit       | Total Quantity   |
|---------------|------------|------------------|
|               | Nos.       | 2                |
| Capacity      | TPD        | 2,600 & 2,300    |
| Working days  | per/Annum  | 340 & 348.5      |
| Working hours | Hours /Day | 24               |
| <b>Total</b>  | <b>TPA</b> | <b>1,685,550</b> |

### Process Description

Limestone will be the primary raw material for clinker making. Along with coal, it will be fed into the clinker kiln and the manufactured clinker will be sent to cement mill. Company will installed cement plant, Portland Pozzolana Cement (PPC) using fly ash and Portland Blast Furnace Slag Cement (PBFS) using blast furnace slag.

Dry process of cement manufacturing offers more advantages, particularly in fuel consumption and is the most rational and logical choice. In the proposed plant, dry process has been selected to manufacture clinker, which comprises of rotary kiln, preheater and pre-calciner. The typical process diagram for cement manufacturing is depicted in the **Fig 2.14**.

**FIG 2.14: MANUFACTURING PROCESS**



In dry process, the raw materials are dried in a combined drying-cum-grinding installation to reduce the moisture content to below 1%. The drying in the grinding unit is achieved by using kiln exhaust gases for normal moisture. The ground raw mix is then homogenized in silos and fed into the rotary kiln. Heat required for evaporation of added moisture is eliminated in this process. Material balance of cement plant is given in **Table 2.36**.

**TABLE 2.36: REVISED MATERIAL BALANCE OF CEMENT PLANT  
(NO CHANGE IN CEMENT PRODUCTION)**

|                                        | Sanctioned as per EC     |                      |      | Revised as per present proposal as per TOR |                      |      |
|----------------------------------------|--------------------------|----------------------|------|--------------------------------------------|----------------------|------|
| (1) Cement Plant                       |                          |                      |      |                                            |                      |      |
| Raw Material Inputs                    | Specific consumption T/T | Quantity (TPA)       | %    | Specific consumption T/T                   | Quantity (TPA)       | %    |
| (i) Portland Blast Furnace Slag Cement |                          |                      |      |                                            |                      |      |
| Slag Generation from Blast Furnace     | 0.700                    | 467,775              | 70%  | 0.400                                      | 382,750              | 40%  |
| Clinker                                | 0.250                    | 167,063              | 25%  | 0.550                                      | 526,281              | 55%  |
| Gypsum                                 | 0.050                    | 33,412               | 5%   | 0.050                                      | 47,844               | 5%   |
| (ii) Portland Pozzolana Cement         |                          |                      |      |                                            |                      |      |
| Fly Ash from Middlings & Char          | 0.350                    | 356,055              | 35%  | 0.350                                      | 255,054              | 35%  |
| Clinker                                | 0.600                    | 610,380              | 60%  | 0.600                                      | 437,235              | 60%  |
| Gypsum                                 | 0.050                    | 50,865               | 5%   | 0.050                                      | 36,436               | 5%   |
| Total                                  |                          | 1,685,550            |      |                                            | 1,685,600            |      |
| Outputs                                | Specific Generation T/T  | Quantity (TPA)       | %    | Specific Generation T/T                    | Quantity (TPA)       | %    |
| Cement                                 |                          | 1,685,550            | 100% |                                            | 1,685,600            | 100% |
| Total                                  |                          | 1,685,550            | 100% |                                            | 1,685,600            | 100% |
|                                        |                          |                      |      |                                            |                      |      |
| (2) Clinker Plant                      |                          |                      |      |                                            |                      |      |
| Raw Material Inputs                    | Specific consumption T/T | Total Quantity (TPA) | %    | Specific consumption T/T                   | Total Quantity (TPA) | %    |
| Lime stone                             | 1.500                    | 1,166,165            | 83%  | 1.500                                      | 1,445,274            | 83%  |
| Clay component                         | 0.030                    | 23,323               | 2%   | 0.030                                      | 28,905               | 2%   |
| Silica component                       | 0.040                    | 31,098               | 2%   | 0.040                                      | 38,541               | 2%   |
| Mill scale (from CCM/RM/SM/DPP)        | 0.030                    | 23,323               | 2%   | 0.030                                      | 28,905               | 2%   |
| Coal                                   | 0.200                    | 155,489              | 11%  | 0.200                                      | 192,703              | 11%  |
| Others                                 | 0.010                    | 7,774                | 1%   | 0.010                                      | 9,635                | 1%   |
| Total                                  | 1.810                    | 1,407,172            | 100% | 1.810                                      | 1,743,964            | 100% |
| Outputs                                | Specific Generation T/T  | Quantity (TPA)       | %    | Specific Generation T/T                    | Quantity (TPA)       | %    |
| Clinker                                | 1.000                    | 777,443              | 55%  | 1.000                                      | 963,516              | 55%  |
| Burning & other losses                 | 0.810                    | 629,728.83           | 45%  | 0.810                                      | 780,448              | 45%  |
| Total                                  | 1.810                    | 1,407,172            | 100% | 1.810                                      | 1,743,964            | 100% |

## 2.8 CAPTIVE POWER PLANT

### 2.8.1 WHRB power generation unit

135 MW waste heat recovery boilers based power plant was sanctioned in EC. Additional 100 MW is proposed to utilize the heat from gases exiting DRI kilns, blast furnace and coke oven. The total capacity of WHRB will be 235 MW. The waste gases emanating from DR kilns at 1000°C will be utilized for generating power through WHRBs. Additional entire flue gas from coke oven plant shall be used in WHRB while part of the blast furnace

gas shall be used in WHRB. The flue gases contain substantial sensible heat (average temperature 950°C), it is proposed to utilize the heat for power generation through waste heat recovery boilers. The top pressure of the MBF will also be utilised to establish a top pressure recovery turbine (TRT). For waste heat recovery, boiler and steam turbines to be used are given in Table 2.37.

**TABLE 2.37: CONFIGURATION OF SANCTIONED AND PROPOSED WHRB**

| Facilities                            | Sanctioned as per EC     | Proposed Additional or change as per TOR | Total After expansion   |
|---------------------------------------|--------------------------|------------------------------------------|-------------------------|
| WHRBs Connected with 500 TPD DR Kilns | 20 MW<br>2X50 TPH        | 5 MW                                     | 25 MW<br>2X50 TPH       |
| WHRBs Connected with 600 TPD DR Kilns | 48 MW<br>4X60 TPH        | 17 MW                                    | 65 MW<br>3 X 85 TPH     |
| WHRBs Connected with 900 TPD DR Kilns |                          | 60 MW<br>2 X 120 TPH                     | 60 MW<br>2 X 120 TPH    |
| WHRB Connected with MBFs              | 31 MW<br>1X50 +1X90 TPH  | 4 MW                                     | 35 MW<br>1X50 +2X45 TPH |
| WHRB connected with MBFs TRT          | -                        | 10 MW                                    | 10 MW                   |
| WHRB Connected with Coke Oven         | 36 MW<br>1X60 +1X100 TPH | 4 MW                                     | 40 MW<br>2X60 +1X40 TPH |
| <b>Total Power (MW)</b>               | <b>135 MW</b>            | <b>100 MW</b>                            | <b>235 MW</b>           |

The waste heat recovery boilers consist of radiation chambers with water walls just like conventional boiler with a drum to evaporate steam at 34 kg/cm<sup>2</sup> pressure. The steam is carried to super heater system where the temperature is maintained at 485°C. The boiler has an economizer, which utilises the heat of outgoing gases to raise the temperature of feed water from 100 to 200°C. The steam is used to rotate the turbine and to generate power. The condensed steam is collected and recycled to the boilers as boiler feed water. A DM water plant is provided for preparation of de-mineralized water for make-up to the steam-condensate cycle.

The output of the boilers will be used to generate electricity through Steam Turbo Generator Sets of capacities as mentioned above. The flue gases leave the economizer zone at about 150°C. The gases are passed through ESPs, where the dust concentration is brought down below permissible limit.

## 2.8.2 CFBC Power generation unit

**AFBC/ CFBC:** 250 MW power plant has been sanctioned and additional 210 MW is proposed. The total capacity of the power plant shall be 460 MW based on coal fines, middlings from washery and char from DRI kilns has been proposed. The sanctioned and proposed configuration of AFBC/ CFBC power plant is given in Table 2.38.

**TABLE 2.38: CONFIGURATION OF SANCTIONED AND PROPOSED CPP**

| Description                   | Unit       | Sanctioned as per EC | Proposed additional as per TOR | Total after expansion  |
|-------------------------------|------------|----------------------|--------------------------------|------------------------|
| AFBC/ CFBC                    | Nos.       | 6                    | 8                              | 14                     |
| Capacity and TPH              | TPH        | 2x125 + 4x250        | 8x125 + 1X130 & Less 1X250     | 10x125 + 1X130 + 3x250 |
| Working days                  | Per/Annum  | 340                  | 340                            | 340                    |
| Working hours                 | Hours /Day | 24                   | 24                             | 24                     |
| <b>Total Power generation</b> | MW         | 250                  | 210                            | 460                    |

Material and energy balance is given in **Table 2.39**.

**TABLE 2.39: MATERIAL BALANCE OF SANCTIONED AND PROPOSED CPP**

|                                               |                            | Sanctioned as per EC |                    | Proposed Additional as per TOR | Total after Expansion |                    |                       |
|-----------------------------------------------|----------------------------|----------------------|--------------------|--------------------------------|-----------------------|--------------------|-----------------------|
| Raw Material Inputs                           | Specific Consumption T/MWh | Quantity (TPA)       | % Power Generation | Quantity (TPA)                 | Quantity (TPA)        | % Power Generation | Power Generation (MW) |
| Char Generation from DR Plant                 | 1.472                      | 285,248              | 12.36              | 129,099                        | 414,347               | 10.97              | 31.83                 |
| Middlings from Coal Washery                   | 1.104                      | 1,759,908            | 76.28              | 377,502                        | 2,137,410             | 56.60              | 218.93                |
| Coal Fines from RM handling at DR Plant       | 0.883                      | 158,001              | 6.85               | 79,028                         | 237,029               | 6.28               | 30.35                 |
| <b>Power Generated from above Fuel</b>        |                            | <b>2,203,157</b>     | <b>95.5</b>        | <b>585,629</b>                 | <b>2,788,786</b>      | <b>73.85</b>       | <b>281.10</b>         |
| Coal required for Balance Power               | 0.576                      | 103,934              | 4.50               | 805,055                        | 908,989               | 24.07              | 178.90                |
| Limestone                                     | 0.013                      | 32,640               |                    | 45,938                         | 78,578                |                    | 0                     |
| <b>Total</b>                                  |                            | <b>2,339,732</b>     | <b>100</b>         | <b>1,436,622</b>               | <b>3,776,353</b>      |                    | <b>460.0</b>          |
| Outputs                                       |                            | Quantity (TPA)       |                    |                                |                       | % of material      |                       |
| Material Handling Loss (5%)                   |                            | 115,354.59           |                    | 73,463                         | 188,818               | 5.00%              |                       |
| Material combusted in AFBC/CFBC (FC, VM, etc) |                            | 9,39,988.67          |                    | 625,135                        | 1,565,124             | 41.45%             |                       |
| Ash from Char (52% Ash)                       |                            | 148,328.95           |                    | 67,132                         | 215,460               | 5.71%              |                       |
| Ash from Middlings (56% Ash)                  |                            | 985,548.43           |                    | 211,401                        | 1,196,950             | 31.70%             |                       |
| Ash from Coal fines (45% Ash)                 |                            | 71,100.67            |                    | 35,563                         | 106,663               | 2.82%              |                       |
| Ash from Coal (45% Ash)                       |                            | 46,770               |                    | 362,275                        | 409,045               | 10.83%             |                       |
| Limestone in ash                              |                            | 32,640               |                    | 61,653                         | 94,293                | 2%                 |                       |
| <b>Total</b>                                  |                            | <b>2,339,732</b>     |                    | <b>1,436,622</b>               | <b>3,776,353</b>      | <b>100</b>         |                       |

### **Coal Handling System**

The coal received crushed and screened at plant for the use of the steel making and in the process coal fines are generated. These coal fines are utilized for energy generation. Also, there will be generation of middlings in the washery which are also proposed for consumption in power generation. Char from the sponge iron kiln are third source of fuel for the power plant.



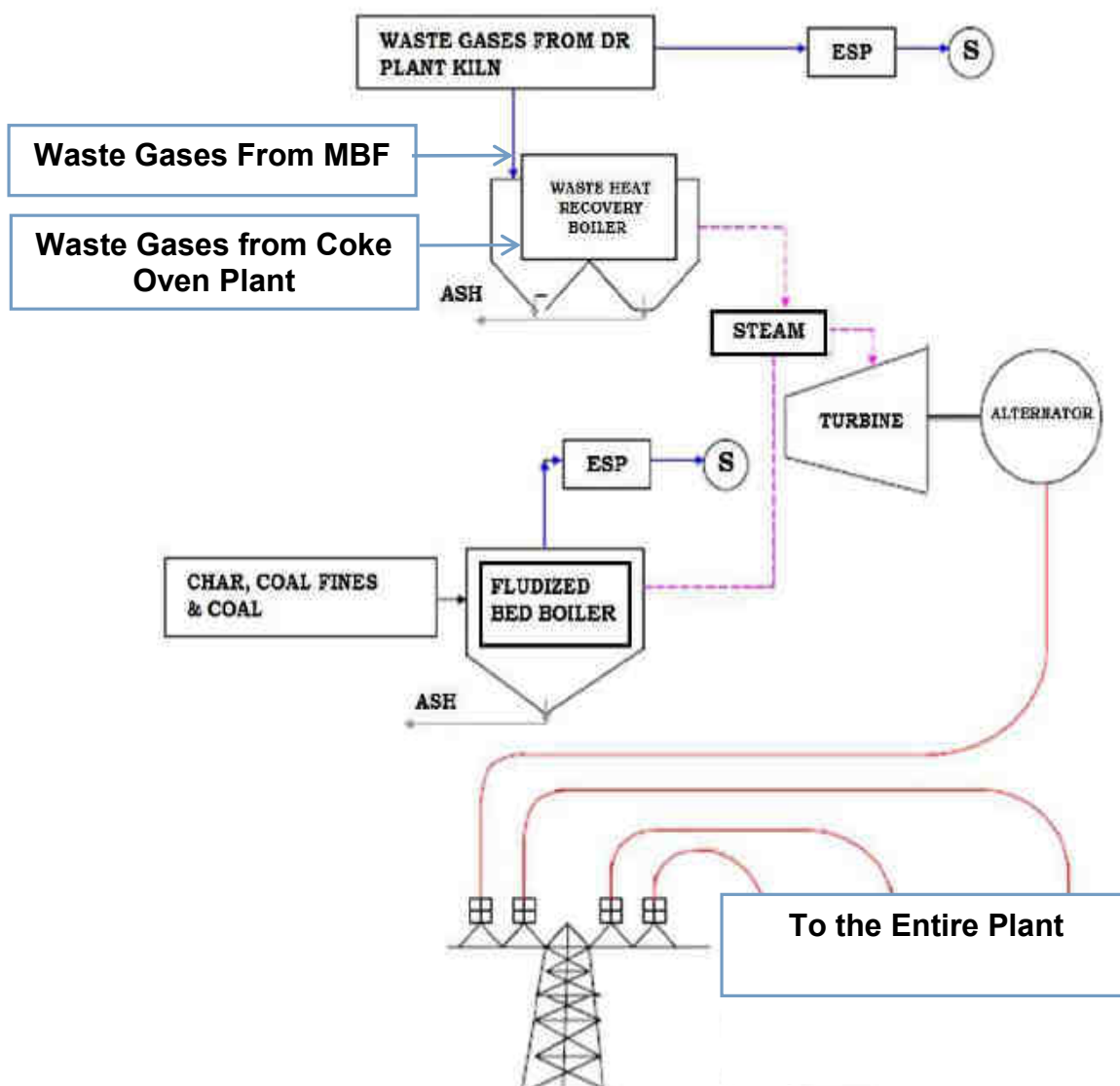
### Ash handling system

For handling of fly ash of the steam generator, dense phase, pneumatic conveying system is provided. The ash collected in the hoppers located in economizer, air pre-heated sections of ESP hoppers will be pneumatically conveyed and collected. Ash will be utilize in manufacture Portland Pozzolana Cement (PPC) within plant premises, Brick manufacturing and Road making.

### Cooling water system

Cooling water system is the main consumer of water in a thermal power plant. Cooling water is required for condenser and auxiliary cooling. The water required for condenser cooling should be soft water, free from suspended solids. A circulating water system with a cooling tower, make-up water system and blow down system shall be provided. flow sheet of CPP is given in **Fig 2.15**.

**FIG 2.15: TYPICAL FLOW DIAGRAM OF POWER PLANT**



## 2.9 RAW MATERIAL

The overall requirement of the raw material for the integrated steel plant Chaliyama is given in **Table 2.40**. Mode of transport for raw materials will be by rail/ road.

**TABLE 2.40: ANNUAL RAW MATERIALS CONSUMPTION FOR ENTIRE 3.55 MTPA PLANT (TPA)**

| Sl. No. | Facilities          | Raw Material                          | Unit | Sanctioned as per EC | Proposed additional | Total      | Inhouse   | Outhouse   | Source                                |
|---------|---------------------|---------------------------------------|------|----------------------|---------------------|------------|-----------|------------|---------------------------------------|
| 1       | Beneficiation Plant | Low Grade Iron Ore Fines (0 to 5 mm)  | TPA  | 5,389,927            |                     | 5,389,927  | 0         | 5,389,927  | Own mine/ OMC/Open market             |
|         |                     | Flocculant                            | TPA  | 269                  |                     | 269        | 0         | 269        | Open Market                           |
| 2       | Pelletisation Plant | Iron Ore/ Fines/ concentrate          | TPA  | 3,233,956            | 28,304,794          | 31,538,750 | 3,233,956 | 28,304,794 | Inhouse and Own mine/ OMC/Open market |
|         |                     | Dolomite (Flux)                       | TPA  | 41,272               | 361,228             | 402,500    | 0         | 402,500    | Open market                           |
|         |                     | Bentonite                             | TPA  | 44,220               | 387,030             | 431,250    | 0         | 431,250    | Open market                           |
|         |                     | Coke Breeze                           | TPA  | 50,116               | 438,634             | 488,750    | 25        | 488,725    | Open market                           |
|         |                     | Coal >= 5500 Kcal /kg (emergency use) | TPA  | 98,463               | 861,787             | 960,250    | 0         | 960,250    | Open market                           |
| 3       | Coal Washery        | ROM Coal                              | TPA  | 4,140,960            | 888,240             | 5,029,200  | 0         | 5,029,200  | Open market                           |
| 4       | DRI Plant           | Iron Ore/Iron Oxide                   | TPA  | 2,419,710            | 951,015             | 3,370,725  | 3,370,725 | 0          | Inhouse                               |
|         |                     | Coal                                  | TPA  | 1,290,512            | 684,733             | 1,975,245  | 1,975,245 | 0          | Inhouse                               |
|         |                     | Dolomite                              | TPA  | 48,394               | 41,492              | 89,886     | 0         | 89,886     | Open market                           |
| 5       | Mini Blast Furnace  | Iron Ore                              | TPA  | 657,195              | -492,083            | 165,113    | 0         | 165,113    | Own mine/ OMC/Open market             |
|         |                     | Sinter                                | TPA  | 1,662,570            | 1,144,343           | 2,806,913  | 2,806,913 | 0          | Inhouse                               |
|         |                     | Pellet                                | TPA  | 0                    | 330,225             | 330,225    | 330,225   | 0          | Inhouse                               |
|         |                     | Coke                                  | TPA  | 951,143              | -115,868            | 835,275    | 835,275   | 0          | Inhouse                               |
|         |                     | Coal dust                             | TPA  | 77,963               | 213,412             | 291,375    | 0         | 291,375    | Open Market                           |
|         |                     | Dolomite                              | TPA  | 218,295              | 53,655              | 271,950    | 0         | 271,950    | Open Market                           |
|         |                     | Quartz                                | TPA  | 81,081               | 19,929              | 101,010    | 0         | 101,010    | Open Market                           |
| 6       | Sinter Plant        | Iron Ore Fines                        | TPA  | 1,579,442            | 965,254             | 2,544,696  | 0         | 2,544,696  | Own mine/ OMC/Open market             |
|         |                     | Coke Fines                            | TPA  | 166,257              | 68,443              | 234,700    | 234,700   | 0          | Inhouse                               |
|         |                     | Lime Stone                            | TPA  | 216,134              | 151,433             | 367,567    | 0         | 367,567    | Open Market                           |

| Sl. No. | Facilities                  | Raw Material                                 | Unit | Sanctioned as per EC | Proposed additional | Total     | Inhouse   | Outhouse  | Source                  |
|---------|-----------------------------|----------------------------------------------|------|----------------------|---------------------|-----------|-----------|-----------|-------------------------|
|         |                             | Dolomite                                     | TPA  | 216,134              | 151,433             | 367,567   | 0         | 367,567   | Open Market             |
|         |                             | From Pellet plant (iron ore fines)           | TPA  | 240,772              | 2,107,325           | 2,348,097 | 2,348,097 | 0         | Inhouse                 |
|         |                             | ESP, BF dust, etc. from DRI                  | TPA  | 97,376               | 44,071              | 141,447   | 141,447   | 0         | Inhouse                 |
|         |                             | Dust (Iron Ore, Coke, Sinter Fines) from MBF | TPA  | 77,963               | 19,162              | 97,125    | 97,125    | 0         | Inhouse                 |
|         |                             | Sludge from GCP from MBF                     | TPA  | 7,796                | -7,796              | 0         |           | 0         |                         |
|         |                             | Bag Filter Dust from coke oven plant         | TPA  | 50,736               | -2,265              | 48,471    | 48,471    | 0         | Inhouse                 |
|         |                             | BF dust from IF                              | TPA  | 13,123               | 24,373              | 37,496    | 37,496    | 0         | Inhouse                 |
|         |                             | BF dust from EAF                             | TPA  | 42,989               | -4,895              | 38,094    | 38,094    | 0         | Inhouse                 |
|         |                             | Sinter Return Fines                          | TPA  | 581,900              | -157,784            | 424,116   | 424,116   | 0         | Inhouse                 |
| 7       | Coke Oven Plant             | Coking Coal                                  | TPA  | 1,691,200            | -75,500             | 1,615,700 | 0         | 1,615,700 | Open Market             |
| 8       | SMS                         |                                              |      |                      |                     |           |           |           |                         |
| 8.1     | SMS-IF                      | DRI                                          | TPA  | 604,360              | 935,640             | 1,540,000 | 1,540,000 | 0         | Inhouse                 |
|         |                             | Pig Iron / Hot Metal                         | TPA  | 111,774              | 139,313             | 251,087   | 251,087   | 0         | Inhouse                 |
|         |                             | Steel Scrap                                  | TPA  | 74,516               | 9,180               | 83,696    | 44,673    | 39,022    | Inhouse and Open market |
| 8.2     | SMS-EAF                     | DRI                                          | TPA  | 1,008,000            | -300,850            | 707,150   | 707,150   | 0         | Inhouse                 |
|         |                             | Hot Metal/Pig Iron from MBF                  | TPA  | 1,063,206            | 134,344             | 1,197,550 | 1,181,209 | 16,341    | Inhouse and open market |
|         |                             | Lime                                         | TPA  | 289,800              | 14,700              | 304,500   | 304,500   | 0         | Inhouse                 |
|         |                             | Pig Iron from Outside                        | TPA  | 78,222               | -78,222             | 0         |           | 0         |                         |
| 9       | Finished Product facilities |                                              |      |                      |                     |           |           |           |                         |
| 9.1     | Rolling Mill                | Semi Finished Product from IF-CCM            | TPA  | 1,019,153            | 490,047             | 1,509,200 | 1,509,200 | 0         | Inhouse                 |
|         |                             | Semi Finished Product from EAF-CCM           | TPA  | 679,140              | 440,526             | 1,119,666 | 1,119,666 | 0         | Inhouse                 |
|         |                             | Semi finished purchased from outside         | TPA  | 85,280               | -85,280             | 0         |           | 0         |                         |
| 9.2     | Strip Mill                  | Semi Finished Product from CCM               | TPA  | 867,347              | -357,143            | 510,204   | 510,204   | 0         | Inhouse                 |
| 9.3     | Ductile Pipe                | Hot Metal from Blast Furnace                 | TPA  | 408,163              | 102,041             | 510,204   | 510,204   | 0         | Inhouse                 |
| 10      | Producer Gas Plant          | Coal                                         | TPA  | 214,080              | 1,418,284           | 1,632,364 | 539,355   | 1,093,008 | Inhouse and Open market |
| 11      | Lime Plant                  | Lime Stone                                   | TPA  | 521,640              | 26,460              | 548,100   | 0         | 548,100   | Open Market             |

| Sl. No. | Facilities          | Raw Material                            | Unit       | Sanctioned as per EC | Proposed additional | Total             | Inhouse           | Outhouse          | Source      |
|---------|---------------------|-----------------------------------------|------------|----------------------|---------------------|-------------------|-------------------|-------------------|-------------|
|         |                     | Fuel Oil                                | TPA        | 57,960               | 2,940               | 60,900            | 0                 | 60,900            | Open Market |
| 12      | Cement Plant        | Slag Generation from Blast Furnace      | TPA        | 467,775              | -85,025             | 382,750           | 382,750           | 0                 | Inhouse     |
|         |                     | Clinker                                 | TPA        | 167,063              | 359,218             | 526,281           | 526,281           | 0                 | Inhouse     |
|         |                     | Gypsum                                  | TPA        | 33,412               | 14,432              | 47,844            | 0                 | 47,844            | Open Market |
|         |                     | Portland Pozzolana Cement               |            |                      |                     |                   |                   |                   |             |
|         |                     | Fly Ash from Middlings & Char           | TPA        | 356,055              | -101,001            | 255,054           | 255,054           | 0                 | Inhouse     |
|         |                     | Clinker                                 | TPA        | 610,380              | -173,145            | 437,235           | 437,235           | 0                 | Inhouse     |
|         |                     | Gypsum                                  | TPA        | 50,865               | -14,429             | 36,436            | 0                 | 36,436            | Open Market |
|         | Clinker Plant       | Lime stone                              | TPA        | 1,166,165            | 279,109             | 1,445,274         | 0                 | 1,445,274         | Open Market |
|         |                     | Clay component                          | TPA        | 23,323               | 5,582               | 28,905            | 0                 | 28,905            | Open Market |
|         |                     | Silica component                        | TPA        | 31,098               | 7,443               | 38,541            | 0                 | 38,541            | Open Market |
|         |                     | Mill scale (from CCM/RM/SM/DPP)         | TPA        | 23,323               | 5,582               | 28,905            | 28,905            | 0                 | Inhouse     |
|         |                     | Coal                                    | TPA        | 155,489              | 37,214              | 192,703           | 0                 | 192,703           | Open Market |
|         |                     | Others                                  | TPA        | 7,774                | 1,861               | 9,635             | 0                 | 9,635             | Open Market |
| 13      | Captive Power Plant | Char Generation from DR Plant           | TPA        | 285,248              | 129,099             | 414,347           | 414,347           | 0                 | Inhouse     |
|         |                     | Middlings from Coal Washery             | TPA        | 1,759,908            | 377,502             | 2,137,410         | 2,137,410         | 0                 | Inhouse     |
|         |                     | Coal Fines from RM handling at DR Plant | TPA        | 158,001              | 79,028              | 237,029           | 237,029           | 0                 | Inhouse     |
|         |                     | Coal required for Balance Power         | TPA        | 103,934              | 805,055             | 908,989           | 0                 | 908,989           | Open Market |
|         |                     | Limestone                               | TPA        | 32,640               | 45,938              | 78,578            | 0                 | 78,578            | Open Market |
|         | <b>Total</b>        |                                         | <b>TPA</b> | <b>37,902,962</b>    | <b>42,021,264</b>   | <b>79,924,226</b> | <b>28,558,170</b> | <b>51,366,056</b> |             |

In addition to above, the fuel requirement shall be for the dozers and heavy machinery used for handling and management of raw materials and solid waste, which is anticipated to the tune of 50,000 litre per annum. The producer gas will be used in pellet plant to the tune of 5,382,000,000 Nm<sup>3</sup>/yr. The furnace oil will be used @ 17litre/T in rolling mill and @ 50 litre/T in Strip mill and Ductile Pipe Plant. The total FO requirement will be 93,350 KL/annum.

## 2.10 FINISHED PRODUCTS

The finished and intermediate products from the plant which shall be consumed in-house or sold are given in **Table 2.41**.

**TABLE 2.41: ANNUAL FINISHED/INTERMEDIATE PRODUCTS  
MANUFACTURING FOR ENTIRE 3.55 MTPA PLANT**

| Sl. No. | Facilities          | Product                         | Unit | Sanctioned as per EC | Proposed additional | Total             | Consumed Inhouse  | Sale              |
|---------|---------------------|---------------------------------|------|----------------------|---------------------|-------------------|-------------------|-------------------|
| 1       | Beneficiation Plant | Beneficiated Iron Ore (product) | TPA  | 3,233,956            |                     | 3,233,956         | 3,233,956         | 0                 |
| 2       | Pelletisation Plant | Pellets                         | TPA  | 2,948,000            | 25,802,000          | 28,750,000        | 3,700,950         | 25,049,050        |
| 3       | Coal Washery        | Washed Coal                     | TPA  | 2,070,480            | 444,120             | 2,514,600         | 2,514,600         | 0                 |
| 4       | DRI Plant           | Sponge Iron (DRI)               | TPA  | 1,613,140            | 634,010             | 2,247,150         | 2,247,150         | 0                 |
| 5       | Mini Blast Furnace  | Hot Metal/ Pig Iron             | TPA  | 1,559,250            | 383,250             | 1,942,500         | 1,942,500         | 0                 |
| 6       | Sinter Plant        | Sinter                          | TPA  | 1,662,570            | 1,164,870           | 2,827,440         | 2,806,913         | 20,528            |
| 7       | Coke Oven Plant     | Coke                            | TPA  | 1,120,000            | -50,000             | 1,070,000         | 1,070,000         | 0                 |
| 8       | SMS-IF-CCM          | Semi-Finished Product from CCM  | TPA  | 679,140              | 830,060             | 1,509,200         | 1,509,200         | 0                 |
| 9       | SMS-EAF-CCM         | Semi-Finished Product from CCM  | TPA  | 1,886,500            | -240,100            | 1,646,400         | 1,629,870         | 16,530            |
| 10      | Rolling Mill        | Finished Product                | TPA  | 1,750,000            | 800,000             | 2,550,000         | 0                 | 2,550,000         |
| 11      | Strip Mill          | Finished Product                | TPA  | 850,000              | -350,000            | 500,000           | 0                 | 500,000           |
| 12      | Ductile Pipe        | Finished Product                | TPA  | 400,000              | 100,000             | 500,000           | 0                 | 500,000           |
| 13      | Lime Plant          | Lime                            | TPA  | 289,800              | 14,700              | 304,500           | 304,500           | 0                 |
| 14      | Cement Plant        | Cement                          | TPA  | 1,685,550            | 1,685,600           | 3,371,150         | 0                 | 3,371,150         |
| 15      | clinker Plant       | Clinker                         | TPA  | 777,443              | 963,516             | 1,740,959         | 963,516           | 777,443           |
|         | <b>Total</b>        |                                 |      | <b>22,525,829</b>    | <b>32,182,026</b>   | <b>54,707,855</b> | <b>21,923,155</b> | <b>32,784,700</b> |

## 2.11 POWER

DRI Kiln gas, Blast furnace gas and Coke oven gas contains significant heat, which could be passed through Waste Heat Recovery Boiler to generate steam. The steam could be used to generate heat energy, power and electricity. The top pressure of the MBF can be directly used for power generation through turbine.

The existing power requirement of the project is 394 MW. Additional 300 MW will be required of the expansion. The total power requirement of the project shall be 694 MW. The plant shall generate 695 MW energy in form of electricity from its captive power plant and shall be utilized in DRI, SMS, IF LRF, etc. and the additional power is available for outside sale. Energy consumption is given in **Table 2.42**

TABLE 2.42: ENERGY CONSUMPTION

| S.N. | Description                                      | Sanctioned as per EC |             |         |                |                            | Proposed additional as per TOR |                            | Total after Expansion |             |         |                |                            |
|------|--------------------------------------------------|----------------------|-------------|---------|----------------|----------------------------|--------------------------------|----------------------------|-----------------------|-------------|---------|----------------|----------------------------|
|      |                                                  | No of Days           | No of Hours | KWH Req | Capacity (TPA) | Power Requirement (MW)     | Capacity (TPA)                 | Power Requirement (MW)     | No of Days            | No of Hours | KWH Req | Capacity (TPA) | Power Requirement (MW)     |
| 1    | Sponge Iron Plant                                | 350                  | 24          | 80      | 1,613,140      | 15.15                      | 634,010                        | -0.64                      | 355                   | 24          | 55      | 2,247,150      | 14.51                      |
| 2    | Pellet Plant                                     | 335                  | 24          | 64      | 2,948,000      | 23.47                      | 25,802,000                     | 155.33                     | 335                   | 24          | 50      | 28,750,000     | 178.79                     |
| 3    | Iron Ore beneficiation                           | 330                  | 24          | 3       | 5,389,927      | 2.04                       | 0                              | 0.00                       | 330                   | 24          | 3       | 5,389,927      | 2.04                       |
| 4    | Coal Washery                                     | 327                  | 20          | 15      | 4,140,960      | 9.50                       | 888,240                        | -3.40                      | 330                   | 20          | 8       | 5,029,200      | 6.10                       |
| 5    | Mini Blast Furnace                               | 350                  | 24          | 150     | 1,559,250      | 27.84                      | 383,250                        | 1.06                       | 350                   | 24          | 125     | 1,942,500      | 28.91                      |
| 6    | Sinter                                           | 325                  | 21          | 45      | 1,662,570      | 10.96                      | 1,164,870                      | 5.10                       | 330                   | 24          | 45      | 2,827,440      | 16.07                      |
| 7    | Coke Oven Plant                                  | 350                  | 24          | 10      | 1,120,000      | 1.33                       | -50,000                        | -0.06                      | 350                   | 24          | 10      | 1,070,000      | 1.27                       |
| 8.1  | SMS-IF                                           | 350                  | 24          | 750     | 693,000        | 61.88                      | 1,540,000                      | 66.46                      | 350                   | 24          | 700     | 2,233,000      | 128.33                     |
| 8.2  | SMS-EAF                                          | 350                  | 24          | 400     | 1,925,000      | 91.67                      | -245,000                       | -11.67                     | 350                   | 24          | 400     | 1,680,000      | 80.00                      |
| 8.3  | SMS-CCM                                          | 350                  | 24          | 100     | 2,464,000      | 29.33                      | 756,000                        | 9.00                       | 350                   | 24          | 100     | 3,220,000      | 38.33                      |
| 9.1  | Flat/Round/Wire/Rod/ Structural Mill             | 350                  | 20          | 140     | 1,750,000      | 35.00                      | 800,000                        | 12.36                      | 350                   | 20          | 130     | 2,550,000      | 47.36                      |
| 9.2  | Strip Mill/Sheet/Coil/ Wire & Bar Mill/Wire Rope | 350                  | 20          | 140     | 850,000        | 17.00                      | -350,000                       | -7.71                      | 350                   | 20          | 130     | 500,000        | 9.29                       |
| 9.3  | Ductile Pipe Plant                               | 350                  | 20          | 100     | 400,000        | 5.71                       | 100,000                        | 25.54                      | 350                   | 16          | 350     | 500,000        | 31.25                      |
| 10   | Producer Gas Plant                               | 333                  | 24          | 0.02    | 480,000,000    | 1.20                       | 4,906,800,000                  | 8.85                       | 335                   | 24          | 0.015   | 5,386,800,000  | 10.05                      |
| 11   | Oxygen Plant                                     | 350                  | 24          | 1       | 68,600,000     | 8.17                       | 61,250,000                     | 7.29                       | 350                   | 24          | 1       | 129,850,000    | 15.46                      |
| 12   | Lime Plant                                       | 350                  | 24          | 1       | 304,500        | 0.04                       | 0                              | 0.00                       | 350                   | 24          | 1       | 304,500        | 0.04                       |
| 13   | Cement Plant                                     | 340                  | 24          | 72      | 1,685,600      | 14.76                      | 0                              | -2.51                      | 344                   | 24          | 60      | 1,685,600      | 12.25                      |
| 14   | Power                                            | 340                  | 24          | 0.1     | 385            | 38.50                      | 310                            | 31.00                      | 350                   | 24          | 0.1     | 695            | 69.50                      |
| 15   | Colony                                           |                      |             |         |                |                            |                                | 3.9                        |                       |             |         |                | 3.9                        |
|      | <b>Total Requirement</b>                         |                      |             |         |                | <b>393.54,<br/>Say 394</b> |                                | <b>299.89,<br/>Say 300</b> |                       |             |         |                | <b>693.44,<br/>Say 694</b> |
|      | Power Generation                                 |                      |             |         |                | 385                        |                                | 310                        |                       |             |         |                | 695                        |
|      | Power from outside                               |                      |             |         |                | 9                          |                                |                            |                       |             |         |                |                            |
|      | Power for outside sale                           |                      |             |         |                |                            |                                | 10                         |                       |             |         |                | 1                          |

## 2.12 WATER REQUIREMENT

Fresh water will be stored in a raw water reservoir. Water from the reservoir will be subjected to clari-flocculation, sludge settling and gravity filtration. Clear water will be utilized for cooling water make up and as service water. For potable water system, the filtered water will be subjected to chlorination. For make up to the steam-condensate cycle (boiler feed water), demineralization of the filtered water by cation and anion exchange resins is envisaged. Consumption of industrial water in different operations can be broadly classified under the following heads:

- Evaporation losses in raw water reservoir
- Losses in water treatment
- Make up to cooling water systems
- Boiler feed water
- Dust suppression
- Horticulture and green belt
- Service water, e.g., make-up to fire water system, etc.

### 2.12.1 Water requirement for entire plant

The estimated sanctioned make-up water requirement for the Complete Steel Plant is 2981 cum per hour. Water withdrawal permission of 2950 cum/hr from Bramhani River has been obtained from the Water Resource Department, Govt. of Odisha. Additional 771 KLH water will be required for the proposed expansion. The total water requirement for the project shall be 3752 KLH. IPICOL recommended for allocation of additional water requirement of 7.86 cusec from river Bramhani vide letter no. CGM/SLNA/RML-226/18/2160 dated 24.08.2020. Water permission and recommendation letter is enclosed as **Annexure IV**. Daily make up water requirement has been given in **Table 2.43**. The water balance diagram is given in **Fig 2.16** for total steel plant.

The project design encompasses optimum water consumption through the concept of recycling and reuse. The waste water generated from various units will be treated to meet the stipulated norms and then reused within the plant for process use, dust suppression and gardening. No waste water will be discharged outside the plant premises.

### 2.12.2 Fire water requirement

Water requirement for fire protection system shall be met from the raw water reservoir and separate pumps shall be provided.

### 2.12.3 Dust Suppression Water System

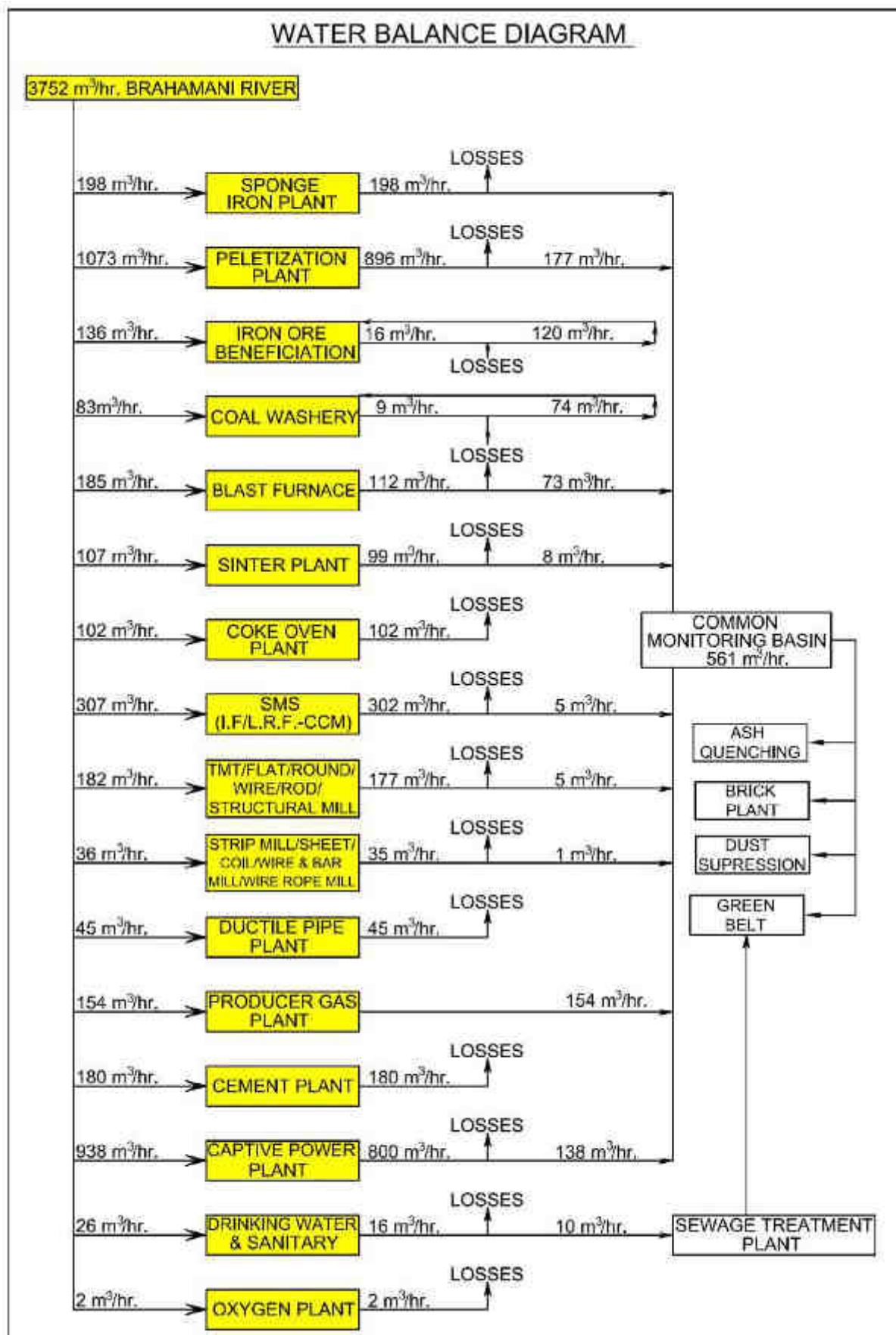
The dust suppression will be carried out by sprinkling water on the raw material stock piles etc. Dust suppression will be accomplished by makeup water as well as cooling tower blow downs from time to time thereby reducing the make-up water requirement.

**TABLE 2.43: WATER REQUIREMENT AND DISCHARGE FOR ENTIRE PLANT (KLH)**

| Sl. No. | Plant                                 | Unit | Sanctioned as per EC |                      |                              |                        | Proposed additional as per TOR |                      |                              |                        | Total after Exapnsion |                      |                             |                        |
|---------|---------------------------------------|------|----------------------|----------------------|------------------------------|------------------------|--------------------------------|----------------------|------------------------------|------------------------|-----------------------|----------------------|-----------------------------|------------------------|
|         |                                       |      | Capacity (TPA)       | Fresh/ Make-up Water | Evaporation / Consumed water | Discharge/ Waste Water | Capacity (TPA)                 | Fresh/ Make-up Water | Evaporation / Consumed water | Discharge/ Waste Water | Capacity (TPA)        | Fresh/ Make-up Water | Evaporation/ Consumed water | Discharge/ Waste Water |
| 1       | Sponge Iron Plant                     | TPA  | 1,613,140            | 196                  | 196                          | 0                      | 634,010                        | 2                    | 2                            | 0                      | 2,247,150             | 198                  | 198                         | 0                      |
| 2       | Pellet Plant                          | TPA  | 3,000,000            | 55                   | 46                           | 9                      | 25,750,000                     | 1,018                | 850                          | 168                    | 28,750,000            | 1,073                | 896                         | 177                    |
| 3       | Iron ore Beneficiation Plant          | TPA  | 5,389,927            | 204                  | 23                           | 181                    | 0                              | -68                  | -8                           | -60                    | 5,389,927             | 136                  | 16                          | 120                    |
| 4       | Coal Washary                          | TPA  | 4,140,960            | 68                   | 8                            | 61                     | 888,240                        | 14                   | 2                            | 13                     | 5,029,200             | 83                   | 9                           | 74                     |
| 5       | Mini Blast Furnace                    | TPA  | 686,000              | 408                  | 248                          | 160                    | 1,256,500                      | -223                 | -136                         | -88                    | 1,942,500             | 185                  | 112                         | 73                     |
| 6       | Sinter Plant                          | TPA  | 1,662,570            | 397                  | 368                          | 29                     | 1,164,870                      | -290                 | -268                         | -22                    | 2,827,440             | 107                  | 99                          | 8                      |
| 7       | Coke Oven                             | TPA  | 1,120,000            | 147                  | 147                          | 0                      | -50,000                        | -45                  | -45                          | 0                      | 1,070,000             | 102                  | 102                         | 0                      |
| 8       | SMS (I.F./L.R.F.-CCM)                 | TPA  | 2,618,000            | 343                  | 338                          | 5                      | 602,000                        | -36                  | -36                          | -1                     | 3,220,000             | 307                  | 302                         | 5                      |
| 9.1     | TMT/Flat/ Round/ Wire/ Rod/ Strl Mill | TPA  | 1,750,000            | 300                  | 291                          | 9                      | 800,000                        | -118                 | -114                         | -4                     | 2,550,000             | 182                  | 177                         | 5                      |
| 9.2     | Strip mill/sheet                      | TPA  | 850,000              | 158                  | 153                          | 5                      | -350,000                       | -122                 | -119                         | -4                     | 500,000               | 36                   | 35                          | 1                      |
| 9.3     | Ductile pipe                          |      | 400,000              | 74                   | 74                           | 0                      | 100,000                        | -30                  | -30                          | 0                      | 500,000               | 45                   | 45                          | 0                      |
| 10      | PGP                                   |      | 480,000,000          | 14                   | 0                            | 14                     | 4,906,800,000                  | 140                  | 0                            | 140                    | 5,386,800,000         | 154                  | 0                           | 154                    |
| 11      | Oxygen                                |      | 68,600,000           | 0                    | 0                            | 0                      | 61,250,000                     | 2                    | 2                            | 0                      | 129,850,000           | 2                    | 2                           | 0                      |
| 12      | lime plant                            |      | 304,500              | 0                    | 0                            | 0                      | 0                              | 0                    | 0                            | 0                      | 304,500               |                      |                             |                        |
| 13      | cement plant                          |      | 1,685,600            | 182                  | 182                          | 0                      | 0                              | -2                   | -2                           | 0                      | 1,685,600             | 180                  | 180                         | 0                      |
| 14      | power plant                           |      | 385                  | 385                  | 328                          | 57                     | 310                            | 553                  | 472                          | 81                     | 695                   | 938                  | 800                         | 138                    |
| 15      | Drinking Water and Sanitary           |      |                      | 50                   | 31                           | 19                     |                                | -24                  | -15                          | -9                     |                       | 26                   | 16                          | 10                     |
|         | <b>Total</b>                          |      |                      | <b>2,981</b>         | <b>2,433</b>                 | <b>548</b>             |                                | <b>771</b>           | <b>555</b>                   | <b>216</b>             |                       | <b>3,752</b>         | <b>2,988</b>                | <b>765</b>             |



FIG 2.16: WATER BALANCE DIAGRAM FOR TOTAL PLANT



## 2.13 MANPOWER

The manpower requirement for the sanctioned capacity is 2650 persons. Additional 2200 person will be required for the proposed expansion. The total manpower for the 3.55 MTPA plant shall be 4850 persons.

### *Facilities to manpower*

Infrastructure facilities such as sanitation, fuel, restrooms, etc. will be provided to the labour force during construction as well as to the casual workers including truck drivers.

## 2.14 PROJECT IMPLEMENTATION SCHEDULE

The completion schedule of the all facilities within 84 months after received Environmental Clearance. The tentative project implementation schedule is given in **Table 2.44**.

**TABLE 2.44: PROJECT IMPLEMENTATION SCHEDULE**

| Sl. No. | Facilities          | Completion schedule |
|---------|---------------------|---------------------|
| 1.      | DRI plant           | 80 month            |
| 2.      | Mini Blast Furnace  | 60 month            |
| 3.      | SMS                 | 60 month            |
| 4.      | Rolling mill        | 80 month            |
| 5.      | Strip Mill          | 80 month            |
| 6.      | Ductile pipe        | 80 month            |
| 7.      | Power plant         | 80 month            |
| 8.      | Pelletisation plant | 84 month            |
| 9.      | Coal washery        | 84 month            |
| 10.     | Oxygen Plant        | 60 month            |
| 11.     | Lime Plant          | 60 month            |
| 12.     | Sinter plant        | 60 month            |
| 13.     | Coke oven plant     | 60 month            |
| 14.     | Producer gas plant  | 84 month            |
| 15.     | Cement plant        | 60 month            |

## CHAPTER 3

### DESCRIPTION OF THE ENVIRONMENT

#### 3.1 GENERAL

As per the requirement of EIA Notification dated 14.09.2006, the base line data has to be generated and collected. This is to be used to establish the present environmental scenario. This has to cover the study area, period, components, methodology, maps and baseline for valued environmental components.

As per the procedure laid down in the EIA Notification dated 14.09.2006, Form-I, proposed terms of reference (TOR) for the EIA along with the pre-feasibility report was submitted to MOEF&CC vide online application no. IA/OR/IND/172347/2020 dated 11<sup>th</sup> September 2020 with request to permit use of the already collected baseline data of the period 01.03.2019 to 31.05.2019. The TOR was issued by MOEF&CC vide letter no. J-11011/309/2018-IA.II(I) on 19.09.2020.

##### 3.1.1 Sources of Environmental Data

The baseline information on micro-meteorological data, ambient air quality, water quality, soil quality and noise levels have been recorded at site by M/s Min Mec R&D Laboratory, New Delhi (NABL certificate no. TC 6337 valid upto 20/11/2021 and MoEF&CC notification no. SO 3744(E) at Sl. No. 97, valid upto 16/10/2025, both enclosed in **Annexure XXI**). Long term meteorological data was collected from the nearest IMD station, Angul. Primary data on flora, fauna, traffic volumes, etc. was also collected during field visits. Apart from these, secondary data have been collected from Census Handbook, Revenue Records, Forest Department, etc.

##### 3.1.2 Study area

For the description of baseline environmental scenario, the plant area has been considered as the “core zone”. The area falling within a distance of 10 km from the boundary of the core zone has been considered as the “buffer zone”. The core zone and the buffer zone together form the “study area”. Baseline status and impact assessment has been done for the study area as shown in **Fig 3.1**.

#### 3.2 TOPOGRAPHY AND DRAINAGE

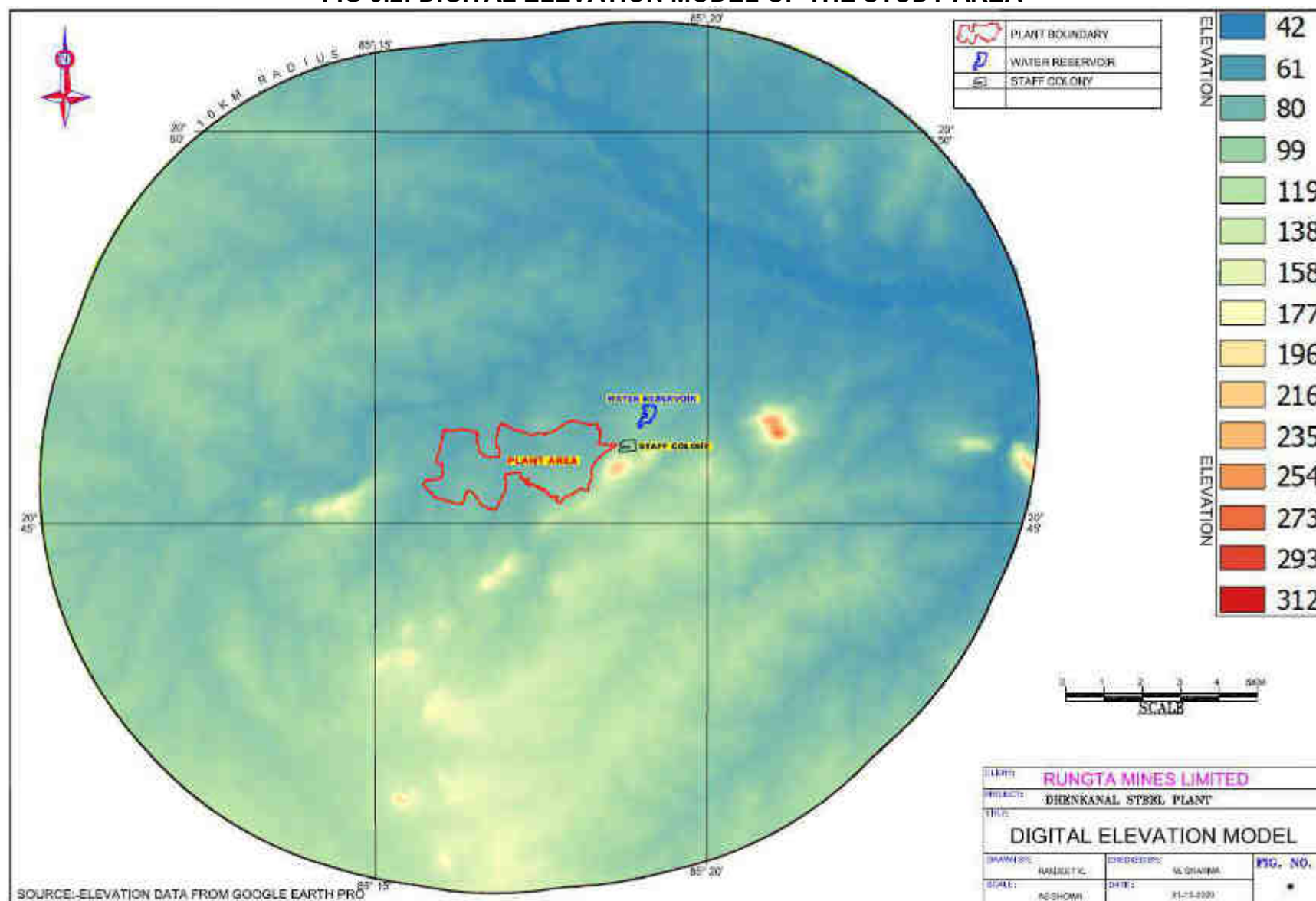
The topography and drainage map of the study area is shown in **Fig 3.1**.

**3-2**





FIG 3.2: DIGITAL ELEVATION MODEL OF THE STUDY AREA



### 3.2.1 Topography

**Core zone:** The existing project area has a comparatively flat terrain and elevation is approximately 75-95 m AMSL. The proposed expansion area has an elevation of 65-100 m in majority area of main plant, as measured through google earth. The overall slope is towards the northern side towards Nigra Nala.

The elevation of the proposed colony area is 93 to 169 m. It is located on a slope at the base of the Jharbandh hill. The elevation of the proposed water reservoir area is 87-95 m and is a flat land near to Jharbandh village.

**Buffer zone:** Topographically, the study area represents a flat to gently undulating sloping topography with few scattered hillocks. The notable hillocks are Jharbandh Reserve Forest with a peak at 229 m, lying on the eastern side of the project site. The hillock of Nimidha RF has a peak at an elevation of 312 m, lying in north-north-east of the project.

The third prominent hillock is a dense jungle of Sal near village Naraharipur lying west-south west of the project. Smaller hillocks exist on a line from Jharbandh reserve forest in the centre of the study area towards south west side. The area south of the Brahmani River gently slopes towards the northeast. The surface elevation in buffer zone varies from 60 m to 312 m.

A digital elevation map of the study area has been prepared and given in **Fig 3.2**. The prominent hillocks of the study area can be seen clearly as elongated north east-south west oriented yellow coloured shapes lying east of the plant and going southwest wards. The highest elevations have been coloured in red and emerge on the east-north eastern side on Nimidha Reserve Forest.

### 3.2.2 Drainage

**Core zone:** The proposed project site is located 0.7 km south of Nigra (Lingra) Nala and 4.90 km south west of Brahmani River. As seen on toposheet, five first order seasonal drains and one aquaduct originate from within plant boundary or from its immediate vicinity and flow out from the northern boundary. These drains originate from and connect multiple seasonal ponds before flowing into Nigra Nala, which ultimately joins the Brahmani river. A total of seventeen ponds exist in the total existing & proposed plant area.

**Buffer zone:** The drainage of the area is controlled by the south-easterly flowing Brahmani river situated in the north-eastern part of the study area. The river is fed by various seasonal sub-parallel nalas like Nigra, Kisinda Jhor, Kusumder Jhor, Bade Jhor, etc.

Rivers/ Water bodies present in 10 km radius are given in **Table 3.1**.

TABLE 3.1: RIVER/ NALA PRESENT IN 10 KM RADIUS

| River/ Nala               | Nearest distance      |           |                                      |           |                              |           |
|---------------------------|-----------------------|-----------|--------------------------------------|-----------|------------------------------|-----------|
|                           | With respect to plant |           | With respect to water reservoir area |           | With respect to Staff Colony |           |
|                           | Distance, km          | Direction | Distance, km                         | Direction | Distance, km                 | Direction |
| Nigra or Lingra Nadi      | 0.7                   | N         |                                      |           |                              |           |
| Brahmani River            |                       |           | 4.9                                  | NE        |                              |           |
| Kisinda Jor               | 5.0                   | N         |                                      |           |                              |           |
| Kantei Nala               | 4.8                   | WSW       |                                      |           |                              |           |
| Matilia Nadi              | 7.0                   | WSW       |                                      |           |                              |           |
| Bauli Nadi                | 6.9                   | W         |                                      |           |                              |           |
| Barha Jor                 | 7.8                   | SE        |                                      |           |                              |           |
| Kusumdor Jor              | 3.6                   | SE        |                                      |           |                              |           |
| Agana Nadi                |                       |           | 9.3                                  | ESE       |                              |           |
| Bangurasingha Nala        |                       |           | 8.6                                  | E         |                              |           |
| Parjang Branch Canal      |                       |           | 7.9                                  | NE        |                              |           |
| Ria Jor                   |                       |           | 5.9                                  | NE        |                              |           |
| Rengali Right Main Canal  |                       |           | 0.7                                  | N         |                              |           |
| Pond in Khajuria          | 7.5                   | S         |                                      |           |                              |           |
| Pond in Ranjagol          | 5.6                   | S         |                                      |           |                              |           |
| Pond in Sanamunda         | 2.6                   | SW        |                                      |           |                              |           |
| Pond in Bankirhi          | 4.8                   | SW        |                                      |           |                              |           |
| Pond in Garhasantri       | 7.8                   | NW        |                                      |           |                              |           |
| Pond in Brundabanpur      | 9.7                   | NNW       |                                      |           |                              |           |
| Pond in Barhamunda        | 0.7                   | S         |                                      |           |                              |           |
| Pond in Sanahindola       | 7.5                   | S         |                                      |           |                              |           |
| Pond in Kantimili         | 1.8                   | SSW       |                                      |           |                              |           |
| Pond in Nuaparha          | 4.6                   | SW        |                                      |           |                              |           |
| Pond in Talamulapatana    | 7.9                   | WSW       |                                      |           |                              |           |
| Pond in Krushnachandrapur | 7.2                   | SSW       |                                      |           |                              |           |
| Pond in Jhanjiribahal     | 9.5                   | NW        |                                      |           |                              |           |
| Pond in Taltali           | 6.8                   | W         |                                      |           |                              |           |
| Pond in Kalandapal        | 9.1                   | W         |                                      |           |                              |           |
| Pond in Madhupur          | 1.2                   | SE        |                                      |           |                              |           |
| Pond in Nua               | 3.3                   | SE        |                                      |           |                              |           |
| Pond in Barsingh          | 4.1                   | SSE       |                                      |           |                              |           |
| Pond in Meramundali       |                       |           | 1.0                                  | NE        |                              |           |
| Pond in Malibirha         |                       |           | 3.3                                  | NE        |                              |           |
| Pond in Paribhandar       |                       |           | 7.6                                  | NNE       |                              |           |
| Pond in Hatura            | 9.5                   | SW        |                                      |           |                              |           |
| Pond in Garhatelemula     | 6.9                   | WSW       |                                      |           |                              |           |
| Pond in Kusuna            | 8.0                   | W         |                                      |           |                              |           |
| Pond in Rakala            | 5.2                   | W         |                                      |           |                              |           |
| Pond in Dhalapur          |                       |           | 5.9                                  | E         |                              |           |

| River/ Nala          | Nearest distance      |           |                                      |           |                              |           |
|----------------------|-----------------------|-----------|--------------------------------------|-----------|------------------------------|-----------|
|                      | With respect to plant |           | With respect to water reservoir area |           | With respect to Staff Colony |           |
|                      | Distance, km          | Direction | Distance, km                         | Direction | Distance, km                 | Direction |
| Pond in Kateni       |                       |           | 6.4                                  | NNE       |                              |           |
| Pond in Garha Santri | 7.8                   | WNW       |                                      |           |                              |           |
| Pond in Nimidha      |                       |           | 3.4                                  | E         |                              |           |
| Pond in Jharband     |                       |           |                                      |           | 0.1                          | N         |
| Reservoir Near Nua   | 4.2                   | SE        |                                      |           |                              |           |

### 3.3 CLIMATE

The climate of region is mainly tropical type and is influenced to some extent by the conditions in the Bay of Bengal. South west monsoon season starts from June and extends upto October. The summer is severe during May-June with high temperatures. A pleasant winter prevails from December to January.

Meteorological parameters have been studied on the basis of data recorded at nearest IMD station, Angul (20 km, WNW) during 2001-2011 and are appended in **Annexure V** and briefly discussed in the following paragraphs.

#### 3.3.1 Temperature, Rainfall and Relative Humidity

The average daily maximum and minimum temperature, relative humidity and average rainfall for each of the twelve months for the period 2001-2011 as recorded at IMD station Angul have been furnished in **Table 3.2**.

**TABLE 3.2: AVERAGE MONTHLY TEMPERATURE, RELATIVE HUMIDITY AND RAINFALL (IMD STATION, ANGUL)**

| Months         | Temperature °C |              | Relative humidity in % |              | Average Rainfall (mm) |
|----------------|----------------|--------------|------------------------|--------------|-----------------------|
|                | Maximum        | Minimum      | at 8.30 hrs            | at 17.30 hrs |                       |
| January        | 28.66          | 13.05        | 70                     | 58           | 11.8                  |
| February       | 32.75          | 15.37        | 67                     | 52           | 7.8                   |
| March          | 36.75          | 19.45        | 69                     | 52           | 25.7                  |
| April          | 39.85          | 23.49        | 66                     | 48           | 30.5                  |
| May            | 40.26          | 25.20        | 66                     | 51           | 66.9                  |
| June           | 36.25          | 24.41        | 69                     | 62           | 170.5                 |
| July           | 32.77          | 23.27        | 80                     | 73           | 305.0                 |
| August         | 31.89          | 22.95        | 80                     | 76           | 259.0                 |
| September      | 32.24          | 22.83        | 78                     | 76           | 225.8                 |
| October        | 32.51          | 19.91        | 74                     | 68           | 95.1                  |
| November       | 30.03          | 16.87        | 68                     | 60           | 10.4                  |
| December       | 28.32          | 13.02        | 68                     | 61           | 7.9                   |
| <b>Average</b> | <b>33.53</b>   | <b>19.99</b> | <b>71</b>              | <b>61</b>    | <b>Total 1216.4</b>   |



For the above mentioned 10 years period, monthly average of minimum temperatures recorded at IMD station Angul ranged from 13.02°C in December to 25.20°C in May. The monthly average of maximum temperature ranged from 28.32°C in December to 40.26°C in May.

In case of relative humidity, it is higher during the period of monsoon and lower during other months.

The rainfall data shows that the average monthly rainfall varies between 7.8 mm (February) to 305.0 mm (July). The total of monthly average rainfall for the period 2001-2011 comes to 1216.4 mm while the decadal average of the annual totals comes to 1185.5 mm. Bulk of the rainfall in the study area is received during the south west monsoon between June to October. From **Annexure V**, heaviest rainfall was recorded as 589.1 mm in the month of July 2009. More than 60% of the rainfall is recorded in the months of June, July, August and September.

### 3.3.2 Wind speed and windroses

The nearest station where data was available in similar climatological conditions is Angul. The wind speed and direction data from 2009 to 2011 have been given in **Table 3.3** and the windrose diagrams for the period 1981-2010, as sourced from climatological tables of IMD, are presented in **Fig 3.3** and **Fig 3.4** for 8:30 hrs and 17:30 hrs respectively.

An observation of the windroses shows that the predominant wind direction at 8.30 am and 5.30 pm is from North-western sector almost through out the year.

**TABLE 3.3: AVERAGE WIND SPEED AND DIRECTION (2009-2011)  
RECORDED AT IMD STATION ANGUL**

| Month     | At 8.30 hrs   |             | At 17.30 hrs  |             |
|-----------|---------------|-------------|---------------|-------------|
|           | Speed (km/hr) | Direction   | Speed (km/hr) | Direction   |
| January   | 2             | NW          | 2             | SE, NW & NE |
| February  | 2             | NW          | 2             | NW & SE     |
| March     | 2             | NW & SW     | 2             | NW, SW & SE |
| April     | 2             | SE, NW & NE | 2             | NW, SW & SE |
| May       | 2             | NW & SE     | 2             | SE & NE     |
| June      | 2             | NW          | 2             | SW & SE     |
| July      | 2             | SW, NW & NE | 2             | NW, SW & SE |
| August    | 2             | SW, NW & NE | 2             | NW & SE     |
| September | 2             | NW & NE     | 2             | SW & NE     |
| October   | 2             | NW & SE     | 2             | NW & NE     |
| November  | 2             | NW          | 2             | NW          |
| December  | 2             | NW          | 2             | NW, SW & SE |

**FIG 3.3: WINDROSE DIAGRAM OF IMD DATA OF ANGUL AT 08:30 HRS**

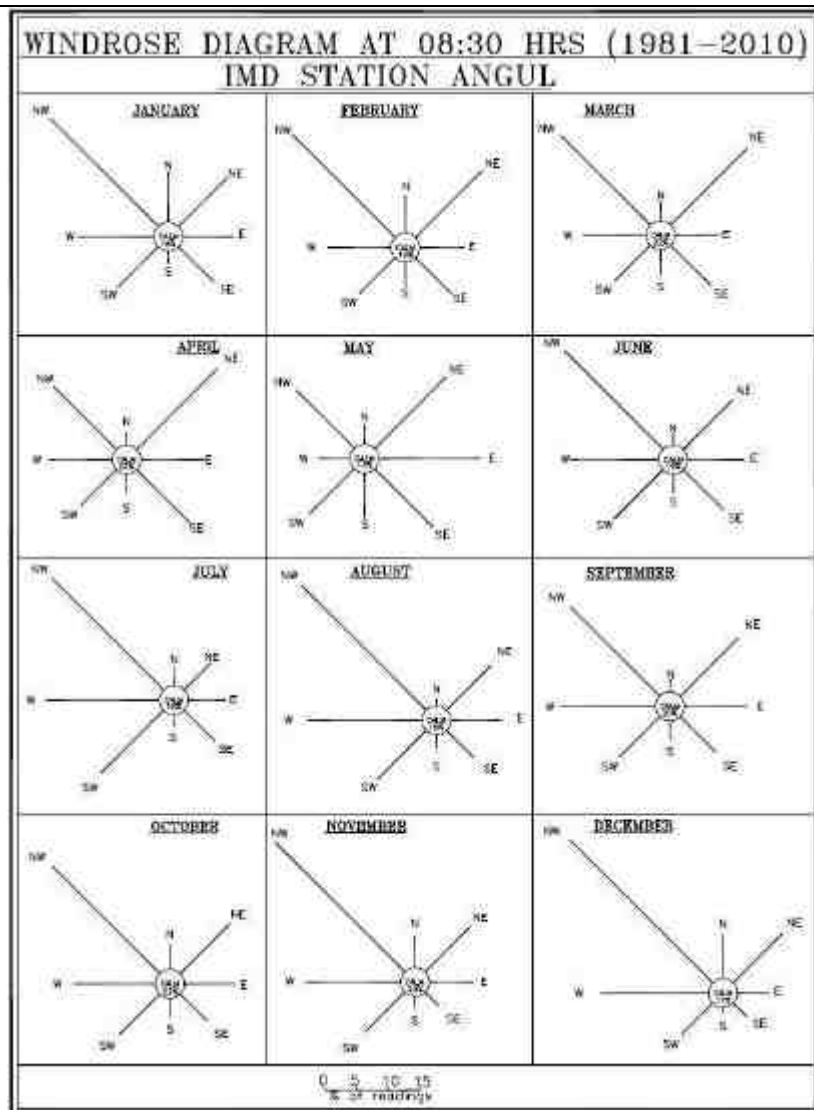
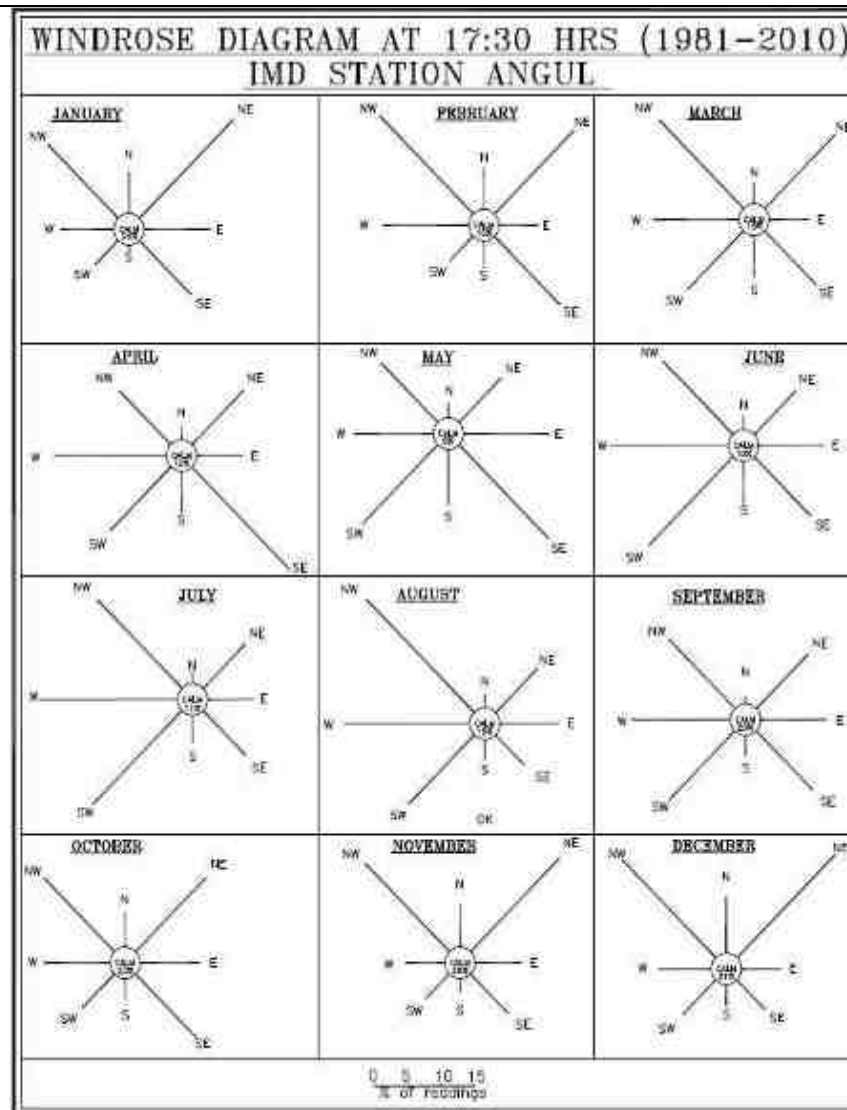


**FIG 3.4: WINDROSE DIAGRAM OF IMD DATA OF ANGUL AT 17:30 HRS**



### 3.4 MICRO-METEOROLOGY

The micro-meteorological data of the study area have been recorded continuously by Min Mec R&D Laboratory, New Delhi with an automatic weather station from 1<sup>st</sup> March to 31<sup>st</sup> May 2019. The daily average of the monitored micro-meteorological data is given in **Annexure VI** and summarized in **Table 3.4**. The various parameters are discussed in subsequent paragraphs.

**TABLE 3.4: SUMMARY OF MONITORED MICRO-METEOROLOGICAL DATA (MARCH TO MAY 2019)**

| Particulars                | Maximum             | Minimum | Average |
|----------------------------|---------------------|---------|---------|
| Temperature (°C)           | 42.0                | 20.00   | 32.22   |
| Relative humidity (%)      | 86.5                | 18.20   | 48.39   |
| Cloudiness (Octas)         | 8.0                 | 0.0     | 0.06    |
| Wind speed (km/h)          | 39.2                | Calm    | 9.91    |
| Predominant wind direction | S (12.23% Readings) |         |         |

*Note : Calm is <1.8 km/h*

The above table shows that temperature was recorded as a minimum of 20°C and maximum of 42°C and relative humidity as a minimum of 18.2% and maximum of 86.5%. The cloudiness data shows that skies were clear for maximum length of time during the monitoring period. The wind speed varied between calm (less than 1.8 km/h) to 39.2 km/h with an average of 9.91 km/hr. The predominant wind direction, including calms, was observed from S with 12.23% of occurrences. The wind frequency table is given in **Table 3.5** and the corresponding wind rose diagram is shown in **Fig 3.5**.

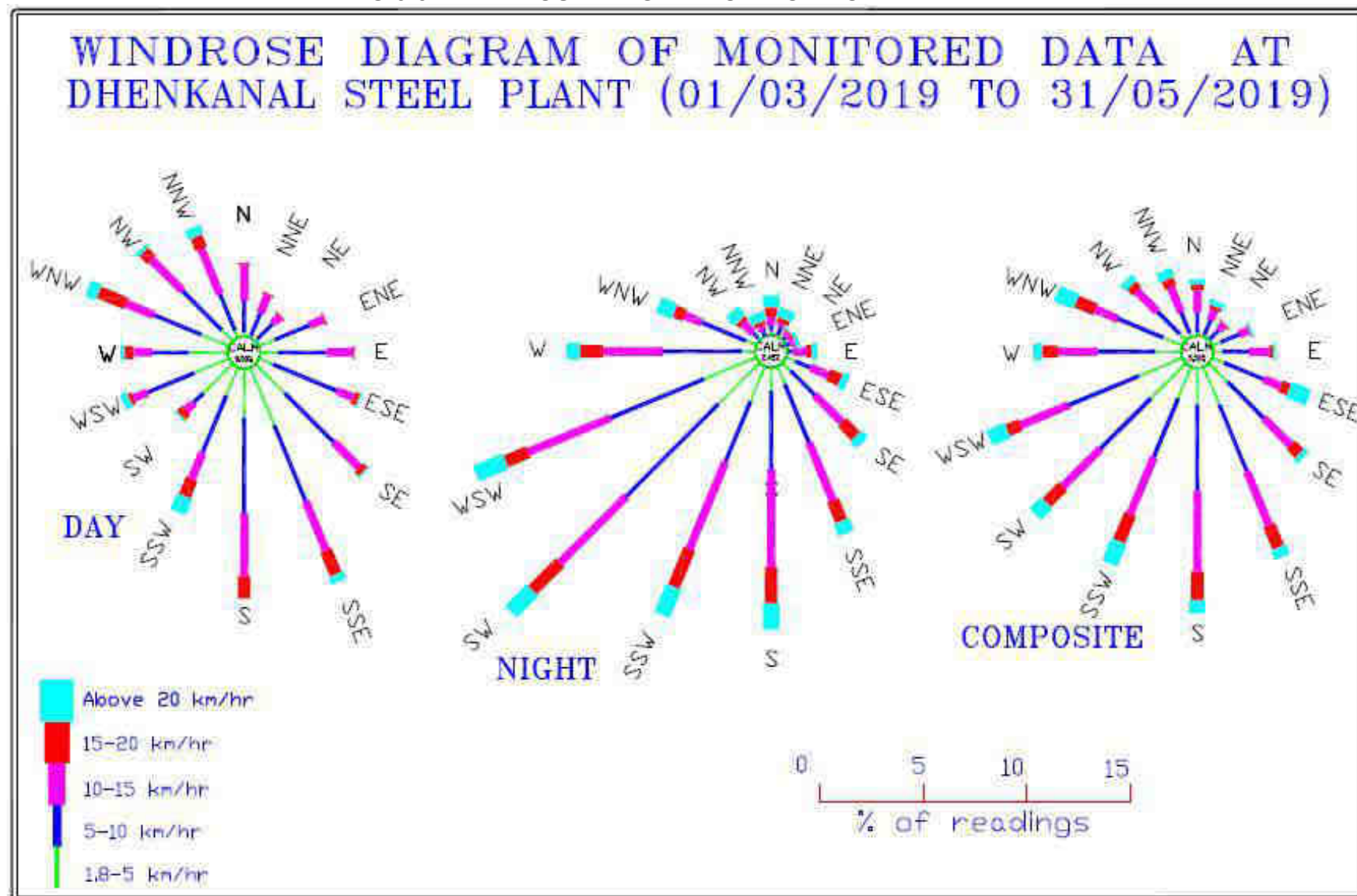
**TABLE 3.5: WIND FREQUENCY TABLE OF MONITORED DATA (MARCH-MAY 2019)**

| Direction<br>from | Percent frequency (wind speed in km/h) |       |      |       |       |      |       |         |
|-------------------|----------------------------------------|-------|------|-------|-------|------|-------|---------|
|                   | Calm                                   | 1.8-5 | 5-10 | 10-15 | 15-20 | >20  | Total | Ex.Calm |
|                   | DAY TIME (06 hrs to 17 hrs)            |       |      |       |       |      |       |         |
| E                 | 0.09                                   | 0.82  | 2.36 | 1.27  | 0.09  | 0.00 | 4.63  | 4.54    |
| ENE               | 0.09                                   | 0.82  | 1.81 | 0.72  | 0.09  | 0.00 | 3.53  | 3.44    |
| NE                | 0.09                                   | 0.09  | 1.09 | 0.45  | 0.09  | 0.00 | 1.81  | 1.72    |
| NNE               | 0.00                                   | 0.09  | 1.18 | 0.91  | 0.09  | 0.00 | 2.27  | 2.27    |
| N                 | 0.18                                   | 0.18  | 1.54 | 1.72  | 0.09  | 0.00 | 3.71  | 3.53    |
| NNW               | 0.00                                   | 0.36  | 1.90 | 2.36  | 0.63  | 0.45 | 5.7   | 5.70    |
| NW                | 0.54                                   | 0.72  | 2.72 | 2.08  | 0.54  | 0.18 | 6.78  | 6.24    |
| WNW               | 0.63                                   | 1.45  | 2.45 | 1.45  | 1.45  | 0.54 | 7.97  | 7.34    |
| W                 | 1.27                                   | 1.90  | 1.72 | 0.91  | 0.45  | 0.18 | 6.43  | 5.16    |
| WSW               | 1.99                                   | 1.81  | 2.45 | 0.72  | 0.18  | 0.36 | 7.51  | 5.52    |
| SW                | 0.91                                   | 1.99  | 0.63 | 0.54  | 0.36  | 0.09 | 4.52  | 3.61    |
| SSW               | 0.27                                   | 1.45  | 2.99 | 1.36  | 0.91  | 0.82 | 7.80  | 7.53    |
| S                 | 0.63                                   | 2.36  | 4.62 | 2.99  | 1.09  | 0.00 | 11.69 | 11.06   |
| SS E              | 0.72                                   | 2.99  | 3.99 | 2.54  | 1.27  | 0.36 | 11.87 | 11.15   |

| Direction from                       | Percent frequency (wind speed in km/h) |              |              |              |              |             |               |              |
|--------------------------------------|----------------------------------------|--------------|--------------|--------------|--------------|-------------|---------------|--------------|
|                                      | Calm                                   | 1.8-5        | 5-10         | 10-15        | 15-20        | >20         | Total         | Ex.Calm      |
| SE                                   | 0.82                                   | 1.99         | 3.35         | 1.72         | 0.27         | 0.09        | 8.24          | 7.42         |
| ESE                                  | 0.27                                   | 0.72         | 3.35         | 0.82         | 0.27         | 0.09        | 5.52          | 5.25         |
| <b>TOTAL</b>                         | <b>8.50</b>                            | <b>19.74</b> | <b>38.15</b> | <b>22.56</b> | <b>7.87</b>  | <b>3.16</b> | <b>99.98</b>  | <b>91.48</b> |
| <b>NIGHT TIME (18 hrs to 05 hrs)</b> |                                        |              |              |              |              |             |               |              |
| E                                    | 0.00                                   | 0.00         | 0.27         | 0.63         | 0.27         | 0.27        | 1.44          | 1.44         |
| E                                    | 0.00                                   | 0.00         | 0.18         | 0.18         | 0.09         | 0.18        | 0.63          | 0.63         |
| ENE                                  | 0.00                                   | 0.00         | 0.18         | 0.18         | 0.09         | 0.09        | 0.54          | 0.54         |
| NE                                   | 0.00                                   | 0.09         | 0.36         | 0.18         | 0.27         | 0.45        | 1.35          | 1.35         |
| NNE                                  | 0.00                                   | 0.18         | 0.27         | 0.45         | 0.45         | 0.54        | 1.89          | 1.89         |
| N                                    | 0.00                                   | 0.00         | 0.27         | 0.27         | 0.18         | 0.45        | 1.17          | 1.17         |
| NNW                                  | 0.09                                   | 0.09         | 0.36         | 0.63         | 0.27         | 0.54        | 1.98          | 1.89         |
| NW                                   | 0.09                                   | 0.54         | 2.27         | 0.91         | 0.54         | 0.82        | 5.17          | 5.08         |
| WNW                                  | 0.73                                   | 0.63         | 3.81         | 2.90         | 1.09         | 0.63        | 9.79          | 9.06         |
| W                                    | 0.82                                   | 2.72         | 4.90         | 4.26         | 1.18         | 1.54        | 15.42         | 14.60        |
| WSW                                  | 0.09                                   | 2.81         | 6.26         | 4.53         | 1.90         | 1.45        | 17.04         | 16.95        |
| SW                                   | 0.27                                   | 1.81         | 3.17         | 4.53         | 1.99         | 1.45        | 13.22         | 12.95        |
| SSW                                  | 0.18                                   | 1.09         | 3.81         | 4.71         | 1.72         | 1.27        | 12.78         | 12.60        |
| S                                    | 0.09                                   | 0.91         | 3.08         | 2.99         | 1.09         | 0.63        | 8.79          | 8.70         |
| SSE                                  | 0.09                                   | 0.54         | 1.63         | 1.90         | 0.91         | 0.45        | 5.52          | 5.43         |
| SE                                   | 0.00                                   | 0.45         | 0.82         | 0.91         | 0.63         | 0.36        | 3.17          | 3.17         |
| ESE                                  | 2.45                                   | 11.86        | 31.64        | 30.16        | 12.67        | 11.12       | 99.90         | 97.45        |
| <b>Total</b>                         | <b>0.00</b>                            | <b>0.00</b>  | <b>0.27</b>  | <b>0.63</b>  | <b>0.27</b>  | <b>0.27</b> | <b>1.44</b>   | <b>1.44</b>  |
| <b>COMPOSITE (Day + Night)</b>       |                                        |              |              |              |              |             |               |              |
| E                                    | 0.05                                   | 0.41         | 1.31         | 0.95         | 0.18         | 0.14        | 3.04          | 2.99         |
| ENE                                  | 0.05                                   | 0.41         | 1.00         | 0.45         | 0.09         | 0.09        | 2.09          | 2.04         |
| NE                                   | 0.05                                   | 0.05         | 0.63         | 0.32         | 0.09         | 0.05        | 1.19          | 1.14         |
| NNE                                  | 0.00                                   | 0.09         | 0.77         | 0.54         | 0.18         | 0.23        | 1.81          | 1.81         |
| N                                    | 0.09                                   | 0.18         | 0.91         | 1.09         | 0.27         | 0.27        | 2.81          | 2.72         |
| NNW                                  | 0.00                                   | 0.18         | 1.09         | 1.31         | 0.41         | 0.45        | 3.44          | 3.44         |
| NW                                   | 0.32                                   | 0.41         | 1.54         | 1.36         | 0.41         | 0.36        | 4.40          | 4.08         |
| WNW                                  | 0.36                                   | 1.00         | 2.36         | 1.18         | 1.00         | 0.68        | 6.58          | 6.22         |
| W                                    | 1.00                                   | 1.27         | 2.76         | 1.90         | 0.77         | 0.41        | 8.11          | 7.11         |
| WSW                                  | 1.40                                   | 2.27         | 3.67         | 2.49         | 0.68         | 0.95        | 11.46         | 10.06        |
| SW                                   | 0.50                                   | 2.40         | 3.44         | 2.54         | 1.13         | 0.77        | 10.78         | 10.28        |
| SSW                                  | 0.27                                   | 1.63         | 3.08         | 2.95         | 1.45         | 1.13        | 10.51         | 10.24        |
| S                                    | 0.41                                   | 1.72         | 4.21         | 3.85         | 1.40         | 0.63        | 12.22         | 11.81        |
| SSE                                  | 0.41                                   | 1.95         | 3.53         | 2.76         | 1.18         | 0.50        | 10.33         | 9.92         |
| SE                                   | 0.45                                   | 1.27         | 2.49         | 1.81         | 0.59         | 0.27        | 6.88          | 6.43         |
| ESE                                  | 0.14                                   | 0.59         | 2.08         | 0.86         | 0.45         | 0.23        | 4.35          | 4.21         |
| <b>TOTAL</b>                         | <b>5.50</b>                            | <b>15.83</b> | <b>34.87</b> | <b>26.36</b> | <b>10.28</b> | <b>7.16</b> | <b>100.00</b> | <b>94.50</b> |

**Note:** Calm is cut off at wind speed <1.8 km/hr as per CPCB  
The totals may vary from 100% due to rounding off error

FIG 3.5: WIND ROSE DIAGRAM OF MONITORED DATA



### 3.5 AMBIENT AIR QUALITY

#### 3.5.1 Location of sampling stations

Ambient air quality monitoring was undertaken at 8 different stations within the study area during the summer season of 2019. The ambient air sampling stations were established in the core and buffer zone to study the present ambient air quality. The sampling station locations are given in **Table 3.6** and the same are marked in **Fig 3.6**.

**TABLE 3.6: LOCATION OF AIR SAMPLING STATIONS**

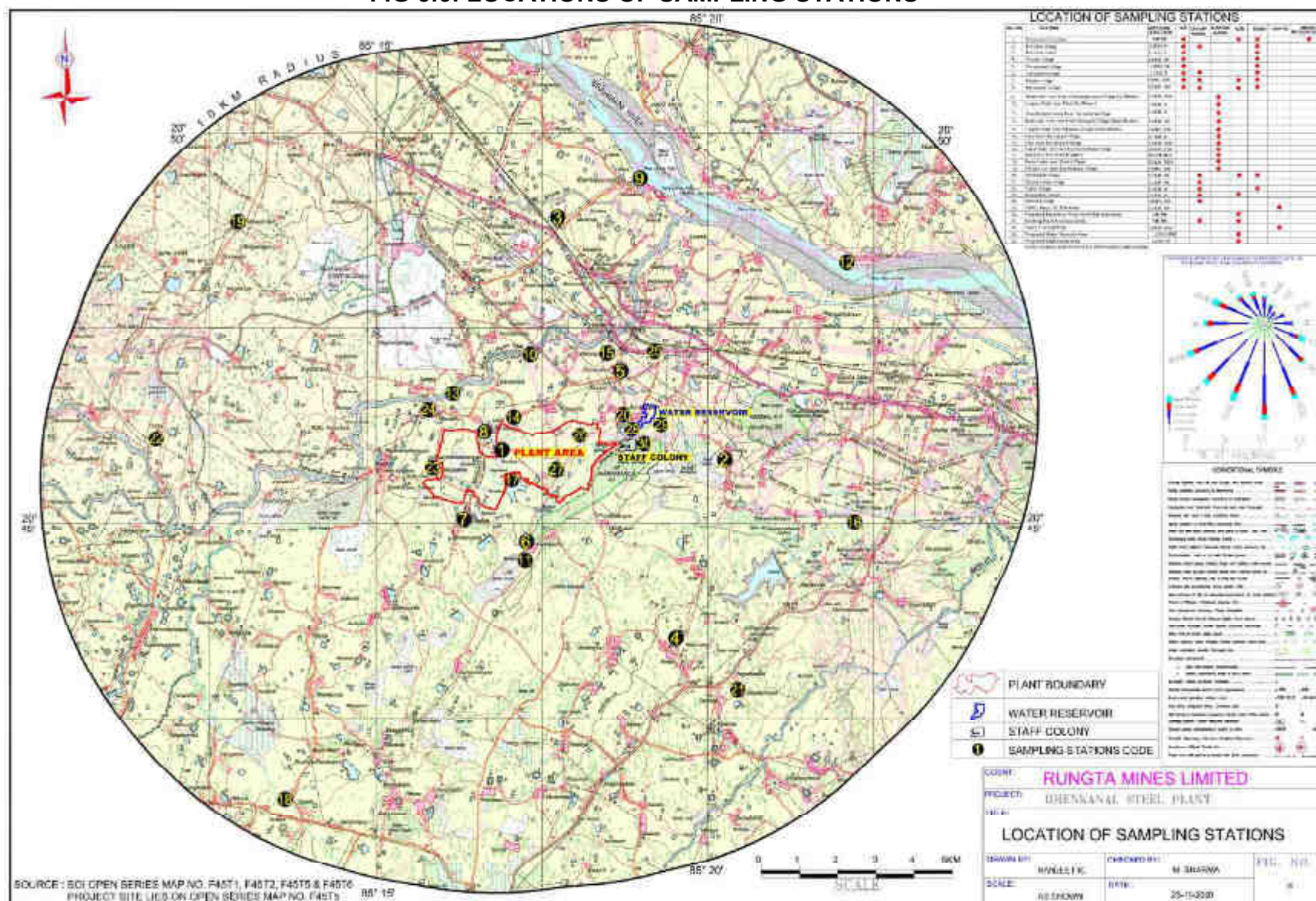
| Station No. | Station No. (Refer Fig 3.6) | Location           | Distance & Direction from Plant boundary | Justification for location                                          |
|-------------|-----------------------------|--------------------|------------------------------------------|---------------------------------------------------------------------|
| CA1         | 1                           | Proposed Core Zone | Within                                   | Plant site where activities will take place                         |
| BA1         | 2                           | Nimidha village    | 2.8, E                                   | Between two forests. Control location due to hill acting as barrier |
| BA2         | 3                           | Mosonia village    | 5.3, N                                   | First predominant downwind direction                                |
| BA3         | 4                           | Thokar village     | 4.6 SE                                   | Cross wind, distant station                                         |
| BA4         | 5                           | Nimabahali village | 1.5, NE                                  | Second predominant downwind direction                               |
| BA5         | 6                           | Tarkabera village  | 1.1, S                                   | First predominant upwind direction                                  |
| BA6         | 7                           | Kadala village     | 0.5, SW                                  | Second predominant upwind direction                                 |
| BA7         | 8                           | Beruanpal village  | 0.20, NW                                 | Nearest habitation to expansion area                                |

#### 3.5.2 Sampling schedule and parameters

The study was for 3 months with frequency of twice a week at each site. 24-hour average samples were collected from each station for respirable particulate matter (RPM or PM<sub>10</sub>), fine particulate matter (PM<sub>2.5</sub>), sulphur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>) and carbon monoxide (CO). Additionally, BaP, ammonia, benzene, nickel, arsenic and lead were monitored at the core zone for the monitoring period and for one sample at each of the sampling stations in buffer zone. These samples were analysed in laboratory by adopting the methods specified in National Ambient Air Quality Standards.



FIG 3.6: LOCATIONS OF SAMPLING STATIONS



### 3.5.3 Methodology

#### ***Respirable particulate matter (PM<sub>10</sub>)***

The sampling of ambient air was performed with respirable dust sampler, which is primarily a high volume sampler fitted with a cyclone separator for pre-separation of particles larger than 10 microns diameter. Air exiting from the separator is drawn at a measured rate through the separator followed by a pre-weighed glass fibre sheet of 20 x 25 cm sizes (Whatman, EPM-2000 or equivalent). The PM<sub>10</sub> concentrations are determined gravimetrically from the average airflow rate, sampling period and the mass of particulate matter collected over the GF filter surface.

#### ***Fine Particulate Matter (PM<sub>2.5</sub>)***

The sampling of ambient air was performed with fine particulate sampler for particles less than 2.5 microns diameter. The PM concentrations are determined gravimetrically from the average airflow rate, sampling period and the mass of particulate matter collected over the PTFE filter surface.

#### ***Sulphur Dioxide***

The sampling of ambient air for evaluating SO<sub>2</sub> concentrations was performed with a multigas sampler, using the vacuum created by the respirable dust sampler for drawing the air samples through the impingers. Air is drawn at a measured and controlled rate of 300 ml/min through a solution of sodium tetra-chloromercurate.

After completion of the sampling, the used absorbing reagent is treated with dilute solutions of sulfamic acid, formaldehyde and para rosaniline hydrochloride. The absorbance of the intensely coloured para rosaniline methyl sulphonic acid is measured and the amount of SO<sub>2</sub> in the sample is computed from graphs prepared with standard solutions. The ambient SO<sub>2</sub> concentrations were computed from the amount of SO<sub>2</sub> collected and the volume of air sampled.

#### ***Nitrogen dioxide***

The sampling of ambient air for evaluating NO<sub>2</sub> concentrations was performed with a multigas sampler, using the vacuum created by the respirable dust sampler for drawing the air samples through the impingers. Air is drawn at a measured and controlled rate of about 300 ml/minute through an orifice-tipped impinger containing solutions of sodium hydroxide and sodium arsenite. After completion of the sampling, an aliquot of the used absorbing solution was treated with solutions of H<sub>2</sub>O<sub>2</sub>, sulphanilamide and NEDA.

The nitrite ion present in the impinger was calculated from the absorbance of the resulting solution and from the graphs prepared with standard solutions. The ambient NO<sub>2</sub> concentrations were computed from the total



nitrite ion present in the impingers, overall efficiency of the impinger and the procedure, and the volume of air sampled.

### ***Carbon monoxide***

The method of determining carbon monoxide is by portable CO detector Model no. gaZguard Tx of Pollution Protection Systems which works on the principle of eletrochemical detection of pollutant at any instant.

### ***Benzene***

The sampling of ambient air for evaluating benzene concentrations is performed by VOC Analyser by opening a tube at two ends, connecting it to a sample pump, and pulling air through the tube with the pump. Airborne chemicals are trapped onto the surface of the sorbent with sampling flow rate in the range of 20-100 ml/ min. The tube is then sealed with push-on caps. The sample is re-extracted or desorbed by conventional solvent (generally 1-5 ml of carbon disulphide) using ultrasonication for 15 min to remove analyte from the sorbent material. Desorbed samples are analyzed using gas chromatograph (GC) fitted with capillary column and flame ionization detector (FID).

### ***NH<sub>3</sub>***

The sampling of ambient air for evaluating NH<sub>3</sub> concentrations was performed by placing 10 ml of absorbing solution of 0.1 N H<sub>2</sub>SO<sub>4</sub> in an impinger and sample for one hour at the flow rate of 1 to 2 L/min. After sampling, the volume of sample is measured and transferred to a sample storage bottle. The contents of the sample bottle are transferred to a 25 ml glass stopper graduated cylinder. All the solutions and sample are maintained at 25° C. 2 ml buffer and 5 ml working phenol solution is added, mixed, and filled to about 22 ml. 2.5 ml of working hypochlorite solution is added and rapidly mixed. It is then diluted to 25 ml, mixed and stored in the dark for 30 minutes to develop colour. The absorbance of the solution is measured at 630 nm on a spectrophotometer using 1 cm cells. The concentration of NH<sub>3</sub> in µg/m<sup>3</sup> is calculated from standard graph.

### ***Benzo (a) pyrene***

The sampling of ambient air is carried out using respirable dust sampler using EPM- 2000 glass fibre or equivalent filter. Filter paper is divided in two equal parts. Half portion of filter paper is used for the measurement of B(a)P. For extracting the sample, the collected filter papers are cut into strips using scissors and transferred to 250 ml beaker. These samples are extracted with about 50ml of toluene using ultra sonic bath for about 30 minutes. The procedure is repeated twice (50ml x 2 times) for complete extraction. The extracts are filtered into evaporative flask of 250 ml with the help of Whatman filter paper No. 20 or filter-disc. The extraction process is repeated twice and extractants combined. The toluene extract is evaporated using rotary evaporator with water bath as cool as possible (temperature not

exceeding 40°C) taking care that it is not evaporated upto total dryness. It should be stopped at near dryness (less than 1 ml, visible). Then 2.0 ml of toluene is added to rinse the wall of evaporation flask and extract transferred into a beaker of 5 ml capacity. The extracted residue is diluted and made up to 0.5 ml or 1 ml. 1 µl or 2 µl is injected into GC-FID for analysis. The resulting concentration is recorded.

#### **Heavy metals (nickel, lead, arsenic)**

The sampling of ambient air for evaluating lead, nickel and arsenic is done by collect the particulate matter on glass fibre filter (EPM 2000 or equivalent) using PM 10 sampler. Filter paper is divided in two equal parts. Half portion of filter paper is used for the measurement of lead, nickel and arsenic. The sample is extracted by hot plate procedure and the digested sample is analysed using ICP. The concentration is calculated using calibration graph.

A summary of the methodology is given in **Table 3.7**

**TABLE 3.7: SUMMARY OF PROCEDURES FOR DETERMINING VARIOUS AIR QUALITY PARAMETERS**

| Parameters            | Testing Procedure                                                                                                                                                                                        |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PM <sub>10</sub>      | IS:5182 (Part 23) using respirable dust sampler (RDS), gravimetric analysis                                                                                                                              |
| PM <sub>2.5</sub>     | Adapted from CPCB guidelines using fine particulate sampler, gravimetric analysis                                                                                                                        |
| SO <sub>2</sub>       | Absorption in sodium tetra chloro-mercurate followed by colorimetric estimation using P-rosaniline hydrochloride and formaldehyde (IS : 5182 Part. II. 1969)                                             |
| NO <sub>2</sub>       | Absorption in dil. NaOH and then estimated through spectrophotometer with sulphanilamide and N(I-Nephtyle) Ethylene diamine Dihydrochloride and Hydrogen Peroxide (IS:5182 1975, Part VI)                |
| CO                    | Electrochemical detection by portable CO detector                                                                                                                                                        |
| Benzene               | Collection by organic vapour sampler followed by solvent extraction and GC analysis (IS:5182 (Part 11))                                                                                                  |
| NH <sub>3</sub>       | CPCB Guidelines- Absorption in 0.1 N H <sub>2</sub> SO <sub>4</sub> followed by reaction with phenol and hypochlorite solution for colour development and spectrophotometric concentration determination |
| BaP                   | Collection on filter paper using respirable dust sampler followed by solvent extraction and GC analysis (IS:5182 (Part 12))                                                                              |
| Arsenic, Nickel, Lead | Collection on filter paper using respirable dust sampler followed by digestion and ICP analysis (IS 3025 (Part 2))                                                                                       |

Analysis results with respect to PM<sub>2.5</sub>, PM<sub>10</sub>, SO<sub>2</sub> and NO<sub>2</sub> are presented in **Annexure VII** and summarized in **Table 3.8**. They are also compared with the National Ambient Air Quality Standards dated 18<sup>th</sup> November 2009,

which give the limits for industrial as well as residential & rural areas, copy given in **Annexure VIII**.

**TABLE 3.8: SUMMARY OF AMBIENT AIR QUALITY MONITORING RESULTS**

| Pollutant       |                        | 24 hourly average concentration in $\mu\text{g}/\text{m}^3$ except CO in $\text{mg}/\text{m}^3$ |                 |                 |                |                     |                   |                |                    | Permissible Limits, NAAQS 2009 |
|-----------------|------------------------|-------------------------------------------------------------------------------------------------|-----------------|-----------------|----------------|---------------------|-------------------|----------------|--------------------|--------------------------------|
|                 |                        | Proposed Core Zone                                                                              | Nimidha village | Mosonia village | Thokar village | Nimabaha li village | Tarkabera village | Kadala village | Beruan pal village |                                |
| PM10            | Min.                   | 65.0                                                                                            | 55.1            | 66.4            | 42.1           | 57.6                | 40.7              | 41.1           | 64.1               | 100                            |
|                 | Max                    | 70.9                                                                                            | 65.8            | 70.8            | 54.9           | 68.9                | 57.7              | 61.1           | 69.9               |                                |
|                 | Avg                    | 67.8                                                                                            | 61.0            | 69.2            | 48.3           | 63.1                | 49.6              | 51.5           | 66.6               |                                |
|                 | 98 <sup>th</sup> %tile | 70.7                                                                                            | 65.4            | 70.8            | 54.7           | 68.7                | 57.5              | 60.9           | 69.5               |                                |
| PM2.5           | Min.                   | 34.7                                                                                            | 30.5            | 35.7            | 24.3           | 31.4                | 22.6              | 22.0           | 34.5               | 60                             |
|                 | Max                    | 41.7                                                                                            | 37.8            | 42.3            | 31.8           | 39.9                | 32.9              | 36.7           | 42.2               |                                |
|                 | Avg                    | 38.4                                                                                            | 34.7            | 39.3            | 27.8           | 35.8                | 28.0              | 29.3           | 37.5               |                                |
|                 | 98 <sup>th</sup> %tile | 41.2                                                                                            | 37.8            | 42.1            | 31.6           | 39.6                | 32.8              | 35.9           | 41.2               |                                |
| SO <sub>2</sub> | Min.                   | 9.6                                                                                             | 8.0             | 12.6            | BDL            | 9.1                 | 7.2               | 6.6            | 9.1                | 80                             |
|                 | Max                    | 13.2                                                                                            | 11.5            | 16.9            | 9.3            | 14.6                | 10.0              | 13.3           | 14.0               |                                |
|                 | Avg                    | 11.0                                                                                            | 9.7             | 14.5            | 7.1            | 11.8                | 8.5               | 10.6           | 11.5               |                                |
|                 | 98 <sup>th</sup> %tile | 13.2                                                                                            | 11.5            | 16.9            | 9.2            | 14.6                | 9.9               | 13.3           | 14.0               |                                |
| NO <sub>2</sub> | Min.                   | 13.2                                                                                            | 11.4            | 15.0            | 8.2            | 13.0                | 9.5               | 11.7           | 12.3               | 80                             |
|                 | Max                    | 17.7                                                                                            | 16.9            | 21.4            | 13.0           | 21.5                | 13.8              | 18.8           | 16.9               |                                |
|                 | Avg                    | 15.6                                                                                            | 13.9            | 18.5            | 10.2           | 18.5                | 12.1              | 15.3           | 15.0               |                                |
|                 | 98 <sup>th</sup> %tile | 17.6                                                                                            | 16.7            | 21.4            | 12.5           | 21.4                | 13.8              | 18.5           | 16.9               |                                |
| CO              | Min.                   | 0.344                                                                                           | 0.288           | 0.527           | BDL            | 0.357               | 0.243             | 0.187          | 0.349              | 2                              |
|                 | Max                    | 0.596                                                                                           | 0.496           | 0.790           | 0.357          | 0.646               | 0.400             | 0.575          | 0.620              |                                |
|                 | Avg                    | 0.497                                                                                           | 0.373           | 0.630           | 0.219          | 0.485               | 0.333             | 0.406          | 0.472              |                                |
|                 | 98 <sup>th</sup> %tile | 0.590                                                                                           | 0.490           | 0.774           | 0.355          | 0.630               | 0.400             | 0.569          | 0.620              |                                |

**TABLE 3.8 (Contd...)**

| Sl. No. | Date of Sampling               | Location           | NH <sub>3</sub> ( $\mu\text{g}/\text{m}^3$ ) | BaP ( $\text{ng}/\text{m}^3$ ) | C <sub>6</sub> H <sub>6</sub> ( $\mu\text{g}/\text{m}^3$ ) | Pb ( $\mu\text{g}/\text{m}^3$ ) | As ( $\text{ng}/\text{m}^3$ ) | Ni ( $\text{ng}/\text{m}^3$ ) |
|---------|--------------------------------|--------------------|----------------------------------------------|--------------------------------|------------------------------------------------------------|---------------------------------|-------------------------------|-------------------------------|
| 1.      | 01/03/2019-29/05/2019          | Proposed Core Zone | BDL                                          | N.D.                           | N.D.                                                       | BDL                             | BDL                           | BDL                           |
| 2.      | 16-17/03/2019                  | Mosonia Village    | BDL                                          | N.D.                           | N.D.                                                       | BDL                             | BDL                           | BDL                           |
| 3.      | 16-17/03/2019                  | Tarkabeda Village  | BDL                                          | N.D.                           | N.D.                                                       | BDL                             | BDL                           | BDL                           |
| 4.      | 17-18/03/2019                  | Kadala Village     | BDL                                          | N.D.                           | N.D.                                                       | BDL                             | BDL                           | BDL                           |
| 5.      | 17-18/03/2019                  | Nimabahali Village | BDL                                          | N.D.                           | N.D.                                                       | BDL                             | BDL                           | BDL                           |
| 6.      | 17-18/03/2019                  | Thokar Village     | BDL                                          | N.D.                           | N.D.                                                       | BDL                             | BDL                           | BDL                           |
| 7.      | 18-19/03/2019                  | Beruanpal Village  | BDL                                          | N.D.                           | N.D.                                                       | BDL                             | BDL                           | BDL                           |
| 8.      | 18-19/03/2019                  | Nimidha Village    | BDL                                          | N.D.                           | N.D.                                                       | BDL                             | BDL                           | BDL                           |
|         | Permissible Limits, NAAQS 2009 |                    | 400 (24 hrs)                                 | 01 (annual)                    | 05 (annual)                                                | 1.0 (24 hrs)                    | 06 (annual)                   | 20 (annual)                   |

# N.D: Not detected

Note: BDL (Below Detection Limit) of SO<sub>2</sub><6.0; NH<sub>3</sub><1.0  $\mu\text{g}/\text{m}^3$ ; Pb<0.07  $\mu\text{g}/\text{m}^3$ ; As<0.6  $\text{ng}/\text{m}^3$ ; Ni<0.6  $\text{ng}/\text{m}^3$

Twenty four hour average PM10 level was found to range from 40.7 to 70.9  $\mu\text{g}/\text{m}^3$ , PM 2.5 was found to vary from 22.0 to 42.3  $\mu\text{g}/\text{m}^3$ , SO<sub>2</sub> from 6.6 to 16.9  $\mu\text{g}/\text{m}^3$  and NO<sub>2</sub> from 8.2 to 21.5  $\mu\text{g}/\text{m}^3$ . All the values are on the lower that the permissible limits at all the locations. The concentrations of SO<sub>2</sub> and NO<sub>2</sub> are considerably low compared to the 80  $\mu\text{g}/\text{m}^3$  NAAQS permissible limit for residential, rural and other areas. The concentrations of

PM<sub>2.5</sub> are within limits of 60 µg/m<sup>3</sup> as per National Ambient Air Quality Standard.

The CO level was observed between BDL to 0.790 mg/m<sup>3</sup> while the limits are 2 mg/m<sup>3</sup>.

NH<sub>3</sub> level was observed BDL (<1 µg/m<sup>3</sup>) in all the locations. The permissible limits for NH<sub>3</sub> are prescribed as 400 µg/m<sup>3</sup>.

BaP and C<sub>6</sub>H<sub>6</sub> level were not detected in any locations in the study area.

Pb, As and Ni were also observed below detectable limits of 0.07µg/m<sup>3</sup>, 0.6 ng/m<sup>3</sup>, and 0.6 ng/m<sup>3</sup>, respectively, which are much below the permissible limits of 1 µg/m<sup>3</sup>, 6 ng/m<sup>3</sup> and 20 ng/m<sup>3</sup>, respectively.

### 3.6 WATER ENVIRONMENT

#### 3.6.1 Surface water resources

**Core zone:** As seen on toposheet, five first order seasonal drains and one aquaduct originate from within plant boundary or from its immediate vicinity and flow out from the northern boundary. These drains originate from and connect multiple seasonal ponds before flowing into Nigra Nala and ultimately Brahmani River. There exist seventeen rain fed ponds within the project site, which dry during the summer months. One of the south-north seasonal streams flowing within the eastern side of the project site, also feeds two of the seasonal ponds. No perennial surface water body exists within the project site.

**Buffer zone:** River Brahmani and it's tributaries control the drainage of the area. The Brahmani is perennial in nature with a nominal flow during the summer season. It's important tributaries are Ramiala Nadi, Nigre Nadi, Purajhor Nadi etc. The smaller streams show dendritic pattern while the major river and it's tributaries show sub-parallel drainage, indicating structural control.

*(Source: Ground water information booklet of Dhenkanal district, CGWB, South Eastern Region, Bhubaneswar May, 2013.)*

In the buffer zone, there several water bodies created due to the man made embankments. The nearest such water body is adjoining the south side of the project boundary. One of the largest man-made water bodies is between villages Sidheshwarpur and Maniannali. Other tanks and reservoirs are clearly visible in **Fig 3.1** and are present in almost all villages. Some of the reservoirs have water distribution networks such as canals and aqueducts.

#### 3.6.2 Ground water resources

Ground water information booklet of Dhenkanal district, CGWB, South Eastern Region, Bhubaneswar May, 2013 has been used as the basis of the information presented below.

**Geology & hydro-geology:** The project falls in Hindol block of Denkanal District. A study of the hydrogeological map (**Fig 3.7**) of the district shows that the geology underlying the project site comprises Granite and Gneiss of Pre-Cambrian group. The granite, granite gneiss are highly weathered and fractured. In these, the ground water is restricted to weathered zones and underlying fractured zones- confined and unconfined aquifers. The thickness of the weathered zone varies from 5 to 20 m, which form the repository of groundwater at shallow depth. Groundwater occurs under phreatic condition in this zone.

**Depth to water table:** As per the “Ground Water Monitoring Report (Year 2019)” by Rungta Mines Ltd., water level was monitored at 20 observation wells. At Jharbandh it varied from 8.30 m bgl (April) to 2.01 m bgl (September). At Galapada it varied from 8.90 m bgl (April) to 2.20 m bgl (August). In buffer zone it varied from 8.55 m bgl (April) to 0.62 m bgl (Aug)

**Yield potential:** The ground water potential in such formations lies between 1-5 litres per second. The deep bore wells yield up to 12 litre per second depending upon the topographic setting, proximity to major lineaments, thickness of weathered zone and number as well as potential of saturated fracture zones. The result of shallow deposit wells constructed by CGWB in this district indicates that weathered as well as semi-weathered granite gneiss form moderately potential aquifer.

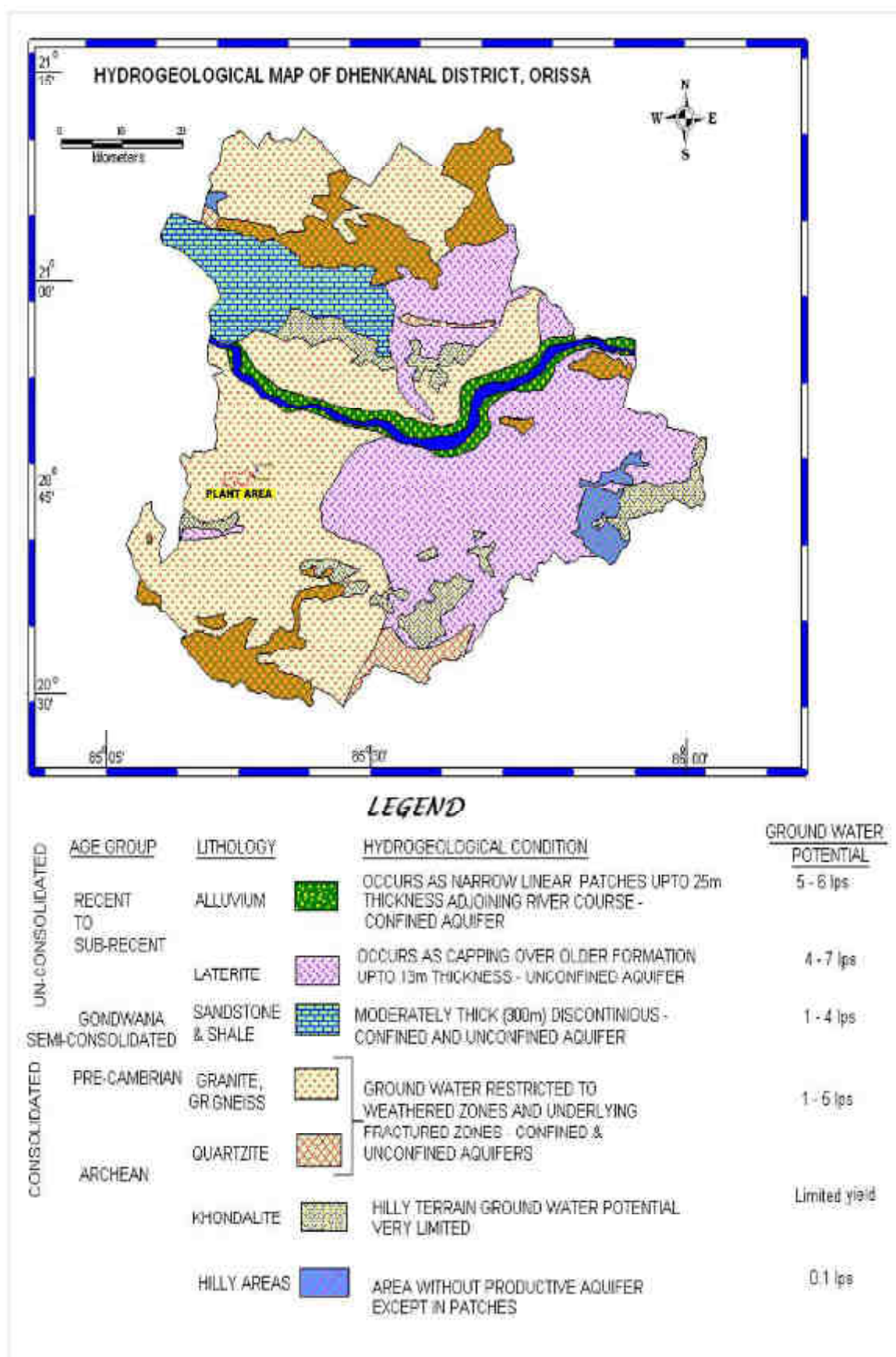
**Ground water development:** Ground water development in the district is mainly through the dug wells, dug-cum-bore wells and bore wells. Ground water is used mainly for domestic as well as irrigation purposes. The stage of ground water development in the district is only 25.16% while in Hindol block it is even lesser at 19.42%.

The groundwater resource potential and the utilization for the project area and study area has been worked out as per the methodology suggested by Groundwater Estimation Committee (GEC 2015).

#### **A. By rainfall infiltration method**

|                                                                                                                                                        |   |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|---|---------------|
| Total study area (as per Census 2011)                                                                                                                  | - | 501.27 Sq.km. |
| Area suitable for ground water recharge (as per Census 2011)                                                                                           | - | 426.26 Sq.km  |
| Annual Average Rainfall (IMD Angul 2001-2011)                                                                                                          | - | 1216.4 mm     |
| Rainfall infiltration index (avg) as per GEC recommendation for Granite Acidic Rocks (Pegmatite, Granite, Syenite, Rhyolite etc.) - Weathered, Jointed | - | 11%           |
| Monsoon groundwater recharge                                                                                                                           | - | 57.04 MCM     |

FIG 3.7: HYDROGEOLOGICAL MAP OF DHENKANAL DISTRICT, ORISSA



**B. By water table fluctuation method**

|                                                                                                                                     |   |              |
|-------------------------------------------------------------------------------------------------------------------------------------|---|--------------|
| Total study area (as per Census 2011)                                                                                               | - | 501.27 Sq.km |
| Area suitable for ground water recharge (as per Census 2011)                                                                        | - | 426.26 Sq.km |
| Average seasonal change of water table (as per CGWB brochure for May 2013)                                                          | - | 4.2 m        |
| Specific yield as per GEC recommendation for Granite Acidic Rocks (Pegmatite, Granite, Syenite, Rhyolite etc.) - Weathered, Jointed | - | 3.0%         |
| Monsoon groundwater recharge                                                                                                        | - | 53.71 MCM    |

The difference between the two expressed as a percentage of the rainfall infiltration method is (-) 5.83%, thus, the rainfall recharge for normal monsoon is to be taken as equal to 0.8 times the value estimated by the rainfall infiltration factor method as per the recommendations on ground water resource estimation methodology. Thus, 53.71 MCM per annum is the estimated annual ground water resource.

**C. Return flow from surface irrigation**

|                                                   |   |             |
|---------------------------------------------------|---|-------------|
| Total irrigated area (as per Census 2011)         | - | 4575.02 Ha. |
| Surface water irrigated area (as per Census 2011) | - | 3893.26 Ha. |
| Applied water / Ha.                               | - | 0.5 m/Ha.   |
| Total applied water                               | - | 19.47 MCM   |
| Return seepage, Average 35%                       | - | 6.81 MCM    |

Thus, annual ground recharge will be  $53.71 + 6.81 = 60.52$  MCM

**Ground Water Use**

There are three major consumer of ground water in the area (i) Domestic (ii) Irrigation (iii) Livestock. There are several industries and mines in the study area which will also have drinking water requirement. It is assumed that the industrial requirement shall be met through surface water sources. Hence, the drinking water of industries has been considered as a part of domestic subheading, since majority of the employees live locally.

**A. Domestic**

|                                                                     |   |          |
|---------------------------------------------------------------------|---|----------|
| Total population as per Census 2011                                 | - | 219562   |
| Decadal growth rate (rural for Jharkhand)                           | - | 14.05%   |
| Present population (2020) estimated on basis of decadal growth rate | - | 247326   |
| Population dependent on Ground water                                | - | 147839   |
| Per capita domestic need                                            | - | 135 LPD  |
| Total annual ground water use                                       | - | 7.28 MCM |

**B. Irrigation**

As per Census 2011, the total irrigated area is 4575.02 ha. The major part of irrigation is done by surface water (canal- 3090.33 ha, tanks/ lakes- 656.20 ha and by others – 146.73 ha). Ground water is used for 681.76 ha.

|                                      |               |
|--------------------------------------|---------------|
| Total area irrigated by ground water | - 681.76 Ha   |
| Gross irrigation (50 cm/ha)          | - 340.88 ha m |
| Return seepage, average 35%          | - 119 ha m    |
| Net water withdrawal                 | - 2.22 MCM    |

**C. Livestock**

The water consumption for livestock has been empirically considered as 5% of human consumption, which comes to 0.36 MCM.

**D. Industrial use**

The water consumption for industries has been empirically considered as 500 cum/day by 5 operational industries within the study area, which comes to 0.83 MCM.

**E. Annual ground water use**

$$7.28 + 2.22 + 0.36 + 0.83 = 10.69 \text{ MCM}$$

**Ground water balance**

| Sl. No. | Particulars                                                                                                                                                                                                                             | Million Cubic Meter (MCM)                                      |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| 1.      | Total annual replenishable recharge <ul style="list-style-type: none"> <li>By rainfall infiltration factor method (million m<sup>3</sup>/year)</li> <li>By groundwater table fluctuation method (million m<sup>3</sup>/year)</li> </ul> | 57.04 ✓<br>(0.8 times of 57.04 = 45.63 is considered)<br>53.71 |
| 2.      | Estimated annual ground water recharge including return seepage (million m <sup>3</sup> /year)                                                                                                                                          | 60.52                                                          |
| 3.      | Estimate Annual draft (million m <sup>3</sup> /year)                                                                                                                                                                                    | 10.69                                                          |
| 4.      | Net annual ground water availability (million m <sup>3</sup> /year)                                                                                                                                                                     | 49.83                                                          |
| 5.      | Stage of ground water development in %                                                                                                                                                                                                  | 17.66%                                                         |
| 6.      | Category as per GEC                                                                                                                                                                                                                     | Safe                                                           |



### 3.6.3 Water quality

The baseline status of surface and ground water quality in the study area was carried out by collecting representative samples. The locations were chosen on the basis of proximity to the project site, the likely impact of the project on downstream having control samples in upstream.

#### **Location of Sampling Stations**

The location of ground and surface water sample sources is as given in **Table 3.9** and shown in **Fig 3.6**.

**TABLE 3.9: LOCATION OF WATER SAMPLING STATIONS**

| Station No.             | Station No. (Ref. Fig 3.6) | Source    | Location                                                | Distance and direction from Plant |
|-------------------------|----------------------------|-----------|---------------------------------------------------------|-----------------------------------|
| <b>I. Surface Water</b> |                            |           |                                                         |                                   |
| SW1.                    | 9.                         | River     | Brahmani river near Kharhagaprasad village (Up Stream)  | 6.5 km, NNE                       |
| SW2                     | 10                         | River     | Lingra Nadi near Plant (Up Stream)                      | 1.8 km, NNW                       |
| SW3                     | 11                         | Nala      | Gandhijharan nala near Tarkabeda village                | 1.4 km, SSW                       |
| SW4                     | 12                         | River     | Brahmani river near Pani Gengitia village (Down Stream) | 7.6 km, NNE                       |
| SW5                     | 13                         | River     | Lingra nadi near Kankalu village (Down Stream)          | 0.9 km, NW                        |
| SW6                     | 14                         | Nala      | Nala Near Beruanpal village                             | 0.10 km, NW                       |
| SW7                     | 15                         | Nala      | Nala near Nimabahali village                            | 1.8 km, NE                        |
| SW8                     | 16                         | Nala      | Kusumador jor near Bishwanath village                   | 6.5 km, ESE                       |
| SW9                     | 17                         | Reservoir | Reservoir near Minor irrigation project near boundary   | Adjoining                         |
| SW10                    | 18                         | Nala      | Kantel nala near Gulehi village                         | 8.3 km, SSW                       |
| SW11                    | 19                         | Nala      | Kisinda Jor near Narendarpur village                    | 7.6 km, N                         |
| <b>II. Ground Water</b> |                            |           |                                                         |                                   |
| GW1                     | 2                          | Bore well | Nimidha village                                         | 2.8 km, E                         |
| GW2                     | 6                          | Hand pump | Tarkabera village                                       | 1.1 km, S                         |
| GW3                     | 7                          | Hand pump | Kadala village                                          | 0.50 km, SW                       |
| GW4                     | 8                          | Hand pump | Beruanpal village                                       | 0.20 km, NW                       |
| GW5                     | 20                         | Hand pump | Jharbandh village                                       | 0.7 km, ENE                       |
| GW6                     | 21                         | Hand pump | Dhuliamunda village                                     | 6.3 km, SE                        |

| Station No. | Station No. (Ref. Fig 3.6) | Source    | Location            | Distance and direction from Plant |
|-------------|----------------------------|-----------|---------------------|-----------------------------------|
| GW7         | 22                         | Hand pump | Taltali village     | 7.4 km,W                          |
| GW8         | 23                         | Hand pump | Benipathar village  | 0.20 km, W                        |
| GW9         | 24                         | Hand pump | Kankalu village     | 2.7 km, WNW                       |
| GW10        | 27                         | Hand pump | Existing plant area | Within                            |

### Methodology

Samples from surface and ground water sources were collected by adopting grab sampling. The samples were collected in polyethylene sampling bottles. In case of surface water, sample was collected from a point 12" below the surface.

The physico-chemical quality of water samples were characterized by adopting the relevant parts of IS:3025 "Standard Methods for Water Analysis", APHA methods and other standard methods for select parameters prescribed in IS 10500:2012, Schedule VI of Environment Protection Rules and the 'Water Quality Standards for Surface Water Sources' by CPCB. For analysis, the samples were brought to Min Mec R&D Laboratory, New Delhi, after proper preservation.

### Analytical Results

The physico-chemical characteristics of ground and surface water samples are presented in **Annexure IX**. To facilitate comparison with drinking water standards, "Characteristics for Drinking Water" as per IS 10500:2012, has been included in the **Annexure X**. Surface water test results have been summarised in **Table 3.10** and ground water test results are summarised in **Table 3.11**.

**TABLE 3.10: SURFACE WATER TEST RESULTS**

| Sl. No. | Parameters                                 | As per IS 10500:2012 & Amendment No. 1 |                                                      | Test Results (range) | Classification as per CPCB's Water Quality Standards for Surface Water Sources |
|---------|--------------------------------------------|----------------------------------------|------------------------------------------------------|----------------------|--------------------------------------------------------------------------------|
|         |                                            | Requirement (Acceptable Limits)        | Permissible Limit in the absence of Alternate source |                      |                                                                                |
| 1.      | Turbidity, NTU                             | 1                                      | 5                                                    | BDL                  |                                                                                |
| 2.      | pH value                                   | 6.5 - 8.5                              | No relaxation                                        | 7.16 - 7.86          | A                                                                              |
| 3.      | Specific conductance, $\mu$ mhos           | -                                      | -                                                    | 175 - 775            |                                                                                |
| 4.      | Total Dissolved Solids, mg/l               | 500                                    | 2000                                                 | 116 - 460            |                                                                                |
| 5.      | Total Suspended Solids, mg/l               | -                                      | -                                                    | BDL                  |                                                                                |
| 6.      | Total Hardness as CaCO <sub>3</sub> , mg/l | 200                                    | 600                                                  | 64 - 280             |                                                                                |
| 7.      | Alkalinity, mg/l                           | 200                                    | 600                                                  | 74 - 330             |                                                                                |

| Sl. No. | Parameters                            | As per IS 10500:2012 & Amendment No. 1 |                                                      | Test Results (range) | Classification as per CPCB's Water Quality Standards for Surface Water Sources |
|---------|---------------------------------------|----------------------------------------|------------------------------------------------------|----------------------|--------------------------------------------------------------------------------|
|         |                                       | Requirement (Acceptable Limits)        | Permissible Limit in the absence of Alternate source |                      |                                                                                |
| 8.      | Sulphate as SO <sub>4</sub> mg/l      | 200                                    | 400                                                  | 8.961 - 61.558       |                                                                                |
| 9.      | Phosphorous as P, mg/l                | -                                      | -                                                    | BDL                  |                                                                                |
| 10.     | Chloride as Cl, mg/l                  | 250                                    | 1000                                                 | 15 - 118             |                                                                                |
| 11.     | Calcium as Ca, mg/l                   | 75                                     | 200                                                  | 13 - 45              |                                                                                |
| 12.     | Dissolved oxygen, mg/l                | -                                      | -                                                    | 6.8 - 7.1            | A                                                                              |
| 13.     | Biochemical Oxygen Demand (BOD), mg/l | -                                      | -                                                    | 5 - 15               | Below E                                                                        |
| 14.     | Chemical Oxygen Demand (COD), mg/l    | -                                      | -                                                    | 10.7527 - 25.0896    |                                                                                |
| 15.     | Sodium as Na, mg/l                    | -                                      | -                                                    | 6.5 - 75.4           |                                                                                |
| 16.     | Potassium as K, mg/l                  | -                                      | -                                                    | 1.8 - 14.5           |                                                                                |
| 17.     | Magnesium as Mg, mg/l                 | 30                                     | 100                                                  | 8 - 34               |                                                                                |
| 18.     | Iron as Fe, mg/l                      | 1                                      | No relaxation                                        | BDL                  |                                                                                |
| 19.     | Fluoride as F, mg/l                   | 1                                      | 1.5                                                  | 0.1418 - 0.7802      |                                                                                |
| 20.     | Oil & Grease, mg/l                    | -                                      | -                                                    | BDL                  |                                                                                |
| 21.     | Silver as Ag, mg/l                    | 0.1                                    | No relaxation                                        | BDL                  |                                                                                |
| 22.     | Boron as B, mg/l                      | 0.5                                    | 1                                                    | 0.0145 - 0.1636      |                                                                                |
| 23.     | Chromium as Cr,mg/l                   | 0.05                                   | No relaxation                                        | BDL                  |                                                                                |
| 24.     | Copper as Cu, mg/l                    | 0.05                                   | 1.5                                                  | BDL                  |                                                                                |
| 25.     | Manganese as Mn, mg/l                 | 0.1                                    | 0.3                                                  | BDL                  |                                                                                |
| 26.     | Nickel as Ni, mg/l                    | 0.02                                   | No relaxation                                        | BDL                  |                                                                                |
| 27.     | Selenium as Se, mg/l                  | 0.01                                   | No relaxation                                        | BDL                  |                                                                                |
| 28.     | Arsenic as As, mg/l                   | 0.01                                   | No relaxation                                        | BDL                  |                                                                                |
| 29.     | Zinc as Zn, mg/l                      | 5                                      | 15                                                   | BDL - 0.0378         |                                                                                |
| 30.     | Acidity as CaCO <sub>3</sub> ,mg/l    | -                                      | -                                                    | 4-12 at pH 8.3       |                                                                                |
| 31.     | Nitrate as NO <sub>3</sub> , mg/l     | 45                                     | No relaxation                                        | 0.74 - 14.62         |                                                                                |
| 32.     | Hexavalent Chromium, mg/l             | -                                      | -                                                    | BDL                  |                                                                                |
| 33.     | Residual Free Chlorine, mg/l          | 0.2                                    | 1                                                    | NIL                  |                                                                                |
| 34.     | Total Coliform (MPN/100ml)            | -                                      | -                                                    | 6 - 17               | A                                                                              |
| 35.     | Residual free chlorine, mg/l          | -                                      | -                                                    | NIL                  | -                                                                              |
| 36.     | E. Coli                               | -                                      | -                                                    | Absent-Present       | -                                                                              |

**\* Classification:**

**A- Drinking Water Source, without conventional treatment but after disinfection**

**B- Bathing, Swimming and Recreation**

**C- Drinking Water Source after conventional treatment**

**D- Propagation of Wild Life Fisheries**

**E- Irrigation, Industrial Cooling and Controlled waste disposal**

**Note : BDL(Below Detection Limit) of Turbidity (NTU) <1, TSS <10, P <0.1, Fe <0.1, O&G <5, Ag <0.01, Cr <0.01, Cu <0.01, Mn <0.01, Ni <0.01, Se <0.01, As <0.01, Zn <0.01, Cr6+ <0.1 mg/l**

**Source: Test report No. MMW/05-2019/1 dated 08/05/2019 by Min Mec R&D Laboratory, New Delhi**

The analysis of surface water sample shows that all the parameters are within the permissible limits except total dissolved solids, total hardness, magnesium in pond water of core zone which exceeds the desirable limits but are within the permissible limits as per IS 10500:2012. As per CPCBs criteria for classification of surface waters, the waters are suitable for irrigation, industrial cooling and controlled waste disposal.

**TABLE 3.11: GROUND WATER TEST RESULTS**

| Sl. No. | Parameters                                 | As per IS 10500:2012 & Amendment No. 1 |                                                      | Test Results (range) |
|---------|--------------------------------------------|----------------------------------------|------------------------------------------------------|----------------------|
|         |                                            | Requirement (Acceptable Limits)        | Permissible Limit in the absence of Alternate source |                      |
| 1.      | Turbidity, NTU                             | 1                                      | 5                                                    | BDL                  |
| 2.      | pH value                                   | 6.5 - 8.5                              | No relaxation                                        | 6.87 - 7.76          |
| 3.      | Specific conductance, $\mu$ mhos           | -                                      | -                                                    | 637 - 1029           |
| 4.      | Total Dissolved Solids, mg/l               | 500                                    | 2000                                                 | 366 - 628            |
| 5.      | Total Suspended Solids, mg/l               | -                                      | -                                                    | BDL                  |
| 6.      | Total Hardness as CaCO <sub>3</sub> , mg/l | 200                                    | 600                                                  | 288 - 384            |
| 7.      | Alkalinity, mg/l                           | 200                                    | 600                                                  | 212 - 433            |
| 8.      | Sulphate as SO <sub>4</sub> mg/l           | 200                                    | 400                                                  | 12.987 - 65.325      |
| 9.      | Phosphorous as P, mg/l                     | -                                      | -                                                    | BDL                  |
| 10.     | Chloride as Cl, mg/l                       | 250                                    | 1000                                                 | 21 - 159             |
| 11.     | Calcium as Ca, mg/l                        | 75                                     | 200                                                  | 51 - 99              |
| 12.     | Sodium as Na, mg/l                         | -                                      | -                                                    | 23.2 - 74.3          |
| 13.     | Potassium as K, mg/l                       | -                                      | -                                                    | 1 - 2.5              |
| 14.     | Magnesium as Mg, mg/l                      | 30                                     | 100                                                  | 32 - 41              |
| 15.     | Iron as Fe, mg/l                           | 1                                      | No relaxation                                        | BDL - 0.2            |
| 16.     | Fluoride as F, mg/l                        | 1                                      | 1.5                                                  | BDL - 0.7127         |
| 17.     | Silver as Ag, mg/l                         | 0.1                                    | No relaxation                                        | BDL                  |
| 18.     | Boron as B, mg/l                           | 0.5                                    | 1                                                    | BDL - 0.0278         |
| 19.     | Chromium as Cr, mg/l                       | 0.05                                   | No relaxation                                        | BDL                  |
| 20.     | Copper as Cu, mg/l                         | 0.05                                   | 1.5                                                  | BDL                  |
| 21.     | Manganese as Mn, mg/l                      | 0.1                                    | 0.3                                                  | BDL-0.0668           |
| 22.     | Nickel as Ni, mg/l                         | 0.02                                   | No relaxation                                        | BDL                  |
| 23.     | Selenium as Se, mg/l                       | 0.01                                   | No relaxation                                        | BDL                  |
| 24.     | Arsenic as As, mg/l                        | 0.01                                   | No relaxation                                        | BDL                  |
| 25.     | Zinc as Zn, mg/l                           | 5                                      | 15                                                   | BDL-0.3323           |
| 26.     | Acidity as CaCO <sub>3</sub> , mg/l        | -                                      | -                                                    | 4-12 at pH 8.3       |
| 27.     | Nitrate as NO <sub>3</sub> , mg/l          | 45                                     | No relaxation                                        | 0.62 - 30.84         |
| 28.     | Hexavalent Chromium, mg/l                  | -                                      | -                                                    | BDL                  |
| 29.     | Residual Free Chlorine, mg/l               | 0.2                                    | 1                                                    | NIL                  |

**Note:** BDL(Below Detection Limit) of Turbidity (NTU) <1, TSS <10, P <0.1, Fe <0.1, F <0.1, O&G <5, Ag <0.01, B <0.01, Cr <0.01, Cu <0.01, Mn <0.01, Ni <0.01, Se <0.01, As <0.01, Zn <0.01, Cr6+ <0.1 mg/l

**Source:** Test report No. MMW/05-2019/1 dated 08/05/2019 by Min Mec R&D Laboratory, New Delhi

The analysis of ground water samples shows that all the parameters are within the permissible limits in absence of alternate source.

### 3.7 NOISE LEVEL

#### 3.7.1 Monitoring Locations

Ten monitoring locations including plant area were selected so as to represent the entire study area. The locations of monitoring stations are indicated in **Fig 3.6** and given in **Table 3.12**.

**TABLE 3.12: LOCATION OF NOISE MONITORING STATIONS**

| Station No.<br>(Ref Fig 3.6) | Name of Monitoring Station | Distance (km) and<br>Direction from the Plant |
|------------------------------|----------------------------|-----------------------------------------------|
| 1                            | Plant area                 | Within                                        |
| 2                            | Nimidha village            | 2.8 Km, E                                     |
| 3                            | Mosonia village            | 5.3 Km, N                                     |
| 4                            | Thokar village             | 4.6 Km, SE                                    |
| 5                            | Nimabahali village         | 1.5 Km, NE                                    |
| 6                            | Tarkabera village          | 1.1 Km, S                                     |
| 7                            | Kadala village             | 0.5 Km, SW                                    |
| 8                            | Beruanpal village          | 0.20 Km, NW                                   |
| 9                            | Jharbandh village          | 0.7 km, NE                                    |
| 10                           | Taltali village            | 7.4 km, W                                     |

#### 3.7.2 Methodology

For measurement of ambient noise level, a Digital Sound Level Meter was used. The meter was calibrated with a standard acoustic calibrator before using in the field. The measurements were carried out continuously for the 24-hour period to obtain hourly equivalent sound pressure level. From these values, day and night time as well as 24-hour Leq values were also calculated. The Leq is the equivalent continuous sound level, which is equivalent to the same sound energy as the fluctuating sound measured during observation period.

#### 3.7.3 Observations

Results of ambient noise measurements are presented in **Annexure XI** and summarized in **Table 3.13**. The Ambient Air Quality Standards in respect of Noise is given in **Annexure XII** and OSHA damage risk criteria are reproduced in **Annexure XIII**.

**TABLE 3.13: AMBIENT NOISE LEVELS IN dB(A) (ALL VALUES IN LEQ)**

| Location           | Noise levels in dB(A) |       |         | Permissible limits |       | Area |
|--------------------|-----------------------|-------|---------|--------------------|-------|------|
|                    | Day                   | Night | Average | Day                | Night |      |
| Plant Area         | 51.18                 | 41.35 | 49.41   | 75                 | 70    | I    |
| Nimidha village    | 49.73                 | 39.80 | 48.19   | 55                 | 45    | R    |
| Mosonia village    | 48.46                 | 41.00 | 48.94   | 55                 | 45    | R    |
| Thokar village     | 51.52                 | 42.10 | 50.00   | 55                 | 45    | R    |
| Nimabahali village | 48.58                 | 41.12 | 46.98   | 55                 | 45    | R    |
| Tarkabera village  | 49.52                 | 41.53 | 47.88   | 55                 | 45    | R    |
| Kadala village     | 49.79                 | 40.17 | 48.03   | 55                 | 45    | R    |
| Beruan pal village | 49.98                 | 40.02 | 48.44   | 55                 | 45    | R    |
| Jharbandh village  | 51.32                 | 42.08 | 49.81   | 55                 | 45    | R    |
| Taltali village    | 50.54                 | 41.23 | 49.03   | 55                 | 45    | R    |

*Abbreviation: I- Industrial, R- Residential*

*Source: Test report no. MMN/05-19/03 dated 28/05/2019 and MMN/06-19/11 dated 12/6/2019 by Min Mec R&D Laboratory, New Delhi*

Leq values observed during day time varies from 48.46 to 51.52 dB(A) and at night time varies from 39.80 to 42.10 dB(A). The day and night time Leq values noted from the 10 noise monitoring stations in the study area indicate that the noise levels are well within the limits prescribed for the noise level in the residential zone.

### 3.8 TRAFFIC VOLUME

#### 3.8.1 Monitoring Locations

A traffic volume survey was conducted round the clock on 16-17/04/2019 at Nimabahali Chowk (NH-55) and on 17-18/04/2019 at Nimbahali to Jharbandh road. The traffic monitoring station is shown in **Fig 3.6**.

#### 3.8.2 Methodology

Traffic count were made continuously for 24 hours by visual observation and counting of vehicles under four categories, viz., heavy motor vehicles, light motor vehicles, two/three wheelers, cycles and others. At the end of each hour, fresh counting and recording was undertaken. Thus, total numbers of vehicles per hour under the different categories were determined.

#### 3.8.3 Observations

A summary of the traffic volume monitored at two locations during survey period is given in **Table 3.14 & 3.14A** and details are given in **Annexure XIV**.

**TABLE 3.14: TRAFFIC VOLUME AT NIMABAHALI CHOWK, NH55**

| Traffic vehicle    | No. of vehicles per day | Equivalence Factor | Equivalent Passenger Car Unit |
|--------------------|-------------------------|--------------------|-------------------------------|
| H.M.V.             | 7339                    | 3.0                | 22017                         |
| L.M.V.             | 3138                    | 1.0                | 3138                          |
| Two/three wheelers | 1962                    | 0.5                | 981                           |
| Cycles             | 610                     | 0.5                | 305                           |
| <b>Grand Total</b> | <b>13049</b>            |                    | <b>26441</b>                  |

**TABLE 3.14A: TRAFFIC VOLUME ON NIMBAHALI TO JHARBANDH ROAD**

| Traffic vehicle    | No. of vehicles per day | Equivalence Factor | Equivalent Passenger Car Unit |
|--------------------|-------------------------|--------------------|-------------------------------|
| H.M.V.             | 54                      | 3.0                | 162                           |
| L.M.V.             | 51                      | 1.0                | 51                            |
| Two/three wheelers | 154                     | 0.5                | 77                            |
| Cycles             | 200                     | 0.5                | 100                           |
| <b>Grand Total</b> | <b>459</b>              |                    | <b>390</b>                    |

It was observed that the movement of heavy motor vehicles (trucks) is uniform during the daytime and night times on NH55. These are mainly coal carrying trucks from the Talcher coalfield. The road from project site till NH is 5 m wide while the carriageway of NH is presently 7.0-7.5 m and undergoing widening. The present traffic load is 88% of the maximum capacity on the NH as per IRC norms. NH is undergoing widening from Cuttack till Sambalpur resulting in a 23.5 m wide cross section. It will comprise of 8.5 m wide carriageways for both directions separated by 2.5 m median. There will be 2 m wide shoulders in either side.

### 3.9 LAND ENVIRONMENT

#### 3.9.1 Core zone

Land use of the total project area of 1769 acres, after expansion, prior to project construction is agricultural land (1477.738 acres) under private ownership and government land (291.262 acres). The government land has 7.8 acres forest land, which has already received stage II forest clearance from MOEF&C vide letter No. 5-ORB207/2014-BHU dated 02/07/2015. Company has acquired 608.495 acres (comprising 540.705 acres private land + 67.790 acres Government land) and the same has been converted to industrial use. Balance 1160.505 acres is yet to be acquired. The balance land will be also be converted into industrial use & colony. Additionally, 9.85 acres of private land in village Jharbandh and 3.05 acres of private land in village Nimabahali have been allotted to company for construction of approach road, which is outside the project area.

### 3.9.2 Study area

Land use pattern of study area has been studied on the basis of 2011 Census data. The number of villages falling in different Districts and sub districts and the corresponding areas are given in **Table 3.15**.

**TABLE 3.15: DISTRICTS/SUB DISTRICT WISE VILLAGES IN STUDY AREA**

| District     | Sub District       | No. of villages | Area (ha)    |
|--------------|--------------------|-----------------|--------------|
| Dhenkanal    | Parajung           | 15              | 3644         |
|              | Motunga            | 47              | 9871         |
|              | Bhushan Steel Ltd. | 23              | 5292         |
|              | Balami             | 45              | 11889        |
|              | Hindol             | 13              | 2767         |
|              | Rasol              | 13              | 6330         |
| Angul        | Banarpal           | 38              | 9383         |
|              | Bhushan Steel Ltd. | 2               | 249          |
|              | kankinali          | 1               | 130          |
| Forest Area  |                    |                 | 572          |
| <b>Total</b> |                    | <b>197</b>      | <b>50127</b> |

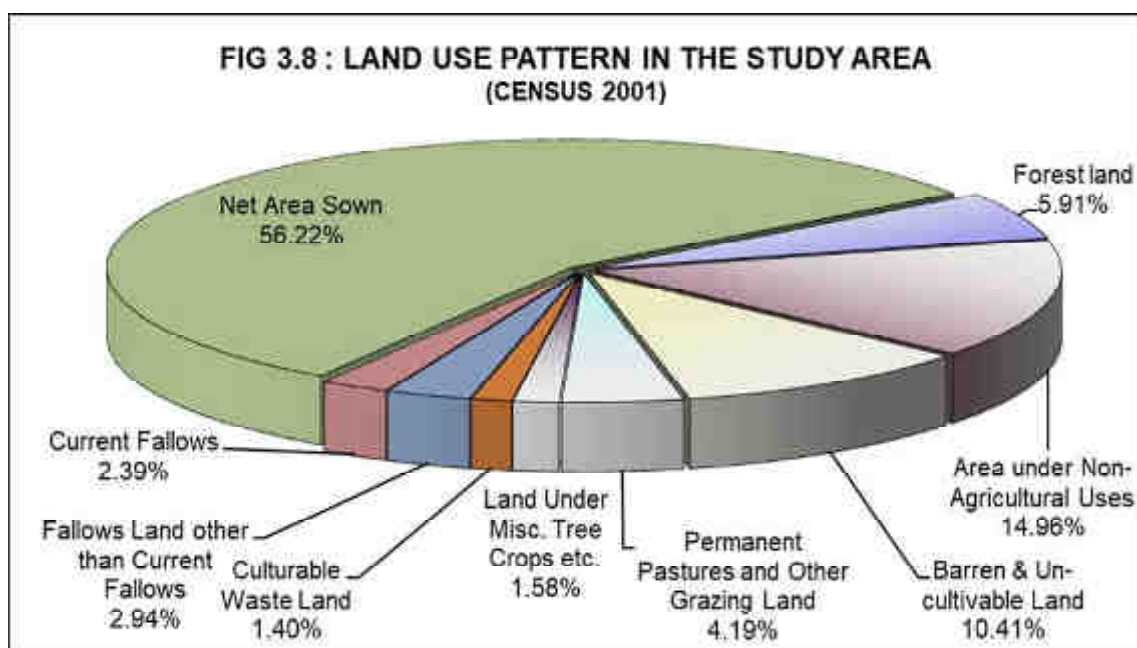
Detailed break up of landuse pattern within study area is given in **Annexure XV** and summarised in **Table 3.16**. The landuse pattern is graphically presented in **Fig 3.8**.

**TABLE 3.16: LAND USE DETAILS OF STUDY AREA (AS PER CENSUS 2011)**

| Land use                                  | Area (Ha.) | % of Total Area |
|-------------------------------------------|------------|-----------------|
| Net area sown                             | 28179.10   | 56.22           |
| Current fallows                           | 1197.93    | 2.39            |
| Fallows land other than current fallows   | 1474.82    | 2.94            |
| Culturable waste                          | 700.23     | 1.40            |
| Land under misc tree crops                | 793.03     | 1.58            |
| Permanent pastures and other grazing land | 2102.81    | 4.19            |
| Barren land                               | 5216.46    | 10.41           |



| Land use                         | Area (Ha.)   | % of Total Area |
|----------------------------------|--------------|-----------------|
| Area under non agricultural uses | 7500.76      | 14.96           |
| Forest land                      | 2961.96      | 5.91            |
| <b>Total</b>                     | <b>50127</b> | <b>100</b>      |



A perusal of above table shows that 5.91% of total area is forest land, 14.96% is area under non-agricultural uses, 56.22% is net area sown, 4.19% is permanent pastures and other grazing land, 2.39% is current fallows, 10.41% is barren and un-cultivable land, 2.94% is fallows land, 1.40% is culturable waste land and 1.58% land under miscellaneous tree crops.

### 3.9.3 Land use based on satellite imagery

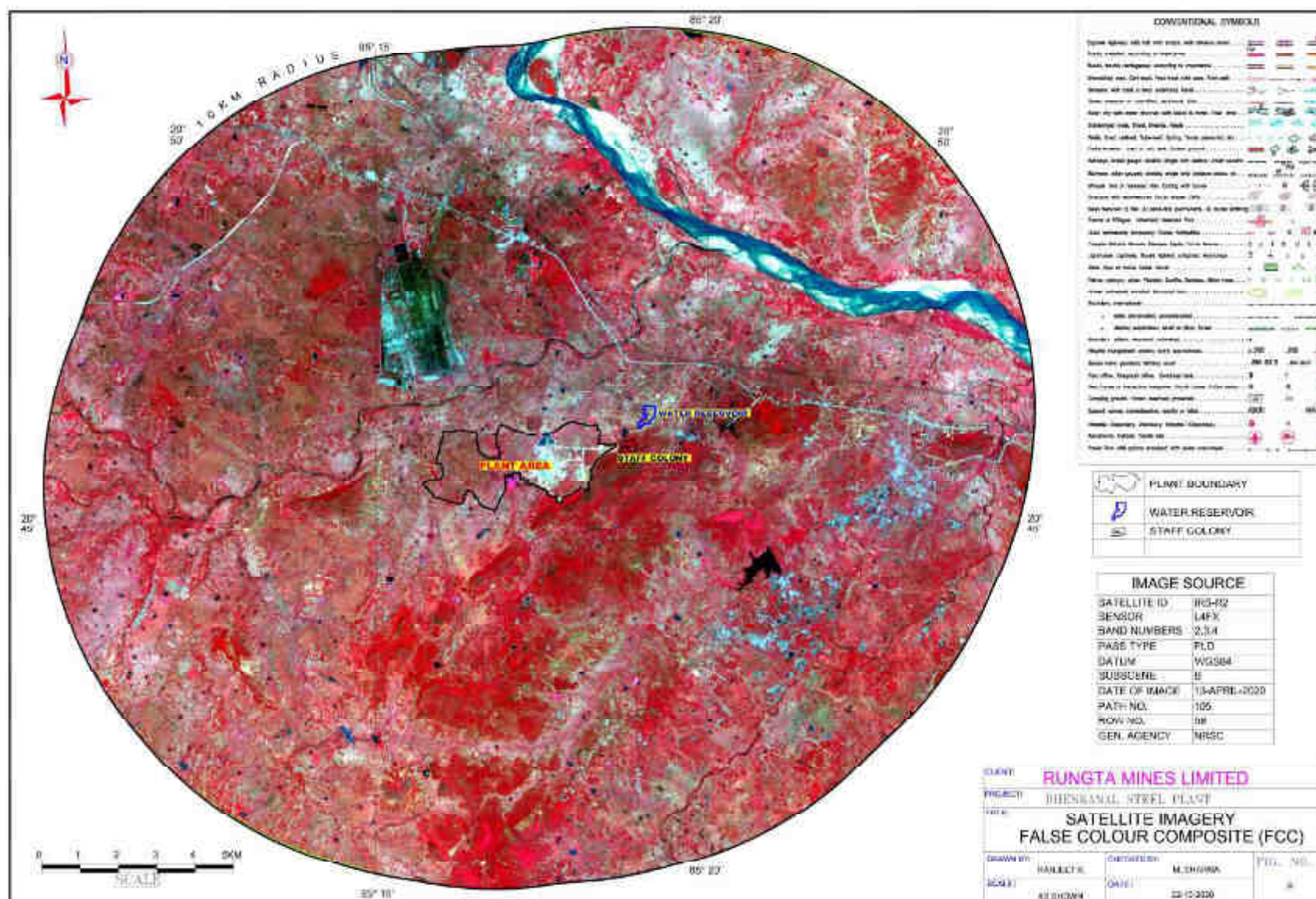
Land use/ land cover information relates to the status, spatial distribution & area extent of different land use categories.

**Data Inputs : Satellite-IRS-R2, Sensor- L4FX, path- 105, Row-58**

**Collateral Data : Survey of India Open Source map**

**Interpretation:** The IRS–R2 STD satellite data has been used for digital classification of land use categories. The satellite data has been geo-referenced with Survey of India Open Source map of the area. The 10 km area has been stratified by generating forest mask from Open Source map. In non forest area the supervised classification of maximum likelihood procedure has been used to classify land use classes. The satellite image of the 10 km radius is given in **Fig 3.9**.

FIG 3.9: 10 KM RADIUS SATELLITE IMAGERY



### 3.10 SOIL QUALITY

Top soil samples were collected from total nine locations as given in **Table 3.17** and shown in **Fig 3.6**. Detail soil analysis result is given in **Annexure XXVII** and summarized in **Table 3.18**.

**TABLE 3.17: SOIL SAMPLING STATIONS**

| Station no. | Location                                       | Distance, km & Direction                       |
|-------------|------------------------------------------------|------------------------------------------------|
| S1          | Proposed Core Zone                             | Within                                         |
| S2          | Kadala village                                 | 0.5, SW                                        |
| S3          | Beruanpal village                              | 0.2, NW                                        |
| S4          | Jharbandh Village                              | 0.7, NE                                        |
| S5          | Benipathar Village                             | 0.2, W                                         |
| S6          | Proposed Expansion Area North Side (Core zone) | within                                         |
| S7          | Existing Plant area (core zone)                | within                                         |
| S8          | Proposed Water reservoir Area                  | Part of core zone but 1.2, ENE from main plant |
| S9          | Proposed Staff Colony Area                     | Part of core zone but 0.3, E from main plant   |

**TABLE 3.18: SOIL TEST RESULT**

| Parameters                           | Protocol                    | Range               |
|--------------------------------------|-----------------------------|---------------------|
| Textural Classification <sup>#</sup> | IS 1498:1970                | Medium grained sand |
| Colour                               | -                           | Brown-Blackish      |
| pH                                   | IS 2720 (P26)               | 6.6-7.8             |
| E.C. (mS/cm)                         | IS 14767:2000               | 0.0642-0.507        |
| CaCO <sub>3</sub> (%by mass)         | IS 2720 (P23)               | 1.5-4.5             |
| Specific Gravity                     | IS : 2720 (P 3/Sec 1) -1980 | 2.09-2.45           |
| Moisture (%by mass)                  | IS 2720 (P 2)               | 14.609-25.668       |
| Organic Carbon (%by mass)            | Method no. 9*               | 0.08-0.66           |
| Organic Matter (%by mass)            | Method no. 9*               | 0.19-1.48           |
| Phosphorous (mg/kg)                  | Method no. 13*              | 0.04-4.17           |
| Nitrate-Nitrogen (mg/kg)             | Method no. 12*              | 0.39-67.18          |
| Sodium (Kg/ha)                       | Method no. 14*              | 42.56-339.36        |

| Parameters                               | Protocol         | Range    |
|------------------------------------------|------------------|----------|
| Potassium (Kg/ha)                        | Method no. 14*   | 82-953   |
| Calcium <sup>2+</sup> me/100 gram Soil   | Method no. 16.a* | 7.4-29.6 |
| Magnesium <sup>2+</sup> me/100 gram Soil | Method no. 16.b* | 1.1-5.1  |

**Source:** Test report no. MMS/06-19/10 dated 12/06/2019 by Min Mec R&D Laboratory

**Note:** – \*Methods Manual, Soil Testing in India, Department of Agriculture & Cooperation, Ministry of Agriculture (MOA), Government of India

Soil analysis results indicate the following:

- The soil is medium grained sand having brown to blackish colour with pH ranging from 6.6 to 7.8 which is neutral to mild alkaline in nature
- The EC for all the samples is normal ranging from 0.0642 to 0.507 mS/cm.
- Organic carbon is deficient except soil samples taken from Kadala village, Beruanpal village and Benipathar village.
- All the soil samples are deficient in Nitrogen, Potassium and Phosphorous

### 3.11 ECOLOGY

#### 3.11.1 Forests

There are no National parks, Wildlife Sanctuary, Biospheres reserves within 10 km radius. The nearest sanctuary is Satkosia Gorge WLS at a distance of 22 km in SW direction from the project.

There are three protected and reserve forests present within 10 km radius of the project. They are listed in **Table 3.19** and their location are shown in **Fig 3.10**.

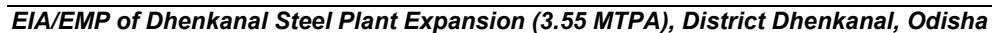
**TABLE 3.19: LIST OF FORESTS IN 10 KM RADIUS OF THE PROJECT**

| Sl. No. | Name of forest   | Distance (KM) | Direction |
|---------|------------------|---------------|-----------|
| 1.      | Jharbandh RF     | Adjoining     | SE        |
| 2.      | Ganthigarihia PF | 3.3 km        | NW        |
| 3.      | Nimidha RF       | 2.0 km        | E         |

As per the revised classification of forest types of India by Champion and Seth, the forests of Dhenkanal Division are Northern Tropical Semi-evergreen forests. These occur in the lower hills and valleys above 600 m elevation in the forest division of Dhenkanal. While the top storey trees are deciduous and remain leafless for a short time, the second storey is evergreen. The important tree species are Arjun, Mango, Mankar Kendu, Champa, Rai, Manda and Nageswar.



**3-35**



### 3.11.2 Flora

**Core Zone:** Trees, herbs, shrubs are found in the core area. Some of the trees found in the core zone are Babool, Mango, Neem, Jamun etc. while herbs, shrubs and climbers are Morning glory, Jatropha, Tulsi, Doob etc. Authenticated list of flora found in core zone is given in **Annexure XVI**. Total eighteen trees, seven shrubs, six herbs and four grasses are present in the core zone. No plantation has been started yet within the project boundary by the project proponent. Even though the toposheet (**Fig 3.10**) shows a mango garden in north eastern corner, no such garden exists as on date.

**Buffer Zone:** Various types of plant species, cropping pattern, plantation on roads etc. are discussed in subsequent paragraphs.

During the survey, 43 tree species, 2 bamboo species, 16 shrubs, 8 herbs, 2 climbers and 4 grass species were found in the study area. The plant species authenticated by Divisional Forest Officer, Dhenkanal Division have been listed in **Annexure XVI**. Some of the species of trees are Babul, Mango, Char, Neem, Palas, Karanj, Teak, etc. Herbs, shrub, bamboo, grass and climbers found in study area include Kanta bas, Jatropha, Kaner, Tulsi, Ban Tulsi, Makal, Dhuba etc. The SOI map (**Fig 3.10**) also shows presence of dense jungle, mainly Sal on hillock near Naraharipur and scattered patches of open Sal in the study area.

**Cropping pattern:** The agriculture is dependent on the moderate monsoon. Irrigation facilities in form of canals/ ponds/ wells are available in the study area. The main crop of the area is paddy. The area under major field crops and horticulture is given in **Table 3.20**.

**TABLE 3.20: AREA UNDER MAJOR FIELD CROP & HORTICULTURE IN DHENKANAL DISTRICT**

| Sl. No.                            | Particulars | Total Area (Ha) |
|------------------------------------|-------------|-----------------|
| <b>Major Field Crop Cultivated</b> |             |                 |
| 1.                                 | Paddy       | 112.0           |
| 2.                                 | Horse gram  | 7.63            |
| 3.                                 | Greengram   | 22.2            |
| 4.                                 | Black Gram  | 25.8            |
| 5.                                 | Groundnut   | 12.0            |
| 6.                                 | Mustard     | 2.48            |
| <b>Horticulture Crops - Fruits</b> |             |                 |
| 1.                                 | Mango       | 8.4             |
| 2.                                 | Citrus      | 0.9             |
| 3.                                 | Cashew      | 1.7             |
| 4.                                 | Coconut     | 1.1             |
| 5.                                 | Banana      | 0.5             |

| Sl. No.                                | Particulars  | Total Area (Ha) |
|----------------------------------------|--------------|-----------------|
| <b>Horticulture Crops - Vegetables</b> |              |                 |
| 1.                                     | Potato       | 0.2             |
| 2.                                     | Onion        | 0.8             |
| 3.                                     | Sweet Potato | 3.4             |
| 4.                                     | Vegetables   | 25.4            |
| <b>Medicinal &amp; Aromatic Crops</b>  |              |                 |
| 1.                                     | Garlic       | 0.7             |
| 2.                                     | Turmeric     | 0.4             |
| 3.                                     | Ginger       | 0.3             |
| 4.                                     | Corriander   | 0.8             |
| <b>Plantation Crops</b>                |              |                 |
| 1.                                     | Eucalyptus   | 2.0             |
| 2.                                     | Teak         | 0.5             |

(Source: Agriculture Contingency Plan for District Dhenkanal, Odisha (2008))

**Plantation on roads:** Plantation of species on the roadside are *Acacia nilotica*, *Albizia lebbek*, *Azadirachta indica*, *Butea monosperma*, *Cassia fistula*, *Dalbergia sisoo*, *Diospyros melanoxylon*, *Ficus benghalensis*, *Ficus glomerata*, *Mangifera indica*, etc.

**Vegetation in the Hamlets:** The species composition near the hamlets is different from those found in the natural environmental conditions. The vegetation structure surrounding the hamlets reflects a typical character of habitation. The trees in the settlement area are catering to the needs of local population such as fodder, fuel-wood, fruit, and timber and for religious purposes. Some of the common species found in the hamlets comprise *Mangifera indica*, *Syzygium cumini*, *Madhuca indica*, *Tamarindus indica*, *Tectona grandis* etc. Mango and cashew plantations are also present in the study area, the location of which is visible on the toposheet (**Fig 3.10**).

**Medicinal plant species:** The study area is also endowed with several medicinal plants. Medicinal plants found in the study area are used by the people of villages for their daily use and minor ailments. The common medicinal plants of the region are *Azadirachta indica*, *Butea monosperma*, *Cassia fistula*, *Ficus benghalensis*, *Madhuca indica*, *Melia composite*, *Mangifera indica*, *Ocimum sanctum*, *Syzygium cumini*, etc.

**Fuel wood plant species:** Villagers collect dry leaves, stems and log to fulfill their daily need for fuel wood requirement. *Syzygium cumini* (Jamun), *Mangifera indica* (Mango) etc. are the species, used for fuel wood.

### 3.11.3 Fauna

A "Site Specific Conservation Plan" had been prepared in the past with respect to Dhenkanal Steel Plant and was approved by Principal Chief

Conservator of Forest (WL) & Chief Wildlife Warden, Odisha vide Memo no. 3188/1/WL-SSP-10/2015 dated 09.04.2015. Copy of approval letter is enclosed as **Annexure XXX**.

The complete list of fauna authenticated by Divisional Forest Officer, Dhenkanal Division found in the plant and study area is given in **Annexure XVI**. The study area does not fall under the path of migratory birds and also no Schedule I wild life is observed in the study area. As per conservation plan, Peafowl, Sambar, Elephant and Python are found in Dhenkanal Forest Division.

**Core zone:** Fauna in the core area is less as compared to buffer area. Avifaunal species found in area are House Crow, Indian mynah, owl, Blue rock pigeon, Jungle fowl, Grey partridge and parakeet. Mammals found are five striped palm squirrel, common mongoose, Indian Hare, house rat and monkey. Reptiles reported are krait, garden lizard, chameleon, house gecko and rat snake.

**Buffer zone:** A total of 25 fauna species were recorded comprising 9 species of mammals, 6 species of reptiles and 10 bird species. The mammalian species observed in the study area are jackal, mongoose, squirrel, bat etc. Bird species observed are Indian myna, goose, owl, pigeon, house crow etc. and reptiles are common krait, garden lizard, chameleon etc.

**Livestock:** Livestock occupies an important place in the rural economy of Dhenkanal and Angul district. It provides them with the draught power required for cultivation and an additional means of supplementing their income. The live-stock plays a vital role in the agricultural economy because it not only supplies milk, meat, manure, bones, hides and skins, hoofs and horns but also serves as draught cattle for drawing carts, ploughs and also for drawing water. Villagers keep cow, goat, buffalo, sheep, hen etc. for poultry, milk, eggs etc.

### 3.12 SOCIO-ECONOMIC CONDITIONS

The socio-economic conditions of the area are described in the following paragraphs.

#### 3.12.1 Demographic profile

**Core Zone:** There were 54 families within the project boundary at the time the project was conceived prior to the year 2010. After the environmental clearance on 02.08.2010, these families have been resettled & rehabilitated in village Nimabahali at an aerial distance of 2.4 km. As per the directions of Land Acquisition Officer, District Office, Dhenkanal a compensation of Rs. 7 lakhs per family has also been paid. As in Dec 2018, there are no inhabitants within the plant boundary or the proposed expansion area.



**Buffer Zone:** There are 197 inhabited villages in the buffer zone of the study area. The total population within the study area is 219562. The district and sub district wise population as per Census 2011 records is given in **Table 3.21**.

**TABLE 3.21: DISTRICT & SUB DISTRICT WISE POPULATION  
(CENSUS 2011)**

| District     | Sub District       | No. of villages | No. of households | Total population | Males          | Females        |
|--------------|--------------------|-----------------|-------------------|------------------|----------------|----------------|
| Dhenkanal    | Parajung           | 15              | 4034              | 15668            | 7914           | 7754           |
|              | Motunga            | 47              | 12523             | 52955            | 27624          | 25331          |
|              | Bhushan Steel Ltd. | 23              | 5,185             | 22,293           | 12,025         | 10,268         |
|              | Balami             | 45              | 12,057            | 47,592           | 24,376         | 23,216         |
|              | Hindol             | 13              | 2164              | 8380             | 4104           | 4276           |
|              | Rasol              | 13              | 5,621             | 23,154           | 11,920         | 11,234         |
| Angul        | Banarpal           | 38              | 10737             | 47583            | 24673          | 22910          |
|              | Bhushan Steel Ltd. | 2               | 272               | 1,098            | 558            | 540            |
|              | <b>kantinali</b>   | <b>1</b>        | <b>212</b>        | <b>839</b>       | <b>450</b>     | <b>389</b>     |
| <b>Total</b> |                    | <b>197</b>      | <b>52,805</b>     | <b>219,562</b>   | <b>113,644</b> | <b>105,918</b> |

The village wise demographic details including population of males, females, schedule cast, schedule tribe, literacy level are given in **Annexure XVII** and summarised in **Table 3.22**. The population of SC & ST and sex wise break-up of literacy levels are shown in **Fig 3.11** and **3.12** respectively.

**TABLE 3.22: DEMOGRAPHIC DETAILS OF THE STUDY AREA  
(AS PER CENSUS 2011)**

| Sl.      | Description                 | Population | Percentage |
|----------|-----------------------------|------------|------------|
| <b>1</b> | <b>Total Population</b>     | 219652     | 100        |
| 1.1      | Male Population             | 113644     | 51.76      |
| 1.2      | Female Population           | 105918     | 48.24      |
| 1.3      | Females/1000 males          | 932        | -          |
| <b>2</b> | <b>No. of households</b>    | 52805      | -          |
| 2.1      | Family size, persons/family | 4          | -          |
| <b>3</b> | <b>Caste wise break up</b>  |            |            |
| 3.1      | Schedule caste              | 52712      | 23.10      |
| 3.2      | Schedule Tribe              | 11544      | 5.18       |
| <b>4</b> | <b>Literacy</b>             |            |            |
| 4.1      | Total literates             | 154089     | 70.18      |
| 4.2      | Male literates              | 87394      | 39.80      |
| 4.3      | Female literates            | 66695      | 30.38      |

**FIG 3.11 : LITERACY LEVEL IN THE STUDY AREA  
(CENSUS 2011)**

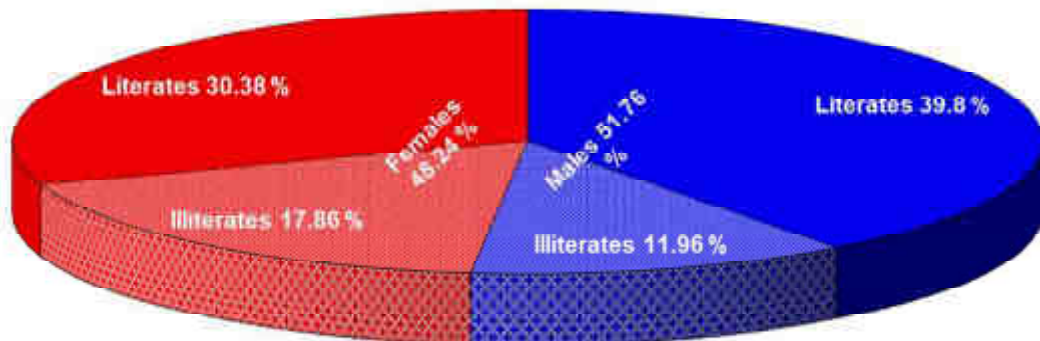
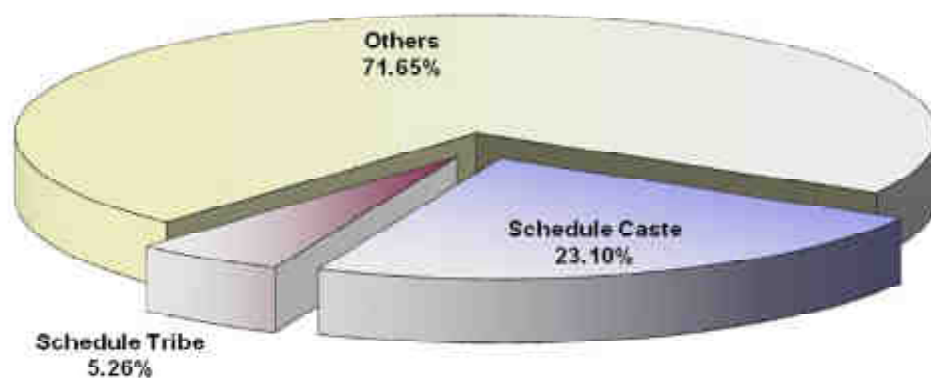


**FIG 3.12 : BREAK UP OF SC & ST IN THE STUDY AREA  
(CENSUS 2011)**



Mostly the population is rural and the percentage of Scheduled Tribes is 5.26% and Schedule Castes is 23.10% of the total population. The male population exceeds female population. The average family size is 4-5 persons per family. The literacy level is approximately 70% and it is lower among females (30.38%) then males (39.8%). There are 932 women against every 1000 men in the study area.

### 3.12.2 Employment and occupation

Employment pattern and occupation are the two main indicators of the economic profile. The employment pattern for individual villages, based on 2011 Census data is given in **Annexure XVIII**. A summary of employment pattern and occupation for the study area is presented in **Table 3.23**.

**TABLE 3.23: SUMMARY OF EMPLOYMENT & OCCUPATION IN THE STUDY AREA**

| Description                         | Numbers      | %          |
|-------------------------------------|--------------|------------|
| Main workers                        | 52746        | 24.02      |
| Marginal workers                    | 22817        | 10.39      |
| Non workers                         | 143999       | 65.58      |
| <b>Break-up of main workers</b>     |              |            |
| Cultivators (%)                     | 9261         | 17.56      |
| Agricultural labours (%)            | 8439         | 16.0       |
| Household industries (%)            | 2382         | 4.53       |
| Other workers (%)                   | 32654        | 61.91      |
| <b>Total</b>                        | <b>52746</b> | <b>100</b> |
| <b>Break-up of marginal workers</b> |              |            |
| Cultivators (%)                     | 2044         | 8.96       |
| Agricultural labours (%)            | 11018        | 48.29      |
| Household industries (%)            | 1132         | 4.96       |
| Other workers (%)                   | 8623         | 37.79      |
| <b>Total</b>                        | <b>22817</b> | <b>100</b> |

The employment pattern, break-up of main workers and break-up of marginal workers are graphically depicted in **Fig 3.13**, **3.14** and **3.15** respectively.

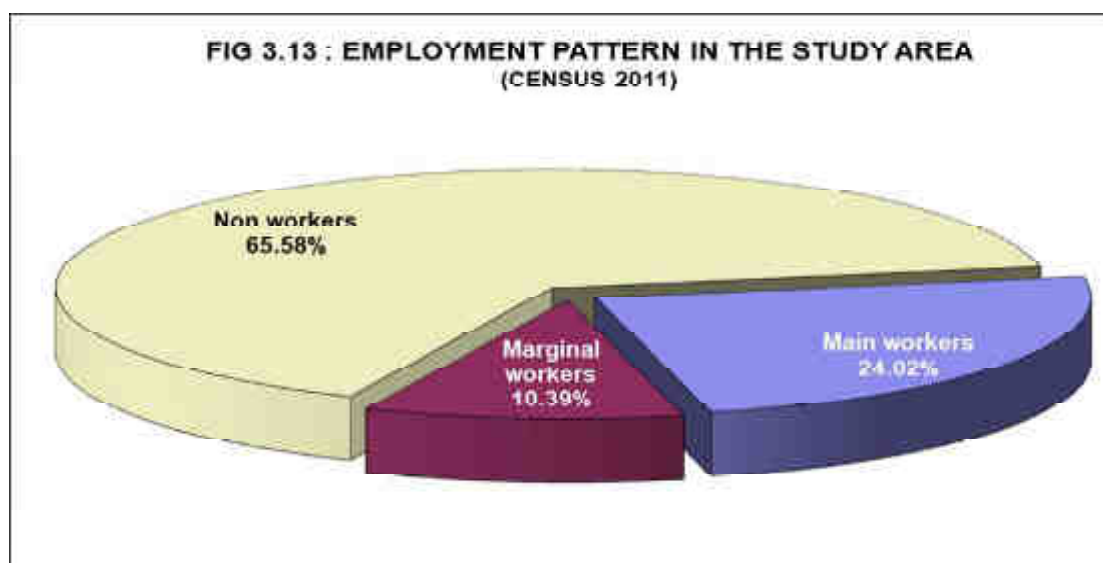


**FIG 3.14 : BREAK UP OF MAIN WORKERS IN THE STUDY AREA  
(CENSUS 2011)**

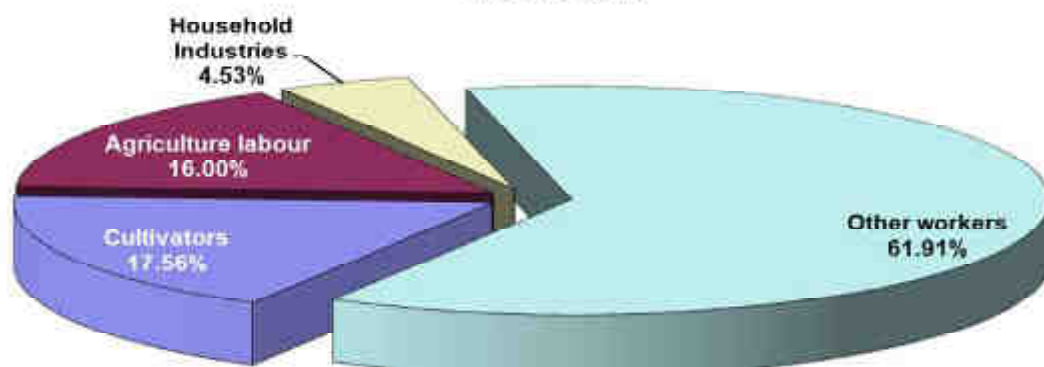
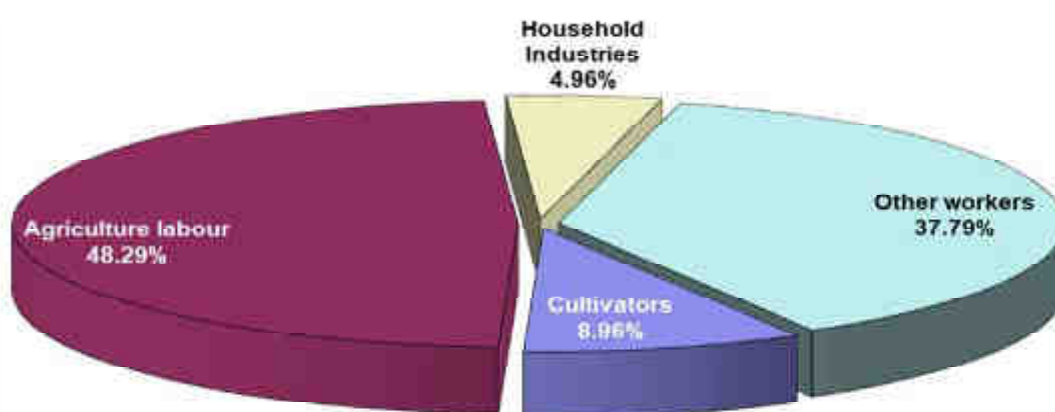


**FIG 3.15 : BREAK UP OF MARGINAL WORKERS IN THE STUDY AREA  
(CENSUS 2011)**



### 3.12.3 Amenities

Details of amenities available in individual villages are given in **Annexure XIX**. A summary of the same in **Table 3.24**.

**TABLE 3.24: AMENITIES AS PER CENSUS 2011**

|                         |                                                                                                                                                                                                                                                                                                                     |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Education               | 8 Pre-Primary Schools, 254 Primary Schools, 126 Middle schools, 61 Secondary schools, 20 Sr. Sec. Schools, 9 Degree college Arts& science, 3 Engineering colleges, 2 Medicine Colleges, 3 Management Institute, 4 Polytechnic and 12 Vocational Training School/ITI                                                 |
| Medical and health care | 1 Primary Health Centre, 25 Primary Health Sub Centre, 10 Maternity and child welfare centre, 1 TB Clinic, 4 Allopathic hospitals, 2 Hospital Alternative Medicine, 11 Dispensary, 6 Veterinary hospitals, 5 family welfare centres, 2 Non Govt. Med facilities out patient, 7 Non Govt. Medical Facilities-Medical |

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                | Practitioner with MBBS degree, 1 Non Govt. Medical Facilities-Medical Practitioner with other Degree, 1 Non Govt. Medical Facilities-Medical Practitioner with no Degree, 1 Non Govt. Medical Facilities-Traditional Practitioner and Faith Healer, 74 Non. Govt. Med facilities Medicine shop and 1 Non Govt. Med. Facilities others                                                                                                                                                                                                            |
| Power Supply                   | 180 Power supply for domestic use, 70 power supply for agricultural use, 64 power supply for all Users                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Communication                  | 29 post office, 11 sub post office, 10 post & Telegraph office, 195 Village PIN Code, 126 Telephone Line, 184 mobile phone coverage, 5 internet cafes/ Mobile PCO and 26 private courier facility                                                                                                                                                                                                                                                                                                                                                |
| Water supply                   | 16 Tap with untreated water, 1 covered wells, 182 Uncovered Wells, 193 Hand Pumps, 8 Tube Wells/Borehole, 41 Spring, 77 River/Canals and 184 Tank/Pond/Lakes, & 9 others                                                                                                                                                                                                                                                                                                                                                                         |
| Banks and commercial societies | 1 ATM, 1 commercial bank, 2 cooperative bank, 3 Agricultural Credit Societies, 188 Self-Help Group (SHG), 130 Public Distribution System (PDS), 15 Agricultural Marketing society and 187 ASHA                                                                                                                                                                                                                                                                                                                                                   |
| Transport approach to village  | 27 National Highways, 17 State Highways, 40 Major District Roads, 83 Other District Roads, 119 Black Topped (pucca) Roads, 182 Gravel (kuchha) Roads, 27 Water Bounded Macadams, 134 All Weather Roads, Navigable waterways(Rivers/canals), 34 Navigable waterways (River/ canal) and 195 foot path.<br><br>35 Public Bus Services, 61 Private Bus Services, 15 railway station, 86 Auto/Modified Autos, 54 Taxis, 11 Vans, 93 Tractors, 194 Cycle-pulled Rickshaws (manual driven), 179 Carts Driven by Animals and 30 Sea/River/Ferry Service) |
| Sports and Entertainment       | 92 Sports Fields, 73 Sports Club/Recreation Centres, 1 cinema/video halls, 15 public library, 15 Public reading Room and 186 Daily Newspaper supply                                                                                                                                                                                                                                                                                                                                                                                              |

### 3.13 INDUSTRIES

The list of industries present in the study area is given below in **Table 3.25** and shown in **Fig 3.16**.

**TABLE 3.25: LIST OF INDUSTRIES IN STUDY AREA**

| Sl. No. | List of industries and mines                                 | Distance (km) /direction | Operational status |
|---------|--------------------------------------------------------------|--------------------------|--------------------|
| 1       | MGM Steel's sponge iron unit & WHRB                          | 1.8 km E                 | Operational        |
| 2       | Navbharat Ventures Ltd.'s Ferro-chrome plant and power plant | 3.7 km N                 | Operational        |
| 3       | MLR's Tulsidiha Ferro-alloys plant                           | 2.3 km N                 | Not operational    |

| Sl. No. | List of industries and mines                                   | Distance (km) /direction | Operational status             |
|---------|----------------------------------------------------------------|--------------------------|--------------------------------|
| 4       | Bhushan Steel Limited's Steel Plant                            | 1.3 km NNW               | Operational                    |
| 5       | Lanco power plant                                              | 5.2 km N                 | Partly constructed & abandoned |
| 6       | BRG Irons & Steel Co.'s sponge iron & ingot manufacturing unit | 5.3 km N                 | Not operational                |
| 7       | Kanak Durga stone crusher                                      | 5.6 km SE                | Operational                    |
| 8       | GMR Kamalanga Energy Ltd.                                      | 9.2 km N                 | Operational                    |
| 9       | Hind Metals Pvt. Ltd.'s Ferro Alloys plant                     | 3.4 km N                 | Dismantled                     |
| 10      | Ravirun Vinmay Pvt. Ltd.                                       | 6.0 km N                 | Not operational                |
| 11      | Bhuvée Profile and Stainless (P) Ltd.                          | 5.1 km N                 | Not operational                |

### 3.14 PLACES OF TOURISM/RELIGIOUS/HISTORICAL INTEREST

There is no important archaeological (ASI)/ historical place or other place of tourist or religious importance within the study area except village temples and mosques. However, the toposheet shows monuments near Garha Santri-Arahata village road, Pirhasahi-Taltali road, Pirhasahi-Ganthigarhia PF road, Kankinali-Barasingha road and near Kalandapal village, all at distance of 7.5 km and beyond.

### 3.15 SEISMICITY

The Plant area falls in seismic Zone – II, which is not an active seismic zone.

### 3.16 RAW MATERIAL AND SLAG ANALYSIS

This is a proposed project which is not in operation yet. However, the raw materials such as iron ore and scrap have been analysed in other operational steel plant of the company, namely, Kamanda Steel Plant, Odisha and slag analysis have been analysed in operational steel plant of the company, namely Chaliyama Steel Plant, Jharkhand

The result of the Hg, As and Fluoride analysis with respect to Iron ore and scrap is given in **Table 3.26**. The TCLP study result of slag is given in **Table 3.27**.



FIG 3.16: LOCATION OF INDUSTRIES

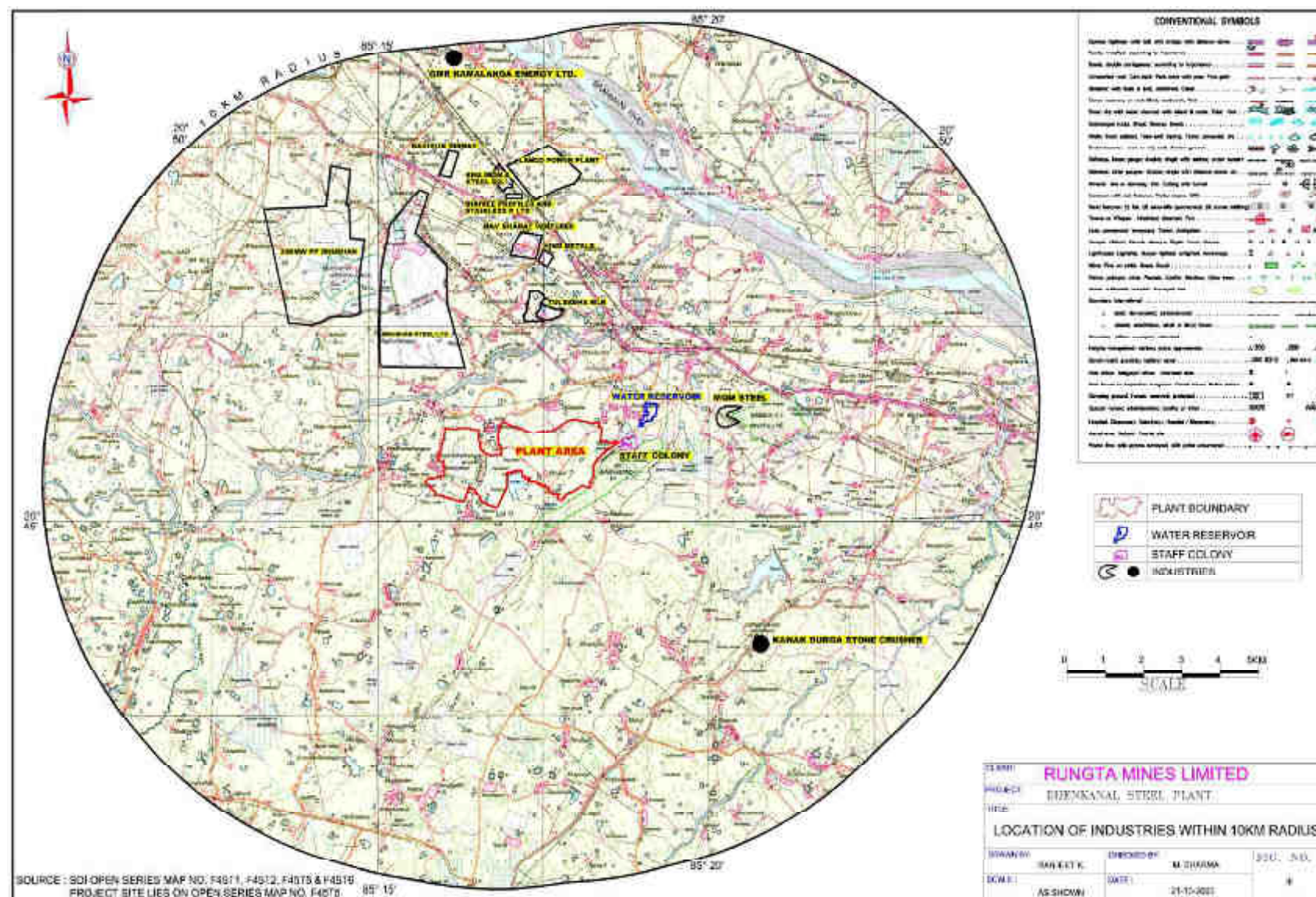


**TABLE 3.26: ANALYSIS OF RAW MATERIAL  
(CONCENTRATION IN  $\mu\text{g}/\text{m}^3$ )**

|    | Scrap | Iron Ore |
|----|-------|----------|
| Hg | 0.69  | 0.61     |
| As | 5.66  | 6.35     |
| F  | <5    | <5       |

*Source: Report no. TSP-001/08/2016/307 dated 08.09.2016 of IMMT (CSIR) Laboratory, Bhubaneswar*

**TABLE 3.27: TCLP TEST RESULTS FOR SLAG**

| Parameter         | Protocol         | Results ( $\mu\text{g}/\text{m}^3$ ) |
|-------------------|------------------|--------------------------------------|
| Silver (as Ag)    | IS 3025 (Part-2) | BDL                                  |
| Aluminium (as Al) | IS 3025 (Part-2) | BDL                                  |
| Arsenic (as As)   | IS 3025 (Part-2) | BDL                                  |
| Boron, (as B)     | IS 3025 (Part-2) | BDL                                  |
| Cadmium (as Cd)   | IS 3025 (Part-2) | BDL                                  |
| Cobalt (as Co)    | IS 3025 (Part-2) | BDL                                  |
| Chromium (as Cr)  | IS 3025 (Part-2) | 0.0015                               |
| Copper (as Cu)    | IS 3025 (Part-2) | 0.0210                               |
| Mercury (as Hg)   | IS 3025 (Part-2) | BDL                                  |
| Manganese (as Mn) | IS 3025 (Part-2) | 0.0110                               |
| Nickel (as Ni)    | IS 3025 (Part-2) | BDL                                  |
| Lead (as Pb)      | IS 3025 (Part-2) | BDL                                  |
| Selenium (as Se)  | IS 3025 (Part-2) | 0.0003                               |
| Zinc (as Zn)      | IS 3025 (Part-2) | 0.0014                               |

*Source: Report no. LT02-CCD/20/16 dated 26.08.2020 of IMMT (CSIR) Laboratory, Bhubaneswar*



## CHAPTER 4

### ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

#### 4.1 GENERAL ASPECTS

Environment Management Plan for expansion of Dhenkanal Steel Plant of M/s Rungta Mines Ltd. (RML) has been prepared for the proposed enhancement of production capacity from 3.0 MTPA to 3.55 MTPA steel by enhancing capacity of its facilities. The proposed plant will be established within the existing sanctioned area (674.765 acres) as well as in additional area adjacent & near to it (1094.235 acres). The plant will have an impact on land, air, water, noise, soil, ecology, socio-economics, etc.

The environment management plan includes the evaluation of total impacts after superimposing the predicted impacts over the base line data. This helps in incorporating proper mitigation measures wherever necessary for preventing deterioration in environmental quality. Keeping in mind the environmental baseline scenario as detailed in Chapter 3 and the proposed project activity described in Chapter 2, it is attempted to assess the likely impact and its extent on various environmental parameters in this chapter.

The important environmental parameters likely to be affected due to steel and power sector projects are as follows:

- Topography and drainage
- Climate
- Air environment
- Land environment
- Water environment
- Solid waste
- Noise environment
- Traffic density
- Ecology
- Socio-economic environment
- Occupational health and safety
- Historical Monuments

The beneficial impacts anticipated from an industrial project, irrespective of their relevance to the proposed project, would be the employment opportunity available and the activities carried out in the surrounding villages under corporate environment responsibility and corporate social responsibility.

## 4.2 TOPOGRAPHY AND DRAINAGE

### 4.2.1 Topography

**Impact:** The core zone represents almost flat but sloping land. The elevation of the existing plant area varies from 75-95 m AMSL while that of the proposed expansion area varies from 65 to 100 m. The entire land is devoid of topographical features like hills but has portions of low lying areas. As in October 2020, two DRI, 4x20T IF, 1x3 strand CCM and 50 MW CPP is under construction as per environmental clearance dated 02.08.2010 & its subsequent amendments and enhancements. Change in topography will occur in core zone (existing & expansion) due to digging and filling, construction of the plant buildings, walls, stock yards, etc. and excavation for raw water reservoir and rain water harvesting ponds. A colony will also be constructed in 34 acres. The ground will be levelled, where required. There will be a permanent change in the topography due to construction activities. The construction once achieved will not be reversed. There will be no impact on topography of the buffer zone except in the 3.05 acres area, where it is proposed to construct the approach road.

**Management:** The change in topography in the core zone will lead to changes in the sheet flow pattern of rain water within the core zone. For that provision of storm water drains shall be made. The excavated material shall be used in landscaping and filling low lying areas within and around the project site. Thus, the intention is to balance the digging & filling so that no extra earth is left or required. As soon as the material is dug, it will be simultaneously utilised. Planning shall be done in advance for the location and quantity of utilisation of the dug out material.

### 4.2.2 Drainage- Impact & Mitigation

There is no perennial river or water body in the project area. A perusal of the toposheet shows that five first order seasonal streams, seventeen ponds and the sheet flow of rain water shall get affected within the core zone due to installation of buildings. Impact on the drainage in the buffer zone is not anticipated as no construction will be taking place outside plant boundary.

There are six ponds within the project area of 674.765 acres sanctioned as per EC dated 04.06.2020. These ponds are seasonal in nature. Of these ponds, four are within / very near the earmarked green belt area. These four ponds will be conserved and developed as water bodies. These would be connected to the proposed Raw Water Reservoir and will facilitate rain water harvesting.

However, the volume of water from the plant area going outside the plant will reduce during rainfall as the rainwater will be stored in raw water reservoir / rain water harvesting ponds. The plant area is 1769 acres (715.90 ha) and rainfall 1216.4 mm. Thus, maximum possible runoff volume getting affected can be 5.39 MCM/ annum of which 86% will occur in June-October. Since 67% of the plant will get constructed or paved or have road or have lining (where material will be stored in open) and 33% will be green belt, average 0.6 runoff coefficient for entire plant has been considered.

The seasonal drains flow into Lingra Nala, which joins Brahmani river. Brahmani river flow was estimated as 145.39 cum/s on 14.07.2010 as per "Report on Discharge Measurement Survey of River Brahmani in and around Dhenkanal, Orissa" by Geosolution Pro Services Pvt. Ltd. As per "Integrated Hydrological Data Book (non classified river basins)" of Central Water Commission, March 2012, the nearest hydrological observation site on Brahmani river is at Talcher. The maximum discharge observed was 8386 cumecs and minimum observed was 23.7 cumecs. The annual 50% dependable flow has been identified as 14041 MCM/annum. The runoff from plant can atmost reduce by 5.39 MCm, which is 0.038% of the likely flow in Brahmani river with 50% dependability. Thus, the impact shall be negligible on the flow of Brahmani river.

#### **4.3 CLIMATE AND METEOROLOGY- IMPACT AND MITIGATION**

##### **a) Construction phase**

The plant and colony construction will have marginal impact on climate or meteorology during construction phase as mostly civil/ mechanical work concerning erection of plant will be carried out. There will be use of fossil fuel in the vehicles bringing raw material, DG sets used during construction or any specific diesel based machinery such as JCB, dozer, etc. The emissions will be insignificant and temporary to have any impact on the long term climate of the region.

##### **b) Operation phase**

The project envisages installation of several units within the integrated steel plant, many of which will require cooling. This will add substantial heat and increase the ambient temperature locally. The project envisages installation of power generating units based on Waste Heat Recovery Boilers (WHRB) to recover heat from exit gases from DRI kilns, MBF and coke oven. However, even with the heat recovery boilers, the gases get discharged at about 150°C. Thus, during operational phase, slight variation in temperature is likely on account of heat generation from various units and their cooling requirement.

Due to concrete buildings heat island phenomenon will occur which will be localized and manifest itself in the premises of the plant. Therefore impact on climate will be small and insignificant.

The other activity, which can be considered in this context is the stack emissions and thermal pollution. The thermal pollution will be restricted to a smaller area around the stacks till the air cools naturally and the stack emissions will contribute to incremental values of pollutants. The climate is controlled by the pressure depression in the Bay of Bengal and is not anticipated to be affected by local activities under discussion. Therefore no mitigation measures are proposed.

Further, carbon dioxide (green house gas) contributing fossil fuels will be in the form of diesel and auxiliary oil used to operate the trucks, vehicles and rolling mill, which will be a necessity. In order to sequester CO<sub>2</sub>, plantation is a suitable method. Hence, 33% of the plant area shall be under greenbelt.

In coal/ middling/ fines based power plants, the carbon dioxide emissions are a global concern since it is a green house gas (GHG). In addition to power plants, combustion or loss of Fixed carbon from coal will take place in other units such as DRI kilns, clinker kiln, MBF, pellet plant, sinter plant and coke oven, to some extent. The CO<sub>2</sub> emissions have been calculated on the basis of the likely fixed carbon content of the various fuels that will be consumed on the plant will be follows:

| Raw material                                    | Quantity, TPA | Fixed carbon content % |                       | Quantity of CO <sub>2</sub> likely to be released, TPA/annum** |
|-------------------------------------------------|---------------|------------------------|-----------------------|----------------------------------------------------------------|
| Coal & coal fines*                              | 5960926       | 35.09                  |                       | 7669526                                                        |
| Coking coal                                     | 1615700       | 40                     |                       | 2369694                                                        |
| Coke                                            | 835275        | 80-86<br>(consider 83) |                       | 2542020                                                        |
| Coke breeze & fines                             | 723450        |                        |                       | 2201700                                                        |
|                                                 |               | <b>Mol. weight</b>     |                       |                                                                |
|                                                 |               | <b>Material</b>        | <b>CO<sub>2</sub></b> |                                                                |
| Dolomite [CaMg(CO <sub>3</sub> ) <sub>2</sub> ] | 1131903       | 184                    | 44                    | 270673                                                         |
| Limestone [CaCO <sub>3</sub> ]                  | 2360941       | 100                    | 44                    | 1038814                                                        |
| Total                                           |               |                        |                       | 18613355                                                       |

**Note :**

\* *Middlings, washed coal or dolochar have not been considered separately as the total FC of coal will be getting distributed into these fractions by virtue of process flow*

\*\* *It is assumed that entire carbon from fuels by forming CO<sub>2</sub> and one CO<sub>2</sub> molecule from limestone & dolomite will be released*

As such, there is no practically applicable technology to sequester this CO<sub>2</sub> at present. However, research underway across the world and pilot projects have been executed. If any such technology becomes commercially viable in the future, it shall be taken up. Plantation is a suitable method to sequester carbon and 33% of the plant area shall be under greenbelt.

## 4.4 AIR QUALITY

### 4.4.1 Impact on air quality

#### *a) Construction phase*

The construction and erection of proposed plant and equipment will generate dust resulting in higher SPM levels in surrounding area. Further due to deployment of various mechanical equipment and transport vehicle, enhanced SO<sub>2</sub> and NO<sub>2</sub> levels are expected. Thus, air quality is likely to be affected which will require mitigation measures. However, the impact on the air quality during construction phase will be localized, temporary and reversible in nature.

Dust emissions from non-residential and commercial construction are a function of the total area of land disturbed and the duration of activities done. Based on field studies, the AP-42 (Compilation of Air Pollutant Emission Factors, US EPA, Section 13.2.3) gives the total suspended particulate emission factor estimate as 2.69 megagrams (Mg)/hectare/month of activity. The entire plant area is 1769 acres (715.90 ha) but the construction activity will occur only in a part according to the implementation plan given in Table 2.45 of Chapter 2. The duration of the activity will also last as long as scheduled.

The likely impacts on air quality during the construction phase are comparatively low and reversible, and managed through proper maintenance and operation of construction/erection equipment as well as periodic sprinkling. However, during operation phase, the various operations would discharge huge quantities of particulates and gaseous pollutions, which must be controlled before discharge into atmosphere.

#### *b) Operation phase*

Two types of generation and discharge of pollutants, viz., fugitive emissions and stack emissions, have been considered and discussed in subsequent sections:

- (I) Stack emission of gases from the various units and the associated facilities will add pollutants to the atmosphere, which will require mitigation measures.
- (II) Fugitive emissions comprise mostly of dust generated due to handling of raw material/ pollution control equipment dust and solid waste. The products have not been considered to contribute to dust generation due to their nature.

#### **4.4.1.1 Stack emissions**

The details of stacks and stack emissions for proposed plant are given in **Table 4.1**.

**TABLE 4.1: STACK DATA FOR PROPOSED 3.55 MTPA STEEL PLANT**

| S.N.       | Production Units                                                                      |      | Stack Height (m) | Top Dia (m) | Area (m <sup>2</sup> ) | Volumetric Flow Rate (Nm <sup>3</sup> /Hr) | Volumetric Flow Rate (m <sup>3</sup> /s) | Exit Velocity (m/Sec) | Temp. (°C) | Temp. (°K) | Pollutant emission         |                 |                 |
|------------|---------------------------------------------------------------------------------------|------|------------------|-------------|------------------------|--------------------------------------------|------------------------------------------|-----------------------|------------|------------|----------------------------|-----------------|-----------------|
|            |                                                                                       |      |                  |             |                        |                                            |                                          |                       |            |            | Rate (mg/Nm <sup>3</sup> ) |                 |                 |
|            |                                                                                       |      |                  |             |                        |                                            |                                          |                       |            |            | SPM                        | SO <sub>2</sub> | NO <sub>2</sub> |
| <b>1.1</b> | <b>DRI PROCESS STACKS AFTER WHRB ESP (2X500TPD, 3x600TPD &amp; 2X900TPD DR Plant)</b> |      |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1          | 500 TPD Kiln WHRB Stack                                                               | K-1  | 80               | 2.75        | 5.94                   | 125,000                                    | 53.800                                   | 18.13                 | 150        | 423        | 30                         | 281             | 1.053           |
| 2          | 500 TPD Kiln WHRB Stack                                                               | K-2  |                  |             |                        | 125,000                                    | 53.800                                   |                       |            |            |                            |                 |                 |
| 3          | 600 TPD Kiln WHRB Stack                                                               | K-3  | 80               | 3.0         | 7.07                   | 145,000                                    | 62.408                                   | 17.67                 | 150        | 423        | 30                         | 291             | 0.545           |
| 4          | 600 TPD Kiln WHRB Stack                                                               | K-4  |                  |             |                        | 145,000                                    | 62.408                                   |                       |            |            |                            |                 |                 |
| 5          | 600 TPD Kiln WHRB Stack                                                               | K-5  | 80               | 3.0         | 7.07                   | 145,000                                    | 62.408                                   | 8.83                  | 150        | 423        | 30                         | 291             | 1               |
| 6          | 900 TPD Kiln WHRB Stack                                                               | K-6  | 80               | 3.0         | 7.07                   | 160,000                                    | 68.864                                   | 19.49                 | 150        | 423        | 30                         | 396             | 1.480           |
| 7          | 900 TPD Kiln WHRB Stack                                                               | K-7  |                  |             |                        | 160,000                                    | 68.864                                   |                       |            |            |                            |                 |                 |
| <b>1.2</b> | <b>DRI KILNS-DE-DUSTING STACKS</b>                                                    |      |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1          | DRI K-1 to K-4 in-plant Dedusting                                                     | RMHS | 35               | 2           | 3.14                   | 120,000                                    | 39.438                                   | 12.56                 | 50         | 323        | 30                         |                 |                 |
| 2          |                                                                                       | CDH  | 30               | 1.8         | 2.54                   | 65,000                                     | 24.669                                   | 9.70                  | 100        | 373        | 30                         |                 |                 |
| 3          |                                                                                       | PSB  | 35               | 2           | 3.14                   | 120,000                                    | 39.438                                   | 12.56                 | 50         | 323        | 30                         |                 |                 |
| 4          | DRI K-5 to K-7 in-plant Dedusting                                                     | RMHS | 35               | 2.2         | 3.80                   | 145,000                                    | 47.655                                   | 12.54                 | 50         | 323        | 30                         |                 |                 |
| 5          |                                                                                       | CDH  | 30               | 2           | 3.14                   | 80,000                                     | 30.362                                   | 9.67                  | 100        | 373        | 30                         |                 |                 |
| 6          |                                                                                       | PSB  | 35               | 2.2         | 3.80                   | 145,000                                    | 47.655                                   | 12.54                 | 50         | 323        | 30                         |                 |                 |
| <b>2</b>   | <b>PELLET PLANT (5X3.75 MTPA + 10X 1.0 MTPA)</b>                                      |      |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1          | ESP-Drying &Pre.heating Travelling Grate                                              | in   | 90               | 6.5         | 33.17                  | 940,000                                    | 420.838                                  | 12.69                 | 167        | 440        | 30                         | 2.6355          | 0.089           |
| 2          | ESP-Drying &Pre.heating Travelling Grate                                              | in   | 90               | 6.5         | 33.17                  | 940,000                                    | 420.838                                  | 12.69                 | 167        | 440        | 30                         | 2.6355          | 0.089           |
| 3          | ESP-Drying &Pre.heating Travelling Grate                                              | in   | 90               | 6.5         | 33.17                  | 940,000                                    | 420.838                                  | 12.69                 | 167        | 440        | 30                         | 2.6355          | 0.089           |
| 4          | ESP-Drying &Pre.heating Travelling Grate                                              | in   | 90               | 6.5         | 33.17                  | 940,000                                    | 420.838                                  | 12.69                 | 167        | 440        | 30                         | 2.6355          | 0.089           |
| 5          | ESP-Drying &Pre.heating Travelling Grate                                              | in   | 90               | 6.5         | 33.17                  | 940,000                                    | 420.838                                  | 12.69                 | 167        | 440        | 30                         | 2.6355          | 0.089           |
| 6          | Raw Material Handling Stack                                                           |      | 30               | 1.8         | 2.54                   | 90,000                                     | 34.158                                   | 13.43                 | 100        | 373        | 30                         |                 |                 |
| 7          | Finished Product Handling Stack                                                       |      | 30               | 1.8         | 2.54                   | 90,000                                     | 34.158                                   | 13.43                 | 100        | 373        | 30                         |                 |                 |
| 8          | ESP-Drying &Pre.heating Travelling Grate                                              | in   | 60               | 4           | 12.56                  | 433,884                                    | 194.250                                  | 15.47                 | 167        | 440        | 30                         | 1.5226          | 0.051           |
| 9          | ESP-Drying &Pre.heating Travelling Grate                                              | in   | 60               | 4           | 12.56                  | 433,884                                    | 194.250                                  | 15.47                 | 167        | 440        | 30                         | 1.5226          | 0.051           |
| 10         | ESP-Drying &Pre.heating Travelling Grate                                              | in   | 60               | 4           | 12.56                  | 433,884                                    | 194.250                                  | 15.47                 | 167        | 440        | 30                         | 1.5226          | 0.051           |
| 11         | ESP-Drying &Pre.heating Travelling Grate                                              | in   | 60               | 4           | 12.56                  | 433,884                                    | 194.250                                  | 15.47                 | 167        | 440        | 30                         | 1.5226          | 0.051           |
| 12         | ESP-Drying &Pre.heating Travelling Grate                                              | in   | 60               | 4           | 12.56                  | 433,884                                    | 194.250                                  | 15.47                 | 167        | 440        | 30                         | 1.5226          | 0.051           |
| 13         | ESP-Drying &Pre.heating Travelling Grate                                              | in   | 60               | 4           | 12.56                  | 433,884                                    | 194.250                                  | 15.47                 | 167        | 440        | 30                         | 1.5226          | 0.051           |
| 14         | ESP-Drying &Pre.heating Travelling Grate                                              | in   | 60               | 4           | 12.56                  | 433,884                                    | 194.250                                  | 15.47                 | 167        | 440        | 30                         | 1.5226          | 0.051           |
| 15         | ESP-Drying &Pre.heating Travelling Grate                                              | in   | 60               | 4           | 12.56                  | 433,884                                    | 194.250                                  | 15.47                 | 167        | 440        | 30                         | 1.5226          | 0.051           |

| S.N.       | Production Units                                                                                     |        | Stack Height (m) | Top Dia (m) | Area (m <sup>2</sup> ) | Volumetric Flow Rate (Nm <sup>3</sup> /Hr) | Volumetric Flow Rate (m <sup>3</sup> /s) | Exit Velocity (m/Sec) | Temp. (°C) | Temp. (°K) | Pollutant emission         |                 |                 |
|------------|------------------------------------------------------------------------------------------------------|--------|------------------|-------------|------------------------|--------------------------------------------|------------------------------------------|-----------------------|------------|------------|----------------------------|-----------------|-----------------|
|            |                                                                                                      |        |                  |             |                        |                                            |                                          |                       |            |            | Rate (mg/Nm <sup>3</sup> ) |                 |                 |
|            |                                                                                                      |        |                  |             |                        |                                            |                                          |                       |            |            | SPM                        | SO <sub>2</sub> | NO <sub>2</sub> |
| 16         | ESP-Drying &Pre.heating in Travelling Grate                                                          |        | 60               | 4           | 12.56                  | 433,884                                    | 194.250                                  | 15.47                 | 167        | 440        | 30                         | 1.5226          | 0.051           |
| 17         | ESP-Drying &Pre.heating in Travelling Grate                                                          |        | 60               | 4           | 12.56                  | 433,884                                    | 194.250                                  | 15.47                 | 167        | 440        | 30                         | 1.5226          | 0.051           |
| 18         | Raw Material Handling Stack                                                                          |        | 30               | 1.8         | 2.54                   | 42,000                                     | 15.940                                   | 6.27                  | 100        | 373        | 30                         |                 |                 |
| 19         | Finished Product Handling Stack                                                                      |        | 30               | 1.8         | 2.54                   | 15,000                                     | 5.693                                    | 2.24                  | 100        | 373        | 30                         |                 |                 |
| <b>3</b>   | <b>COAL WASHERY (1X400TPH+1X235 TPH)</b>                                                             |        |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1          | Coal Washery in-plant Dedusting (400 TPH)                                                            |        | 30               | 1.7         | 2.27                   | 90,000                                     | 29.579                                   | 13.04                 | 50         | 323        |                            |                 |                 |
| 2          | Coal Washery in-plant Dedusting (235 TPH)                                                            |        | 30               | 1.7         | 2.27                   | 52,294                                     | 17.187                                   | 7.58                  | 50         | 323        |                            |                 |                 |
| <b>4</b>   | <b>BLAST FURNACE (1x600 cum + 2x450 cum)</b>                                                         |        |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1          | Stove Stack (to WHRB 450 cum)                                                                        | BF-01  | 30               | 1.8         | 2.54                   | 80,000                                     | 34.432                                   | 13.54                 | 150        | 423        | 30                         | 200             | 150             |
| 2          | Stock House De-dusting                                                                               | BF-02  | 47               | 1.8         | 2.54                   | 93,000                                     | 29.618                                   | 11.65                 | 40         | 313        | 30                         |                 |                 |
| 3          | Stove Stack (to WHRB 600 cum)                                                                        | BF-05  | 30               | 2.2         | 3.80                   | 140,000                                    | 60.256                                   | 15.86                 | 150        | 423        | 30                         | 200             | 150             |
| 4          | Stock House De-dusting                                                                               | BF-06  | 47               | 2.2         | 3.80                   | 163,000                                    | 51.912                                   | 13.66                 | 40         | 313        | 30                         |                 |                 |
| <b>5</b>   | <b>SINTER (2x80 m<sup>2</sup>+1x110 m<sup>2</sup>)</b>                                               |        |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1          | Sinter Plant-Main Stack (80 m <sup>2</sup> )                                                         | SP-MS  | 55               | 5           | 19.63                  | 865,000                                    | 372.299                                  | 18.97                 | 150        | 423        | 30                         | 49.747          | 0.227           |
| 2          | Sinter Plant-De-Dusting                                                                              | SP-DD  | 45               | 2           | 3.14                   | 160,000                                    | 50.956                                   | 16.23                 | 40         | 313        | 30                         |                 |                 |
| 3          | Sinter Plant-Main Stack (110 m <sup>2</sup> )                                                        | SP-MS  | 80               | 6.5         | 33.17                  | 1,184,000                                  | 509.597                                  | 15.36                 | 150        | 423        | 30                         | 31.233          | 0.119           |
| 4          | Sinter Plant-De-Dusting                                                                              | SP-DD  | 55               | 2.5         | 4.91                   | 273,000                                    | 86.944                                   | 17.72                 | 40         | 313        | 30                         |                 |                 |
| <b>6</b>   | <b>COKE OVEN, 1.07 MTPA (6 Batteries x 0.07 MTPA + 1 Battery x 0.25 MTPA + 1 Battery x 0.4 MTPA)</b> |        |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1          | Coke Oven 1x250000 TPA (to WHRB stack)                                                               | SP-MS  | 85               | 2.5         | 4.91                   | 175,000                                    | 87.785                                   | 17.89                 | 220        | 493        | 30                         | 27.744          | 0.025           |
| 2          | Coke Oven 1x400000 TPA (to WHRB stack)                                                               | SP-MS  | 100              | 3.2         | 8.04                   | 290,000                                    | 145.472                                  | 18.10                 | 220        | 493        | 30                         | 28.138          | 0.025           |
| 3          | Coke Oven 6x70000 TPA (to WHRB stack)                                                                | SP-MS  | 100              | 3.2         | 8.04                   | 290,000                                    | 145.472                                  | 18.10                 | 220        | 493        | 30                         | 26.801          | 0.024           |
| <b>7.1</b> | <b>SMS-COMPLEX, 3.22 MTPA (IF 7X20T + LRF 4X25T + 3X45 T)</b>                                        |        |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1          | 2x20T IF DES + 25T LRF                                                                               | IF-01  | 30.5             | 2           | 3.14                   | 90,000                                     | 34.158                                   | 11                    | 100        | 373        | 30                         |                 |                 |
| 2          | 2x20T IF DES + 25T LRF                                                                               | IF-02  | 30.5             | 2           | 3.14                   | 90,000                                     | 34.158                                   | 11                    | 100        | 373        | 30                         |                 |                 |
| 3          | 2x20T IF DES + 25T LRF                                                                               | IF-03  | 30.5             | 2           | 3.14                   | 90,000                                     | 34.158                                   | 11                    | 100        | 373        | 30                         |                 |                 |
| 4          | 1x20T IF DES                                                                                         | IF-04  | 30.5             | 1.8         | 2.54                   | 90,000                                     | 34.158                                   | 13                    | 100        | 373        | 30                         |                 |                 |
| 5          | 2x20T IF DES + 25T LRF                                                                               | IF-05  | 30.5             | 2           | 3.14                   | 90,000                                     | 34.158                                   | 11                    | 100        | 373        | 30                         |                 |                 |
| 6          | 2x20T IF DES + 45T LRF                                                                               | IF-06  | 30.5             | 2           | 3.14                   | 90,000                                     | 34.158                                   | 11                    | 100        | 373        | 30                         |                 |                 |
| 7          | 2x20T IF DES + 45T LRF                                                                               | IF-07  | 30.5             | 2           | 3.14                   | 90,000                                     | 34.158                                   | 11                    | 100        | 373        | 30                         |                 |                 |
| 8          | 2x20T IF DES + 45T LRF                                                                               | IF-08  | 30.5             | 2           | 3.14                   | 90,000                                     | 34.158                                   | 11                    | 100        | 373        | 30                         |                 |                 |
| <b>7.2</b> | <b>SMS-COMPLEX (1X90T EAF + 1X90T LRF and 1X110 T EAF + 1X110T LRF)</b>                              |        |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1          | 90T EAF Fume Extraction+LRF Stack                                                                    | EAF-01 | 60               | 4           | 12.56                  | 627,000                                    | 257.103                                  | 20                    | 130        | 403        | 30                         |                 |                 |

| S.N. | Production Units                                                 |        | Stack Height (m) | Top Dia (m) | Area (m <sup>2</sup> ) | Volumetric Flow Rate (Nm <sup>3</sup> /Hr) | Volumetric Flow Rate (m <sup>3</sup> /s) | Exit Velocity (m/Sec) | Temp. (°C) | Temp. (°K) | Pollutant emission         |                 |                 |
|------|------------------------------------------------------------------|--------|------------------|-------------|------------------------|--------------------------------------------|------------------------------------------|-----------------------|------------|------------|----------------------------|-----------------|-----------------|
|      |                                                                  |        |                  |             |                        |                                            |                                          |                       |            |            | Rate (mg/Nm <sup>3</sup> ) |                 |                 |
|      |                                                                  |        |                  |             |                        |                                            |                                          |                       |            |            | SPM                        | SO <sub>2</sub> | NO <sub>2</sub> |
| 2    | 110T EAF Fume Extraction+LRF Stack                               | EAF-02 | 70               | 5           | 19.63                  | 766,000                                    | 314.101                                  | 16                    | 130        | 403        | 30                         |                 |                 |
| 8.1  | FLAT/ ROUND/ WIRE/ ROD/ STRUCTURAL/ TMT/ OTHERS MILL (2.55 MTPA) |        |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1    | Reheating Furnace Stack                                          | RH-1   | 60               | 3           | 7.07                   | 92,700                                     | 60.178                                   | 8.52                  | 365        | 638        | 30                         | 176.05          | 114.617         |
| 2    | Reheating Furnace Stack                                          | RH-2   | 60               | 3           | 7.07                   | 92,700                                     | 60.178                                   | 8.52                  | 365        | 638        |                            | 0               | 0.000           |
| 3    | Reheating Furnace Stack                                          | RH-2   | 60               | 3           | 7.07                   | 92,700                                     | 60.178                                   | 8.52                  | 365        | 638        |                            | 0               | 0.000           |
| 4    | Reheating Furnace Stack                                          | RH-2   | 60               | 3           | 7.07                   | 92,700                                     | 60.178                                   | 8.52                  | 365        | 638        |                            | 0               | 0.000           |
| 8.2  | STRIP MILL (1X0.5 MTPA)                                          |        |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1    | Reheating Furnace Stack                                          | RH-1   | 80               | 4           | 12.56                  | 209,000                                    | 135.676                                  | 10.80                 | 365        | 638        |                            | 0               | 0.000           |
| 8.3  | DUCTILE PIPE MILL (2X0.25 MTPA)                                  |        |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1    | Reheating Furnace Stack (for back-up only)                       | RH-1   | 60               | 3           | 7.07                   | 92,700                                     | 60.178                                   | 8.52                  | 365        | 638        |                            | 0               | 0.000           |
| 9    | PRODUCER GAS PLANT (5387 MILLION NM <sup>3</sup> /HR)            |        |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1    | Coal Handling System for Producer Gas Plant                      | PGP-1  | 30               | 2           | 3.14                   | 52,450                                     | 19.906                                   | 6.34                  | 100        | 373        |                            |                 |                 |
| 2    | Coal Handling System for Producer Gas Plant                      | PGP-1  | 30               | 2           | 3.14                   | 52,450                                     | 19.906                                   | 6.34                  | 100        | 373        |                            |                 |                 |
| 3    | Coal Handling System for Producer Gas Plant                      | PGP-1  | 30               | 2           | 3.14                   | 52,450                                     | 19.906                                   | 6.34                  | 100        | 373        |                            |                 |                 |
| 10   | CEMENT PLANT (1+2300 TPD + 1X2600 TPD)                           |        |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1    | Crushing Section                                                 |        | 30               | 2           | 3.14                   | 157,000                                    | 50.800                                   | 17                    | 45         | 318        | 30                         |                 |                 |
| 2    | Raw Mill / Kiln (for 2300 TPD)                                   |        | 80               | 4           | 12.56                  | 704,000                                    | 281.514                                  | 20                    | 120        | 393        | 30                         | 3.8906          | 6.225           |
| 3    | Cement Plant Mill                                                | CP-1   | 60               | 4           | 12.56                  | 950,000                                    | 324.786                                  | 21                    | 63         | 336        | 30                         |                 |                 |
| 4    | Bag Filling / Packing / Product Area                             |        | 35               | 1           | 0.79                   | 30,000                                     | 10.714                                   | 16                    | 78         | 351        | 30                         |                 |                 |
| 5    | Crushing Section                                                 |        | 30               | 2           | 3.14                   | 134,000                                    | 43.358                                   | 17                    | 45         | 318        | 30                         |                 |                 |
| 6    | Raw Mill / Kiln (for 2600 TPD)                                   |        | 80               | 4           | 12.56                  | 600,000                                    | 239.927                                  | 20                    | 120        | 393        | 30                         | 5.1604          | 8.257           |
| 7    | Cement Plant Mill                                                | CP-2   | 60               | 4           | 12.56                  | 809,000                                    | 276.581                                  | 21                    | 63         | 336        | 30                         |                 |                 |
| 8    | Bag Filling / Packing / Product Area                             |        | 35               | 1           | 0.79                   | 25,000                                     | 8.929                                    | 16                    | 78         | 351        |                            |                 |                 |
| 11   | POWER PLANT-10X125TPH + 1x130+3X250TPH FBB                       |        |                  |             |                        |                                            |                                          |                       |            |            |                            |                 |                 |
| 1    | 125 TPH FBB                                                      | FBB-01 | 90               | 2.7         | 5.72                   | 113,750                                    | 48.958                                   | 17.11                 | 150        | 423        | 30                         | 100             | 100             |
| 2    | 125 TPH FBB                                                      | FBB-02 |                  |             |                        | 113,750                                    | 48.958                                   |                       |            |            |                            |                 |                 |
| 3    | 125 TPH FBB                                                      | FBB-03 | 90               | 2.7         | 5.72                   | 113,750                                    | 48.958                                   | 17.11                 | 150        | 423        | 30                         | 100             | 100             |
| 4    | 125 TPH FBB                                                      | FBB-04 |                  |             |                        | 113,750                                    | 48.958                                   |                       |            |            |                            |                 |                 |
| 5    | 125 TPH FBB                                                      | FBB-05 | 90               | 2.7         | 5.72                   | 113,750                                    | 48.958                                   | 17.11                 | 150        | 423        | 30                         | 100             | 100             |
| 6    | 125 TPH FBB                                                      | FBB-06 |                  |             |                        | 113,750                                    | 48.958                                   |                       |            |            |                            |                 |                 |
| 7    | 125 TPH FBB                                                      | FBB-07 | 90               | 2.7         | 5.72                   | 113,750                                    | 48.958                                   | 17.11                 | 150        | 423        | 30                         | 100             | 100             |
| 8    | 125 TPH FBB                                                      | FBB-08 |                  |             |                        | 113,750                                    | 48.958                                   |                       |            |            |                            |                 |                 |
| 9    | 125 TPH FBB                                                      | FBB-09 | 90               | 2.7         | 5.72                   | 113,750                                    | 48.958                                   | 17.11                 | 150        | 423        | 30                         | 100             | 100             |
| 10   | 125 TPH FBB                                                      | FBB-10 |                  |             |                        | 113,750                                    | 48.958                                   |                       |            |            |                            |                 |                 |
| 11   | 250 TPH FBB                                                      | FBB-11 | 110              | 3.8         | 11.34                  | 227,500                                    | 97.917                                   | 17.28                 | 150        | 423        | 30                         | 100             | 100             |
| 12   | 250 TPH FBB                                                      | FBB-12 |                  |             |                        | 227,500                                    | 97.917                                   |                       |            |            |                            |                 |                 |
| 13   | 250 TPH FBB                                                      | FBB-13 | 110              | 2.7         | 5.72                   | 227,500                                    | 97.917                                   | 17.11                 | 150        | 423        | 30                         | 100             | 100             |



| S.N. | Production Units                            |       | Stack Height (m) | Top Dia (m) | Area (m <sup>2</sup> ) | Volumetric Flow Rate (Nm <sup>3</sup> /Hr) | Volumetric Flow Rate (m <sup>3</sup> /s) | Exit Velocity (m/Sec) | Temp. (°C) | Temp. (°K) | Pollutant emission         |                 |                 |
|------|---------------------------------------------|-------|------------------|-------------|------------------------|--------------------------------------------|------------------------------------------|-----------------------|------------|------------|----------------------------|-----------------|-----------------|
|      |                                             |       |                  |             |                        |                                            |                                          |                       |            |            | Rate (mg/Nm <sup>3</sup> ) |                 |                 |
|      |                                             |       |                  |             |                        |                                            |                                          |                       |            |            | SPM                        | SO <sub>2</sub> | NO <sub>2</sub> |
| 14   | Power Plant Raw Material in-plant Dedusting | PP-01 | 45               | 2.5         | 4.91                   | 135,000                                    | 44.368                                   | 9.04                  | 50         | 323        | 30                         |                 |                 |
| 15   | Power Plant Raw Material in-plant Dedusting | PP-02 | 45               | 2.5         | 4.91                   | 135,000                                    | 44.368                                   | 9.04                  | 50         | 323        | 30                         |                 |                 |
| 16   | Power Plant Raw Material in-plant Dedusting | PP-03 | 45               | 2.5         | 4.91                   | 135,000                                    | 44.368                                   | 9.04                  | 50         | 323        | 30                         |                 |                 |
| 17   | Power Plant Raw Material in-plant Dedusting | PP-04 | 45               | 2.5         | 4.91                   | 135,000                                    | 44.368                                   | 9.04                  | 50         | 323        | 30                         |                 |                 |

The gases coming out from the units shown above contain pollutants like particulate matter, SO<sub>2</sub> and NO<sub>2</sub>. These gas streams are a major source of air pollution, if control/ mitigation measures are not incorporated. The control measures are discussed in **Section 4.4.2**.

#### 4.4.1.2 Fugitive emissions

For the purpose of assessing fugitive emission from the plant after expansion to 3.55 MTPA, the sources of fugitive emission have been identified as follows:

**TABLE 4.2: FUGITIVE EMISSION SOURCES AND EMISSION RATES**

| Pollution source<br>Unit / location (legend on map in Fig 2.1, Chapter 2) | Loading area m <sup>2</sup> | Material loaded TPH | Emission rates µg/m <sup>2</sup> -h |          |          |
|---------------------------------------------------------------------------|-----------------------------|---------------------|-------------------------------------|----------|----------|
|                                                                           |                             |                     | SPM                                 | PM10     | PM2.5    |
| Raw material pellet plant                                                 | 30484                       | 365.393             | 2.63E-09                            | 9.85E-10 | 5.66E-10 |
| Raw material complex                                                      | 175328                      | 2101.55             | 2.63E-09                            | 9.85E-10 | 5.66E-10 |
| Raw material complex                                                      | 187212                      | 2243.99             | 2.63E-09                            | 9.85E-10 | 5.66E-10 |
| Solid waste management                                                    | 108447                      | 752.282             | 5.07E-09                            | 1.90E-09 | 1.09E-09 |
| Slag dump management                                                      | 108125                      | 750.049             | 5.07E-09                            | 1.90E-09 | 1.09E-09 |
| Raw material storage                                                      | 139773                      | 1675.37             | 2.63E-09                            | 9.85E-10 | 5.66E-10 |

Since coal is the pre-dominant raw material, the fugitive emission factors have been calculated as per the research presented in “Emission factors for the quantification of dust in Indian Coal Mines” by Mrinal K. Ghose (Published by Center for Mining Environment, ISM, Dhanbad in its "Journal of Scientific & Industrial Research", Vol 63, September 2004 on pages 763-768). Continuous loading and unpaved surfaces have been considered and emission rate has been calculated as follows:

Particulate emission, lb/tonne of material loaded =  

$$(0.0018 \cdot (S/5) \cdot (U/S) \cdot (h/10)) / (((M/2)^2) \cdot 5)$$

Where      S = Silt %, considered as 2.02%  
               U = Wind speed (mph at 4 m AG), considered as 5.725 mph  
               M= Unbound moisture in material (%), considered as 10%  
               h= Drop height (ft), considered as 3.28 ft

#### **4.4.1.3 Simulation model for prediction of ground level concentrations due to stack and fugitive emissions**

In order to predict the impact of the project, air quality prediction modelling has been carried out using US EPA's ISCST3 model. ISC3 short term mode (ISCST3) is a steady-state Gaussian plume model which can be used to assess pollutant concentrations from a wide variety of sources associated with an industrial complex. This model can account for the following: settling and dry deposition of particles; downwash; point, area, line, and volume sources; plume rise as a function of downwind distance; separation of point sources; and limited terrain adjustment.

The following options were considered while modeling to predict the incremental ground level concentrations of pollutants due to emissions from the proposed units.

- The stack and emission details for Proposed unit have been adopted from **Table 4.1 and Table 4.2**.
- The prediction has been done to estimate concentration value over a radial distance of 10 km from the source for receptors outside the project boundary.
- Emission rate was considered constant throughout the averaging period.
- Ground level concentrations were computed without any decay coefficient.
- The micro-meteorological observations made during the study period have been taken as input meteorological data. Calm wind conditions recorded during study period were also considered.

The dispersion modelling has been carried out for the following scenarios:

- Stack and fugitive emissions from stacks & material handling in stock & solid waste yards as approved in EC dated 04/06/2020 for 3.0 MTPA steel plant (Refer **Annexure XX(b)** for input and output data). The stack data has been updated with respect to previous EIA since detailed designing has been carried out in some units and is underway in some units.
- Stack and fugitive emissions from the entire project due to stacks & material handling in stock & solid waste yards (Refer **Annexure XX(a)** for input and output data)

The maximum computed concentrations in the entire study area and on the ambient air quality stations is given in **Table 4.4**.

#### 4.4.1.4 Resultant GLC due to stack emissions and fugitive emissions

The predicted incremental ground level concentration (**Table 4.3 & 4.4**) obtained due to stack emissions and fugitive emissions when superimposed on baseline concentration is high, but within the National Ambient Air Quality Standards for Residential Areas as can be seen in **Table 4.3 and Table 4.5**. It is assumed that while transportation will occur through road initially, the railway siding will be developed in about 5 years time and majority of transportation will shift to rail, thus, the impact of traffic will eventually become negligible.

**TABLE 4.3: CALCULATED MAXIMUM GROUND LEVEL CONCENTRATION FOR EXISTING EC (3.0 MTPA) AND PROPOSED EXPANSION OF PLANT TO 3.55 MTPA (ALL VALUES IN  $\mu\text{g}/\text{m}^3$ )**

| Pollutant         | Incremental GLC |                |                                         | Max. Baseline observed | Resultant     | NAAQS 2009 |
|-------------------|-----------------|----------------|-----------------------------------------|------------------------|---------------|------------|
|                   | 3.0 MTPA        | 3.55 MTPA      | Increment due to expansion by 0.55 MTPA |                        |               |            |
| (a)               | (b)             | (c)            | (d)=(b)-(c)                             | (e)                    | (f) = (c)+(e) | (g)        |
| PM <sub>10</sub>  | 21.31154        | 21.4364        | 0.12486                                 | 70.9                   | 92.3364       | 100        |
| PM <sub>2.5</sub> | 12.25414        | 12.32598       | 0.07184                                 | 42.3                   | 54.62598      | 60         |
| SO <sub>2</sub>   | 28.98054        | 35.32741       | 6.34687                                 | 16.9                   | 52.22741      | 80         |
| NO <sub>2</sub>   | 14.55249        | 14.5858        | 0.03331                                 | 21.5                   | 36.0858       | 80         |
| Refer             | Annexure XX(a)  | Annexure XX(b) |                                         |                        |               |            |

**TABLE 4.4: CALCULATED MAXIMUM INCREMENTAL GROUND LEVEL CONCENTRATION ( $\mu\text{g}/\text{m}^3$ ) AT AMBIENT AIR QUALITY STATIONS**

| Sl. No. | Station name       | PM <sub>10</sub> |           |           | PM <sub>2.5</sub> |           |           | SO <sub>2</sub> |           |           | NO <sub>2</sub> |           |           |
|---------|--------------------|------------------|-----------|-----------|-------------------|-----------|-----------|-----------------|-----------|-----------|-----------------|-----------|-----------|
|         |                    | 3.0 MTPA         | 3.55 MTPA | Increment | 3.0 MTPA          | 3.55 MTPA | Increment | 3.0 MTPA        | 3.55 MTPA | Increment | 3.0 MTPA        | 3.55 MTPA | Increment |
| CA1     | Proposed Core Zone | 6.07             | 6.16      | 0.09      | 3.49              | 3.54      | 0.05      | 28.98           | 32.89     | 3.91      | 10.56           | 10.59     | 0.02      |
| BA1     | Nimidha village    | 4.20             | 4.20      | 0.00      | 2.42              | 2.42      | 0.00      | 9.71            | 11.06     | 1.35      | 4.49            | 4.50      | 0.01      |
| BA2     | Mosonia village    | 4.09             | 4.17      | 0.08      | 2.35              | 2.40      | 0.05      | 9.73            | 11.21     | 1.49      | 4.35            | 4.36      | 0.01      |
| BA3     | Thokar village     | 1.75             | 1.76      | 0.01      | 1.01              | 1.01      | 0.00      | 4.52            | 5.30      | 0.78      | 2.48            | 2.48      | 0.00      |
| BA4     | Nimabahal village  | 4.89             | 4.95      | 0.06      | 2.81              | 2.85      | 0.03      | 9.63            | 11.94     | 2.31      | 5.24            | 5.25      | 0.01      |
| BA5     | Tarkabera village  | 2.82             | 2.79      | -0.03     | 1.62              | 1.61      | -0.02     | 7.92            | 9.34      | 1.42      | 3.16            | 3.17      | 0.01      |
| BA6     | Kadala village     | 6.00             | 6.04      | 0.04      | 3.45              | 3.48      | 0.02      | 11.48           | 13.43     | 1.95      | 4.79            | 4.80      | 0.01      |
| BA7     | Beruan pal village | 5.91             | 5.98      | 0.07      | 3.40              | 3.44      | 0.04      | 25.01           | 28.10     | 3.09      | 9.87            | 9.89      | 0.02      |

**Note : Refer Annexure XX(A) and XX(B) for input & output of model**

**TABLE 4.5: CUMULATIVE IMPACT DUE TO INCREMENTAL AND AMBIENT CONCENTRATION ( $\mu\text{g}/\text{m}^3$ )**

| Pollutant       | Sampling Station   | Base line value | Incremental Values due to stack emissions (refer Table 4.4) | Total |
|-----------------|--------------------|-----------------|-------------------------------------------------------------|-------|
| PM10            | Proposed Core Zone | 70.90           | 0.09                                                        | 70.99 |
|                 | Nimidha village    | 65.80           | 0.00                                                        | 65.80 |
|                 | Mosonia village    | 70.80           | 0.08                                                        | 70.88 |
|                 | Thokar village     | 54.90           | 0.01                                                        | 54.91 |
|                 | Nimabahali village | 68.90           | 0.06                                                        | 68.96 |
|                 | Tarkabera village  | 57.70           | -0.03                                                       | 57.67 |
|                 | Kadala village     | 61.10           | 0.04                                                        | 61.14 |
|                 | Beruan pal village | 69.90           | 0.07                                                        | 69.97 |
| PM2.5           | Proposed Core Zone | 41.70           | 0.05                                                        | 41.75 |
|                 | Nimidha village    | 37.80           | 0.00                                                        | 37.80 |
|                 | Mosonia village    | 42.30           | 0.05                                                        | 42.35 |
|                 | Thokar village     | 31.80           | 0.00                                                        | 31.80 |
|                 | Nimabahali village | 39.90           | 0.03                                                        | 39.93 |
|                 | Tarkabera village  | 32.90           | -0.02                                                       | 32.88 |
|                 | Kadala village     | 36.70           | 0.02                                                        | 36.72 |
|                 | Beruan pal village | 42.20           | 0.04                                                        | 42.24 |
| SO <sub>2</sub> | Proposed Core Zone | 13.20           | 3.91                                                        | 17.11 |
|                 | Nimidha village    | 11.50           | 1.35                                                        | 12.85 |
|                 | Mosonia village    | 16.90           | 1.49                                                        | 18.39 |
|                 | Thokar village     | 9.30            | 0.78                                                        | 10.08 |
|                 | Nimabahali village | 14.60           | 2.31                                                        | 16.91 |
|                 | Tarkabera village  | 10.00           | 1.42                                                        | 11.42 |
|                 | Kadala village     | 13.30           | 1.95                                                        | 15.25 |
|                 | Beruan pal village | 14.00           | 3.09                                                        | 17.09 |
| NO <sub>2</sub> | Proposed Core Zone | 17.70           | 0.02                                                        | 17.72 |
|                 | Nimidha village    | 16.90           | 0.01                                                        | 16.91 |
|                 | Mosonia village    | 21.40           | 0.01                                                        | 21.41 |
|                 | Thokar village     | 13.00           | 0.00                                                        | 13.00 |
|                 | Nimabahali village | 21.50           | 0.01                                                        | 21.51 |
|                 | Tarkabera village  | 13.80           | 0.01                                                        | 13.81 |
|                 | Kadala village     | 18.80           | 0.01                                                        | 18.81 |
|                 | Beruan pal village | 16.90           | 0.02                                                        | 16.92 |

A perusal of above table shows that the pollutant concentrations in the ambient air will remain below the National Ambient Air Quality Standard prescribed by CPCB (**Annexure VIII**). The highest resultant values at

ambient air quality stations are likely to be 92.336  $\mu\text{g}/\text{m}^3$ , 54.626  $\mu\text{g}/\text{m}^3$ , 52.227  $\mu\text{g}/\text{m}^3$  and 36.086  $\mu\text{g}/\text{m}^3$  for PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub> and NO<sub>2</sub> which will be well within the permissible limits for residential and rural areas after adding to the baseline values. (Standards for PM<sub>10</sub> is 100  $\mu\text{g}/\text{m}^3$ , PM<sub>2.5</sub> is 60  $\mu\text{g}/\text{m}^3$ , SO<sub>2</sub> 80  $\mu\text{g}/\text{m}^3$  and NO<sub>2</sub> 80  $\mu\text{g}/\text{m}^3$  as per CPCB).

#### 4.4.1.6 Cumulative impact due industries in study area

Cumulative impact assessment for industries within 2 km is usually been carried out in the past. There are no industries within 2 km radius of the proposed project.

#### 4.4.2 Management of air quality

Following mitigation measures shall be taken:

##### a) Construction phase

- Water spraying on material to be handled before beginning work and spraying on unpaved surfaces twice a day will improve the working conditions and minimize dust pollution.
- Water spraying during loading and unloading operations to be carried out, where applicable
- The designated areas for roads and parking spaces shall be black topped at the earliest.
- Transportation to be carried out in covered trucks.
- Transport vehicles shall be maintained leak proof to avoid spillage of rubble and soil.
- Welding operations shall be carried out within cordoned areas.
- Preventive maintenance of all trucks, earthmovers and construction equipment to be done as per manufacturers norms

The mitigation measures will apply both on plant buildings and colony construction. As per AP-42 of US EPA, the recommended measures for various activities during construction phase are summarised in **Table 4.6**.

**TABLE 4.6: RECOMMENDED MEASURES FOR CONTROL OF FUGITIVE EMISSIONS DURING CONSTRUCTION**

| Emission Source               | Recommended Control Method(s)                                  |
|-------------------------------|----------------------------------------------------------------|
| Debris handling               | Wind speed reduction, Wet suppression <sup>#</sup>             |
| Truck transport <sup>##</sup> | Wet suppression, Paving<br>Chemical stabilization <sup>^</sup> |
| Bulldozers                    | Wet suppression <sup>^^</sup>                                  |
| Pan scrapers                  | Wet suppression of travel routes                               |

| Emission Source            | Recommended Control Method(s)                                            |
|----------------------------|--------------------------------------------------------------------------|
| Cut/fill material handling | Wind speed reduction, Wet suppression                                    |
| Cut/fill haulage           | Wet suppression, Paving, Chemical stabilization                          |
| General construction       | Wind speed reduction, Wet suppression<br>Early paving of permanent roads |

# *Dust control plans should contain precautions against watering programs that confound track out problems.*

## *Loads could be covered to avoid loss of material in transport, especially if material is transported offsite.*

^ *Chemical stabilization usually cost-effective for relatively long-term or semi-permanent unpaved roads.*

^^ *Excavated materials may already be moist and not require additional wetting. Furthermore, most soils are associated with an " optimum moisture" for compaction.*

#### **b) During operation phase**

The air quality prediction exercise carried out for stack, fugitive and traffic emissions gave maximum resultant ground level concentrations of 92.336  $\mu\text{g}/\text{m}^3$ , 54.626  $\mu\text{g}/\text{m}^3$ , 52.227  $\mu\text{g}/\text{m}^3$  and 36.086  $\mu\text{g}/\text{m}^3$  for PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub> and NO<sub>2</sub>. These resultant concentrations are within the required standards.

Following general control measures shall be adopted for controlling air pollution:

- Use of After Burning Chamber in the DRI units for combustion of CO.
- Use of high efficiency electrostatic precipitators in case of DRI kilns, sinter plant and power plants
- Keeping appropriate stack height as per CPCB norms.
- Dust extraction system with bag filters shall be provided at different places, such as kiln inlet area, crushing unit, cooling out let area
- PM from level below 30  $\text{mg}/\text{Nm}^3$  will be released from DRI kiln and sinter plant, 30  $\text{mg}/\text{Nm}^3$  at BF stove, WHRB exit (based on DRI, MBF & coke oven gases) and in all other sub-units below 30  $\text{mg}/\text{Nm}^3$ . Some of these emissions will be equal or much below the norms specified by MOEF&CC vide GSR 414(E) dated 30.05.2008, GSR 277(E) dated 31/03/2012 and SO 3305(E) dated 07.12.2015. Even though the permissible limit for PM emissions is 250  $\text{mg}/\text{Nm}^3$  for rolling mills, the emissions are not expected to go that high in view of the fuels proposed to be used. Furthermore, the reheating furnaces will be operational for about 20% of the time since hot charging is envisaged for 80% of the time.
- Gas Cleaning Plant will be incorporated in the blast furnace.

- Dust and fume extraction systems will be incorporated in the electric arc furnace and the induction furnaces for control of dust and fumes
- Rungta Mines Limited (Dhenkanal Steel Plant) will install advanced controller based ESPs, PTFE based high volume bag filters
- The use of dolomite, limestone as additive in the kilns (DRI, clinker, etc) will reduce SO<sub>2</sub> emissions significantly.
- Controlled combustion air supply, controlled combustion temperature and use of low NO<sub>x</sub> burners will control NO<sub>2</sub> formation in all sub-unit
- Fugitive dust due to handling of coal and iron ore and other raw materials etc. will be controlled by sprinkling /dust extraction system.
- Waste heat recovery boiler to utilize waste heat from exit DRI gases, coke oven gas and MBF gas for generation of steam and subsequently power.
- Leakage from the equipment, ducts and transfer points shall be regularly checked and stopped.
- Development of green belt will help to check air pollution
- All fugitive emissions will be minimized.
- Regular monitoring and awareness among workers will help in controlling air pollution.

The colony is not anticipated to have any emissions during operation since only people will be living there. The fuel that they will consume will be in cooking or driving. It will be ensured that only cylinder gas is used for cooking and vehicles in the premises have 'Pollution Under Check' Certificate at the most, the DG set will operate in.

### ***Fugitive emissions control***

Control and mitigation measures specifically for fugitive dust emissions are as follows:

1. Dust extraction systems, with bag filters will be provisioned at all transfer points and crushing/ grinding operations. Dust laden air will be drawn through ID Fans, and passed through bag filters to bring down the dust content below 30 mg/Nm<sup>3</sup>. The clean air will be discharged into the atmosphere.
2. Few raw materials and most finished product will be stored in covered sheds.
3. Water sprinkling will be done regularly over all open storage dumps of solid wastes and raw materials.

4. In order to prevent the spread of fugitive dust, green belt of adequate width will be developed all along the plant boundary.

#### **4.4.3 Control of emissions from various sub-units**

##### **4.4.3.1 Stack emissions from DRI plant**

- The flue gas coming out from the rotary kiln passes through a dust settling chamber, in which the heavier dust is settled down. The bottom of the dust settling chamber is immersed in the wet scrapper water which is working as the sealing to avoid the gas leakage and false air entry.
- Then the gas passes through the After Burning Chamber (A.B.C.) in which the carbon monoxide and un-burnt carbon are burnt completely and converted into CO<sub>2</sub>.
- The flue gas is taken to the Waste Heat Recovery Boiler (WHRB), where the recoverable heat is utilized for generation of high pressure steam.
- The flue gas is next passed through an electro static precipitator (ESP), where the particulate matter concentration is reduced to less than 30 mg/Nm<sup>3</sup>.
- Control of SO<sub>2</sub> is achieved by provision of adequate height to the stack. The heights of the stacks have been determined by estimated 'S' contents in coal and CPCB guideline. About 90-95% sulphur from coal can be absorbed by the limestone. For the purpose of air quality prediction modelling, only 80% has been assumed as worst case scenario.

##### **4.4.3.2 Stack emissions from steel melting shop**

In order to control the air pollution in the induction furnace, dust extraction system will be installed. It consists of a suction hood, a cyclone and a bag filter. The suction hood is mounted on the head of furnace, the flue gases will be sucked through the hood. The blower sucks the flue gases through the hood and along the pipe, which is connected to the cyclone and filter. The cyclone and filter separate the solid particles. These particles fall to the bottom and are collected and removed. The clean air is exhausted through the Air Vent, in which the dust concentration will be much less than the limit of 30 mg/Nm<sup>3</sup>.

##### **4.4.3.3 Stack emissions from blast furnace**

- **Gas Cleaning Plant:**

The major source of pollution in the blast furnace is top gas. The top gas from the furnace will flow through four off-takes and a single down-comer into the dust catcher for primary cleaning. Here, major portion of the dust in



the gas is separated. The bottom of the dust catcher is fitted with a pug mill for withdrawing the dust and loading it on to self-dumping type trucks. The semi-clean gas is further cleaned in a high energy dry scrubber gas cleaning unit in two stages. The scrubber controls the furnace top pressure. The scrubber outlet gas will have a maximum dust content of 30 mg/Nm<sup>3</sup>. The dust from the gas-cleaning unit will be reused in the sinter plant.

The blast furnace flue gas will be passed through Waste Heat Recovery Boilers for power generation. Thereafter, the gas will be used as fuel in blast furnace stove, reheating furnaces or elsewhere after cleaning in Gas Cleaning Plant. Unutilised gas will be flared.

- ***Dust and fume extraction systems:***

They will be provided for the stock house. Necessary hoods and duct work will be installed inside the buildings to control the pollution levels. The dust-laden air will be passed through bag filter where the dust will be collected before the gases are exhausted through ID fans to the tall stacks.

#### **4.4.3.4 Stack emissions from WHRB and FBC boilers**

- High efficiency electrostatic precipitator has been provided for separation of dust from the flue gas. The ESP would bring down the concentration of particulate matter to less than 30 mg/Nm<sup>3</sup> level. Overall efficiency of ESP will be around 99.50%.
- For control of SO<sub>2</sub>, a stack of adequate height shall be provided. Lime dosing at atleast 2T/hr shall be done. The dosing will be done as per sulphur content of fuel.
- Low NOx burners shall be used to minimise NOx generation.
- The boiler bottom hoppers and E.S.P. hoppers will be provided with a dense phase ash handling system. The dust collected from these hoppers will be sent to an ash silo by pneumatic conveying system. The ash stored in the ash silo will be taken to the solid waste disposal site for storage and final disposal to brick manufacturing plants of the company and others as well as own proposed cement plant.

#### **4.4.3.5 Emissions from Sinter plant**

Centralised plant dedusting system will be installed to provide dust free working atmosphere in sintering plant. All dust generating points will be covered. The dust laden air will be sucked through hoods and duct work and clean the air in ESP before releasing into the atmosphere through the stack.

Dust will be collected in hoppers which will be fitted with double cone valves to discharge dust without air leakage. Dust collected below the sinter

strands and in the ESP will be transported to the proportioning building and recycled in the sinter making process.

#### **4.4.3.6 Emissions from Pelletisation Plant**

High efficiency electrostatic precipitators will be used with indurating furnace to control emissions. The stack height has also been calculated based on CPCB norms. Dust extraction system with bag filters shall be provided at various locations as shown below:

| Sub-unit of pellet plant     | Air Pollution Control Measure | Maximum Emission, mg/m <sup>3</sup> |
|------------------------------|-------------------------------|-------------------------------------|
| 1. Raw material Handling     | Bag Filter                    | 30                                  |
| 2. Travelling Grate          | ESP                           | 30                                  |
| 3. Finished product Handling | Bag Filter                    | 30                                  |

Low NOx burners will be used in indurating furnace. Fugitive dust due to handling of coal and iron ore and other raw materials etc. will be controlled by sprinkling/ dust extraction system. Leakage from the equipment, ducts and transfer points shall be regularly checked and stopped.

#### **4.4.3.7 Emissions from Coal washery**

1. Transportation of the coal will be through completely enclosed conveyors to avoid fugitive emissions. The transfer points will be provided with water sprays to avoid dust generation.
2. All the crushers and screens will be erected on vibration absorbing platforms to avoid noise and vibrations.
3. The crushers and screens will be provided with acoustic enclosures to reduce noise in ambient environment.
4. Workers working near high noise generating machineries will be provided with ear plugs/muffs.

#### **4.4.3.8 Emissions from Coke Oven Plant**

Uncontrolled fugitive particulate emissions are associated with material handling operations. These operations consist of unloading, storing, grinding / crushing. Dry fog type dust suppression system will be installed in the coal preparation unit including crushers, screens, etc.

Oven charging in non-recovery type ovens produces insignificant emissions of particulate matter and organic compounds because of negative pressure inside ovens. Proper charging techniques normally allow most charging emissions to be captured by the battery collecting main. During the coking cycle of 66 hours, uncontrolled organic compound emissions from the thermal distillation process may occur through poorly sealed doors, charge

lids, off take caps, collecting main, and through cracks that may develop in oven brickwork. Door leaks will be controlled by diligent cleaning and maintenance, rebuilding, and by manual application of eluting material to the door seal. An effective patching may control charge lid and off take leaks and eluting program. Adequate flue gas desulphurization system shall be adopted for the coke oven.

Pushing coke out of coke ovens and into a quench car is a major source of particulate emissions. If the coke mass is not fully coked (green coke), gaseous pollutants will be emitted. Pushing emissions are minimized by using mobile scrubber cars with hoods, shed enclosures evacuated to gas cleaning devices like cyclone and bag houses, or traveling hoods with a fixed duct leading to a stationary gas cleaner. The outlet of bag filter will be connected to stack.

The coke dust collected by dust collector shall be delivered to the dust storage bin and finally shall be transported out by trucks after humidifying treatment. The dust transfer system shall be totally enclosed and dust suction hoods shall be installed in each dust generation point, which shall be connected to the ground de-dusting system. The whole system shall be PLC controlled.

The quenching facilities will also be appropriately designed with demister system to trap particulate matter emission. This is necessary because quenching hot coke with cold water creates thermal shock, releasing particulate matter from hot coke. Water vapor from water heated during contact with hot coke rises from quenched coke and entrains particulate matter from the coke mass. In addition, dissolved solids from the quench water may also become entrained in the steam plume rising from the tower.

#### **4.4.3.9 Emissions from Producer Gas plant:**

The coal handling plant in the PGP shall have bag filter and dry fog systems while the gas emission from coal gasification process containing tar shall be directly used in pellet plant by feeding to kiln and burned. Kiln flue gas is passed through ESP before releasing to the atmosphere.

#### **4.4.3.10 Emissions from Ductile Pipe Plant:**

1. Provision of bag filter and ID fan
2. Annealing Furnace- scrubber and ID fan (when heating will be done by burning of Furnace Oil)
3. Air Pollution from magnesium converter, zinc coating units will be taken care of by installing bag filter and ID fan
4. Air pollution from Bitumin/ Epoxy Painting unit shall be taken care by installing flue air duct connected to a chimney via scrubber and ID fan
5. Fugitive emissions control from various transfer points/ storage areas, etc. by bag filters, suction hoods, dust collector systems and dust suppression systems.

6. Regular maintenance of plant/ machinery will reduce noise and keep it under 70 db(A)
7. Ear pugs to be given to workers in the ductile pipe plant area.

#### 4.4.3.11 Emissions from Cement Plant

- For dedusting of Kiln/Raw Mill gases, RABH has been envisaged which shall keep the dust content in exhaust gases below 30 mg/Nm<sup>3</sup>. The main exhaust stack of the kiln will be kept sufficiently high to enable the dispersion of the dust particles over a larger area.
- For dedusting of gases from the clinker cooler, existing ESP modification has been considered which shall keep dust content in exhaust gases below 30 mg/Nm<sup>3</sup>.
- For drying of coal in the drying-cum-grinding operation of coal, kiln exhaust gases shall be used.
- Bag filter has been envisaged for dedusting of coal mill vent gases, which shall maintain a clean dust content of less than 30 mg/Nm<sup>3</sup>.
- All other dust sources are considered as secondary sources as these are not process implied. These will have -
  - Dust suppression systems on the hopper to suppress the generated during unloading of trucks in dump hoppers.
  - Nuisance bag filters on raw material transport section, corrective material transport section, raw material grinding section, raw meal silo section, clinker handling section, clinker transport section, additive material handling section, cement mill hopper section, cement mill section and cement silo section.

#### 4.4.3.12 Summary of air pollution control systems used and their efficiency

A summary of the various air pollution control systems in various units of the integrated steel plant is given in **Table 4.7**.

**TABLE 4.7: SUMMARY OF AIR POLLUTION CONTROL SYSTEMS**

| Sl. No. | Name of Unit           | Air Pollution Control Device          | % Efficiency (approx)   |
|---------|------------------------|---------------------------------------|-------------------------|
| 1.      | Sponge Iron Plant      | ESP                                   | 99.95                   |
| 2.      | DRI Dedusting          | ESP / Bag House                       | 99.90                   |
| 3.      | Sinter Plant Dedusting | ESP                                   | 99.95                   |
| 4.      | Sinter Machine         | ESP                                   | 99.98                   |
| 5.      | Blast Furnace          | Multicyclone & dry gas cleaning plant | 85% & 95%               |
| 6.      | BF Stock House         | Bag Filters                           | 99.6                    |
| 7.      | SMS (EAF)              | FES and Bag Filters                   | Capture efficiency – 96 |

| Sl. No. | Name of Unit                                          | Air Pollution Control Device | % Efficiency (approx)   |
|---------|-------------------------------------------------------|------------------------------|-------------------------|
| 8.      | SMS (IF)                                              | FES and Bag Filter           | Capture efficiency -95  |
| 9.      | SMS Plant Dedusting                                   | Bag Filters                  | 99                      |
| 10.     | Rolling/ strip/ ductile pipe Mill (reheating furnace) | Bag filter                   | 95                      |
| 11.     | Coke Oven                                             | Scrubber                     | 90                      |
| 12.     | Power Plant (AFBC)                                    | ESP                          | 99.98                   |
| 13.     | Pelletisation plant                                   | ESP, Bag filter              | 99.95, 98               |
| 14.     | Ferro alloys plant                                    | FES and Bag Filters          | Capture efficiency – 95 |
| 15.     | Washery                                               | Bag filter                   | 99.5                    |
| 16.     | Cement mill                                           | RABH, Bag filters            | 99.5, 95                |

**Abbreviation: Fume extraction system; ESP- electrostatic precipitator, RABH - Reverse Air bag filter**

## 4.5 LAND ENVIRONMENT

### 4.5.1 Impact on Land & its Management

**Construction phase:** The possible impact on landform of the area will occur due to land grading, digging, filling, excavation of earthworks, making roads, boundary wall and plant related civil construction activity. Exact volume of excavated earthworks is difficult to estimate at this preliminary stage. The plant layout has been designed after considering the slope of the land. No earth will be brought from outside or disposed outside the premises, if possible. In case filling is required in any portion of the land, it shall be done by using solid waste from other plants of the Company. Any excavated earth will be stored at earmarked place with proper slopes and utilized for levelling and landscaping purpose within the plant premises. The surplus earth generated during excavation will be used for grading work, utilized in making approach road and landscaping activities. Compaction of the reclaimed land will be done and the area will be regenerated with trees and bushes. Excavation work will be carried out during dry season and avoided during rainfall events to prevent soil erosion and washout of excavated materials.

**Operation:** The land use of the core area will be changed during the construction and the operation phases. Land use of the land already under possession of the project proponent has been changed to industrial. The plant will be spread over 1769 acres land. During construction phase, parts of the project area will be converted into internal roads, water reservoir, buildings, green belt and plantation, etc. The features of the plot will undergo changes due to construction. The resultant land uses within the plot is shown in **Table 4.8**.

TABLE 4.8: BREAK UP OF PLOT AREA

| Sl. No. | Description                                       | Sanctioned as per EC |            | Proposed Additional | Total after Expansion |              |
|---------|---------------------------------------------------|----------------------|------------|---------------------|-----------------------|--------------|
|         |                                                   | Area                 | %          | Area                | Area                  | %            |
| 1       | Plants, facilities                                | 273.685              | 40.56      | 442.715             | 716.4                 | 40.50        |
| 2       | Stock yards, raw material complex, railway siding | 51.81                | 7.68       | 76.19               | 128                   | 7.24         |
| 3       | Area for solid waste                              | 55.2                 | 8.18       | 60.8                | 116                   | 6.56         |
| 4       | Green belt & plantation                           | 222.67               | 33.00      | 361.33              | 584                   | 33.01        |
| 5       | Administration & other buildings                  | 1.4                  | 0.21       | 28.6                | 30                    | 1.70         |
| 6       | Water reservoir                                   | 30                   | 4.45       | 30                  | 60                    | 3.39         |
| 7       | Roads                                             | 40                   | 5.93       | 60.6                | 100.6                 | 5.69         |
| 8       | Colony                                            | 0                    | 0          | 34.0                | 34.0                  | 1.92         |
|         | <b>Total</b>                                      | <b>674.765</b>       | <b>100</b> | <b>1094.235</b>     | <b>1769</b>           | <b>100.0</b> |

Three tier greenbelt (10 m wide) will be developed all along the plant boundary so that the visual aesthetic is improved, it acts as a pollutant sink, forms a barrier against noise propagation and forms a micro-habitat for small sized fauna.

#### 4.5.2 Soil quality

**Impact:** Soil quality might change during construction phase due to handling of construction material but may also change during operation due to open yard storage of raw materials like iron ore, coal and limestone. Further, temporary storage of solid wastes like char, ESP dust, sludge from DRI/ blast furnace, FES dust, BF slag, fly ash, etc. and slightly longer storage of tailings, rejects from washery and DRI kiln accretions in solid waste storage yard would also deteriorate soil quality, if appropriate control and mitigation measures are not implemented. The topsoil generated during construction will be preserved and spread over the area identified for development of green belt and afforestation.

**Management:** The waste disposal area shall be lined by impervious material. The raw material stack yard will also be having concrete impervious base to protect the soil below it. All stock piles will have a stable liner to avoid leaching of materials to ground water. The run off and leachates from the raw materials stack yard and solid waste disposal yard,

respectively, shall not be allowed to mix with storm water drainage but led to settling tank where from they will be released into the common monitoring basin for reuse.

## 4.6 WATER ENVIRONMENT

### 4.6.1 Water consumption

Total fresh water requirement for the operation of entire 3.55 MTPA complex is estimated as 3752 m<sup>3</sup>/hour. Water shall be sourced from Brahmani River. The other source of water will be the recycled water within the plant, collected from various sub-units in a common monitoring basin after decentralised treatment (if needed for that sub-unit). From the common monitoring basin, the water will be reused for dust suppression, sprinkling, ash quenching, fly ash brick plant and green belt watering inside and outside plant area.

The company does not propose to use ground water for any purpose during operation of the plant.

### 4.6.2 Waste water generation from various sources

The waste water generation from various sources is given in **Table 4.9**.

**TABLE 4.9: WASTE WATER GENERATION FROM VARIOUS SOURCES FOR ENTIRE PLANT (3.55 MTPA)**

| Plant facilities                                 | Waste Water generated | Reused     | Waste water utilisation                                                                                                   |
|--------------------------------------------------|-----------------------|------------|---------------------------------------------------------------------------------------------------------------------------|
| Beneficiation                                    | 120                   | 120        | Reused in beneficiation plant                                                                                             |
| Coal Washery                                     | 74                    | 74         | Reused in washery                                                                                                         |
| Pellet Plant                                     | 177                   | 177        | Into Common Monitoring basin and thereafter utilised for Ash quenching fly ash brick making Horticulture Dust suppression |
| Mini Blast Furnace                               | 73                    | 73         |                                                                                                                           |
| Sinter plant                                     | 8.0                   | 8.0        |                                                                                                                           |
| Steel Melt Shop                                  | 5                     | 5          |                                                                                                                           |
| Flat/Round/Wire/Rod/ Structural Mill             | 5                     | 5          |                                                                                                                           |
| Strip Mill/Sheet/Coil/ Wire & Bar Mill/Wire Rope | 1                     | 1          |                                                                                                                           |
| Producer Gas Plant                               | 154                   | 154        |                                                                                                                           |
| Power Plant                                      | 138                   | 138        | Treated in STP and used in green belt                                                                                     |
| Drinking Water and Sanitary                      | 10                    | 10         |                                                                                                                           |
| <b>Grand Total</b>                               | <b>765</b>            | <b>765</b> |                                                                                                                           |

The water consumption and waste water generation along with its route for reutilisation is given in **Fig 2.16** of Chapter 2.

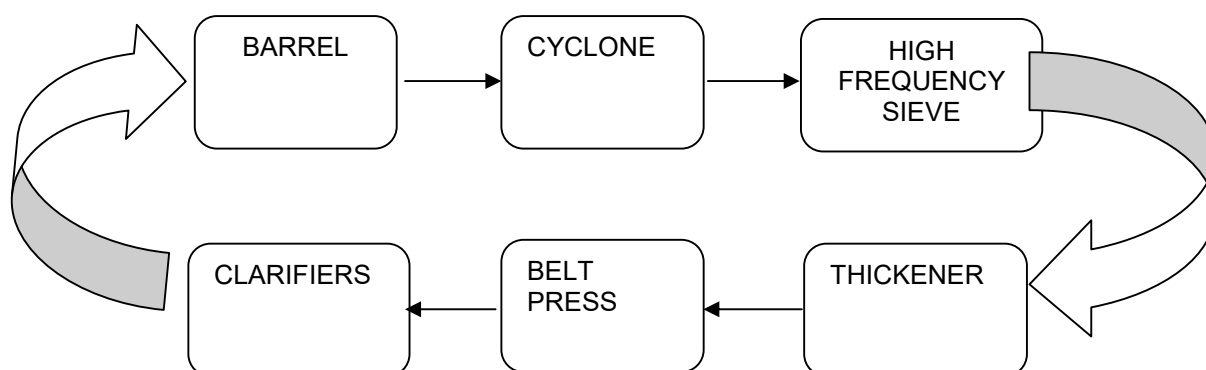
#### 4.6.3 Waste water sources and treatment

Waste water generation from the operation phases will be on account of the following activities which are described along with the treatment option:

1. The prevention and control of water pollution aims at conserving the make-up water by recycling more than 90% of the waste water. However, occasionally small quantities of effluents have to be discharged to prevent build up of excess dissolved solids. **Industrial waste water** comprising blow downs from cooling towers and boilers, DM unit regeneration waste water, wastewater from water pre-treatment, effluent from service water uses like plant washings, leakages, etc. and effluents from various sub-units contain high TDS & SS and will be collected in a “common monitoring basin (CMB)” sump and utilized for dust suppression, ash handling, fly ash brick making and horticulture.
2. **DM Plant-** In the chemical water treatment plant, acidic and alkaline effluents are generated during the generation of cation /anion and the mixed bed exchangers. The effluents from the chemical water treatment plant will be led to a properly sized impervious, neutralization pit. Normally these effluents are self-neutralizing. But, provision will be made for dosing lime into the neutralizing pit to ensure the sufficiently high pH value before these effluents are reused.
3. **Run off** (during rainfall days and monsoon) from coal and iron ore handling areas and run off from solid waste storage & handling areas. will be routed through catch pits of sufficient volume to settle out suspended solids present in the storm water runoff.
4. **Washery waste water** will be recycled in its five stage treatment system and 100% reuse achieved by recirculating the treated water back to the washery.

The media water after being used for washery operations will be screened through a five stage clarification process and all the suspended particulate matter would be squeezed and the clear water is recycled back to the process. The five stage clarification can be schematically depicted in **Fig 4.1**.

**FIG 4.1: PROPOSED FIVE STAGES OF CLARIFICATION IN WASHERY**





5. In the **iron ore beneficiation plant**, the waste water will be sent to the tailing pond wherefrom the overflow will be recirculated back to the iron ore beneficiation plant. 100% reuse is anticipated.
6. **Sewage from plant buildings & colony-** Sewage from the toilets, washrooms, canteen and colony will be treated in STP & soak pit systems. A sequential MBBR technology is planned to be installed with the capacity of 250 m<sup>3</sup>/day. The treated water from the STP will be utilised in green belt development. Zero discharge concepts are planned for the project.
7. **Workshop:** Oil & grease during repair and maintenance of machinery and vehicles will get spilled for which the water collected in the workshop will be passed through oil-water separator (OWS) to remove oil & grease. The water from plant washing or maintenance work will also be passed through OWS to collect oil & grease, which will be stored in a separate container and disposed to authorized recycling vendor.
8. **DI Pipe plant:** In DI pipe plant water is required mainly for cooling the casting machines. The estimated fresh water requirement is about 45 cum/hr. This water will be recirculate back to systems.

#### 4.6.4 Summary of effluent sources and their control systems

The list of water pollution control systems envisaged are summarised in **Table 4.10**.

**TABLE 4.10: LIST OF WATER POLLUTION CONTROL SYSTEMS ENVISAGED**

| Source                                                                        | Pollutants                                      | Control systems                                                                                                   |
|-------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Raw materials handling yards                                                  | Suspended Solids                                | Garland drains, Catch pits and settling tanks                                                                     |
| DM water plant                                                                | pH                                              | Neutralising pit                                                                                                  |
| Cooling tower blow down, Boiler blow down and effluent from various sub-units | Temperature, Suspended Solids, Dissolved solids | Common monitoring basin and reuse in dust suppression, ash management, fly ash brick manufacturing & horticulture |
| Washery                                                                       | Suspended Solids                                | Five stage treatment system                                                                                       |
| Beneficiation plant                                                           | Suspended Solids                                | Tailing pond                                                                                                      |
| Canteens, toilets                                                             | BOD, Suspended Solids                           | Septic tank                                                                                                       |
| Storm water drains                                                            | Suspended solids                                | Desilting chamber prior to storage in rain water harvesting ponds and raw water reservoir                         |

#### 4.6.5 Ground water pollution and management plan

As such the plant working has been planned on zero discharge basis therefore no pollution of any form is anticipated on account of industrial activity. As no effluent will be released leading to contamination of surface or underground water.

The company does not propose to use ground water for any purpose during operation of the plant, hence, no adverse impact on account of industrial activity is foreseen. However the company proposes to enhance ground water recharge by adopting artificial recharge practice.

#### 4.6.6 Rain water harvesting

It is planned to harvest rain water from the plot area as well as from out of it to collect and store it in the surface water reservoir for plant use.

Rain water harvesting is planned in the plot area. It is proposed to collect the rain water in the surface water reservoir. The water that shall get collected in the surface water reservoir is calculated in **Table 4.11**.

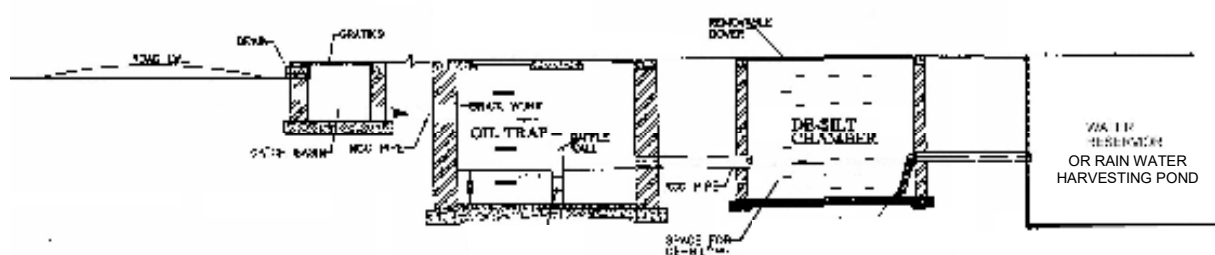
**TABLE 4.11: RAIN WATER HARVESTING PROPOSAL FOR PROJECT SITE**

|                                             | Area, ha | Runoff co-efficient | Rainfall Avwrag e MM | Run off harvested, cum/ year | Remark                                                    |
|---------------------------------------------|----------|---------------------|----------------------|------------------------------|-----------------------------------------------------------|
| (1) Plants, facilities & tailing pond, part | 716.4    | 0.8                 | 1216.4               | 6971432                      | To rain water harvesting pond(s)                          |
| (2) Stock yards & railway siding            | 128      | 0.5                 | 1216.4               | 778496                       | To settling tank & then rain water harvesting pond(s)     |
| (3) Area for solid waste                    | 116      | 0.5                 | 1216.4               | 705512                       | To settling tank & then common monitoring basin for reuse |
| (4) Green belt & plantation                 | 584      | 0.3                 | 1216.4               | 2131133                      | To Rain water harvesting trenches                         |
| (5) Administration & other buildings        | 30       | 0.8                 | 1216.4               | 291936                       | To Rain water harvesting pits                             |
| (6) Water reservoir                         | 60       | 1                   | 1216.4               | 729840                       | Directly into Raw water reservoir                         |
| (7) Roads                                   | 100.6    | 0.7                 | 1216.4               | 856589                       | To desilting chambers and the rain water harvesting pits  |
| (8) Colony                                  | 34       | 0.8                 | 1216.4               | 330861                       | To Rain water harvesting pits                             |
| Total                                       | 1769     |                     |                      | 12795799                     |                                                           |
| Reused for plant (1)+(2)+(3)+(6)            |          |                     |                      | 9185280                      | 71.78%                                                    |
| Recharged to ground (4)+(5)+(7)+(8)         |          |                     |                      | 3610519                      | 28.22%                                                    |

Ignoring losses, it can be seen that water harvesting shall help meet 55 days water requirement of the plant and, therefore, reduce withdrawal from the river.

The surface run off water shall be passing through settling chambers before reaching the reservoir or rain water harvesting ponds to reduce suspended particulate load. It is proposed to have atleast two separate rain water harvesting ponds with cumulative area of 2 ha and depth 5, capable of storing about 1 lakh cum of water. Once the suspended solids settle further in the rain water harvesting pond, the water will be pumped to the raw water reservoir for utilisation. The typical settlement system is shown in **Fig 4.2**.

**FIG 4.2: RAIN WATER OIL TRAP AND DESILTING CHAMBER PRIOR TO RESERVOIR**



## 4.7 SOLID WASTE

### 4.7.1 Solid waste generation and impact

The characteristics of solid waste generated is given in the **Table 4.12**. The likely solid waste generated from entire plant facilities is given in **Table 4.13**.

**TABLE 4.12: SOLID WASTE CHARACTERISTICS**

| Sl. No.              | Source              | Characteristics                                                                                                                                                                                                    |
|----------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DRI Plant</b>     |                     |                                                                                                                                                                                                                    |
| 1                    | Char                | Ash 60%, C 32%, H <sub>2</sub> O 3.5%, VM 1.5%                                                                                                                                                                     |
| 2                    | Coal fines          | Ash 55 %, C 35%                                                                                                                                                                                                    |
| 3                    | ESP & In plant Dust | Fe 10-15%, C 35%, Ash 50%                                                                                                                                                                                          |
| 4                    | Kiln Accretion      | Fe 60-80%, C 3-5%, Ash 15-25%                                                                                                                                                                                      |
| <b>Blast Furnace</b> |                     |                                                                                                                                                                                                                    |
| 5                    | Slag                | FeO 25-28%, CaO 50%, MnO 3-5%, Al <sub>2</sub> O <sub>3</sub> 4-6%, SiO <sub>2</sub> 20-22%, MgO 5-7%                                                                                                              |
| 6                    | MBF Flue Dust       | Fe 45-55%, CaO 18-20%, SiO <sub>2</sub> 2-4%, Al <sub>2</sub> O <sub>3</sub> 3-4%, Fe <sub>2</sub> O <sub>3</sub> 60-70%, SiO <sub>2</sub> 5-7%, Al <sub>2</sub> O <sub>3</sub> 1-2%, CaO 5-7%, MgO 3-4%, C 10-12% |
| 7                    | GCP Sludge          | Fe <sub>2</sub> O <sub>3</sub> 60-70%, SiO 5-7%, AlO <sub>3</sub> 1-2%, CaO 5-7%, MgO 3-4%, C 10-12%                                                                                                               |
| <b>SMS</b>           |                     |                                                                                                                                                                                                                    |
| 8                    | IF & LRF Slag       | CaO 40-60%, SiO 12-18%, MgO 4-7%, Fe <sub>2</sub> O <sub>3</sub> 5-7%                                                                                                                                              |

| Sl. No.             | Source    | Characteristics                                                          |
|---------------------|-----------|--------------------------------------------------------------------------|
| <b>Power Plant</b>  |           |                                                                          |
| 9                   | Fly Ash   | SiO <sub>2</sub> 55-60%, Al <sub>2</sub> O <sub>3</sub> 25-30%, CaO 2-5% |
| <b>Coal Washery</b> |           |                                                                          |
| 10                  | Middlings | Ash : 45%, Carbon : 24%, and S : 0.5%                                    |

**TABLE 4.13: LIKELY SOLID WASTE GENERATION (TPA)**

| Sl. No. | Facility             | Solid waste                                     | Sanctioned as per EC | Proposed Additional | Total after Expansion |
|---------|----------------------|-------------------------------------------------|----------------------|---------------------|-----------------------|
| 1       | Beneficiation Plant  | Tailing                                         | 2,156,240            | 0                   | 2,156,240             |
| 2       | Pellet Plant         | Dust (Iron Ore, Coke, Coal Fines)               | 240,772              | 2,107,325           | 2,348,097             |
| 3       | Coal Washery         | Middlings                                       | 1,759,908            | 377,502             | 2,137,410             |
|         |                      | Reject from washery                             | 310,572              | 66,618              | 377,190               |
| 4       | DRI Kilns            | Char                                            | 289,759              | 124,588             | 414,347               |
|         |                      | ESP dust Bag Filter Dust, scrapper etc          | 200,000              | -58,553             | 141,447               |
|         |                      | Kiln Accretion                                  | 68,474               | -28,060             | 40,414                |
| 5       | MBF                  | BF Slag                                         | 467,775              | 114,975             | 582,750               |
|         |                      | Dust (Iron Ore, Coke, Sinter Fines)             | 77,963               | 19,162              | 97,125                |
|         |                      | Sludge from GCP                                 | 7,796                | -7,796              | 0                     |
| 6       | Sinter Plant         | Sinter Return Fines                             | 581,900              | -157,784            | 424,116               |
| 7       | Coke Oven Plant      | Bag Filter Dust                                 | 50,736               | -2,265              | 48,471                |
| 8       | Induction Furnace    | Bag filter dust                                 | 74,140               | -36,644             | 37,496                |
|         |                      | Slag                                            | 23,510               | 273,777             | 297,287               |
|         | SMS (Caster)         | Mill Scale                                      | 13,860               | 30,800              | 44,660                |
| 9       | Electric Arc Furnace | Slag                                            | 413,280              | 16,926              | 430,206               |
|         |                      | Bag Filter dust                                 | 42,988               | -4,894              | 38,094                |
|         | SMS (Caster)         | Mill scale                                      | 38,500               | -4,900              | 33,600                |
| 10      | Rolling Mill         | Reject from RMS/SM/DPP                          | 14,428               | 21,062              | 35,490                |
|         |                      | Mill Scale                                      | 19,145               | 24,231              | 43,376                |
| 11      | Strip Mill           | Reject                                          | 7,806                | -3,214              | 4,592                 |
|         |                      | Mill Scale                                      | 9,541                | -3,929              | 5,612                 |
| 12      | Ductile Pipe Plant   | Reject                                          | 3,673                | 919                 | 4,592                 |
|         |                      | Mill Scale                                      | 4,490                | 1,122               | 5,612                 |
| 13      | Producer Gas Plant   | Coal Ash                                        | 55,661               | 303,459             | 359,120               |
|         |                      | Coal Tar                                        | 0                    | 65,295              | 65,295                |
| 14      | CPP                  | Fly Ash from Char, middlings, coal fines & coal | 1,284,388            | 738,024             | 2,022,412             |
|         | <b>Total</b>         |                                                 | <b>8,217,305</b>     | <b>3,977,745</b>    | <b>12,195,050</b>     |

Unplanned disposal of these solid wastes will have severe adverse impact on the environment; therefore, adequate control and mitigation measures are to be taken, which have been spelt and in the management plan.

#### 4.7.2 Solid waste management

##### **A. Construction phase:**

- The provisions of Construction and Demolition Waste Management Rules, 2016 shall be followed
- Construction wastes will be segregated as much as possible at site itself to increase the feasibility of recycling concrete and masonry as filling material and steel pieces as saleable scrap.
- Litter disposal and collection points will be established around the work sites.
- Empty packaging materials, drums, glass, tin, paper, plastic, pet bottles, wood, thermocol and other packaging materials, solder butts, etc will be disposed through recyclers (locally called kabadis).
- The construction spoils, Muck generated from drains and sedimentation pits, etc. will be temporarily stored at designated dumpsite located inside the plant premises. Later on these wastes will be used for landfilling / leveling work within the plant premises.
- Careful design, planning and good site management would minimize muck mixed with soil, concrete, mortars and cement grouts. Such waste shall be stored at earmarked place and used as filler for plinth raising purpose.

##### **B. Operation phase:**

The principal solid wastes produced by this integrated steel plant will be Ash, generated from power plant. Fly ash shall be utilised in brick making, road embankments and cement plant, etc, Bag Filter Dust, Char, Kiln Accretion, Slag from SMS, Middlings, Mill Scale, Reject from washery, Reject from RMs/SM/DPP, dusts from dry gas cleaning plant, Sinter Return Fines and Tailing. These wastes will be recycled to the extent possible in the plant itself or sold to outside parties for reuse. BF Slag will be granulated and used in cement manufacturing within plant premises

The quantum of solid waste generation from the different units of proposed plant of 3.55 MTPA along with their reuse and disposal is given in **Table 4.14**.

**TABLE 4.14: SOLID WASTE GENERATION & MANAGEMENT  
FOR 3.55 MTPA ISP**

| Sl. No. | Facility             | Solid waste                            | Total after Expansion | Consumed Inhouse | Dispatch outside | Reuse/ Disposal method                                                                                                                                          |
|---------|----------------------|----------------------------------------|-----------------------|------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Beneficiation Plant  | Tailing                                | 2,156,240             | 0                | 2,156,240        | Collected in small tailing pond, dewatered and dredged for 100% reutilisation as sand substitute in infrastructure/ fine concrete aggregate/ cement manufacture |
| 2       | Pellet Plant         | Dust (Iron Ore, Coke, Coal Fines)      | 2,348,097             | 2,348,097        | 0                | 100% reused in sinter making within project                                                                                                                     |
| 3       | Coal Washery         | Middlings                              | 2,137,410             | 2,137,410        | 0                | 100% reused in CFBC boiler within project                                                                                                                       |
|         |                      | Reject from washery                    | 377,190               | 0                | 377,190          | 100% temporarily stored in solid waste disposal area within project site till sent for backfilling in mine                                                      |
| 4       | DRI Kilns            | Char                                   | 414,347               | 414,347          | 0                | 100% reused in CFBC boiler within project                                                                                                                       |
|         |                      | ESP dust Bag Filter Dust, scrapper etc | 141,447               | 141,447          | 0                | 100% reused in sinter making within project                                                                                                                     |
|         |                      | Kiln Accretion                         | 40,414                | 0                | 40,414           | 100% stored in in land fill temporarily till reused in road sub-based                                                                                           |
| 5       | MBF                  | BF Slag                                | 582,750               | 382,750          | 200,000          | 100% reutilised in making PBS cement within project                                                                                                             |
|         |                      | Dust (Iron Ore, Coke, Sinter Fines)    | 97,125                | 97,125           | 0                | 100% reused in sinter making within project                                                                                                                     |
|         |                      | Sludge from GCP                        | 0                     | 0                | 0                | 100% eliminated after shifting to dry GCP                                                                                                                       |
| 6       | Sinter Plant         | Sinter Return Fines                    | 424,116               | 424,116          | 0                | 100% reused in sinter making within project                                                                                                                     |
| 7       | Coke Oven Plant      | Bag Filter Dust                        | 48,471                | 48,471           | 0                | 100% reused in sinter making within project                                                                                                                     |
| 8       | Induction Furnace    | Bag filter dust                        | 37,496                | 37,496           | 0                | 100% reused in sinter making within project                                                                                                                     |
|         |                      | Slag                                   | 297,287               | 0                | 297,287          | 100% given for metal recovery, converted to aggregates (special balls) and used in road making                                                                  |
|         | SMS (Caster)         | Mill Scale                             | 44,660                | 28,905           | 15,755           | 100% reuse/ sale in own/ other cement plant, useable in pellet making & sinter plant, LRF dephosphorisation process                                             |
| 9       | Electric Arc Furnace | Slag                                   | 430,206               | 0                | 430,206          | 100% given for metal recovery, converted to aggregates (special balls) and used in road making                                                                  |
|         |                      | Bag Filter dust                        | 38,094                | 38,094           | 0                | 100% reused in sinter making within project                                                                                                                     |

| Sl. No. | Facility           | Solid waste                                     | Total after Expansion | Consumed Inhouse | Dispatch outside | Reuse/ Disposal method                                                                                                           |
|---------|--------------------|-------------------------------------------------|-----------------------|------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------|
|         | SMS (Caster)       | Mill scale                                      | 33,600                | 0                | 33,600           | 100% sale                                                                                                                        |
| 10      | Rolling Mill       | Reject from RMS/SM/DPP                          | 35,490                | 35,490           | 0                | 100% reused in steel making within project                                                                                       |
|         |                    | Mill Scale                                      | 43,376                | 0                | 43,376           | 100% sale                                                                                                                        |
| 11      | Strip Mill         | Reject                                          | 4,592                 | 4,592            | 0                | 100% reused in steel making within project                                                                                       |
|         |                    | Mill Scale                                      | 5,612                 | 0                | 5,612            | 100% sale                                                                                                                        |
| 12      | Ductile Pipe Plant | Reject                                          | 4,592                 | 4,592            | 0                | 100% reused in steel making within project                                                                                       |
|         |                    | Mill Scale                                      | 5,612                 | 0                | 5,612            | 100% sale                                                                                                                        |
| 13      | Producer Gas Plant | Coal Ash                                        | 359,120               | 0                | 359,120          | 100% reused as per MOEF Notification 2009. Used in cement making, brick making, block making, aggregate making, and road making. |
|         |                    | Coal Tar                                        | 65,295                | 0                | 65,295           | 100% sale                                                                                                                        |
| 14      | CPP                | Fly Ash from Char, middlings, coal fines & coal | 2,022,412             | 255,054          | 1,767,358        | 100% reused as per MOEF Notification 2009. Used in cement making, brick making, block making, aggregate making, and road making. |
|         | <b>Total</b>       |                                                 | <b>12,195,050</b>     | <b>6,397,986</b> | <b>5,797,064</b> |                                                                                                                                  |

Following practices will be followed for effective management of solid wastes:

- Dust (as handling loss, from air pollution control equipment) from beneficiation plant to the tune of 2%, not accounted in above table, will be re-used in sinter making within the plant.
- Dry grit, dust captured in the initial stage of blast furnace gas cleaning will normally be sufficiently free of tramp elements such as zinc and lead to be recycled to the sinter plant.
- Wet sludge from the scrubber system is usually disposed of to landfill. However, classification of blast furnace sludge using a hydroclone can give a zinc-rich overflow and zinc-lean underflow. The later can be recycled to the sinter plant.
- In general, slag from steel production is crushed to recover the metallic content and the residual slag can be sold as a road aggregate or used on site to build roads or noise barriers.
- BF Slag granulation processes are generally preferable to traditional slag cooling methods from the environmental viewpoint, because the process can be enclosed, less water is consumed and more of the sulphur remains in the slag rather than being emitted. Fume capture and total condensation shall be used. Care is

required to avoid producing mineral fibres (“angel hair”). Granulated slag can also be used for cement making.

- While hot, the sulphur in the blast furnace slag reacts with air to release SO<sub>2</sub>. When water is added, H<sub>2</sub>S is produced by the reaction of water on hot CaS and MnS. It appears that controlling the pH of the cooling water to between 7.5 and 9.5 may inhibit this reaction, which can be significant in slag pit cooling.
- Scale is removed from the open cooling circuit at various points, including the scale pit and sedimentation tanks. This scale is normally relatively free from oil, unless abnormal leaks occur. The scale can be recycled at the sinter plant although it is planned to sell it for cement manufacturing, in current proposal.
- Flyash shall be collected in dry form from the ESP and use in cement plant & manufacturing bricks.
- Reject from washery, which is proposed to store in the solid waste storage area can be later on sent back to the mine for backfilling. This will not only reduce land for waste disposal in plant site but also take care of extra void space at the mine end.
- Mg & Zn Dust/ dross (solid waste) generated will be sold in market to paint manufacturer or used in sinter plan, within premises

#### **4.7.2.1 Other wastes:**

- Soiled cotton / cloth wastes (generated during cleaning of machines and equipment) will be collected in bins burnt in the boilers.
- Electronic wastes and used batteries will be collected and given to authorized recyclers. Management of e-waste shall be in line with the E-Waste (Management) Rules, 2016
- Domestic garbage will be collected from dustbins in containers; biodegradable, inerts and non-biodegradable materials in segregated manner. The manpower is expect to generate a maximum of 150 gms/capita/day of solid waste.
- The biodegradable material will be composed and used as manure inside the premises.
- Recyclable materials like packaging materials, empty drums, bottles, glass, metals, paper, plastic, etc will be given to recyclers.
- Non-recyclable materials will be disposed in sanitary landfill sites as per the local laws and regulations.
- Waste management will be done under following applicable rules
  - In dispensary and first aid centres- as per Biomedical Waste (Management & Handling) Rules, 2016
  - Plastic Waste Management Rules, 2016
  - Solid Waste Management Rules, 2016
  - Batteries (Management and Handling) Rules, 2001



- E-Waste (Management) Rules, 2016
- Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

#### **4.7.2.2 Details of dumping area**

Company has earmarked 116 acres for solid waste disposal within the Integrated steel plant. The area will be well protected with garland drain all around the stacking area. The garland drain would have slope from all sides so that the rain water can travel by gravity through the slope up to collection pit. This garland pit will be constructed with pitch stones. Vertical baffle walls will be constructed at suitable intervals at the bend points of garland drain. They will be constructed on both side of the vertical wall, in alternate manner, to settle the solid waste that flow along with water in the garland drain. The deposited material is manually drawn out from the garland drain to minimize the silting at water collection tank.

The stacking of solid wastes will be done properly, layer by layer, in separate areas, that too step by step. Care shall be taken in dumping area about proper approach roads for transportation. Stacking / dumping of different solid wastes shall be done on separate dumping areas identified for them within the solid waste disposal yard. Each tipper shall be unloaded uniformly in planned manner so that equal height of stack is maintained all around at all the times.

#### **4.7.2.3 Transportation of solid waste**

Transportation of solid waste from point of generation to dumping yard plays a major role in the entire system. As the dumping site is within the plant premises, transportation is not a major problem. The main points concerns are:

- Proper approach roads- plain, wide & stiff
- Solid Waste Loading system & methods at point of generation.
- The Char shall be directly loaded to the tipper. There will be arrangement for temporary stack at the site in case of an emergency arising due to failure of traffic system or shortage of transporting vehicle.
- Water sprinkling arrangement - to minimize fugitive dust.
- Dumping site- proper zigzag roads with good construction & safe measures is must. As the stacking height increases, new approach roads for proper stacking needs to be constructed with utmost safety, precautions & considering ease of unloading.
- Periodical transport road cleaning - to avoid air pollution problem due to dust
- Maintaining the transport vehicles (tippers) - to avoid break downs & road blockages.

- Maintenance of road and strengthening the stability of slope road at the deposition point.

#### 4.7.2.4 Fly ash utilisation plan

A tentative ash utilisation scheme as per the MOEF&CC guidelines is given in **Table 4.15**.

**TABLE 4.15: ASH UTILISATION PLAN**

| <b>Fly ash Generation</b>      | <b>Total</b>   |
|--------------------------------|----------------|
| From PGP                       | 359120         |
| From CPP                       | 2022412        |
| <b>Total Generated</b>         | <b>2381532</b> |
| Bottom Ash generated (20%)     | 476306         |
| Fly Ash generated (80%)        | 1905225        |
| <b>Fly ash utilisation</b>     |                |
| Fly ash to own brick plant     | 86016          |
| Fly ash to other brick plants  | 591360         |
| Fly ash for road making        | 972796         |
| Utilisation in Cement plant    | 255054         |
| <b>Total utilised</b>          | <b>1905225</b> |
| <b>Bottom Ash utilization</b>  |                |
| Road making and land levelling | 476306         |
| <b>Bottom ash for disposal</b> | <b>0</b>       |

The following may be noted in context of fly ash utilisation:

- The company will establish total 4000 bricks/ hour brick plant(s)
- Based on the current consumption of fly ash by other brick manufacturers in the region, it is estimated that fly ash required to manufacture nearly 27500 bricks/ hour will also get consumed
- The utilisation in proposed cement plant in the project site will be commensurate with the clinker production facilities
- Some portion will be used for fly ash for road making

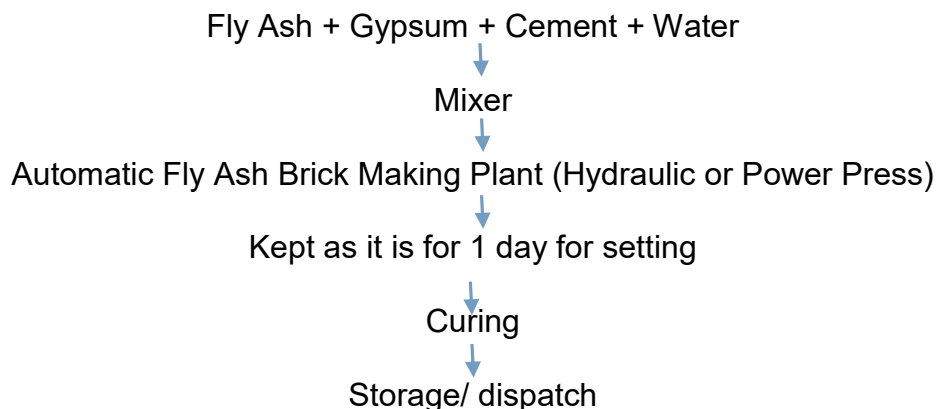
#### 4.7.2.5 Fly Ash Brick plant

The company will install total 4000 bricks/hr pant(s) to manufactured brick to utilise in house generated fly ash.

Fly Ash, cement, finely ground gypsum in requisite proportions will be manually fed into pan mixer where water is also added. The mixing proportion will generally be as follows:

Fly Ash 90-92%  
Cement 1-2%  
Gypsum 5-6% Water 2-3%

After mixing, the mixture will be allowed to belt conveyor through feed in to automatic brick making machine where the bricks will be pressed automatically. The bricks will then be withdrawn from the molding machine and air dried under sun for a day and then water cured for 7 days. The final products will be sorted out and inspected for quality and stacked. The manufacturing process is diagrammatically represented below:



## 4.8 NOISE

### 4.8.1 Impact due to noise

**Construction phase:** During construction phase, the equipment used for construction will be the main noise sources which will have temporary and reversible impact on the noise level of the area. The movement of vehicles bringing construction material and plant components for installation will also generate noise. Construction activities such as cutting, welding, use of vibration machines, etc shall also generate noise. The workers in the vicinity of construction activities, construction machinery, vehicles, etc will be exposed to noise during working hours.

**Operation phase:** In the proposed set up, boilers, turbine generators, DRI Kilns, Continuous Casting Machines, etc will be the major noise sources. The entry gate area will be the traffic-affected and hence, a noise prone area.

After the establishment of the proposed plant, noise sources & traffic affected area will become a major noise concerned areas. The sources of noise generation during operation phase will be as follows:

- Operation of the kilns, furnaces and other sub-units
- Material handling operations, crushers
- ID Fans, motors, pumps
- Trucks, dumpers, loaders, scrappers and earth-movers
- Operation of turbines, etc.

Operation of plant equipments will continuously generate noise, which will have adverse impact on the ambient noise levels. However, the adverse impact is anticipated to be limited to the plant area and its immediate

surroundings. The adverse impact can be more within the project area, and may cause hearing loss and other related problems to the workmen, if mitigation through protective measures are not taken.

Noise propagation through mathematical model and impacts of noise with distance from source has been studied and brought out below.

As the equipment generate noise generally in the range of 100 dB(A) at source it can be safely assumed that the ambient noise levels on any point of boundary line of plant are not higher than 100 dB(A). It has, also been assumed that the area within the units within an imaginary line running at a distance of 3-5 m (say) from noise generating machines will be termed as point noise source to avoid complication in the absence of availability of exact location of various noise generating units, their arrangements and shapes. Taking extreme case of two machines each generating 100 dB(A) working at a point will add upto 103 dB(A) overall noise level. Such source noise level has been considered here for anticipating the impacts.

Noise attenuation with distance in all directions over flat open bare ground is given by

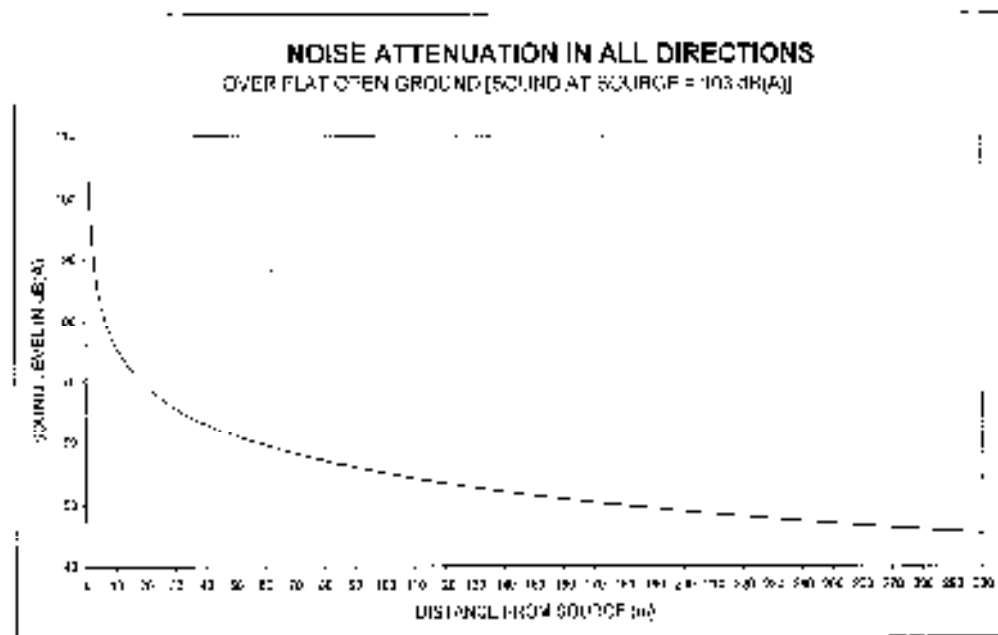
$$\text{Sound level dB(A)} = L_w - 20 \log_{10} R - 8$$

Where :

$L_w$  = Sound level of source, dB(A) assumed 103 dB(A)  
 $R$  = Source distance, m

The same has been plotted in **Fig 4.3**. Assuming source noise level as 103 dB(A).

**FIG 4.3: NOISE ATTENUATION WITH DISTANCE IN ALL DIRECTIONS OVER FLAT OPEN BARE GROUND**



A perusal of graph shows that the sound levels attenuate to value as shown in **Table 4.16**.

**TABLE 4.16: NOISE ATTENUATION WITH DISTANCE ON FLAT BARE GROUND WITHOUT AND WITH GREEN BELT  
COMBINED NOISE OF MORE THAN ONE SOURCE = 103 dB(A)**

| Distance from source (m) | Noise level reduced from 103 dB(A) |                        |
|--------------------------|------------------------------------|------------------------|
|                          | Without green belt, dB(A)          | With green belt, dB(A) |
| 20                       | 70.0                               | 68.5                   |
| 60                       | 60.0                               | 55.5                   |
| 100                      | 56.0                               | 49.0                   |
| 150                      | 52.0                               | 41.0                   |
| 180                      | 50.0                               | 33.0                   |
| 300                      | 45.0                               | <33.0                  |

It means that after distance of about 300 m, the machine noise will merge into the background noise in the day time. This noise level is same as the limit [45 dB(A)] prescribed by GSR 742 (E) dt. 30<sup>th</sup> August 1990 at night time for residential areas. Due to plantation around the plant site, it will be possible to further lower the noise levels below the prescribed limits. It may be noted that the combined noise from various sub-units cannot be more than 103 dB(A) at any point considering the distance between their relative locations. Hence, by combination of such control measures, it will be possible to keep the noise levels below the prescribed limits.

Negligible impact will be there to local people as the plant will develop a thick peripheral greenbelt which will act as a noise absorbing medium and the main habitation of the nearest village is Berunapal at 0.2 km north although some part of the village is settled next to the proposed project boundary.

The noise level data recorded at various places in the study area is well within the desired limit. But, the future establishment of noise due to the proposed project activity may pose some problem, if project management will not adopt appropriate control measures.

#### **4.8.2 Noise pollution control measures**

**Construction phase:** Modern and well maintained machinery will be used for construction activities such that noise levels will be minimized at source itself. The equipment will be kept in good condition to keep noise level well below limits at work place. The onsite workers exposed to high noise equipment and noisy area will be provided with protective devices like ear muffs/plugs. Also traffic will be monitored, vehicles will have PUC certificates and the heavy vehicles carrying construction material will not be allowed during peak traffic hours. Noise and fugitive dust curtains/ barriers will be erected around the areas under construction.

**Operation phase:** The following measures will be taken up to keep the noise levels within permissible limits:

- Provision and maintenance of green belt to prevent noise generated within the plant from spreading beyond the plant boundary.
- Periodic maintenance of noise generating machinery including transportation vehicles
- The noise generation will be reduced at source by erecting noise dampening enclosures or acoustic enclosures and by maintaining the machines and greasing them regularly.
- Provision made for special vibration dampners, rubber packing etc to prevent propagation of noise and vibration to surrounding areas.
- Provision of air silencers to modulate the noise generated by the machines/ equipments/ vehicles
- Noise from safety valves, start up vents, steam jet ejectors of condenser etc. will be reduced by providing silencers at the outlet of down steam piping.
- All the workers engaged at and around high noise generating sources will be provided with ear protection devices like ear mufflers/plugs. Their place of work will be changed regularly so as to reduce their exposure duration to high levels. They will be regularly subjected to medical check-up for detecting any adverse impact on the ears.
- Noise level would be monitored inside and around the plant on a regular basis
- The damage risk criteria as enforced by OSHA and CPCB to reduce hearing loss, stipulates the noise levels up to 90 dB(A) as acceptable limits for 8 hour working shift per day. Noise levels may, however, exceed the prescribed limits in certain work places. At these work places, workers will be posted for shorter durations only. The OSHA damage risk criteria are reproduced in **Annexure XIII** and the Ambient Air Quality Standard in respect of noise is given in **Annexure XII**.

## 4.9 TRANSPORTATION

### 4.9.1 Impact of transportation

It may be noted that transportation shall take place through the following likely routes (Refer **Fig 4.4**):

**Route 1** - From west i.e. Rourkela and Talcher coal field side to plant

**Route 2** - From east i.e. Paradeep port or Bhubaneswar side to plant

Both routes come together at Nimabahal on the NH 55 and move southwards towards the plant. Traffic for the over all quantity of raw material and finished products have been calculated for the 3.55 MTPA plant and given in **Table 4.17**.



**FIG 4.4: TRANSPORTATION ROUTE**

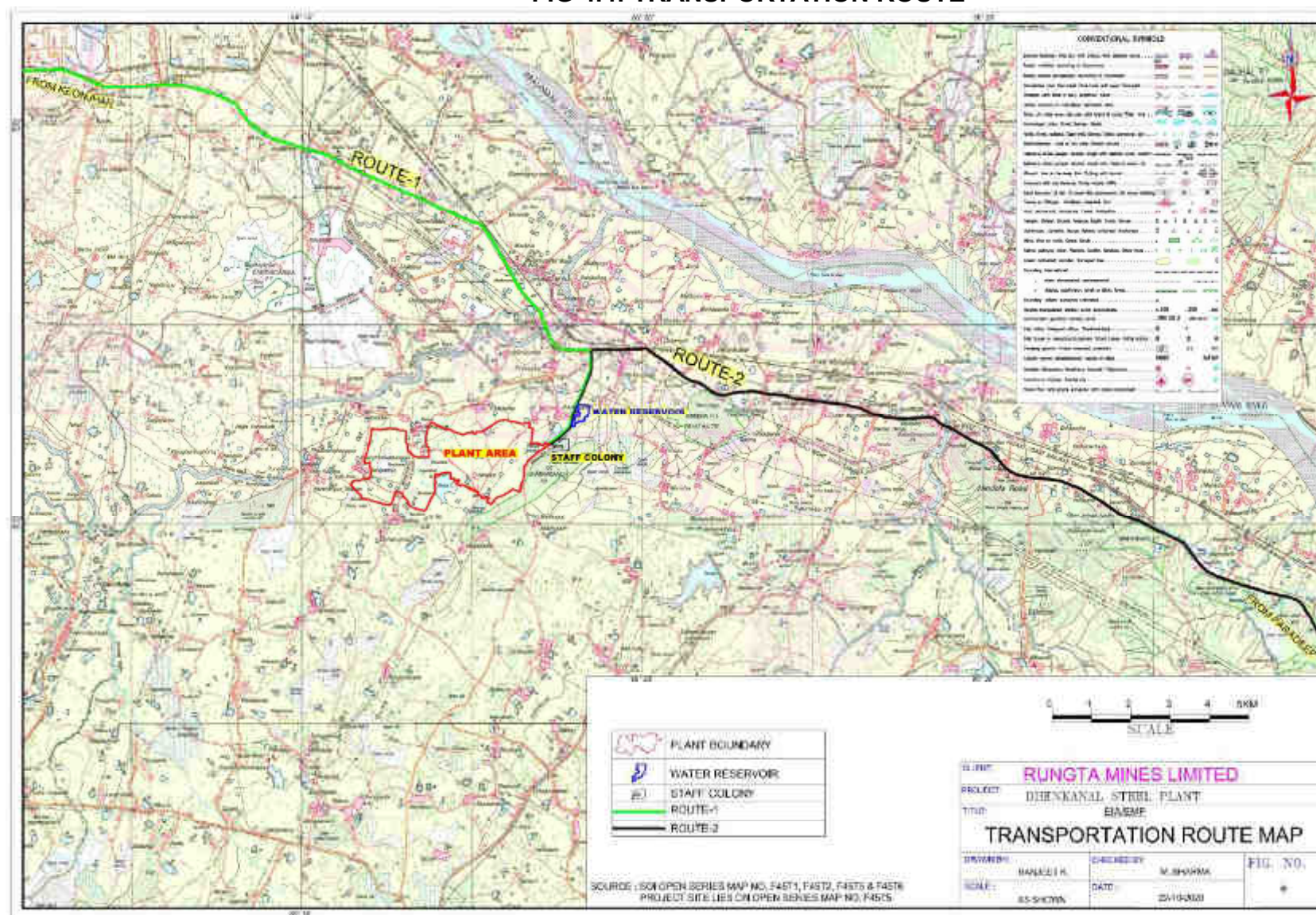


**TABLE 4.17: NUMBER OF TRUCKS REQUIRED FOR RAW MATERIAL**

| <b>Sl. No.</b>            | <b>Facilities</b>   | <b>Raw Material</b>                   | <b>Outhouse (TPA)</b> | <b>Outhouse (TPD)</b> |
|---------------------------|---------------------|---------------------------------------|-----------------------|-----------------------|
| 1                         | Beneficiation Plant | Low Grade Iron Ore Fines (0 to 5 mm)  | 5,389,927             | 16,333                |
|                           |                     | Flocculant                            | 269                   | 1                     |
| 2                         | Pelletisation Plant | Iron Ore/ Fines/ concentrate          | 28,304,794            | 84,492                |
|                           |                     | Dolomite (Flux)                       | 402,500               | 1,201                 |
|                           |                     | Bentonite                             | 431,250               | 1,287                 |
|                           |                     | Coke Breeze                           | 488,725               | 1,459                 |
|                           |                     | Coal >= 5500 Kcal /kg (emergency use) | 960,250               | 2,866                 |
| 3                         | Coal Washery        | ROM Coal                              | 5,029,200             | 15,240                |
| 4                         | DRI Plant           | Dolomite                              | 89,886                | 253                   |
| 5                         | Mini Blast Furnace  | Iron Ore                              | 165,113               | 472                   |
|                           |                     | Coal dust                             | 291,375               | 833                   |
|                           |                     | Dolomite                              | 271,950               | 777                   |
|                           |                     | Quartz                                | 101,010               | 289                   |
| 6                         | Sinter Plant        | Iron Ore Fines                        | 2,544,696             | 7,711                 |
|                           |                     | Lime Stone                            | 367,567               | 1,114                 |
|                           |                     | Dolomite                              | 367,567               | 1,114                 |
| 7                         | Coke Oven Plant     | Coking Coal                           | 1,615,700             | 4,616                 |
| 8                         | SMS                 |                                       |                       |                       |
| 8.1                       | SMS-IF              | Steel Scrap                           | 39,022                | 111                   |
| 8.2                       | SMS-EAF             | Hot Metal/Pig Iron from MBF           | 16,341                | 47                    |
| 9                         | Producer Gas Plant  | Coal                                  | 1,093,008             | 3,263                 |
| 11                        | Lime Plant          | Lime Stone                            | 548,100               | 1,566                 |
|                           |                     | Fuel Oil                              | 60,900                | 174                   |
| 12                        | Cement Plant        | Gypsum                                | 47,844                | 139                   |
|                           |                     | Portland Pozzolana Cement             |                       |                       |
|                           |                     | Gypsum                                | 36,436                | 106                   |
|                           | Clinker Plant       | Lime stone                            | 1,445,274             | 4,201                 |
|                           |                     | Clay component                        | 28,905                | 84                    |
|                           |                     | Silica component                      | 38,541                | 112                   |
|                           |                     | Coal                                  | 192,703               | 560                   |
|                           |                     | Others                                | 9,635                 | 28                    |
| 13                        | Captive Power Plant | Coal required for Balance Power       | 908,989               | 2,597                 |
|                           |                     | Limestone                             | 78,578                | 225                   |
|                           | <b>Total</b>        |                                       | <b>51,366,056</b>     | <b>153,271</b>        |
| <b>Truck Capacity (T)</b> |                     |                                       | <b>25</b>             |                       |
| <b>No. of Trucks/Day</b>  |                     |                                       | <b>6131</b>           |                       |



**(B) NUMBER OF TRUCK REQUIRED FOR PRODUCTS**

| Sl. No.                   | Facilities          | Product                        | Sale (TPA)        | Sale (TPD)    |
|---------------------------|---------------------|--------------------------------|-------------------|---------------|
| 1                         | Pelletisation Plant | Pellets                        | 25,049,050        | 74,773        |
| 2                         | Sinter Plant        | Sinter                         | 20,528            | 62            |
| 3                         | SMS-EAF-CCM         | Semi-Finished Product from CCM | 16,530            | 47            |
| 4                         | Rolling Mill        | Finished Product               | 2,550,000         | 7,286         |
| 5                         | Strip Mill          | Finished Product               | 500,000           | 1,429         |
| 6                         | Ductile Pipe        | Finished Product               | 500,000           | 1,429         |
| 7                         | Cement Plant        | Cement                         | 3,371,150         | 9,800         |
| 8                         | clinker Plant       | Clinker                        | 777,443           | 2,260         |
|                           | <b>Total</b>        |                                | <b>32,784,700</b> | <b>97,085</b> |
| <b>Truck Capacity (T)</b> |                     |                                |                   | <b>25</b>     |
| <b>No. of Trucks/Day</b>  |                     |                                |                   | <b>3884</b>   |

**(C) NUMBER OF TRUCKS REQUIRED FOR SOLID WASTE**

| Sl. No.                  | Facility             | Solid waste                                     | Dispatch outside (TPA) | Dispatch outside (TPD) |
|--------------------------|----------------------|-------------------------------------------------|------------------------|------------------------|
| 1                        | Beneficiation Plant  | Tailing                                         | 2,156,240              | 6,534                  |
| 2                        | Coal Washery         | Reject from washery                             | 377,190                | 1,143                  |
| 3                        | DRI Kilns            | Kiln Accretion                                  | 40,414                 | 114                    |
| 4                        | MBF                  | BF Slag                                         | 200,000                | 571                    |
| 5                        | Induction Furnace    | Slag                                            | 297,287                | 849                    |
| 6                        | SMS (Caster)         | Mill Scale                                      | 15,755                 | 45                     |
| 7                        | Electric Arc Furnace | Slag                                            | 430,206                | 1,229                  |
| 8                        | SMS (Caster)         | Mill scale                                      | 33,600                 | 96                     |
| 9                        | Rolling Mill         | Mill Scale                                      | 43,376                 | 124                    |
| 10                       | Strip Mill           | Mill Scale                                      | 5,612                  | 16                     |
| 11                       | Ductile Pipe Plant   | Mill Scale                                      | 5,612                  | 16                     |
| 12                       | Producer Gas Plant   | Coal Ash                                        | 359,120                | 1,072                  |
|                          |                      | Coal Tar                                        | 65,295                 | 195                    |
| 13                       | CPP                  | Fly Ash from Char, middlings, coal fines & coal | 1,767,358              | 5,050                  |
|                          | <b>Total</b>         |                                                 | <b>5,797,064</b>       | <b>17,054</b>          |
| <b>Truck Capacity</b>    |                      |                                                 |                        | <b>25</b>              |
| <b>No. of Trucks/Day</b> |                      |                                                 |                        | <b>683</b>             |

The truck movement has been assumed for 25 T trucks on an average for raw material, product and for solid waste. In addition there will be 10-25 KL fuel tankers containing LSHS/ FO. The worst case scenario for coal has been considered i.e. Indian coal, wherein higher truck movement will take place. When South African coal will come, the number of coal trucks will reduce.

For transportation of the above volume, the maximum increase in traffic is 10698 trucks/day (21,396 trips) or 891 trucks/hour. The equivalent passenger car units (PCU's) (1 truck=3 PCU's) are 2673/hour. The total number of HMV is 7339 per day during monitoring. The Integrated steel plant, therefore, will lead to quadrupling of the the traffic volume of HMVs, which is a considerable impact on the traffic density. The impact shall be in terms of increase in pollutant gases due to vehicular emissions and dust on road becoming air-borne.

The design service volume of the existing national highway (7.0-7.5 m wide) is 15000 PCUs/day. However, it will get widened to 8.5 m either side road with median, the work of which is already underway. The design service volume of widened highway will become 35,000 PCUs. Thus, the increase in traffic will be 61% of the design service volume. This is further calculated as 30.5% of the maximum carrying capacity. The existing traffic volume on the road at its current width is 88% of the maximum carrying capacity. After widening, the existing traffic volume will be 37.7% of the maximum carrying capacity. Thus, resultant will become 68.2% at full capacity of 3.55 MTPA steel production.

#### **4.9.2 Mitigation**

Vehicular pollution control and management plan:

- All trucks used for transportation of raw material and finished product will be covered with tarpaulin, maintained, optimally loaded and have PUC certificates.
- Maintenance shall be as per the periodicity and procedure specified by the manufacturer
- Trucks will be weighed at the weigh bridge to ensure optimal loading, which in turn optimizes emissions
- Annual statutory Fitness certification for commercial vehicles will be ensured.
- Pollution Under Control (PUC) certificates will be obtained every three months for all categories of vehicles. In case of petrol vehicles idling CO measurements will be taken and in case of diesel vehicles, free acceleration smoke will be measured.
- Vehicles will be Euro-IV compliant, as applicable
- Old vehicles will be phased out to ensure lower emissions by newer vehicles
- Water sprinkling on roads and parking area within plant
- Speed bumps and caution signs along roads
- Training and sensitisation of drivers as part of safety week awareness programs

The alternate method of raw material transportation will be railways, once the siding becomes operational.

The local infrastructure of the area such as road network is adequate to handle the additional traffic and no additional infrastructure needs to be constructed. Only an access road to the plant will be constructed over an area of 12.9 acres in villages Jharbandh and Nimabahal, land for which has been allotted to company, outside the project area.

## 4.10 ECOLOGY

### 4.10.1 Impact on ecology

**Construction Phase:** Total area of the plant is 1769 acres. Presently 2x500 TPD DRI, 4x20 T IF and 50 MW power plant is under construction over an area of 674.765 acres. To undertake the construction in the balance area, top soil will be disturbed and rehandled. Vegetation over this area will also be disturbed. Few plants, which will be up-rooted, will be compensated through future plantation during operation. 584 acres (33%) of the above mentioned area is proposed for green belt and plantation. Hence, negligible impact is anticipated on the flora in the plant area.

The buffer area has floral species, which are commonly found species. Agricultural crops and fruit trees form a part of the commonly found flora in the study area. Impact due to airborne dust from construction activities and transportation are envisaged. Impact can be there in terms of tree cutting for firewood by construction labour in case control measures are not adopted.

7.8 acres (3.156 ha) of Forest land is present within plant area. Stage II forest clearance has been obtained from MOEF&C vide letter no. 5-ORB207/2014-BHU dated 02.07.2015. A "Site Specific Conservation Plan" has been prepared and has been approved by Principal Chief Conservator of Forest (WL) & Chief Wildlife Warden, Odisha vide Memo no 3188/1/WL-SSP-10/2015 dated 09.04.2015.

There are three forests within 10 km namely Jharbandh RF, Ganthigarihia PF and Nimidha RF. There are no wildlife sanctuaries or fragile ecosystems within the study area. Hence, adverse impact on wildlife or fragile eco-system is not envisaged.

Some increase in the concentration of SO<sub>2</sub> in the study area is envisaged. Concentrations of NO<sub>2</sub> and PM will also increase. Fugitive dust emissions may also cause higher ambient PM concentration, if adequate control measures in the management plan are not implemented. These increased concentrations will have adverse secondary impacts on the eco-system if control/ mitigation measures are not implemented.

Availability of water and food wastes during the day will attract some birds and animals towards the site. During construction phase, no impact on terrestrial eco-system comprising birds and animals is envisaged. On the

contrary, with progressive growth of greenery, terrestrial micro-habitats will be developed in the long run.

During construction phase, there are trees planted by farmers in the agricultural land, which will have to be removed, where required as per the proposed layout. Mitigation of the impact is discussed in subsequent section.

**Operation Phase:** Company has done plantation along periphery of existing plant premises in 18 ha out of the proposed 90.11 ha green belt of the sanctioned EC. The impact on the surrounding ecology during the operation of the project will mainly occur from the deposition of air pollutants. Chronic and acute effects on plants and animals may be induced when the concentration of air pollutants exceeds threshold limits. The incremental emissions of air pollutants are not likely to induce any significant changes in the ecology because the national ambient air quality standards will remain within the limits. However deposition of small amount of pollutants may also affect the surrounding ecosystem. Thus, the project has been planned with most efficient air pollution control systems on its stacks. Most of the fugitive dust emission points are also fitted with efficient air pollution control systems (fume extraction systems and bagfilters). Water sprinkling / dry fog type system will be used at to suppress the generation of fugitive dust, where necessary.

USEPA air quality criteria for SO<sub>2</sub> stipulates 0.2 ppm (524 µg/m<sup>3</sup>) level when visible injury to sensitive vegetation in humid regions after 3 hours exposure is observed. In another case, 0.5 ppm SO<sub>2</sub> level (1310 µg/m<sup>3</sup>) for 1 hour exposure results in visible injury to sensitive vegetation in humid regions. At higher SO<sub>2</sub> concentration of 10 ppm (26214 µg/m<sup>3</sup>), visible injury to vegetation in arid regions is observed. Such high ambient air concentration of sulphur dioxide, is not likely to occur in the area.

USEPA air quality criteria for NO<sub>2</sub> stipulates 2 ppm (3760 µg/m<sup>3</sup>) level when foliar injury to vegetation at 4 hours exposure is observed. At a lower NO<sub>2</sub> concentration of 0.25 ppm (470 µg/m<sup>3</sup>) during the growing period, decrease of growth and yield of tomatoes and oranges are observed. Such high ambient air concentration of nitrogen dioxide is unlikely in the study area.

#### 4.10.2 Management of ecology

**Construction phase:** The top soil removed prior to construction will be stored and laid back on the area identified for further plantation. Any tree or plant remove will be compensated manifold.

For trees that will have to be removed as per the proposed layout, the endeavour will be to conserve them to the extent possible. However, if tree needs to be cut, due permission will be sought from the concerned authority and compensatory plantation carried out. Transplantation of tree will be preferred, if possible.

There was no resident fauna in the undeveloped area, but the development of proposed green belt and plantation will provide food and habitat for fauna. Under the proposed green belt and plantation programme, 584 acres of land within premises (about 33.0 % area) shall be provided with green cover in the form of green belt and plantation.

**Operation phase:** During the previous year, the company has carried out tree plantation & greenbelt development within the plant. Till date, the company planted 40,000 trees covering 18 ha land. The main consideration during development of green belt and plantation are effective trapping of fugitive emission, act as sink for stack emissions, sequester carbon, noise control, balancing ecology, waste water reuse and aesthetics.

Plants act as natural sink for a variety of pollutants as well as replenish air with fresh oxygen. The plant species would be fast growing, evergreen having large crown. As a single plant does not have all the qualities, a mixture of several varieties of plants will be chosen. Native trees will be preferred. The widths of the belt will be as per the availability all along the boundary, the criterion for selection of area/ location for green belt would be along pre dominant wind direction, along plant boundary and roadside avenue plantation and around administrative building.

The species suggested for plantation are Kaner (*Nerium*), Ber (*Zizyphus*) Gulmohar (*Delonix regia*) (as a bio-indicator), Babool (*Acacia*), Siris (*Albizia lebeck*), Neem (*Azadirachta indica*), Mango (*Mangifera indica*) and Peepal (*Ficus religiosa*) etc. Native species will be preferred.

The plantation programme has been proposed as given in Table 4.18. A total of 585,000 trees will be planted by the time of project becomes fully operational.

**TABLE 4.18: PLANTATION PROGRAMME**

| Year         | Area in acres | Trees (Nos)   |
|--------------|---------------|---------------|
| <b>past</b>  | 40            | 40000         |
| 2020-2021    | 85            | 85000         |
| 2021-2022    | 97.66         | 98000         |
| 2022-2023    | 100           | 100000        |
| 2023-2024    | 100           | 100000        |
| 2024-2025    | 100           | 100000        |
| 2025-2026    | 61.33         | 62000         |
| <b>Total</b> | <b>584</b>    | <b>585000</b> |

#### 4.10.3 Wildlife Conservation Plan

Stray elephant sometimes come in the study area. Therefore, a "Site Specific Conservation Plan" has been prepared and has been approved by Principal Chief Conservator of Forest (WL) & Chief Wildlife Warden, Odisha vide Memo no 3188/1/WL-SSP-10/2015 dated 09.04.2015. The plan aims at minimizing the impact of all threats and to identify measures for

conservation of fauna available in the study area. The salient management and mitigation strategies are given below:

- 1 Gully plugging with check dams have been suggested to stabilize the gullies. It is suggested to take up low cost structures with locally available material such as LBCD, Brush wood etc.
- 2 Maintenance of fire line, will help prevention and controlling of fire hazards.
- 3 Lighting arrangement in project area requires a careful planning to reduce interference with normal activities of the wild animals in the impact zone. creation of a peripheral barrier and channelization of rain water to designated collection points will prevent contamination of springs and streams outside the project area. Measures suggested to minimize air pollution, noise pollution and to minimize impact of vibration requires proper attention of the project proponent.
- 4 With increase in human and economic activities man-animal conflicts may rise. To meet the exigencies, permanent arrangement requires to be made for immediate treatment of persons affected by wild animal attack and also for payment of ex-gratia.
- 5 The proposed area for implementation of this Action Plan includes three forest blocks spreading over 392.765 hectare and also some area outside the Impact Zone.
- 6 Provision of suitable amounts has been kept for outstanding contribution of NGOs, Schools and Villages towards protection and biodiversity conservation.
- 7 There is also provision for eco-development activities to be taken up by the Company in the impact zone.
- 8 Arrangement will be made for monitoring and evaluation of physical changes of vegetation and for status of population of wild animals.

Budgetary provision has been made by the Company for execution of the wildlife conservation in consultation with the DFO. Rs. 586.53 lakhs have been allocated for plantation, awareness and cattle immunisation within core zone and buffer zone. This includes Rs. 188.63 lakhs by the user agency, Rs. 284.78 lakhs by DFO Dhenkanal and Rs. 113.12 lakhs by the DFO, Angul. Some activities of wildlife conservation plan may be undertaken under CER.

#### **4.11 SOCIO-ECONOMICS - IMPACT AND MANAGEMENT**

##### ***Demography***

During operation phase, total manpower under direct employment requirement will be 4850 persons for various activities like loading, unloading, handling, transportation, general cleaning, horticulture and other

miscellaneous works inside the Plant. Three shifts working for 355 days is planned for most sub-units. Many more persons will be indirectly engaged either on contract basis or in transportation of materials in provision of different services associated with the project. As majority of unskilled and semi-skilled persons will be from the surrounding villages, the net in-migration on account of the job opportunities will be for the highly skilled and supervisory/managerial level posts. Therefore, marginal impact on demographic profile is foreseen. A colony will be built near plant to accommodate the non-native employees.

### ***Employment and occupation***

As stated above, the proposed project will provide direct and indirect job opportunities to a significant number of persons in this rural and under-developed area. Therefore, the project will have significant positive impact on employment and economy of the study area. A portion of the wages earned by the employees and other workers will find its way into the study area in form of cost of services and local food products. This will improve the economic conditions of local inhabitants involved in such service provisions.

### ***Amenities and health***

With the commencement of operation, amenities for communication, education, health, entertainment, canteen, etc would be developed in and around the project area. These amenities will be available to local people also, who will be directly associated with the plant. Even those not associated in the project related activities will be benefited by these amenities.

There were 54 families within the sanctioned project boundary (674.765 acres) at the time the project was conceived prior to the year 2010. After the environmental clearance on 02.08.2010, these families have been resettled & rehabilitated in village Nimabahali at an aerial distance of 2.4 km. As per the directions of Land Acquisition Officer, District Office, Dhenkanal a compensation of Rs. 7 lakhs per family has also been paid. Those displacees opting for job in the company will be trained and absorbed. Land losers will be given preference in employment. Additionally, provision of contractual jobs shall also be there. Land losers not opting for employment will be provided training & skill development opportunities and priority in job contracts. Scholarships to students from project affected families will be given. Additional land (1094.235 acres) for expansion is being acquired through IDCO Government of Odisha. The compensation for fixed assets in land will be paid as per IDCO rules. No displacees are anticipated from expansion area.

### ***Agriculture***

Part of the land acquired for the project was low yield agricultural land without irrigation facilities. This is a very small fraction of total agricultural

land falling in study area; hence, no significant adverse impact on agriculture is envisaged.

### ***Economy***

With the commencement of plant, there will be substantial improvement in the overall economy of the local people in the form of additional income through employment, development of infrastructure in surrounding areas such as transport facility, health and education, shops and ancillary industries. The details of the project benefits through CSR and CER have been given in Chapter 8.

## **4.12 OCCUPATIONAL HEALTH AND SAFETY**

The “Code of practice on safety and health in the iron and steel industry” has been published by International Labour Organisation, Geneva in 2005. It is proposed to comply to the code to ensure safety and health of the workers in the plant.

### **4.12.1 Occupational & Safety Hazards**

The proposed plant is an steel manufacturing unit. The table below summarises the main injury causes and the corresponding prevention strategies. These prevention strategies are proposed in daily plant management:

| <b>Injury Causes:</b>     | <b>Prevention:</b>                         |
|---------------------------|--------------------------------------------|
| a) Slip, Trips & Falls    | a) Housekeeping, clear designated walkways |
| b) Falling/Moving Objects | b) Guards on Machines and elevated areas   |
| c) Lifting & Overload     | c) Manual Handling Training                |
| <b>Injury Types</b>       | d) Proper use of PPE                       |
| d) Arms and Hands         | e) Proper use of PPE                       |
| e) Legs and Feet          | f) Lifting gear, forklifts                 |
| f) Back Injuries          |                                            |

### **4.12.2 Impact on workers**

The occupational safety and health are very closely related to productivity and healthy relation between employer and employees. The main factors of occupational health in the operations are dust, gases and noise, and those for safety are exposure to excessive heat, accidental contact with hot materials, contact with moving parts of machines & equipment, etc. The health and safety of personnel is the primary consideration during operation to achieve uninterrupted production and compliance with statutory requirements. Workers in a steel plant are exposed to many health hazards. The common health hazards are:



- i. Exposure to high temperature operations
- ii. Exposure to gases such as CO and fugitive dust in material handling and operations, which may cause respiratory diseases
- iii. Direct contact with moving machines and equipment.

All these can cause adverse impact if appropriate control measures are not adopted. Exposure problems to noise, dust, heat and gases are the major occupational hazards. Bronchitis, asthma and Noise induced hearing loss are the typical occupational health hazards identified in such plants.

#### **4.12.3 Mitigation measures for protection of health of workers**

Measures to be implemented to reduce the dust generation at the originating point are by installing control devices and / or regular water sprinkling. Plant personnel working in dust prone areas will be required to wear personnel protective equipment like air filters over their nose. Job rotation schemes shall be practiced for over-exposed persons.

Personal Protective Equipments (PPE) like earplugs and muffs will be provided and administrative pressure shall be applied for using them. Auditory examination by qualified doctors upon the first employment and thereafter periodic examination will be conducted which include determination of auditory threshold for pure tones.

Following general measures shall be implemented for protection of health of workers:

- a) Maintenance of pollution control system such as dust suppression system, safety appliances;
- b) Regular maintenance of equipment;
- c) Regular checking and up keeping of break down or leakage;
- d) Use of personal protection equipment wherever needed;
- e) Display of relevant safety norms to be followed in different operational areas;
- f) Use of 'Safety Permit' system for all maintenance jobs;
- g) Provision of ear plugs or muffs to workers exposed to high noise levels;
- h) Rotation of duties of workers;
- i) Creating awareness amongst workers concerning health, pollution and safety through posters, discussion, slogan etc.;
- j) Periodical medical examination of workers;

- k) Provision of suitable civil amenities such as plain drinking water, good service in canteen, etc.;
- l) Assessment of risk from health hazards at work place;
- m) Monitoring of different factors leading to occupational health hazards and taking timely action to mitigate the impact, etc.

#### 4.12.4 Specific Measures for Ensuring Safety

The practices to be followed in the plant are as follows:

**Electrical safety** – All the electrical installations will have rain protection shed, earth pit, three pin industrial plug top, rubber mat in front of panels, fire extinguishers. All the electrical equipment like welding machines, light points, portable electrical tools etc will be connected through ELCBs. In case of defects found during checking will be replaced immediately. Also the earth resistance value will be checked at regular intervals.

**Display of Safety Posters/ Slogans/ Warnings** – It will be displayed at conspicuous locations to spread awareness amongst the workers at site.

**Work Permit System** – Before starting of any critical/ hazardous work (excavation/ radiography/ working at height/ confined space/ electrical maintenance, etc.) it will be mandatory to take prescribed work permit which will be in the knowledge of authorized persons as they sign in that format.

**Valid Test Certificate** – It will be mandatory to have valid load test certificate by Competent Person for all the cranes, lifts, hoists, lifting tools/tackles used at site and displayed on the machine.

**PPEs & Safety Gadgets** – Use of PPEs will be necessary for all staffs/ workers of the project and contracting agencies.

**License for all drivers/operators** – All the drivers/ operators inside the premises will have to have valid license with the, and should be produced when asked. The speed limit inside the premises will be 20km/hr displayed at various locations.

**Fire Management System** – Portable fire extinguishers/ fire buckets at various fire prone locations will be provided.

#### 4.12.5 OHS Facility

An OHS centre shall be constructed in the plant. It will have a first aid center which will be well equipped and manned by competent person and safety Manager. Qualified MBBS doctor with assistant shall be hired to run the centre. Presently pre-induction and periodical medical test prescribed under Rule 62 J are being carried out by Max Diagnostic Private Limited, Dhenkanal. The formats being used and the findings of the tests of the

employees of the company have been given in **Annexure XXVIII** and **XXIX**, respectively.

The following tests will be conducted at the OHS centre along with technical support from private clinical laboratory, for the proposed project:

**Pre-employment medical examination:** A detail history with thorough physical examination will be done prior to induction. The purpose of this examination is to place right man in right job and for future reference.

**Periodic Medical Examination:** periodic medical examination is/ will be carried out as per the national Factories Act & Odisha Factories Rule.

**Specific Examination:** Of workers returning to work after long illness or injury. This will be done in special cases only.

**Supervision and Notification:** The activities are:

- i) To ensure cleanliness and good quality of food in the canteen.
- ii) Notification of any Occupational Health problems to the management, if encountered.
- iii) Maintenance of Health Records and its analysis

#### ***Other measures for OHS***

- As per requirement, 4 nos of First-aid boxes shall be provided and maintained in different locations of plant.
- **Safety Induction** – All the new staffs/ workers will go through safety induction before engagement at site. A prescribed format will be filled and signed by Safety Officer as an evidence of induction.
- **Safety Tool Talk** – It will be organized every month for the workers in the presence of site supervisor, site engineer, Safety manager. Job related safety precautionary measures, good safety practices, case studies etc. will be discussed.
- **Site Safety Inspection** – Safety manager appointed by Rungta Mines Limited (Dhenkanal Steel Plant) & contracting agencies are/ will take daily round in site and the unsafe conditions as well as the unsafe actions noticed will be informed to the immediate supervisor/ engineer for an early rectification. Apart from the above activity, every week a selected area will be inspected jointly like agency, safety manager, area engineer, workmen etc. and the unsafe points observed will be sent to the concerned site in-charge in the prescribed format for an early compliance. Follow-up will be made by safety manager for timely compliance.

- **Reporting of incidents/ near miss case** – It will be mandatory to report all the incidents & near miss cases in the prescribed format by the contracting SO within 12 hours of incident to Plant Head
- **Safety Committee Meeting** – Company is/ will conduct safety review meeting with all the contracting agencies once in every month. The project head and the SO of the contracting agency will be present in the meeting. Various issues related to incidents, non-complied unsafe points, good safety practices, improvements, incident trend & near misses will be discussed religiously with target date. The minutes of meeting will be circulated to all members for their compliance.
- **Safety Awareness/ Motivational Program** – Company is/ will conduct the National Safety Week, Road Safety Week, World Environment Day, National Fire Service Week etc. and distributes prizes to the winners of the contests organized among the staffs/ workers for the purpose. Apart from this contracting agencies will also organize safety competitions among their workers quarterly and distribute prizes to the best safety conscious workers to motivate.
- **Safety Pledge** – Safety Pledge is/ will be administered at site first day of every month where the entire worker gather and safety messages will also delivered them by Safety manager.
- **Fire & Safety Training** – Site based safety training programs will be arranged time to time for the staffs and workmen to educate and make conscious. Best safety practices, case studies on incidents and root causes will also be discussed to make them aware. Demonstrations like rescue, effective use of PPEs will also be organized by various PPEs and safety gadget suppliers for their optimum use.
- **Penalty system**– Company will have a penalty system for those who violate safety norms repeatedly after various instruction verbally and written. The amount will be debited from the Running Bill of the concerned contractor.
- **Good House Keeping**- Company is/ will maintain good house keeping and will reward the contractors who maintain the best house keeping.
- **Self Containing Breathing Apparatus (SCBA)** – Company will procure the SCBA for emergency use.
- **Safety Reward Scheme** – Company will plan to award the best safety performing contractors' quarterly/yearly.

#### 4.12.6 Occupational health data

Since the units of the plant are under construction, the PME data of the workers is presented below:

| Parameter                                                                                            | Details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------------------------------|---|-----|---|--------|---|--------|---|-----------------------|---|-------------|---|--------------------|---|-------------|---|---------------------|---|------------------------|----|-----------------------------|----|--------------------------------|----|-------------------|----|------|----|--------|----|-----------|
| OHS facility                                                                                         | Out side                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| OHS agency                                                                                           | Max Diagnostic Pvt. LTD Dhenkanal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| Pre-Employment / Periodical monitoring frequency as per Factory Act                                  | Periodic medical, Pre employment & annual as per Form no. 31 A and 30 (Sample given in <b>Annexure XXVIII</b> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| Records available                                                                                    | Yes, in plant premises (summary given in <b>Annexure XXIX</b> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| Tests carried out / records Periodical Medical Examination (PME) & Initial Medical Examination (IME) | <table border="1"> <thead> <tr> <th>Sl. No.</th><th>Parameters for Medical Examination</th></tr> </thead> <tbody> <tr><td>1</td><td>Age</td></tr> <tr><td>2</td><td>Height</td></tr> <tr><td>3</td><td>Weight</td></tr> <tr><td>4</td><td>Body Mass Index (BMI)</td></tr> <tr><td>5</td><td>Blood Group</td></tr> <tr><td>6</td><td>Eye Vision (LT/RT)</td></tr> <tr><td>7</td><td>Heart Sound</td></tr> <tr><td>8</td><td>Respiratory systems</td></tr> <tr><td>9</td><td>Cardiovascular systems</td></tr> <tr><td>10</td><td>Abdomen Tenderness (Yes/No)</td></tr> <tr><td>11</td><td>Nervous System (Fits/Epilepsy)</td></tr> <tr><td>12</td><td>Locomotors System</td></tr> <tr><td>13</td><td>Skin</td></tr> <tr><td>14</td><td>Hernia</td></tr> <tr><td>15</td><td>Hydrocele</td></tr> </tbody> </table> | Sl. No. | Parameters for Medical Examination | 1 | Age | 2 | Height | 3 | Weight | 4 | Body Mass Index (BMI) | 5 | Blood Group | 6 | Eye Vision (LT/RT) | 7 | Heart Sound | 8 | Respiratory systems | 9 | Cardiovascular systems | 10 | Abdomen Tenderness (Yes/No) | 11 | Nervous System (Fits/Epilepsy) | 12 | Locomotors System | 13 | Skin | 14 | Hernia | 15 | Hydrocele |
| Sl. No.                                                                                              | Parameters for Medical Examination                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 1                                                                                                    | Age                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 2                                                                                                    | Height                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 3                                                                                                    | Weight                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 4                                                                                                    | Body Mass Index (BMI)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 5                                                                                                    | Blood Group                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 6                                                                                                    | Eye Vision (LT/RT)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 7                                                                                                    | Heart Sound                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 8                                                                                                    | Respiratory systems                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 9                                                                                                    | Cardiovascular systems                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 10                                                                                                   | Abdomen Tenderness (Yes/No)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 11                                                                                                   | Nervous System (Fits/Epilepsy)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 12                                                                                                   | Locomotors System                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 13                                                                                                   | Skin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 14                                                                                                   | Hernia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| 15                                                                                                   | Hydrocele                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| OHS budget                                                                                           | Capital cost for occupational health = Rs. 180 lakhs and Recurring cost = Rs. 121.78 lakhs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |
| Safety measures in plant                                                                             |  <ul style="list-style-type: none"> <li>• Safety Manager appointed to look after the safety aspect</li> <li>• Provision of rest shelter in plant premises with amenities like canteen, drinking water etc.</li> <li>• Provision to use of safety appliances, display board, safety slogan etc.</li> <li>• PPE to workers</li> <li>• Training to workers for safe handling of material and machines</li> <li>• Safety awareness week</li> </ul>                                                                                                                                                                                                                                                                              |         |                                    |   |     |   |        |   |        |   |                       |   |             |   |                    |   |             |   |                     |   |                        |    |                             |    |                                |    |                   |    |      |    |        |    |           |





## CHAPTER 5

### ANALYSIS OF ALTERNATIVES

#### 5.1 SITE ALTERNATIVES

The proposed Steel Plant shall be located in Jharbandh, Galpada, Tarkabeda Kothalu, Beruan Pal, Kankalu, Benipathar, Kadala and Badamunda villages, Dhenkanal, Odisha. Since it is an existing site where construction is already ongoing as per the environmental clearance dated 02.08.2010 for 1.9 MTPA and environmental clearance dated 04.06.2020 for 3.0 MTPA, the Company plans to establish a higher capacity plant of 3.55 MTPA within the same area. The under construction units will be incorporated in the proposed configuration. The site has many advantages such as:

- Rungta Mines Limited has a strong base in the state of Odisha
- About 90% of the existing land (674.765 acres) land required for the project is already in possession of the company. The balance land has already been approved for allotment by IPICOL
- Water requirement from Brahmani river is located nearby (distance of river is 4.9 km in NE)
- Source of power will be captive power plant of the company.
- Raw materials like iron ore, coal, coke, etc will be available in close vicinity for this location or imported through nearest port.
- Availability of labour from nearby village is there
- Access through road and rail is convenient.
- Railway siding can be constructed at site.
- Environmental aspects such as distance from national parks, sanctuaries, forests, environmentally sensitive areas, etc. are favourable.

#### 5.2 TECHNOLOGY SELECTED AFTER ASSESSING ALTERNATIVES

Various units have been assessed for alternatives as given in subsequent paragraphs. They shall be equipped with various air pollution control systems, as applicable, such as dust extraction systems with bag filters at various suction points and electrostatic precipitator (ESP) for separation of dust from the gas.

##### 5.2.1 Beneficiation Plant

Beneficiation Plant mainly involves grinding of iron-ore fines and separation of gangue to the extent possible within the required operational limits.

Grinding of ore can be done in two alternatives (1) Wet Grinding & (2) Dry Grinding.

Later one is more expensive than the wet grinding system in terms of processing & environmental measures. It is generally preferred in areas where there is a scarcity of water. In view of the requirement to transport beneficiated fines in the form of slurry, wet grinding system has been considered.

**a) Dry grinding process**

In case of dry grinding, the iron ore fines are dried in a separate dryer to reduce moisture content to less than 1%. The dried fines are fed to grinding mill. It is desirable to add flux materials and/or bentonite with the iron ore fines in case of dry grinding. Extensive dust separation and pollution control measures are to be adopted for dry grinding. Dry grinding can be carried out either in open circuit or in close circuit.

**b) Wet grinding process**

The iron ore fines are ground in wet grinding mill. The ground product in the form of slurry is pumped to the slurry storage tank fitted with agitation mechanism. Water and finely ground raw materials are separated by pressure filters to obtain filter cakes. The moisture content of the filter cake is very important and depends on the size of the fine materials, nature of the ore, etc. Wet grinding can also be done either in open circuit or in close circuit.

In the present context, for production of DR grade pellets, further up-gradation or higher degree of beneficiation of lower grade ore fines is necessary. The wet beneficiation process is more efficient. Wet grinding is necessary when iron ore fines are transported to pellet plant site in the form of slurry. The comparison between wet & dry grinding is given in **Table 5.1**.

**TABLE 5.1: COMPARISON BETWEEN WET & DRY GRINDING**

|                       | <b>Wet grinding</b>                          | <b>Dry grinding</b>                         |
|-----------------------|----------------------------------------------|---------------------------------------------|
| <b>Advantages</b>     | Lower capital costs                          | Lower wear on mill balls                    |
|                       | Lower energy requirement                     | No need for thickening & filtering          |
|                       | Less Pollution                               | Wider selection of materials for processing |
|                       |                                              | Low water requirement                       |
|                       |                                              | Low binder requirement                      |
| <b>Dis-advantages</b> | “Difficult to filter” materials are excluded | More Pollution                              |
|                       | High wear on mill balls                      | High cost of drying                         |
|                       | Moisture level control is necessary          | Considerable noise level                    |

### 5.2.2 Pelletisation plant

There are two established processes for pelletisation of iron-ore as follows:-

- i. **Straight Grate Process**- Developed by M/s Lurgi (now Outokumpu) of Germany. In this process, drying, preheating, induration & cooling of pellets take place on the same strand.
- ii. **Grate Kiln Process**- Developed by M/s Allis Chalmers (now Metso Minerals) of USA. In this process pellets are dried & preheated on a grate, indurated in a rotary kiln and cooled in a circular cooler.

However, based on the techno-economic analysis and operating experience of existing pellet plants, straight travelling grate kiln process has been selected for this project.

### 5.2.3 Coal Washery

A coal washery will consist of a coal crushing, screening station and a gravity separation method.

Different types of crushers available are:

- Rotary Breakers
- Single – Roll Crusher
- Double – Roll Crusher
- Hammer Mills
- Ring Crushers

Screens Used in Coal Preparation are:

- Scalping screen – for separating refuse and fines prior to size reduction
- Raw coal sizing screen- for separating the raw coal into coarse and fine size for further processing
- Pre-wet screen- to remove fines prior to mechanical cleaning
- Heavy media recovery screens- for recovery and reuse of magnetite
- Desliming screens- to remove extreme fines; and
- Dewatering screens- to remove water

Various gravity based separation methods are given in **Table 5.2**.

**TABLE 5.2: COMPARISON OF DIFFERENT METHODS**

| Methods             | Jigs                                                            | Dense-medium separators                      | Hydro cyclones |
|---------------------|-----------------------------------------------------------------|----------------------------------------------|----------------|
| State of technology | Commercial                                                      | Commercial                                   | Commercial     |
| Advantages          | Large capacity<br>Inexpensive Common<br>type - world wide usage | Good separation second<br>most common method | -              |
| Disadvantages       | Lower separation than                                           | Small capacities                             | Water          |



| <b>Methods</b>      | <b>Jigs</b>                                                                                                         | <b>Dense-medium separators</b>                                                            | <b>Hydro cyclones</b>                                                                              |
|---------------------|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
|                     | dense-medium                                                                                                        |                                                                                           | consumption                                                                                        |
| Costs               | Inexpensive                                                                                                         | Expensive                                                                                 | -                                                                                                  |
| Suitability         | Intermediate efficiency device. For moderately difficult to clean coal. Specific gravity >1.5-1.6, Size: 0.5-150 mm | For difficult or most difficult to clean coal. Specific gravity >1.3-1.9, Size: 0.5-150mm | For coarse to intermediate particles Size:0.5-150mm                                                |
| <b>Methods</b>      | <b>Concentration</b>                                                                                                | <b>Froth flotation</b>                                                                    | <b>Dry cleaning</b>                                                                                |
| State of technology | Commercial                                                                                                          | Commercial                                                                                | Commercial                                                                                         |
| Advantages          | Inexpensive Good pyrite separation                                                                                  | Good results on fines                                                                     | No water required                                                                                  |
| Disadvantages       | Quite small capacities, 10-15 tones/h                                                                               | Complex Poor pyrite separation Poor dewatering characteristics                            | Not for difficult to clean coal                                                                    |
| Cost                | Inexpensive                                                                                                         | Expensive                                                                                 | Lower than wet processes                                                                           |
| Suitability         | Used for fine coal containing a great deal of pyrite. Specific gravity >1.5, Size: 0.0-15 mm                        | Used for fines. Mainly used for metallurgical coals Size: <0.5mm                          | Requires easy coal, Size: >100mm Rough Separation for coal tending to form slimes in wet processes |

*Source: Environmental Impact Assessment Guidance Manual for coal washeries by Administrative Staff College of India, Hyderabad, February 2010*

The coal washery will consist of a coal crushing and screening station followed by washing unit. It will be a three-product coal washery separating washed coal, middlings and rejects.

#### **5.2.4 Coke oven plant**

There are mainly two methods for carbonizing coal to get coke.

##### **1. Recovery type / Bye-Product coke ovens**

In this system, coking coal is heated in ovens in absence of air. In this way coal is carbonized into coke with evolution of coke oven gas from where get fuel gas and bye-products like tar, benzol, naphthalene are obtained.

##### **2. Non- Recovery or Bee-Hive coke Ovens**

In this system coal is heated at 1100 -1200°C in presence of restricted supply of air. Thus, coal yields only coke and the volatile matter are burnt to generate heat. This heat is then utilized for carbonization of the coal inside

the oven and the burnt flue gas is released in the atmosphere. These types of coke ovens are popularly known as Bee-hive ovens or Non-recovery coke Ovens.

Also the quenching type for the coke can be (1) wet or (2) dry. In conventional practice, hot coke is pushed from the oven and quenched by means of water spray. In wet quenching of coke heat is lost, coke quality deteriorates and water pollution is caused. Hence, coke dry cooling technology was developed and adopted on a commercial scale. In Coke dry quenching (CDQ), hot coke from the coke oven is cooled in specially designed refractory lined steel cooling chambers. An inert gas medium is circulated counter-current wise in a closed circuit.

CSQ (Coke Stabilization Quenching) is an advanced wet quenching system with low environmental impact. It was developed as an environmental friendly alternative to CDQ (Coke Dry Quenching). The emissions of dust are as low as for a CDQ and the gaseous emissions are even less. Besides, investment and O&M costs are substantially lower. The process itself is a combination of bottom and top quenching methods, providing extremely short cooling time.

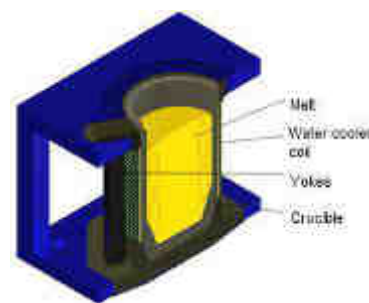
Considering the need of the project, **non recovery type** of coke oven with wet quenching is proposed to be set up. The proposed plant will have a non-recovery type coke oven with following advantages:

- Low capital cost.
- Low revenue cost in regard to operating & maintenance of oven.
- Low cost per tonne of coke / conversion.
- High coke yield.
- Any oven in a battery may be isolated and cooled down for repair any time during running condition without any considerable effect on oven life.
- No effluent, only air emission which are fully combusted. Thus, clean flue gas is released resulting to minimal environmental impact.
- Ovens of non-recovery type are being operated under suction to avoid any leakage during operation to prevent pollution.

## 5.2.5 Steel melting

Several specialised furnaces are used to melt the metal. Furnaces are refractory lined vessels that contain the material to be melted and provide the energy to melt it. Modern furnace types include electric arc furnaces (EAF), induction furnaces, cupolas, reverberatory, and crucible furnaces. Furnace choice is dependent on the alloy system quantities produced. For ferrous materials EAFs, cupolas, and induction furnaces are commonly used. Reverberatory and crucible furnaces are common for producing aluminium, bronze, and brass castings. The various melting processes assessed were as follows:

**Induction furnace :** An induction furnace is an electrical furnace in which the heat is applied by induction heating of metal. The advantage of the induction furnace is a clean, energy-efficient and well-controllable melting process compared to most other means of metal melting. Most modern foundries use this type of furnace and now also more iron foundries are replacing cupolas with induction furnaces to melt cast iron, as the former emit lots of dust and other pollutants.

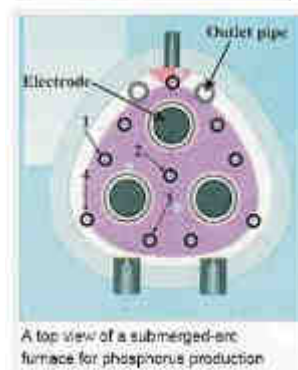


**Electric arc furnaces :** An electric arc furnace (EAF) is a furnace that heats charged material by means of an electric arc. Industrial electric arc furnace temperatures can be up to 1,800°C. Arc furnaces differ from induction furnaces in that the charge material is directly exposed to an electric arc, and the current in the furnace terminals passes through the charged material.



A schematic cross-section through an EAF. Three electrodes (yellow), molten bath (gold), tapping spout at left, refractory brick movable roof, brick shell, and a refractory-lined bowl-shaped hearth.

**Submerged Arc Furnaces:** The Submerged-arc furnace for phosphorus production is a particular sub-type of electric arc furnace used to produce phosphorus and other products. The nomenclature *submerged* means that the furnace's electrodes are buried deep in the furnace burden. A reduction reaction takes place near the tip of the electrodes to facilitate the furnace's process. The electrode tips are buried in the slag/charge, and arcing occurs through the slag, between the matte and the electrode.



A top view of a submerged-arc furnace for phosphorus production

The term "Submerged Arc Furnace" does not really describe all Electric Smelting processes because in some cases, arcing is to be avoided. Although each Smelting Process is unique, most processes fall into one of three operating modes:-

- **Slagless Processes-** with an arc between the electrode and the metal bath.
- **Slag Processes-** frequently with a coke bed formed under the electrode. The coke bed floats on the slag layer and the current passes through the coke bed and the slag before reaching the molten metal. In these slag processes arcing is usually minimized.
- **Slag Resistance Processes-** where the heat is generated by the current passing through a slag layer. There is no coke bed and no arcing should occur.

The most widespread use of Submerged Arc Furnaces in the United States today is in the production of Silicon Alloys in these Slags-Less processes an

arc is made between the Electrodes and the Metal bath within a cavity under the charge mix.

**Chosen technology:** The technology adopted in this plant will be induction furnace and electric arc furnace for steel melt shop.

### 5.2.6 Captive Power Plant

Thermal power technologies involve combustion or gasification of oil, natural gas or coal to produce electricity. Steam generating plants burn all types of coals (anthracite, bituminous, sub-bituminous, lignite and brown coals), oil, natural gas and biomass independently or in combination.

The two fundamental processes for extraction of energy from coal are (i) Direct Solid Combustion such as conventional Pulverised Coal (PC) Combustion or the emerging Fluidised Bed Combustion (FBC) and (ii) Indirect combustion through Coal Gasification followed by coal gas combustion.

#### (i) *Fluidized bed combustion plant*

Fluidised Bed Combustor is a “three-in-one device” characterized by highly desirable features of multi-fuel capability, pollution ( $\text{SO}_2$  and  $\text{NO}_x$ ) control and energy conservation.

Fluidized bed combustion (FBC) reduces emissions of  $\text{SO}_2$  and  $\text{NO}_2$  by controlling combustion parameters and by injecting a sorbent (such as crushed limestone) into the combustion chamber along with coal. Coal mixed with limestone is fluidized by jets of air in the combustion chamber. Sulphur released from the coal as  $\text{SO}_2$  is captured by the sorbent in the bed to form a solid calcium compound that is removed with ash. More than 90 per cent of  $\text{SO}_2$  can be captured this way.

At combustion temperatures of 760 to 871°C, the fluidized mixing of the fuel and sorbent enhanced both combustion and sulphur capture. The operating temperature range is about half of that of a conventional pulverized coal boiler and below the temperature at which thermal  $\text{NO}_x$  is formed. In fact, fluidized bed  $\text{NO}_x$  emissions are about 70 to 80 percent lower than those for conventional pulverized coal boilers. Thus, fluidized bed combustors substantially reduce both  $\text{SO}_2$  &  $\text{NO}_x$  emissions.

Fluidized bed combustion can be circulating atmospheric (CFBC), atmospheric (AFBC), pressurized (PFBC) or Integrated Gasification Combined Cycle (IGCC). AFBC operates at atmospheric pressure while PFBC operates 6 to 16 times higher pressure. PFBC offers potentially higher efficiency and consequently, reduce operating costs and waste relative to AFBC.

The principle of the various types of boilers are diagrammatically seen in **Fig 5.1**.

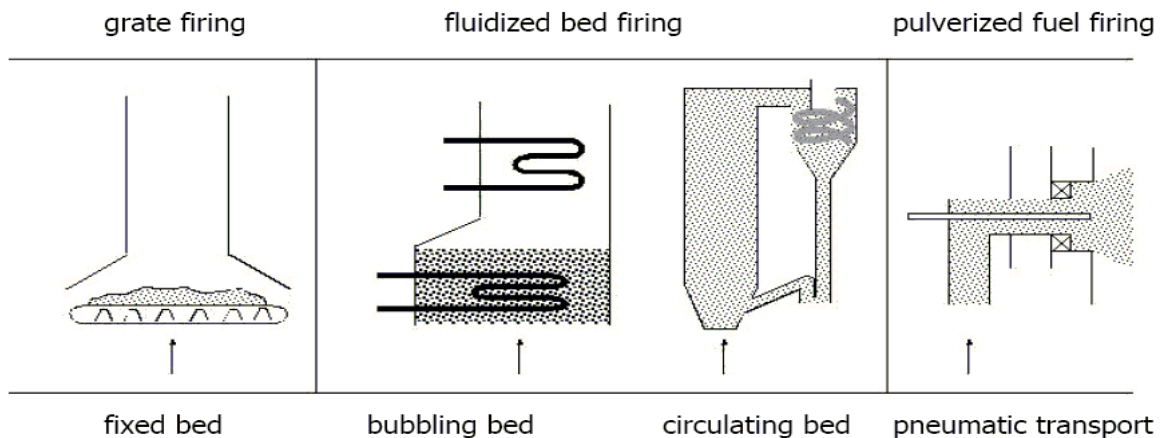


**FIG 5.1: COMBUSTION SYSTEMS FOR SOLID FUELS**

(source: [http://en.wikipedia.org/wiki/Fluidized\\_bed\\_combustion](http://en.wikipedia.org/wiki/Fluidized_bed_combustion))

**1) CFBC (Circulating Fluidized Bed Combustion) :** Circulating fluidized bed is a relatively new technology with the ability to achieve lower emission of pollutants. During the combustion phase, upwards jets of air will cause the solid fuels to be suspended. This is to ensure the gas and solids will mix together turbulently for better heat transfer and chemical reactions. The fuel will be burnt at a temperature of 760-920°C to prevent nitrogen oxide from forming. Sulfur dioxide released during combustion will be absorbed by limestone or dolomite used to mix with the fuel particles in the fluidization phase. The sulfur absorbing chemical and fuel are recycled to increase the efficiency of producing a higher quality steam as well as lower the emission of pollutants.

**2) AFBC (Atmospheric Fluidised Bed Combustion):** Atmospheric fluidized beds use limestone or dolomite to capture sulfur released by the combustion of coal. Jets of air suspend the mixture of sorbent and burning coal during combustion, converting the mixture into a suspension of red-hot particles that flow like a fluid. These boilers operate at atmospheric pressure.

**3) PFBC (Pressurised Fluidised Bed Combustion):** The first-generation PFBC system also uses a sorbent and jets of air to suspend the mixture of sorbent and burning coal during combustion. However, these systems operate at elevated pressures and produce a high-pressure gas stream at temperatures that can drive a gas turbine. Steam generated from the heat in the fluidized bed is sent to a steam turbine, creating a highly efficient combined cycle system.

**4) IGCC (Integrated Gasification Combined Cycle) :** is a technology that uses a high pressure gasifier to turn coal and other carbon based fuels into pressurized gas-synthesis gas (syngas). IGCC plants are advantageous in comparison to conventional coal power plants due to their high thermal efficiency, low non-carbon greenhouse gas emissions and capability to process low grade coal. The key disadvantage is the amount of CO<sub>2</sub> released without pre-combustion capture.

**Chosen technology:** Both AFBC and CFBC have been considered at pre-feasibility stage to generate 460 MW power. However, it has been now decided to only opt for CFBC, in view of its several advantages over AFBC.

**(ii) WHRB Power Generation Unit**

Sponge Iron is produced by heating Iron with coal and other additives under controlled conditions in Rotary Kiln. The outlet gases are mixed with air and burnt to convert CO into CO<sub>2</sub>. As the flue gases contain substantial sensible heat, it is proposed to utilize the heat for power generation through waste heat recovery boilers.

The waste heat recovery boilers consist of radiation chambers with water walls just like conventional boiler with a drum to evaporate steam at pressure. The steam is carried to super heater system where the +500°C temperature is maintained. The boiler has an economizer, which utilises the heat of outgoing gases to raise the temperature of feed water from 100 to 200 °C. The steam is used to rotate the turbine and to generate power. The condensed steam is collected and recycled to the boilers as boiler feed water. A DM water plant is provided for preparation of de-mineralized water for make-up to the steam-condensate cycle. The output of the boilers will be used to generate electricity through Steam Turbo Generator Sets. The flue gases leave the economizer zone at about 150°C. The gases are passed through ESPs, where the dust concentration is brought down to below 100 mg/m<sup>3</sup>. Three ESPs and stacks of appropriate heights are provided, one for each boiler.

In the proposed project, three types of waste heat recovery will occur from: (1) Exiting DRI kiln gases, (2) coke oven gases and (3) MBF gas. Total WHRB based power generation will be 135 MW.

## CHAPTER 6

### ENVIRONMENTAL MONITORING PROGRAM

#### 6.1 INTRODUCTION

Success of any environmental management programme depends upon the efficiency of the organisational set up responsible for implementation of the programme. Regular monitoring of various environmental parameters is also necessary to evaluate the effectiveness of the management programme so that necessary corrective measures can be taken in case there are some drawbacks in the proposed programme. Since environmental quality parameters at work zone are important for maintaining safety, the monitoring work forms part of safety measures also. This chapter deals with the creation of an arrangement for successful implementation of environmental monitoring plan.

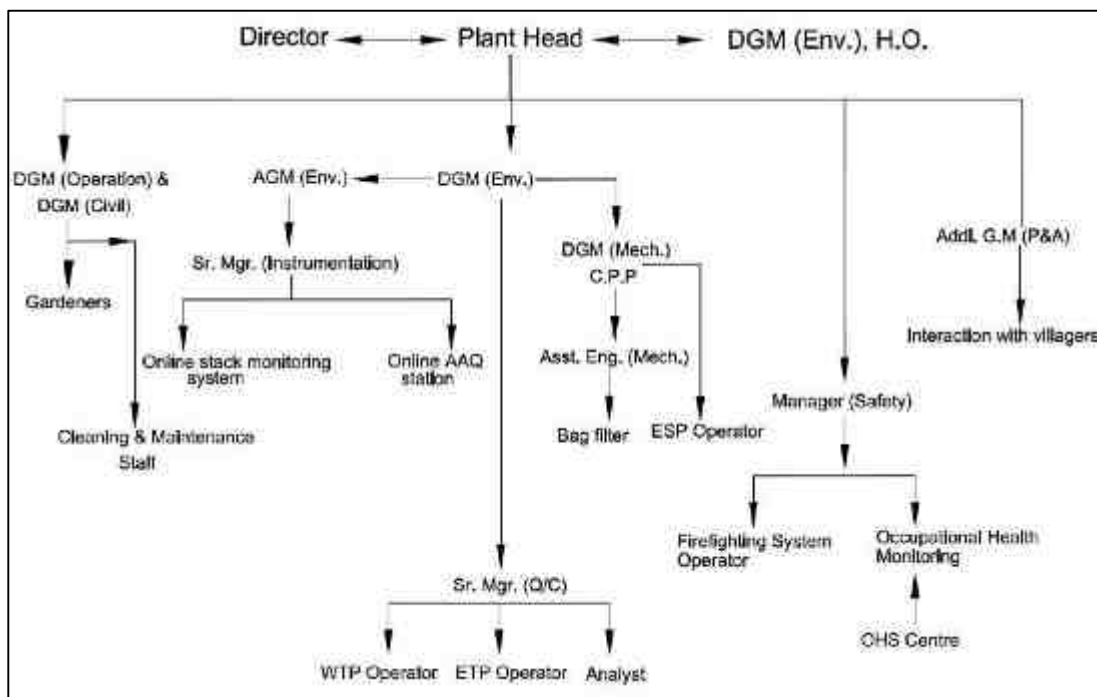
#### 6.2 PROPOSED ORGANIZATIONAL SET-UP

An Environment Department shall be establish at the plant, which will function in conjunction with the Environment Department at Head office in Chaibasa. The organizational chart in the company along with the DGM (Environment) and his team has been shown in **Fig 6.1**.

The said team will be responsible for:

- Ensuring collection of ambient air samples, stack emission samples, water samples, soil samples, effluent samples, noise measurement for analysis, etc. by accredited/ recognised laboratory.
- Implementing the control, protective and mitigation measures.
- Co-ordinating the environment related activities within the project as well as with outside agencies.
- Collecting statistics of health of workers and population of the surrounding villages.
- Green belt development, plantation schedule etc.
- Monitoring the progress of implementation of environmental management programme.
- Monitoring of waste water management plan and disposal of solid waste.

**FIG 6.1: ORGANISATIONAL CHART FOR ENVIRONMENTAL MANAGEMENT**



The monitoring for various parameters of air, water, noise, soil, waste water, stack, etc. will be carried out by an MOEF&CC/ NABL recognized lab as per the monitoring schedule. The samples will be collected from the plant and taken to be analyzed in their laboratory. Within the plant, various online monitoring equipment shall be installed in the stack for monitoring various parameters.

### 6.3 MONITORING SCHEDULE AND PARAMETERS

To evaluate the effectiveness of environment management programme, regular monitoring of the important environmental parameters will be done to ascertain the following:

- Pollution control status within the plant area.
- Generate data for predictive or corrective purpose in respect of pollution.
- Effectiveness of pollution control measures and control facilities.
- To assess environmental impacts.
- To follow the trend of parameters which have been identified as critical.
- Ensure compliances to the conditions of the environmental clearances, consent to operate and consent to establish.
- Submit periodical compliance reports to MOEF&CC, SPCB and submission of various returns under Hazardous waste, Environmental Statement, etc.



Monitoring is as important as pollution control since the efficiency of the control measures can only be determined by monitoring. The schedule, duration and parameters for monitoring have been proposed as given in **Table 6.1**.

**TABLE 6.1: MONITORING SCHEDULE AND PARAMETERS**

| Sl. No. | Description of parameters                                                                                                                                                                           | Location                                                                                                                                                                                                                                                                        | Schedule and duration of monitoring                                                                                                             |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.      | Air Quality Monitoring:<br>Parameters:<br>PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>2</sub> , CO, Ozone, Lead, Ammonia, Benzene, BaP, Arsenic and Nickel (As per NAAQS 2009) | Plant premises                                                                                                                                                                                                                                                                  | Online continuous air quality monitoring stations are already installed.                                                                        |
|         |                                                                                                                                                                                                     | In nearby villages                                                                                                                                                                                                                                                              | One 24 hour sample per season except monsoon or as per the MoEF&CC/ CPCB/ SPCB guidelines, whichever are most stringent.                        |
| 2.      | Stack Emission Monitoring:<br>PM, SO <sub>2</sub> , NO <sub>x</sub>                                                                                                                                 | At all major combustion based stacks                                                                                                                                                                                                                                            | Online continuous monitoring system shall installed as per SPCB directions.<br><br>In absence of online system, once a month manual monitoring. |
| 3.      | Water Quality/effluents<br><br>Water quality of surface and ground as per IS : 10500-2012 except radioactivity                                                                                      | <b>Ground water-</b> One within plant, one on down gradient and one on up gradient of plant in addition to 5 more samples in 10 km radius<br><br><b>Surface water-</b> upstream & downstream at Bramhani River and atleast 6 other nala/ river flowing through nearby villages. | Once in every season.                                                                                                                           |
|         | Effluent- pH, TSS, TDS, BOD, COD                                                                                                                                                                    | ETP- inlet and outlet                                                                                                                                                                                                                                                           | ETP- daily/ online                                                                                                                              |
| 4.      | Ambient noise level                                                                                                                                                                                 | One near plant and at four locations around the plant                                                                                                                                                                                                                           | Prior to every compliance submission                                                                                                            |

| Sl. No. | Description of parameters                                                                                             | Location                                                                                 | Schedule and duration of monitoring   |
|---------|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------|
| 5.      | Inventory of flora (Tree plantation, survival etc.)                                                                   | Green belt                                                                               | Once in a year within the green belt  |
| 6.      | Soil quality for fertility parameters such as N, P, K, organic matter, water holding capacity, density, texture, etc. | One plant area and one from outside plant area from agricultural land within 2 km radius | Once in every season except monsoon   |
| 7.      | Inventory of hazardous waste                                                                                          | Within plant                                                                             | Monthly or as directed in NOC by SPCB |

After study of the monitoring results, mid-course corrections, modifications, improvements, etc. can be carried out in the major equipment's of Air Pollution Control system such as Dust settling Chambers, Electrostatic Precipitator (ESP), Multicone Cyclones, Filter Bag House, Wet Scrubber, etc. These pollution control equipments are an integral part of the production units. They are maintained like any other equipments of production units. Expenses are made every year in the operation and maintenance of such equipments and the performance will have to be monitored periodically.

Within the premises of the plant, tree plantation in green belt will be carried out. Continuous vigil and monitoring of green belt will be done for its performance and survival rate. The plantation will be properly guarded by watch and ward personnel. Provision will be made for fertilizers application and watering on schedule. The company will celebrate 5th of June every year as World Environment Day with an aim to spread the message of clean environment.

#### 6.4 BUDGETARY PROVISION FOR ENVIRONMENTAL MONITORING

Capital and recurring cost estimated for monitoring through in-house equipment as well as through third party, is given in **Table 6.2** and **6.3**, respectively.

**TABLE 6.2: CAPITAL COST FOR ENVIRONMENTAL MONITORING**

| Particulars                         | No. of equipment | Unit cost (Rs. Lakhs) | Capital cost (Rs. Lakh) |            |        |
|-------------------------------------|------------------|-----------------------|-------------------------|------------|--------|
|                                     |                  |                       | As per EC               | Additional | Total  |
| PM2.5 sampler                       | 4                | 1.00                  | 4.00                    | -          | 4.00   |
| Respirable dust sampler             | 4                | 0.65                  | 2.60                    | -          | 2.60   |
| Micro-meteorological station (Auto) | 1                | 1.50                  | 1.50                    | -          | 1.50   |
| Laboratory for testing              | LS               | 10.00                 | 10.00                   | -          | 10.00  |
| Online stack sampler                | 13               | 15.00                 | 195.00                  | 225.00     | 420.00 |

| Particulars  | No. of equipment | Unit cost (Rs. Lakhs) | Capital cost (Rs. Lakh) |               |               |
|--------------|------------------|-----------------------|-------------------------|---------------|---------------|
|              |                  |                       | As per EC               | Additional    | Total         |
| AAQM         | 4                | 15.00                 | 60.00                   | -             | 60.00         |
| Noise meter  | 2                | 0.50                  | 1.00                    | -             | 1.00          |
| <b>Total</b> |                  |                       | <b>274.10</b>           | <b>225.00</b> | <b>499.10</b> |

**TABLE 6.3: RECURRING COST FOR ENVIRONMENTAL MONITORING**

| Particulars                                     | Recurring cost (Rs. Lakhs) |              |               |
|-------------------------------------------------|----------------------------|--------------|---------------|
|                                                 | As per EC                  | Additional   | Total         |
| Testing/Chemicals etc.                          | 2.5                        | 0            | 2.5           |
| Annual Depreciation                             | 54.15                      | 45           | 99.15         |
| Power consumption                               | 2.67                       | 1.35         | 4.02          |
| Repair & Maintenance including oils, lubricants | 11.1                       | 9.13         | 20.23         |
| Manpower                                        | 8.28                       | 0            | 8.28          |
| Third party monitoring                          | 3.0                        | 0            | 3.0           |
| <b>Total</b>                                    | <b>81.7</b>                | <b>55.48</b> | <b>137.18</b> |

**Notes :**

- *Manpower considered for monitoring- 20% time of environmental engineer (Grade-II) and 100% time of 1 Grade-III chemist, 2 Grade-IV (Lab assistant)*
- *The monitoring equipments will operate with electricity @Rs. 5.5/unit*
- *Annual depreciation will occur within 5 years for all except lab, which has been considered 7 years)*

The total capital investment on environmental monitoring of 3.55 MTPA plant is envisaged as Rs 4.99 Crores and recurring expenditure is envisaged as Rs. 137.18 lakhs/year. The increase in investment for expansion from 3.0 to 3.55 MTPA will be Rs. 2.55 Crores and in recurring expenditure it will be Rs. 55.48 lakhs.

## 6.5 CORPORATE ENVIRONMENT POLICY

The Company has formulated a Corporate Environment Policy and it has been duly approved by the Board of Directors vide agenda item no. 6 of minutes of meeting/ resolution dated 10.12.2018 (copy enclosed as **Annexure XXV**).

The Corporate Environment Policy (copy enclosed as **Annexure XXV**) states:

“It is the policy of M/s Rungta Mines Limited to strive to ensure that all aspects of the business have the least harmful effect on the Environment by implementing an effective Environmental Management system to:

- Have full awareness of all Environmental and Factory legislation in India and to ensure that regulatory requirements are duly met with including the conditions/ stipulations/ norms of Environment Clearance.
- Monitor the implementation of the Policy by carrying out periodic audits of compliance with full reporting to the Board of Directors and to suggest necessary remedial measures, if required, thereto.
- Ensure that all Employees in the course of their duties act in accordance with the Environmental Policy. To encourage suppliers, contractors and vendors to act in accordance with Company's Environmental Standards.
- Maintain transparency in matters of Environmental compliance.
- Selection of non polluting technology, waste minimisation, reuse/ recycling and the reduction of energy consumption will be particular areas of attention of the business.
- The Company will also make a positive environmental contribution in the local community by encouraging open communication, general Environmental awareness and the promotion of CSR activities."

On start of operation, more detailed documentation shall be laid down in line with the specific activities in the project, functions and role of the employees.

***Standard operating process / procedures to address deviation/ non-compliances/ violation***

Environmental Manual shall be prepared, either stand alone or as part of the Environmental Management System such as ISO 9001, 14001 and 45001 and implement it. The Manual shall be prepared to comply the Corporate Environmental Policy covering the following aspects:

- 1) Environment clearance conditions/ stipulations/ norms
- 2) Consent to establish conditions / stipulations / norms
- 3) Consent to operate conditions / stipulations / norms
- 4) Monitoring mechanism for compliance through periodic audits
- 5) Reporting of the audit results to Board of Directors
- 6) Corrective and Preventive Actions to be taken
- 7) Self improvement measures

***Hierarchical systems to deal with the environmental issues and for ensuring compliance***

The Company will establish an environmental cell which will be responsible for the compliance of the environmental conditions.

Environment Department will operate under the Plant Head, who will report to the Board of Directors.

Furthermore, Environmental Manual shall be prepared and will define the roles and responsibilities of various members of the team in different hierarchical levels with respect to adherence to the Environmental policy and compliance with Environmental Laws and Regulations.

### ***Systems of reporting of non compliances/ violations***

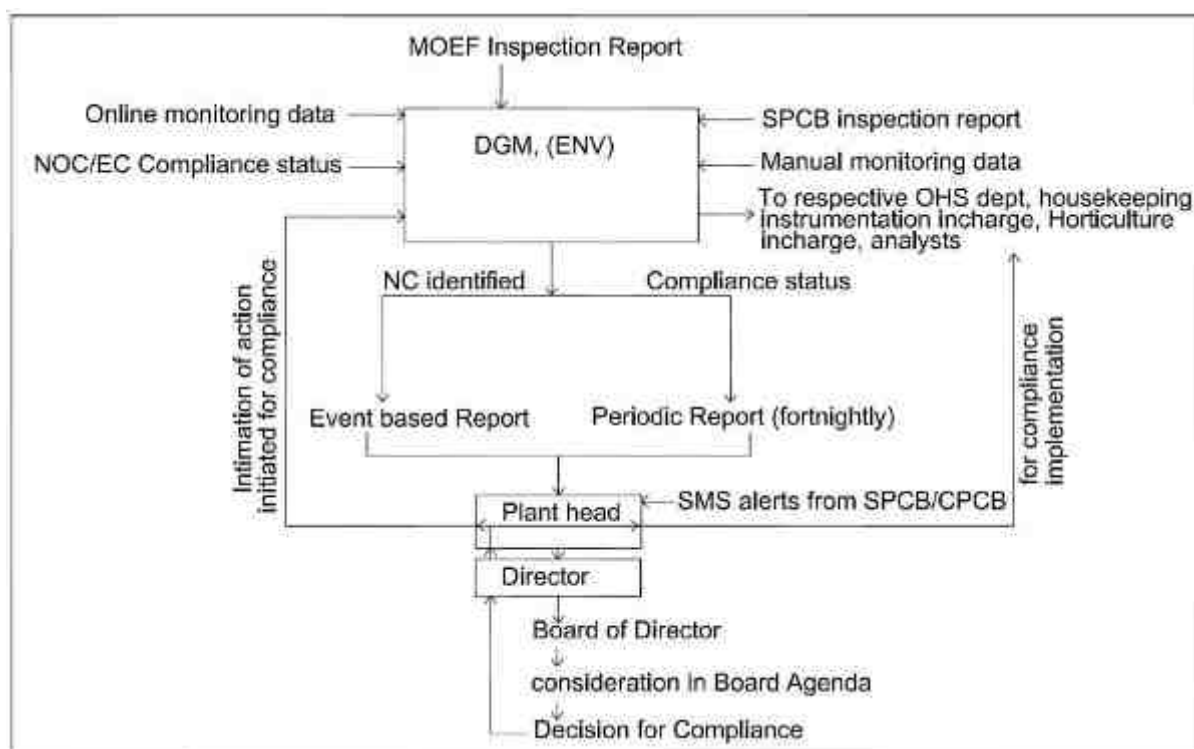
Half yearly Progress Report to the conditions imposed by Ministry of Environment, Forest & Climate Change, Govt. of India, in respect of Environmental Clearance of Steel Plant (2.85 MTPA & 3.0 MTPA dated 11.09.2020 & 04.06.2020, respectively) is being uploaded at Company's website regularly. Deviations from the policy and cases of violation of Environmental clearance conditions as well as Consent to operate as found by MoEF&CC and OSPCB or other public authority will be reported to Board of Directors and corrective as well as preventive action will be taken.

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inputs                              | <ul style="list-style-type: none"> <li>➤ Perusal of data from online monitoring systems attached to stacks</li> <li>➤ Continuous ambient air quality stations</li> <li>➤ SMS alerts from SPCB/ CPCB</li> <li>➤ NOC/ EC conditions compliance status</li> <li>➤ Periodic manual monitoring data</li> <li>➤ Inspection report of MOEF&amp;CC</li> <li>➤ Inspection report of SPCB</li> <li>➤ Complaints from local people, NGO or any other</li> <li>➤ Environmental statement (Form V)</li> </ul> |
| Heirarchy of reporting upwards      | DGM (Environment) at project --> Plant head --> Director --> Board of Directors                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Type of reporting                   | <p>(1) Periodic written report, every fortnight is submitted even when all conditions are complied</p> <p>(2) Event based written reporting whenever any of the inputs reveals non compliance</p>                                                                                                                                                                                                                                                                                                |
| Frequency of consideration by Board | <p>Board of director meets regularly and considers the reports received as one of the agenda items. It is to be recorded in minutes of meeting. In case of non compliance, a decision for its resolution is to be taken and communicated down the line to the person executing the compliance.</p> <p>The Environmental Statement (Form V) is to be considered annually and recorded in the Annual report.</p>                                                                                   |

|                                      |                                                                                                                                                                                                                                                                             |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Heirarchy of downward implementation | Board of Directors --> Director --> Plant head --> to relevant OHS head/ staff or horticulture department or housekeeping or instrumentation department or pollution control devices operator or ETP operator or analysts with intimation to DGM (Environment) of the plant |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Flow chart of the system of reporting of non compliances or violations has been shown in **Fig 6.2**.

**FIG 6.2: FLOW CHART OF THE SYSTEM OF REPORTING OF NON COMPLIANCES**



## CHAPTER 7

### ADDITIONAL STUDIES - RISK ASSESSMENT & DISASTER MANAGEMENT PLAN

As per generic structure of the EIA/EMP report prescribed in EIA Notification dated 14.09.2006, this chapter is to comprise of public consultation, disaster management, social impact assessment and R&R Action plan. Public Hearing shall be held on the basis of report being prepared and shall be added in this Chapter after it is held. The Corporate Social Responsibility and Corporate Environment Responsibility programme has been detailed in Chapter 9. Only the aspect of disaster management plan has been covered in this chapter.

This chapter deals with identification of hazards and disaster and preventive measures for disaster. Proposed Expansion of Dhenkanal Steel Plant may face certain types of hazards which can disrupt normal activities abruptly and lead to disaster like fires, inundation, failure of machinery, hot metal spill, electrocution to name a few. DRI plant, WHRB plant, etc. also pose fire, electrocution, spill and explosion hazards. Disaster management plan is formulated with an aim of taking precautionary steps to control the hazard propagation and avert disaster and also to take such action after the disaster which limits the damage to the minimum.

#### 7.1 HAZARD IDENTIFICATION AND RISK ASSESSMENT

As a consequence of health and safety awareness many measures shall be taken to ensure the security of an individual working in the industrial premises. Risk assessment follows an extensive hazard analysis. Risk is defined as a likelihood of an undesired event (accident injury or death) occurring within a specified period or under specified circumstances. This may be either a frequency or a probability depending on the circumstances. In the working atmosphere, it is not possible to avoid or eliminate risk factor completely. However it is possible to minimize the risk factor to minimal or acceptable level.

The simple six-step risk assessment process includes:

1. Identification of a hazard
2. Identification of the associated risk
3. Assessment of the risk, which includes the (i) likelihood, (ii) severity and (iii) assigning a priority for correction
4. Control of the risk, which includes (i) Elimination, (ii) Engineering a barrier, (iii) Administration controls and (iv) Personal protection equipment
5. Documentation of the process.
6. Monitoring and review of the process.

### 7.1.1 Identification of a hazard and associated risk

The hazard shall be higher for workers directly exposed to hot metal, machines with moving parts, hot machines, hot water conduits, high places, near high pressure equipment, noise, etc. There the danger due to failure of machinery, spillages, exposure to heat, hazard of explosion due to high pressure. Several examples of hazards that may cause injury or illness can be:

- (i) slips, trips and falls on the same level;
- (ii) falls from height;
- (iii) unguarded machinery;
- (iv) falling objects;
- (v) engulfment;
- (vi) working in confined spaces;
- (vii) moving machinery, on-site transport, forklifts and cranes;
- (viii) exposure to controlled and uncontrolled energy sources;
- (ix) exposure to asbestos;
- (x) exposure to mineral wools and fibres;
- (xi) inhalable agents (gases, vapours, dusts and fumes);
- (xii) skin contact with chemicals (irritants (acids, alkalis), solvents and sensitizers);
- (xiii) contact with hot metal;
- (xiv) fire and explosion;
- (xv) extreme temperatures;
- (xvi) radiation (non-ionizing, ionizing);
- (xvii) noise and vibration;
- (xviii) electrical burns and electric shock;
- (xix) manual handling and repetitive work;
- (xx) failures due to automation etc

In the existing plant & proposed expansion project, type of likely hazards and possible areas where this can occur are tabulated in **Table 7.1**.

**TABLE 7.1: LIKELY HAZARDS IN THE PLANT AND THEIR LOCATION**

| Hazard           | Probable Locations                                                                                                                  |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Mechanical       | Coal Crushing Plant, Sponge Iron Plant, Steel Melting Shop, Continuous Casting Machines, Rolling Mills, etc.                        |
| Fire & Explosion | Boiler House, Coal Storage Area, Coal Crushing Plant, Mini Blast Furnace, Sponge Iron Plant, Steel Melting Shop, Continuous Casting |



| Hazard      | Probable Locations                                                     |
|-------------|------------------------------------------------------------------------|
|             | Machines, Rolling Mills, Boiler House, Sinter Plant, Oxygen Plant etc. |
| Electrical. | TG Area, Electrical Substation, Steel Melting Shop, Rolling Mills etc. |
| Chemical.   | Treatment plants, CPP, Pump House                                      |

There can be hazards on the road while coming and going from duty, during transportation of material due to following:

- High concentration of traffic during duty hours
- Heterogenous traffic
- Violation of traffic rules/ speed limit
- Road Condition
- Condition of vehicle

### 7.1.2 Assessment of the risk

Risk analysis follows as extensive hazard analysis. It involves the identification and assessment of potential impact. This requires a thorough knowledge of failure probability, credible accident scenario, vulnerability of population, etc. Much of this information is difficult to get or generate. Consequently the risk analysis is often confined to maximum credible accident studies.

#### ***Risk evaluation***

Risk is defined as probability of occurrence of an accident and its consequences. The risk may be computed by the following formula:

$$FAR = \frac{108}{24 \times 365 \times N} \sum_{i=1}^n (x_i \times f_i)$$

Where:

|       |   |                                                    |
|-------|---|----------------------------------------------------|
| $x_i$ | = | Number of deaths from a particular accident        |
| $f_i$ | = | Frequency of occurrence of the particular accident |
| $n$   | = | Potential types of accidents                       |
| $N$   | = | Total number of people at risk                     |
| FAR   | = | Fatality accident rate                             |

The above concept of risk is quite straight forward. It is based on one specific aspect i.e. individual working in a particular environment that is exposed to a definite level of risk. The formula is based on actual historical record of the accident episodes reported in that particular type of environment. Accordingly the risk factor i.e. probability level of occurrence of accident works out to nil in this case.

All systems natural or man made shall be subject to failure. The nature of failure varies widely as do the causes of failure and the events leading to failure. The failure of systems could be due to:

- Misconception of required capability of systems or environment.
- Design deficiencies and erroneous assumption.
- Errors in operational process
- Improper management of the systems.
- Risk evaluation to determine the acceptable level and reduce the risk level.
- Control decision monitored for meticulous implementation to prevent the occurrence of unclassified and unacceptable accidents.

Attempts have been made to reduce failures of man-made systems with the introduction of safety measures, quality control, reliability analysis, condition monitoring and other approaches in design in order to reduce the probability of failure. Use of measures such as factor of safety shall be usually resorted to in order to improve the reliability of design and where health of the person is at great risk. Such factor has to be very high reducing probabilities of accidents/ disaster to a very low level.

The auxiliary fuels as Low Sulphur Heavy Stock (LSHS)/ Furnace Oil (FO) shall be required at proposed expansion of steel plant. For storage of auxiliary fuels, underground fabricated steel tanks shall be installed, which shall conform to the regulations. Since the tank(s) shall not be above ground, assessment of fire in tank and pool fire in dyke have not been carried out.

The fuel storage tanks shall be operated at ambient conditions. Fire hydrant points and fire extinguishers shall be provided at these locations. The characteristics of auxillary fuel based on IS 11489 -1985 (Reaffirmed in 2016) has been given in **Table 7.2**.

**TABLE 7.2: FUELS CHARACTERISTICS**

| Sl. No. | Parameter                          | Specification |
|---------|------------------------------------|---------------|
| 1       | Pour Point °C                      | +66 Max.      |
| 2       | Flash Point (PMC), °C              | 76 Min.       |
| 3       | Kinematic Viscosity, at 100°C, cSt | 50 Max.       |
| 4       | Relative Density @ 15 °C g/ml      | Report        |

| Sl. No. | Parameter                               | Specification                                  |
|---------|-----------------------------------------|------------------------------------------------|
| 5       | Gross Calorific Value, Cal/g            | Report                                         |
| 6       | Acidity, Inorganic, mg KOH/gm,          | NIL                                            |
| 7       | Ash, percent by Mass.                   | 0.10 Max.                                      |
| 8       | Sediment, percent by Mass               | 0.25 Max.                                      |
| 9       | Sulphur, Total percent by Mass          | 1.0 Max.                                       |
| 10      | Water content % by Vol.                 | 1.0 Max.                                       |
| 11      | Accelerated Dry Sludge, percent by Mass | 0.10 Max                                       |
| 12      | Spot Test for cleanliness, Rating       | No 2 (Faint or poorly defined inner ring), Max |

### 7.1.3 Risk control

#### *On site emergency planning*

The on site emergency plan would be related to the final assessment and it is the responsibility of the management to formulate it. The plan must therefore, be specific to the site.

The plan sets out the way in which designated people at the site of the incident initiate supplementary action at an appropriate time. Designated people may or may not be from amongst the workers. An essential of the plan is the provision for making the affected unit safe, for example, by shutting it down. The plan also contains the full sequence of key personal to be called in from other sections or from off site.

#### *Off site emergency plan*

The off site emergency plan is an integral part of any major hazard control system. It should be based on those accidents identified by the works management, which could affect people and the environment outside the works. Thus, the off site emergency plan follows logically from the analysis that took place to provide the basis for the on site emergency plan and the two plans should therefore complement each other. The key feature of a good off site emergency plan is flexibility in its application to emergencies other than those specifically included in the formation of the plan. The role of the various parties that may be involved in the implementation of an offsite plan are described in detail. The responsibility for the off site plan will be likely to rest either with the works management or with the local authority.

#### **7.1.3.1 Emergency control centers**

The emergency control center is the place from which the operations to handle the emergency will be directed and coordinated. It will be manned by

the site work main controller, key personnel and the senior officers of the fire and police services.

Emergency control centers therefore contains the following :

- a) An adequate number of external telephone.
- b) An adequate numbers of internal telephones
- c) A plan of the workers to show
- d) Areas where there are inventories of LSHS and chlorine
- e) Sources of safety equipment
- f) Fire hydrant system and alternate supply sources
- g) Assembly point, First-aid centre/ casualty treatment centre
- h) Truck parking information
- i) A nominal roll of employee
- j) List of personnel with addresses telephone numbers
- k) Specialized monitoring equipment will be available at all the sensitive points to deal with small to medium spillages of the chemical.
- l) The equipment operators must be trained in development of the equipment.

#### **7.1.3.2 General safety rules**

At the plant where fuels chemicals and other materials are reactive in nature following general guidelines will be made.

- Fitting dress and use of personnel protective equipment recommended for respective job should be adhered to by everyone.
- All unsafe conditions or natural occurrences should be reported promptly to the supervisor/ head of the department of safety.

#### **7.1.3.3 Personal protective equipment (PPE)**

Personnel protective equipment play vital role in reducing the losses in case of an accident. They provide protection to the workmen from injuries during the execution of job. The various protective equipment will be used during expansion phase are:

**Gloves and protective clothing:** Since the chemicals are very corrosive and toxic, those called upon to handle will be provided with gloves and protective clothing.

**Safety Helmets:** Every one inside the plant and the visitors shall wear safety helmets for protection of their head. The material of the helmet will be conform to the safety standard.

**Safety Belts:** Safety belts will be provided for protection in case of fall while working at height.

**Safety Shoes:** Every one inside the plant and the visitors shall wear safety shoes for protection their toes and heels. The material of the shoes will be resistant to the type of chemicals and heat within the plant.

**Safety goggles and face shields:** Suitable goggles protect the eyes from flying objects and harmful rays of welding and furnace flames and also heat, dust and chemicals substances. Standard welders goggles, face shield or hood will be used by the workers and helpers while involved in operations, wherever applicable.

## **7.2 TYPE OF DISASTER**

Disaster can be natural or man made which have a negative impact on society or environment or both.

### **1) Natural disasters**

A natural disaster is the consequence of a natural hazard (e.g. earthquake, flood, tsunamis, hurricane, etc.) which affects humans. The damage is caused by the lack of appropriate emergency management leading to financial, environmental and human life loss. Due to the location of this plant, earthquake is the first and foremost natural hazard followed by flooding. This shall is not near the coast and thus, is not affected by tsunamis or hurricanes.

### **2) Man-made disasters**

The man-made disasters shall be caused by human action, negligence, error, or involving the failure of a system. Human-made disasters can be termed as technological disaster. Technological disasters shall be the results of failure of technology involving material, design, system or operational failures.

#### **7.2.1 Natural disasters**

##### **7.2.1.1 Seismic & Earthquake risk management**

As per the recent categorization, the country has been divided into four zones (II, III, IV and V) and Odisha falls between Zones II and III i.e. low damage risk zone and moderate damage risk zones. The earthquake map from Odisha State Disaster Management Agency is given in **Fig 7.1**.

**FIG 7.1: EARTHQUAKE HAZARD MAP**

(Source: <https://www.osdma.org/earthquake-2/#gsc.tab=0> accessed 15.10.2020)

No major earthquake has been noticed in Odisha state since 2002. However, details of the earthquakes in last 2 decades is given below. (Source: Amateur Seismic Centre, <http://asc-india.org/seismi/seis-orissa.htm>, last accessed on 15.10.2020):

| Date            | Description                                                                                   |
|-----------------|-----------------------------------------------------------------------------------------------|
| 08 April 1982   | Bay of Bengal, Mw 5.2<br>18.510 N, 86.310 E, D=024.0 kms, OT=02:41:16 UTC                     |
| 14 October 1982 | Khajuripada-Banigochha area, Odisha, Mb 4.7<br>20.390 N, 84.420 E, OT=12:56:09 UTC            |
| 01 July 1985    | Bay of Bengal, Mw 5.4<br>18.367 N, 87.188 E, D=010.0 kms, OT=02:23:52 UTC                     |
| 27 March 1995   | Laimura-Deogarh area, Odisha, Mb 4.6<br>21.671 N, 84.565 E, D=010.0 kms, OT=07:52:10.60 UTC   |
| 21 June 1995    | Kasijodi-Nuakot area, Odisha, Mb 4.7<br>21.780 N, 85.327 E, D=033.0 kms, OT=18:35:41.23 UTC   |
| 12 June 2001    | Konokjora-Sundargarh area, Odisha, Mw 4.7<br>22.240 N, 83.918 E, D=025.5 kms, OT=12:41:00 UTC |

After assessment of the website <https://earthquaketrack.com/in-21-dhenkanal/recent> (accessed 15.10.2020) which lists the latest earthquakes, it was found that no earthquakes were found to have occurred in or within 10 km radius of the project site in the last ten years. The earthquake,

nearest to project site was on January 19, 1986, 06:53 UTC (approximately 33 years ago) about 4.4 magnitude earthquake, with epicenter at 21.003, 85.172, 8.2 km from Talcher.

Despite the low level of seismicity and the proximity of low magnitude earthquake that has occurred in the region, the construction of the buildings will be done as per National Building Code and IS 875. In case of damage due to earthquake, the disaster management shall be done in line with National Disaster Management Authority's system.

There is no threat of landslide at project site, it being flat in topography. Although Jharbandh reserve forest is near to the project and located on a hill, the presence of forest will protect the hillside from sliding.

### ***Management Measures:***

Things that need to be done shall be as follows:

- During construction of the various building byelaws and BIS codes will be followed.
- A common meeting point inside the plant site and a contact outside the plant will be identified and known to all employees and workers.
- List important telephone numbers and torch, water, transistor, first-aid kit and non-perishable food will be kept at a designated place. An emergency kit shall be ready at all times.
- Train workers in basic first aid. Teams for first-aid; search and rescue etc. has been formed in the area and preparedness drills are and will be conducted for what to do in case of an event.

In case of occurrence of an earthquake, every individual would have to follow the pointers below:

- Keep calm and help others to keep calm. Do not panic.
- If you shall be inside of a building: Protect yourself by ducking under sturdy table, and staying there until the shaking stops. Turn off electricity and gas.
- If you shall be on the road in a built up area: Immediately move away from buildings, slopes, streetlights, power lines, hoardings, fly-overs etc. into open spaces. Do not run or wander; keep the roads free for movement.
- If you shall be driving: Stop the vehicle away from the buildings, slopes and electric cables; come out of the vehicle, hold it and stay by its side
- Keep calm and expect aftershocks.
- Check if you or anyone else is hurt. Use first-aid and wait for medical help.

- Do not move seriously injured people.
- Do not turn-on electrical appliances and gas.
- Check your building for damages.
- Do not waste water and do not block telephone lines.
- Do not spread rumours and don't panic.
- Volunteer to help.
- Keep the streets clear for emergency services.
- Do not use matches, lighters, camp stoves or electrical equipments, appliances until you can be sure there are no gas leaks. They may create a spark that could ignite leaking gas and cause an explosion and fire.
- Do not use your telephone except for a medical or fire emergency. It could tie up the lines needed for emergency response. If the phone doesn't work send someone for help. Conserve mobile phone & laptop batteries for use in emergency as power may be cut for long.

For general structural safety, the following codes shall be followed:

- IS: 456:2000 "Code of Practice for Plain and Reinforced Concrete.
- IS: 800-2007 "Code of Practice for General Construction in Steel.
- IS: 801-1975 "Code of Practice for Use of Cold Formed Light Gauge Steel Structural Members in General Building Construction.
- IS 875 (Part 2):1987 Design loads (other than earthquake) for buildings and structures Part 2 Imposed Loads.
- IS 875 (Part 3):1987 Design loads (other than earthquake) for buildings and structures Part 3 Wind Loads.
- IS 875 (Part 4):1987 Design loads (other than earthquake) for buildings and structures Part 4 Snow Loads.
- IS 875 (Part 5):1987 Design loads (other than earthquake) for buildings and structures Part 5 special loads and load combination (second revision).
- IS: 883:1994 "Code of Practice for Design of Structural Timber in Building.
- IS: 1904:1986 "Code of Practice for design and construction of foundations in soil".
- IS1905:1987 "Code of Practice for Structural Use of Unreinforced Masonry.
- IS 2911-1-4:2010: Code of Practice for Design and Construction of Pile Foundations.



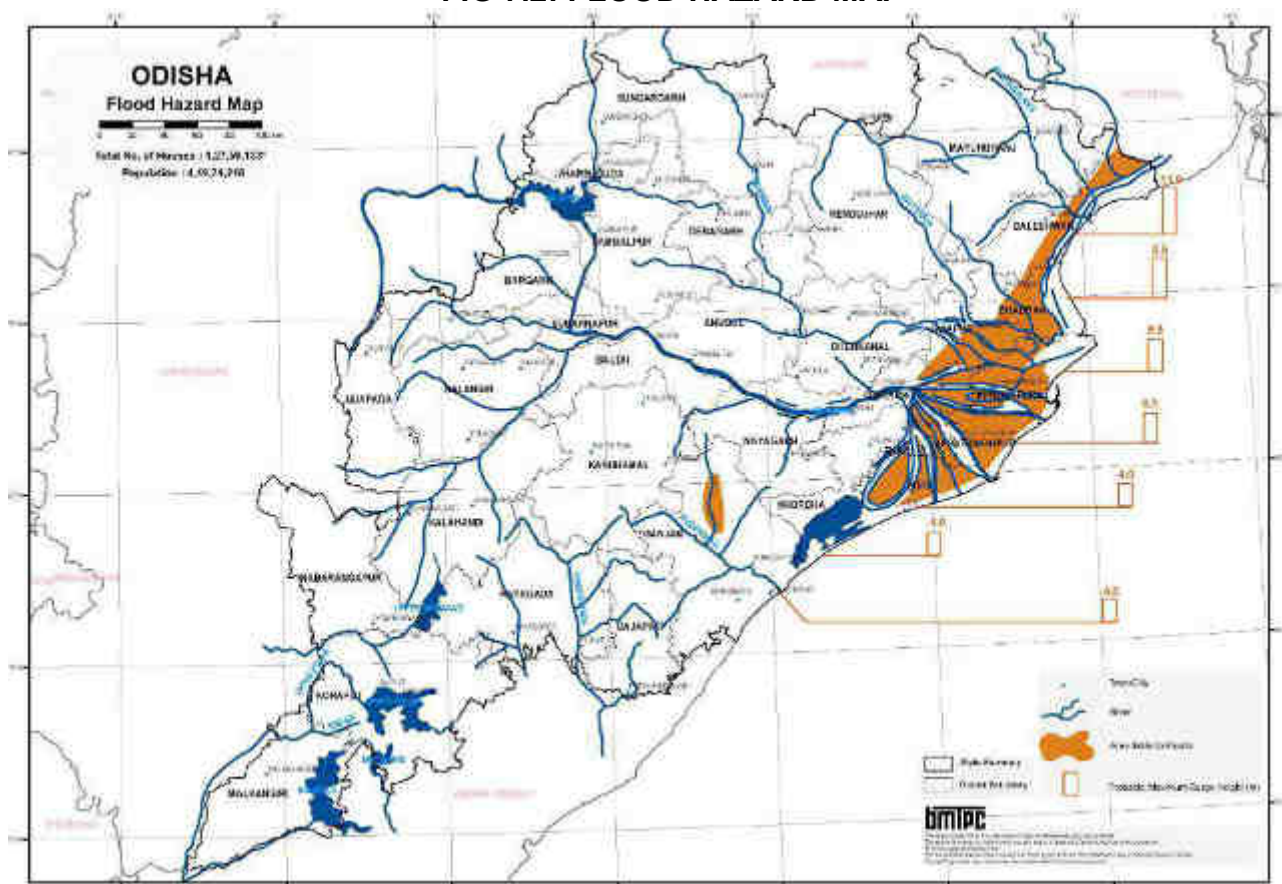
For Earthquake Protection, the following codes shall be followed:

- IS: 1893-2002 “Criteria for Earthquake Resistant Design of Structures (Fifth Revision)”
- IS:13920-1993 “Ductile Detailing of Reinforced Concrete Structures subjected to Seismic Forces - Code of Practice”
- IS:4326-1993 “Earthquake Resistant Design and Construction of Buildings - Code of Practice (Second Revision)”
- IS:13828-1993 “Improving Earthquake Resistance of Low Strength Masonry Buildings - Guidelines”
- IS:13827-1993 “Improving Earthquake Resistance of Earthen Buildings - Guidelines”,
- IS:13935-2009 “Seismic Evaluation, Repair and Strengthening of Masonry Buildings - Guidelines”

### 7.2.1.2 Flood Hazard

A perusal of the flood hazard map of Odisha state given in **Fig 7.2** shows that the project area lies in the area of “no significant flooding”.

**FIG 7.2: FLOOD HAZARD MAP**



(Source : <https://bmtpc.org/DataFiles/CMS/file/VAI2019/od.html> accessed 15.10.2020)

***Flood management***

In case of extreme scenario of occurrence of flood in study area, people from the nearby-flooded villages might flock for shelter to the higher elevations and this project could be one of their refuges in times of distress. Hence, arrangement of flood shelter is proposed in the project as follows:

- Several clean containers for water, large enough for a 3-5 day supply of water.
- A 3-5 day supply of non-perishable food and a non-electric can opener.
- A first aid kit and manual and prescription medicines and special medical needs.
- A battery-powered radio, flashlights, and extra batteries.
- Sleeping bags or extra blankets.
- Water-purifying supplies, such as chlorine or iodine tablets or unscented, ordinary household chlorine bleach.
- Baby food and/ or prepared formula, diapers, and other baby supplies.
- Disposable cleaning cloths, such as "baby wipes" for the whole family to use in case bathing facilities are not available.
- Personal hygiene supplies, such as soap, toothpaste, sanitary napkins, etc.
- An emergency kit for your car with food, flares, booster cables, maps, tools, a first aid kit, fire extinguisher, sleeping bags, etc.
- Rubber boots, sturdy shoes, and waterproof gloves.
- Insect repellent containing DEET or Picaridin, screens, or long-sleeved and long-legged clothing for protection from mosquitoes which may gather in pooled water remaining after the flood.

**7.2.2 Man made disasters**

Disaster may occur due to following hazards in the steel complex.

- Fire
- Explosion
- Oil spillage
- Electrocutation
- Hazardous waste
- Accident
- Liquid hot metal spill

In any plant there shall be various activities or area which pose substantial threat to the workers and hence hazardous in nature. In the proposed project, type of likely hazards that can occur shall be tabulated in **Table 7.3**.

**TABLE 7.3: HAZARD IDENTIFICATION OF THE PROPOSED EXPANSION OF STEEL PLANT**

| Group                          | Item                                                 | Nature of Hazard | Hazard Potential | Remarks                           |
|--------------------------------|------------------------------------------------------|------------------|------------------|-----------------------------------|
| Raw materials handling         | Coal for coking                                      | Fire             | Moderate         | Fire hazard                       |
|                                | Water treatment<br>Chemicals like acids/alkalis      | Toxic            | Major            | Bio-corrosive                     |
|                                | Lube oils/greases                                    | Fire             | Moderate         | Flammable                         |
| <b>Production units</b>        |                                                      |                  |                  |                                   |
| - Coke Plant                   | Dusts and fumes                                      | Asphyxiation     | Moderate         | Air pollution                     |
|                                | VOC emissions from battery                           | Toxic            | Moderate         | Health hazard                     |
|                                | Coke over gas                                        | Fire & Toxic     | Major            | Fire and CO hazard                |
| - Agglomeration (Sintering)    | Dusts                                                | Respiratory      | Moderate         | Ambient air pollution             |
| - Iron making in               | Release of untreated DRI/ BF wastewater              | Toxic            | Major            | Severe pollution of surface water |
|                                | BFG handling                                         | Fire             | Major            | Fire hazard                       |
|                                | Hot metal & slag Handling, dolochar                  | Fire             | Major            | Fire hazard                       |
| - Steel making in              | Release of untreated BOFs wastewater                 | Toxic            | Major            | Severe pollution of surface water |
|                                | BOFG handling                                        | Fire             | Major            | Fire hazard                       |
|                                | Hot liq. Steel & Slag Handling                       | Heat radiation   | Major            | Bio-corrosive                     |
| - Rolling Mills                | Gas firing/fuel firing                               | Fire             | Major            | Fire hazard                       |
|                                | Release of untreated wastewater                      | Toxic            | Major            | Severe pollution of surface water |
| - Captive Power Plant (CPP)    | MBF Gas, Coke over Gas                               | Fire             | Major            | Fire hazard                       |
| <b>Utilities</b>               |                                                      |                  |                  |                                   |
| - Fuel gas                     | Gas leaks                                            | Fire & Toxic     | Major            | Fire & Co Pollution               |
| - Electric Power Supply        | Short circuit                                        | Fire             | Major            | Fire hazard                       |
| - Liquid fuel                  | Fuel handling & storage area                         | Fire & Toxic     | Major            | Fire Hazard                       |
| - Hydraulic oil and lubricants | Accidental discharge of hydraulic oil under pressure | Fire & Toxic     | Moderate         | Fire & personal injury            |

### 7.3 ACCIDENT LEVEL

If there is any disaster in any part of plant/work place due to any reason the classification of area, which may be affected, and nature of accidents can be made as follows:

|   |       |     |                         |
|---|-------|-----|-------------------------|
| 1 | Level | I   | Operator level          |
| 2 | Level | II  | Local community level   |
| 3 | Level | III | Regional/national level |
| 4 | Level | IV  | International level     |

Out of the above, only level-I and level - II class of accidents can be considered applicable for steel complex.

#### ***Level - I Accidents***

Accidents that may happen due to electrocution, fire, explosion, oil spillage, liquid hot metal spill and spontaneous ignition of combustible material at operator level. This level has low probability of occurrence and affects persons inside the plant. Various hazardous area, which have been mentioned above in **Table 7.3** as potential hazard area will be affected during this level of accidents.

#### ***Level-II Accidents***

Accidents of this level can occur in case of sabotage and complete failure of all automatic control/warning systems, and also if the fuel oil stored in tank leaks out. However probability of occurrence of this is very low due to adequate security, training and education of persons of plant responsible for operating such systems.

### 7.4 DISASTER PREVENTIVE MEASURE

In order to prevent disaster due to fire, explosion, oil spillage, electrocution, liquid hot metal spillage and other accidents, following preventive measures shall be adopted:

1. Design, manufacture and construction of all plant and machineries building will be as per national and international codes as applicable in specific cases and laid down by statutory authorities.
2. Provision of adequate access way for movement of equipment and personnel shall be kept.
3. Minimum two no. of gates for escape during disaster shall be provided.
4. Water spraying in coal storage shall be provided.

5. System of fire hydrants comprising electrical motor division and diesel engine drivers fire pumps with electrical motor driver jockey pump for keeping the fire hydrant system properly pressurized and automatic water sprinkling system for all important transformers.
6. Fire hydrants with fire hoses in all areas where fire can break.
7. Shielded cover will be paved on the signal cable to separate from the power cable if they shall be laid together.
8. Steam fire extinguishers shall be adopted at all the dangerous places in the workshops and plant.
9. Ventilation and temperature control facilities is set at all operation room, duty room, and assistant room as well as overhang fans to ensure labour health.
10. The design of this project is set with safety measurements such as lighting proof grounding and anti- electric shock.
11. The safety exit and safety evacuation space would meet the requirements of building design for fireproofing regulations GBJ16-87 (1997 Edition).

#### **7.4.1 Site emergency control room**

In order to control the disaster more effectively, a Site Emergency Control Room (SECR) shall be established at the plant site. The facilities proposed to be provided shall be given in following sections:

- Plant Layout.
- Plant Layout with inventories and locations of fuel oil, storage tanks, coal storage, assembly points, location of safety equipment, etc.
- Hazard identification chart, maximum number of people working at a time, etc.
- Data & location of population around factory.
- Internal telephone connections.
- External telephone connections.
- Hotline connection to district collector, police control room, fire brigade, hospital etc.
- Public address system.
- Torch-lights.
- List of dispensaries and registered medical practitioners around factory.

- Area map of surrounding villages.
- Nominal roll of employees.
- List of personnel with addresses, telephone numbers
- Note pads and ball pens to record message received and instructions to be passed through runners.
- The blown up copy of Layout plan showing areas where accident has occurred.
- Fire hydrant system in different location.
- Truck parking information
- Specialized monitoring & management equipment will be available at all the sensitive points to deal with small to medium spillages of the chemical.

#### **7.4.2 Safety department**

Safety department will be manned by experienced engineers and other supporting staff who brings safety consciousness amongst the work force of plant. The safety department conducts regular safety awareness courses by organizing seminars and training of personnel among the various working levels.

The management will form a “Safety Committee” consisting of equal number of representative of workers and management. The tenure of the committee is of 2 years and the worker’s representative of committee will be elected by the workers. The committee will meet quarterly and most of the safety activities and workers complaints and suggestions will be implemented through this committee.

### **7.5 CONTINGENCY PLAN FOR MANAGEMENT OF EMERGENCY**

To tackle the situation, a disaster control room will be set up which will have links with all control rooms of the plant. An up to date communication facility will be provided to control rooms. In case of disaster, emergency meeting of all concerned sectional heads will be convened to decide control measures and ensure it's implementation. The emergency organisation shall be headed by emergency leader called Site Main Controller (SMC) who will be plant manager. In his absence senior most person available at plant shall be emergency leader till arrival of plant manager.

Besides the top officials described above, rest of the employees shall be divided into three action teams namely A, B, C, and a Non-action Group D. Action team 'A' will consist of staff of section in which accident has occurred. Action team 'B', will consist of staff of non-affected sections and maintenance department. Action team 'C' will consist of supporting staff i.e. Security supervisor, Warehouse Supervisor, Shift Supervisor etc. Group 'D'

will consist of people not included in those teams like contractor, labour, security men etc.

Team 'A' comprising staff of affected section will be taking up the action in case of an emergency. Team 'B' will help team 'A' by remaining in their respective sections ready to comply with specific instructions of SMC. Team 'C' consisting of supporting staff will help team 'A' as required and directed by Team 'B'. Group 'D' will be evacuated to safe region under supervision of Team 'C'.

A multichannel communication network shall connect SECR to control rooms of plant, various shops, and other departments of plant, fire station and neighboring industrial units. Co-ordination among key personnel and their team has been shown in **Fig 7.3**.

### **7.5.1 Outside organisations involved in control of disaster**

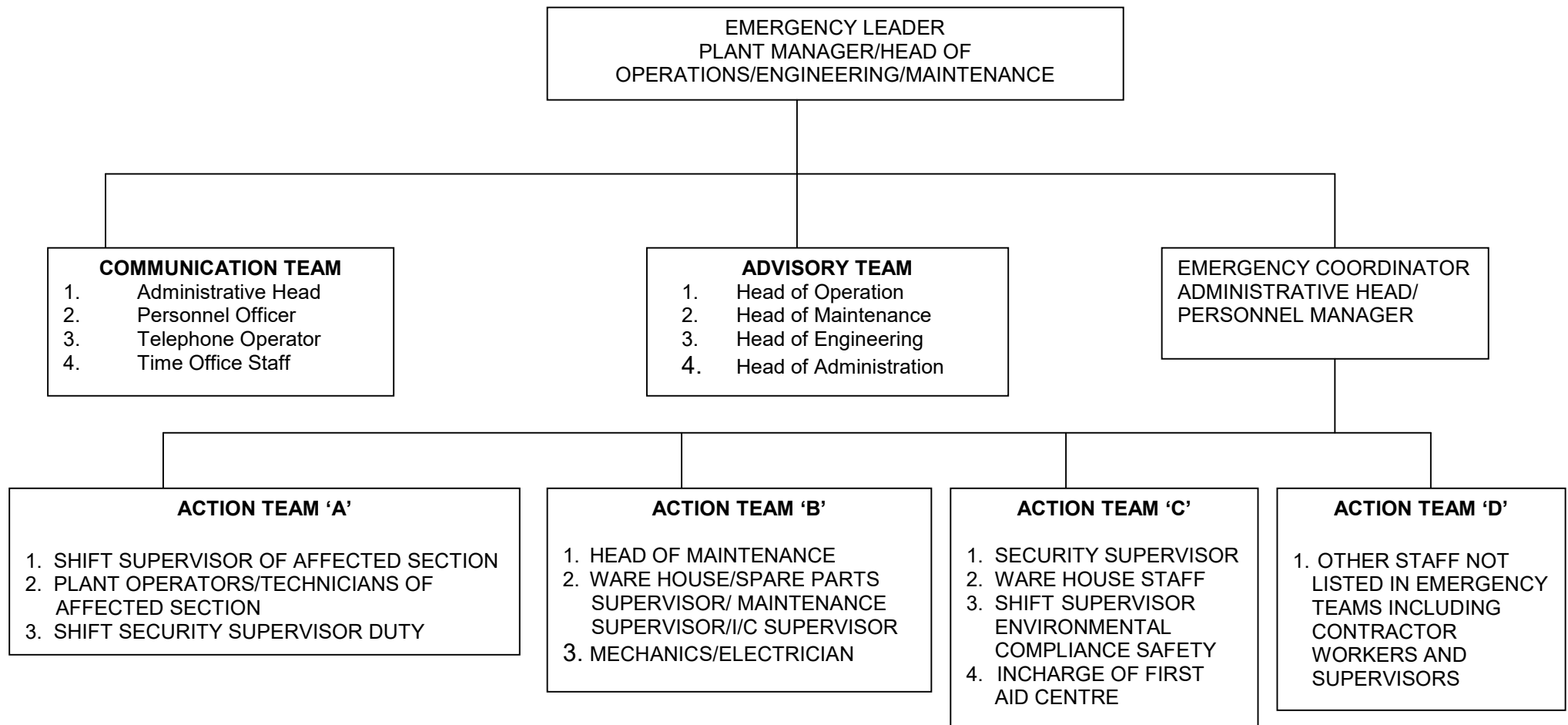
In the event of massive spillage of fuel oil or occurrence of fire, population inside and outside plant boundaries, vegetation and animal etc. may be affected. In such circumstances secondary fire may also take place. In such an event help shall be taken from outside agencies also.

The organizations that shall be involved shall be as follows:

- (a) State and local authorities: District Collector, Revenue Divisional Officer, etc.
- (b) Factory Directorate, Director of factories and boiler, Joint Director of factories and boiler, Asstt. Director of factories and boiler
- (c) Environmental agencies: Member Secretary of State Pollution Control Boards, Regional Officer State Pollution Control Board.
- (d) Fire Department: Chief District Officer
- (e) Police Department: District Superintendent of Police, SHOS of nearby Police Stations
- (f) Public Health Department:
  - District Medical Officer
  - Residential medical officers of PHCs in a radius of 4-5 km around plant site
- (g) Local Community Resources
  - Regional Transport officer
  - Divisional Engineer Telephones

The outside organisations shall directly interact with district magistrate, who in consultation with SMC, shall direct to interact with plant authorities to control the emergencies.

**FIG 7.3: GENERAL COORDINATION AMONG ON SITE EMERGENCY TEAM MEMBERS**





### **7.5.2 Hazard emergency control procedure**

The onset of emergency will in all probability, commence with a major fire or explosion, the following activities will immediately take place to interpret and take control of emergency.

1. Staff member on duty will go to nearest fire alarm call point and trigger off the fire alarm.
2. On site fire crew led by fireman will arrive at the site of incident with fire foam tenders and necessary equipments.
3. Site main controller will arrive at SECR, from where he will receive information continuously from incident controller and give decisions and direction to the incident controller, plant control room, Emergency security controllers and to the site medical officer to take care of casualties.

Site Main Controller will be directing and deciding a wide range of issues. In particular SMC has to decide and direct:

- Whether incident controller requires reinforcement of manpower and facilities
- Whether plant is to be shut down or more importantly kept running.
- Whether staff in different locations is to remain indoor or to be evacuated and assembled at designated collection center.
- Whether missing staff members shall be searched or rescued.
- Whether off-site emergency plan to be activated and a message to that effect is to be sent to district headquarter.

When the incident has eventually been brought under control as declared by the Incident Controller, the SMC shall send two members of his advisory team as inspectors to incident site for:

- An assessment of total damage and prevailing conditions with particular attention to possibility of re-escalation of emergency which might, for the time being, be under control.
- Inspection of other parts of site, which might have been affected by impact of incident.
- Inspection of personnel collection and roll call centers to check if all persons on duty have been accounted for.
- Inspection of all control rooms of plant to assess and record the status of respective plants and any residual action deemed necessary.

Post emergency, the inspectors will return to SECR with their observations and report of finding and will submit the same to SMC.

## 7.6 MISCELLANEOUS PREVENTIVE MEASURES

### 7.6.1 Alarm system to be followed during disaster

On receiving the message of “Disaster, from Site Main Controller, fire station control room attendant will sound SIREN I WAILING TYPE FOR 5 MINUTES. Incident controller will arrange to broadcast disaster message through public address system.

On receiving the message of “Emergency Over” from Incident Controller the fire station control room attendant will give “All Clear Signal, by sounding alarm straight for two minutes. The features of alarm system will be explained to one and all to avoid panic or misunderstanding during disaster.

### 7.6.2 Actions to be taken on hearing the warning signal

On receiving the disaster message following actions will be taken:

- All the members of advisory committee, personnel manager, security controller, etc. shall reach the SECR.
- The process unit persons will remain ready in their respective units for crash shutdown on the instruction from SECR.
- The persons from other sections will report to their respective officer.

### 7.6.3 Safety devices/equipments

In order to make the services more effective the workers and rescue team will be provided with the safety equipment and items like gas mask respirators, fire entry suits, fire blankets, rubber shoes or industrial shoes, rubber glove, ladders, ropes, petromax lamp torches etc.

### 7.6.4 Fire extinguisher

The different type of fire extinguishers will be provided at strategic locations in the plant. The types of fire extinguisher which have been proposed are given in **Table 7.4**.

**TABLE 7.4: DIFFERENT FIRE EXTINGUISHERS AT DIFFERENT SITES**

| Name of Site       | Type of Fire Extinguishers                       |
|--------------------|--------------------------------------------------|
| Generator area     | CO <sub>2</sub> & Foam Type, Dry Chemical Powder |
| Cable galleries    | CO <sub>2</sub> & Foam type, Dry chemical powder |
| High voltage panel | CO <sub>2</sub> & Foam type, Dry chemical powder |
| Control rooms      | CO <sub>2</sub> & Foam type, Dry chemical powder |
| MCC rooms          | CO <sub>2</sub> & Foam type, Dry chemical powder |
| Pump Houses        | CO <sub>2</sub> & Foam type, Dry chemical powder |

| Name of Site             | Type of Fire Extinguishers                                   |
|--------------------------|--------------------------------------------------------------|
| Fuel storage             | CO <sub>2</sub> & Foam type, Dry chemical powder sand basket |
| Guest houses and offices | Dry chemical powder, foam type                               |
| Godowns, store           | CO <sub>2</sub> & Foam type                                  |

#### 7.6.5 Casualty services

The casualty services section will be headed by a medical officer who will be responsible for immediate medical aid and first aid. The section will be fully equipped with all first aid medical facilities. An ambulance will be provided on duty round the clock to tackle the emergency. On receiving the call of emergency, the medical officer will report immediately to disaster site along with mobile first aid equipment and ambulance. The immediate first aid will be made available and the medical officer will assess further line of action in the best interest of victim.

#### 7.6.6 Specific Treatment

Specific treatment / preventive measures for injuries and hazards will be provided in the Medical Centre. Eye and body showers will be provided in different required places of plant. Which shall be identified by the Safety Officer. Major hazards/injuries and treatment facilities in the plant shall comprise of all primary pathological diagnosis, X-Ray, Ultra sound, ECG, Trauma cases, Audiometry Test, Spirometry test, Vision testing, Eye treatment, Burn treatment, Poisoning treatment Electrical Shock treatment and Ambulance Facility.

The emergency, critical cases & diseases which cannot be treated shall be referred & treated at larger hospitals in the district or Medical Colleges or super speciality hospitals.

#### 7.6.7 Industrial Safety

For protection of working personnel, equipment and machineries from any damage or loss and to ensure uninterrupted production, adequate safety and fire fighting measures will be provided. Important provisions shall be as follows:

- Laying down specific Safety, Health & Environment policy to guide.
- Provision of adequate personal safety appliances to workers engaged in hazardous installations.
- Practices of safety inspections / monitoring at regular intervals by a team of experienced professionals to guide & educate the workforce.
- Provision of detection and alarm system to allow a developing fire to be detected at an early stage.

Plant uses a wide variety of specialized equipments and methods for handling raw materials. This equipment ranges from the most basic forklift to Cranes, Derricks, Hoists, Elevators and Conveyors. The hazards of using powerful equipment and of moving heavy materials require a wide variety of protective measures for employees on the site. The work talks about regulatory requirements and safe use for this equipment. The work covers safe rigging and slings for proper lifting, and safety requirements for specific types of Cranes, Derricks, Hoists, Elevators, Conveyors, and forklifts. Bearing this in mind the cranes, hoists, lifts shall be periodically tested and certificate issued for continuous use.

Fitted dress and use of personnel protective equipment will be essential by everyone. All unsafe conditions or unnatural occurrences should be reported promptly to the supervisor/ head of the department of safety.

### **7.6.8 Safety management**

The number of elements of safety management shall be quite large. They also vary from case to case. They can be grouped under five broad categories or sub-systems as follows:

- Managerial Systems
- Accident Prevention Systems
- Support Systems
- Event Management Systems
- Evaluation Systems

#### ***Managerial systems is comprising of:***

- Safety Policy
- Safety Organization
- Safety Objectives
- Safety Responsibilities
- Safety Accountability
- Safety Coordination
- Safety Budget
- Safety Committees
- Safety Meetings
- Safety Laws / Rules

#### ***Accident prevention systems is comprising of:***

- Equipment and workplace standards
- Maintenance & Testing Procedures
- Contractor & Visitor Control
- Safety Work Permit (SWP)

- Hazard Identification, Reporting, Investigation & corrective Action
- Inspection Systems
- Monitoring Systems
- Risk Assessment
- Personal Protective Equipments

***Support systems is comprising of:***

- Induction
- Management skills training
- Job specific training
- Safety Awareness Promotion
- Safety Information Services

***Event management systems is comprising of:***

- Emergency Management
- Occurrence Reporting, Investigation & Analysis
- Compensation & Rehabilitation

***Evaluation systems is comprising of:***

- Safety Performance Reviews
- Safety systems audits (Internal)
- Safety systems reviews
- SWPs compliance
- Safety action plan review
- Safety system audits (External)

#### **7.6.9 Appropriate Personal Protective Equipments (PPE)**

Personal protective equipments shall be given in **Table 7.5**.

**TABLE 7.5: PERSONAL PROTECTIVE EQUIPMENTS**

| Sl. No. | Unit                          | Hazard                                                                              | Injury                                                                  | Use of PPE                                                                                                        |
|---------|-------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| 1.      | Material handling and storage | Dust pollution<br>Hands going between running parts of conveyors<br>Machine's sound | Eye Injury, Dust inhalation<br>Physical injury<br>Hearing system damage | a) Safety Goggles Eye wash taps<br>b) Safety boot, Hand leather gloves<br>c) Ear muffles Fire fighting equipments |

| Sl. No. | Unit                        | Hazard                                                                                                                                                                         | Injury                                                     | Use of PPE                                                                                                                        |
|---------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 2.      | All manufacturing sub-units | Dust pollution, hand going into parts of machines/ conveyors, body part touching hot components, machine's sound, explosion/ blast, hot air/ steam release, hot metal spillage | Burn injury, physical injury, fatality, damage to ear drum | a) Safety Goggles Eye wash taps<br>b) Safety boot, Hand leather gloves, leather aprons<br>c) Ear muffles Fire fighting equipments |

## 7.7 SUMMARY OF THE PROCEEDING OF PUBLIC CONSULTATION

The public hearing will be held on the basis of the prepared EIA-EMP report, which includes the Terms of References prescribed by the Ministry of Environment, Forests and Climate Change. Various points will be raised by the local people and NGOs before or during the public hearing. The same will have to be replied to and the points requiring action from the Company shall be clearly addressed and their execution outlined. The summary of the proceedings of the public consultation and the actions taken or to be taken by the company shall be covered in this section after the completion of the public hearing.

## CHAPTER 8

### PROJECT BENEFITS

#### 8.1 EMPLOYMENT POTENTIAL

During operation of 3.55 MTPA steel plant 4850 persons will be under direct employment of the company while 150 persons are already employed in construction period. Many more persons will be indirectly engaged either on contract basis or in transportation of materials or in provision of different services associated with the project. As majority of unskilled and semi-skilled persons will be from the surrounding villages, benefits will extend to the local population.

#### 8.2 IMPROVEMENT IN SOCIAL AND PHYSICAL INFRASTRUCTURE

With the commencement of operation, amenities for communication, education, health, entertainment, canteen, etc. will get developed in and around the project area. These amenities will be available to local people also, who will be directly associated with the plant. Even those not associated with project related activities will be benefited by these amenities. With the commencement of plant, there is likely to be substantial improvement in the social and physical infrastructure in surrounding villages. This is likely to occur due to the expenditure under Corporate Social Responsibility (CSR) and Corporate Environment Responsibility (CER) (also termed as Environment Social Responsibility previously by MoEF&CC) being done and to be done by the company. These are elaborated in subsequent sections.

#### 8.3 CORPORATE SOCIAL RESPONSIBILITY

##### 8.3.1 Activities in the past

Company believes in growth with a human face and pursuing people-centered development. Company is a socially committed organization and a socially responsible corporate citizen. It attaches great importance to discharging its overall social responsibilities to the community and the society at large where its project is located. The Company is primarily focused on the development of the resident of the surrounding localities under various thematic areas and specific outcomes as given in **Table 8.1**.

**TABLE 8.1: CSR ACTIVITIES PLANNING**

| Sl. No. | Thematic Area               | Targeted Outcome                                                                                                                                                                   |
|---------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.      | Education and communication | <ul style="list-style-type: none"> <li>Enhanced literacy rate</li> <li>Enhanced enrollment ratio in primary education</li> <li>Enhanced proportion of students starting</li> </ul> |

| Sl. No. | Thematic Area                       | Targeted Outcome                                                                                                                                                       |
|---------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         |                                     | grade 1 who reach last grade of primary<br>• Locally available skilled and trained workforce<br>• Increased teacher student ratio                                      |
| 2.      | Health care                         | • Reduction in occurrences of diseases<br>• Reduction in mortality due to diseases                                                                                     |
| 3.      | Provision of safe drinking water    | • Reduction in occurrence of water borne diseases                                                                                                                      |
| 4.      | Sustainable livelihood options      | • Increased per capita income<br>• Reduced migration<br>• Increased green vegetation<br>• Increased local agriculture product<br>• Food security ensured               |
| 5.      | Infrastructure development          | • Better communication round the year<br>• Quality education ensured<br>• Better community hygiene and sanitation                                                      |
| 6.      | Promotion of local culture & sports | • Increased participation of locals in sports at district and state level<br>• Increased constructive participation of people in company activity and govt. programmes |

Photographs of some activities under CSR are shown below:

|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |
| <b>Aganwari centre in village Jharbandh</b>                                         | <b>Aganwari centre in village Galpada</b>                                            |
|  |  |
| <b>RO Plant at village Jharbandh</b>                                                | <b>RO Plant at village Tarkabeda</b>                                                 |



|                                                                                                                                                              |                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
|  <p><b>Construction of RCC Road from village Jharbandh to Nimabahal</b></p> |  <p><b>Aganwari at Village Jharbandh</b></p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|

#### The Company

- has installed deep bore-wells in Jharbandh, Tarkabeda, Galapada villages
- also supplies drinking water through water tankers in acute summer months of May and June
- provided drinking water supply through pipe lines and overhead tanks in village Jharbandh.
- provided an open well as per choice of the people in village Galapada
- has excavated and renovated derelict ponds and created big water bodies in the three project affected villages. Bathing ghats have also been provided in each pond as civic amenities for public convenience and utility.
- has educated 102 unemployed youths from affected families and trained in local Industrial Training Centres (ITC) for up-gradation of their skills and employment. Some of them have successfully passed out in All Odisha Trade Test (AITT). 30 (thirty) other candidates presently are under training in two batches in the local Industrial Training Centres (ITC) who would pass out shortly in two years.
- local people were given financial and social support in education and training in sustainable livelihood opportunities to increase their source of income.

#### 8.3.2 Activities in the future

Based on identified needs of the community priorities have been set out for education, health, infrastructure, sustainable economic development,

sports, arts & culture support and employee voluntarism. Each of the above is described in subsequent sections.

### **8.3.2.1 Education**

In the field of education, a number of initiatives will be undertaken:

- ❖ **Community Teacher Support:** To make up for the deficiency of teachers in Govt Primary, Middle & Secondary Schools in rural areas, particularly in the adopted villages, teachers from the community will be provided. This will also assist in providing job opportunity to the local youth.
- ❖ Financial Support to meritorious and needy students for higher education and for those who clear national/ technical exams.
- ❖ Furniture, Fixture, uniforms, sports kit, school bus facility and other infrastructure development in schools.

### **8.3.2.2 Health**

Comprehensive health services to the community from periphery villages will be provided by conducting/ providing:

- Ambulance
- Periodic Community health checkup at adopted villages and free distribution of medicines.
- **Special camps on health issues at village level** – Health check up camps with medical specialists (gynecologist, pediatric, skin, medicine, ENT, eye etc.) and distribution of medicines free of cost.
- **Population Control:** Organizing family planning camps in the rural areas.
- Financial assistance to critical health cases of adopted villages.
- School Health Check-up Camps

In addition to human health, health of domestic animals will also be addressed through veterinary health camps.

### **8.3.2.3 Sports, Arts and Culture**

Financial and infrastructure support in form of space provisioning for various sports activities and competitions will be promoted. Local festivals, repair and protection of heritage structures and structures/ places of religious significance, local art, etc shall be supported by the Company.

To create awareness for sports, culture, national integrity, social harmony and socio-economic development, the company will organize Youth Clubs in villages. These clubs will be the torch bearers in promoting social harmony and national integrity.

### 8.3.2.4 Infrastructure

The infrastructure in the rural areas is still in the nascent stage and requires support. In this regard, the company has undertaken a holistic approach to develop villages and also improve and provide basic facilities like internal roads, drinking water, drainage system and cleaning of ponds and constructing bathing places for adopted village.

### 8.3.2.5 Self Sustainability and Livelihood Program

These will cover the following topics:

**Agriculture:** Support for multiple cropping, horticulture, medicinal plantation through irrigation and credit support.

#### **Socio-Economic Development: Livelihood Activities**

- In the nearby villages livelihood activities are being conducted, wherein school dropouts, female adolescents and rural ladies are trained about stitching, tailoring, embroidery & knitting, so that they can be self-dependent. Some trained girls are involved in school dress making work. These activities will be continued in future also
- In addition to this, school dropout boys are trained in skill training on Fitter & Electrician work. The trained persons are able to earn money from outside. The training has helped the community in a very significant manner, where in the poor has been employed and supplemented the family incomes.

## 8.4 CORPORATE SOCIAL RESPONSIBILITY BUDGET

The CSR Budget shall be as per the Companies Act 2013 which states that two percent (2%) of the average net profit of the company for last 3 (three) financial years as per the Annual Report of the company has to be allocated for CSR. Since the project is not yet operational or profit making, the expenditure on CSR shall be earmarked as per discussion with villagers and District administration.

Company shall constitute committee of the executives of the company in order to look after the day to day activities, recommendations of release of payments, certifying the completion of work etc. and which will in turn report to CSR Committee on quarterly basis. Committee of executive meets and will continue to meet at regular intervals to ascertain the accomplishment of work/ release of payment.

## 8.5 CORPORATE ENVIRONMENT RESPONSIBILITY

Rungta Mines Limited intends to undertake CER activities for community development as per MoEF&CC's Office Memorandum F.No.22-65/2017-IA.III dated 01.05.2018. As per point 6(III) of the office memorandum, the

activities are to be identified based on the issues raised during public hearing, social need assessment, R&R plan, EMP, etc.

The budget for EMP has been separately identified and given in Chapter 10. The budget for environmental monitoring has been covered in Chapter 6. The public hearing is yet to be held. Hence, the proposed CER activities have been identified on the basis of social need assessment as described in **Table 8.2**. The activities under focus are infrastructure creation for:

- Drinking water supply
- Sanitation
- Health
- Education
- Skill development
- Roads
- Drains
- Electrification including solar power
- Solid waste management facilities
- Scientific support and awareness to local farmers to increase yield of crop and fodder
- Rain water harvesting
- Soil moisture conservation works
- Avenue plantation
- Plantation in community areas

Project would initially target the villages within 2 km of Dhenkanal Steel Plant.

Village level observations were made in Nimabahali, Gandhijhara, Beruanpal, Chandrashekharapur, Kadela, Tarkabera, Madhupur, Jharbandh and Galpada villages to identify deficiencies or needs. There are two villages Balisahi and Jairampur visible on toposheet but are not in the Census 2011 list. It is presumed they have been enumerated as a part of the above mentioned 9 villages. The amenities as reported for the villages in Census 2011 were also studied. As per Census 2011 data, almost all the facilities are available in the villages. The field observations and data analysis indicate that the villages have concerns related to safe drinking water & proper water supply system, open pond and roads at some locations. The summary of the sector wise findings, their present status, identified deficiency and proposed intervention are discussed in **Table 8.2**.

As per the MOEF&CCs office memorandum dated 01.05.2018, an amount equivalent to 0.25% of the capital cost will be spent on Corporate Environment Responsibility (CER) for brownfield projects. Accordingly, the amount of Rs. 13.75 Crores proportional to the proposed investment of Rs. 5500 crore for expansion project shall be spent. It is proposed over a period of ten years of project or commensurate with the actual investment till that time. The above activities will be carried out in consultation with the government authorities and the agencies incharge of the respective infrastructure in the areas of interest.

**TABLE 8.2: PRESENT PHYSICAL & SOCIAL INFRASTRUCTURE NEED ASSESSMENT AND PROPOSED INTERVENTIONS**

| Sector                                            | Present status                                                                                                                                                                                                                                                                                                                                                                                                  | Identified Deficiencies                                                                                                                                                                                                                                                                                                                                                                                                                | Proposed intervention                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. Roads</b>                                   | <ul style="list-style-type: none"> <li>➤ The approach road to only three villages is black topped (pucca) road. These are Gandhijhara, Nimabahali and Galpada</li> <li>➤ Chandrashekharapur, Beruanpal, Jharbandh, Madhupur, Tarkabera and Kadela have other kinds of roads such as all weather road, WBM or gravel roads.</li> <li>➤ Apart from the above, internal street roads needs maintenance.</li> </ul> | <ul style="list-style-type: none"> <li>➤ People of Chandrashekharapur, Beruanpal, Jharbandh, Madhupur, Tarkabera and Kadela villages are facing problem due to absence of black topped road</li> <li>➤ Air borne dust is high due to condition of roads</li> </ul>                                                                                                                                                                     | <ul style="list-style-type: none"> <li>➤ Construction of approach roads in Chandrashekharapur, Beruanpal, Jharbandh, Madhupur, Tarkabera and Kadela villages</li> <li>➤ Also maintenance of roads, where required in phased manner in collaboration with local Panchayat and Govt. schemes.</li> <li>➤ Solar based street lights</li> </ul>                                                                                          |
| <b>2. Drainage</b>                                | <ul style="list-style-type: none"> <li>➤ Drainage system is available but not everywhere.</li> <li>➤ Where drainage is present, they are open drains.</li> <li>➤ Due to open drainages odour problem is prevalent</li> </ul>                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>➤ Water logging in monsoon, breeding of mosquitoes, odour problem and water borne diseases are prevalent.</li> <li>➤ Where absent, drainage system is required.</li> </ul>                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>➤ Construction of drainage system in villages in phased manner</li> <li>➤ Covering of open drains in collaboration with local Panchayat heads and Govt. schemes.</li> </ul>                                                                                                                                                                                                                   |
| <b>3. Sanitation &amp; solid waste management</b> | <ul style="list-style-type: none"> <li>➤ Toilets are available in majority of the village homes and where not present, construction under Swachh Bharat Mission shall be initiated.</li> <li>➤ Dustbins are not there at public places.</li> </ul>                                                                                                                                                              | <ul style="list-style-type: none"> <li>➤ Open urination and defecation in public places causes spread of diseases. Completion of toilets in houses is required on priority</li> <li>➤ Due to lack of proper disposal of solid waste, the dumped wastes are breeding place for many vectors. Stray animals ingest some harmful substances along with food from waste, which results in many diseases and ultimately death of</li> </ul> | <p>Swachh Bharat Mission has initiated construction of toilets, hence, Rungta Mines Ltd. will focus on improvement of overall hygiene &amp; cleanliness by:</p> <ul style="list-style-type: none"> <li>➤ Awareness camps about solid waste segregation and household composting</li> <li>➤ Purchase of dustbins for garbage collection for solid waste disposal.</li> <li>➤ Purchase of anti mosquito fumigation machine.</li> </ul> |

| Sector                                             | Present status                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Identified Deficiencies                                                                                                                                                                                                                                                                                                                                                 | Proposed intervention                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p>these animals.</p> <ul style="list-style-type: none"> <li>➤ Attention towards cleanliness and solid waste management would be required in near by villages.</li> <li>➤ Dustbins shall be put at various public places</li> </ul>                                                                                                                                     | <ul style="list-style-type: none"> <li>➤ Intensive awareness drive among residents to prevent water logging and mosquito breeding</li> <li>➤ Provide support for cleaning staff to clean village roads and common areas periodically.</li> </ul>                                                                                                                                                                                                                                                                                                           |
| <b>4. Drinking Water</b>                           | <ul style="list-style-type: none"> <li>➤ Villages withdraw water from hand pumps and open dug wells for drinking &amp; cooking. Ghats are there on few ponds only.</li> <li>➤ Pipeline water supply systems are not available in the villages except Jharbandh, where it has been constructed by the company.</li> <li>➤ Borewells have been installed by the company in Jharbandh, Tarkabeda, Galapada. Galpada has also been provided an open well. Bathing ghats and excavation of ponds has been carried out in these three villages so far</li> <li>➤ Adequate safe drinking water source are not available in villages hence company supplies drinking water through water tankers in acute summer months of May and June.</li> </ul> | <ul style="list-style-type: none"> <li>➤ Lack of ghats on all water bodies makes access unsafe to them.</li> <li>➤ Improvement in existing water supply system is required.</li> <li>➤ Due to lack of adequate safe drinking water, people are using water of handpumps and uncovered well for drinking and they are using pond water for domestic purposes.</li> </ul> | <p>Activities to be carried out in other villages that those already covered :</p> <ul style="list-style-type: none"> <li>➤ Construction and maintenance of ghats in commonly used ponds.</li> <li>➤ Construction of Water storage tanks.</li> <li>➤ Purchase of water tankers.</li> <li>➤ Water supply through mobile water tankers during festivals and dry season to local villages.</li> <li>➤ Construction of pond for Rain Water Harvesting.</li> <li>➤ Deepening and cleaning of existing ponds</li> <li>➤ Water supply through pipeline</li> </ul> |
| <b>5. Market access and local livelihood means</b> | <ul style="list-style-type: none"> <li>➤ Weekly haat/ markets are there at Galpada.</li> <li>➤ Limited local livelihood means are there due to less industries in the 2 km radius area.</li> <li>➤ Local people are involved in agricultural activities. Dairy, poultry farming, fishing etc. are being followed for income supplementing.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>➤ Other vocations, which are not dependent on industries also need to be taught to local people.</li> <li>➤ Youth need training in ITIs in different vocations to prepare themselves for recruitment in the</li> </ul>                                                                                                           | <ul style="list-style-type: none"> <li>➤ vocational training centre to build capacity for self-employment [for Ladies (stitching, embroidery, tailoring, pickles, etc), for Men (mushroom farming, dairy improvement, poultry farming, fish rearing, bee keeping, etc)]</li> </ul>                                                                                                                                                                                                                                                                         |

| <b>Sector</b>         | <b>Present status</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Identified Deficiencies</b>                                                                                                                                                                                                              | <b>Proposed intervention</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       | <ul style="list-style-type: none"> <li>➤ Company is supporting the education of 102 unemployed youths from affected families and trained in local Industrial Training Centres (ITC)</li> <li>➤ local people were given financial and social support in education and training in sustainable livelihood opportunities to increase their source of income</li> </ul>                                                                                                                                                           | <ul style="list-style-type: none"> <li>➤ upcoming projects.</li> <li>➤ Women empowerment by making them financially self reliant is necessary</li> </ul>                                                                                    | <ul style="list-style-type: none"> <li>➤ The Company is also establishing its own Industrial Training Centre in the locality for providing training on skill development and employment.</li> <li>➤ Training to people for improvement of agriculture</li> </ul>                                                                                                                                                                                                                                                                                               |
| <b>6. Education</b>   | <ul style="list-style-type: none"> <li>➤ Primary schools are available in all villages except Chandrashekharapur.</li> <li>➤ Middle schools are not available in villages Chandrashekharapur, Gandhijhara and Madhupur.</li> <li>➤ Secondary school is available in only 4 villages i.e. Beruanpal, Galpada, Tarkabeda, Kadala</li> <li>➤ For higher education such as graduation and masters level, institutes are available at Dhenkanal and Angul at distance of 36 km and 22 km respectively from the project.</li> </ul> | <ul style="list-style-type: none"> <li>➤ Construction of primary and middle schools</li> <li>➤ General measures for encouraging students to excel in studies</li> </ul>                                                                     | <ul style="list-style-type: none"> <li>➤ Maintenance &amp; expansion of existing of schools as per requirement</li> <li>➤ Construction of schools in consultation with statutory regulatory bodies/ government scheme.</li> <li>➤ Scholarship to meritorious students as educational assistance</li> <li>➤ Financial support to needy students</li> <li>➤ Adult education centre</li> <li>➤ Mid day meals</li> <li>➤ Distribution of Bags, Study Material (Slate, Globe, Maps Charts, Exercise Book, Duster, Chalk etc.) as per demand from school.</li> </ul> |
| <b>7. Health Care</b> | <ul style="list-style-type: none"> <li>➤ Lack of adequate health facilities such as medicine, testing, diagnostic and ambulance facilities in the area.</li> <li>➤ Primary Health subcentre is available only at Galpada village at a distance of 0.5 km from project site, as per Census 2011.</li> <li>➤ Under nourishment/ malnourishment in children</li> </ul>                                                                                                                                                           | <ul style="list-style-type: none"> <li>➤ Diabetes, hypertension, fever, and dysentery/ diarrhoea are the common diseases prevalent in the area.</li> <li>➤ General steps required to make medical access easier for local people</li> </ul> | <ul style="list-style-type: none"> <li>➤ Purchase of ambulance.</li> <li>➤ Post the contact number for the ambulance at Panchayat house/ community centre in the villages</li> <li>➤ Construction of about 10 bedded hospital with facilities in Jharband village.</li> </ul>                                                                                                                                                                                                                                                                                  |

| <b>Sector</b>                      | <b>Present status</b>                                                                                                                                                                                                                                                               | <b>Identified Deficiencies</b>                                                        | <b>Proposed intervention</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                    | ➤ Lack of veterinary facilities                                                                                                                                                                                                                                                     | ➤ Absence of veterinary centre                                                        | <ul style="list-style-type: none"> <li>➤ Provide free consultation and medicines to project affected villagers at proposed hospital of the company.</li> <li>➤ Conducting mobile health/ awareness camp for protection against prevalent common diseases/ family planning camp (Doctor, para-medical staff and free supply of medicines)</li> <li>➤ Financial help to critical medical cases</li> <li>➤ Provision of veterinary doctor and centre.</li> </ul> |
| <b>8. Sports and entertainment</b> | <ul style="list-style-type: none"> <li>➤ Most of the villages have small or big grounds designated for sports.</li> <li>➤ Perusal of amenities as reported in Census 2011 shows that Beruanpal, Galpada, Nimabahali, Jharbandh, Tarkabeda and Kadela have sports fields.</li> </ul> | ➤ Maintenance of existing facilities and motivation to the sports player is required. | <ul style="list-style-type: none"> <li>➤ Construction of community centre</li> <li>➤ Sponsorship to Rural Sports events</li> <li>➤ Sponsorship to local talent to participate at state &amp; national levels</li> <li>➤ Provide equipment to village level teams in different sports such as crickets, football and badminton etc.</li> </ul>                                                                                                                 |



## CHAPTER 9

### ENVIRONMENTAL COST BENEFIT ANALYSIS

The scope of the EIA/EMP has been prescribed vide the Standard Terms of References (TOR) issued by MoEF&CC, New Delhi vide letter no. J-11011/309/2018-IA.II(I) dated 19.09.2020 (**Annexure I**).

As per SO 1533 dated 14<sup>th</sup> September 2006, this chapter is to be prepared if prescribed at scoping stage.

The prescribed scope does not require environmental cost benefit analysis.

## CHAPTER 10

## ENVIRONMENT MANAGEMENT PLAN

## 10.1 ENVIRONMENTAL MANAGEMENT PLAN WITH ADMINISTRATIVE ASPECTS

Environmental Management Plan (EMP) is required to minimize adverse environmental impacts by implementing mitigation measures with implementation and responsibilities during the project under construction and operation. Proposed management measures for pollution control and environmental management in the proposed area are given in **Table 10.1**. The administrative roles of the personnel involved is detailed in Section 10.2.

TABLE 10.1: ENVIRONMENT MANAGEMENT MEASURES WITH ADMINISTRATIVE ASPECT

| Discipline                | Potential impacts and Source                                                                                | Mitigation measures                                                                                                                                                                                                                                      | Administrative Aspect |             | Monitoring Parameters                                                                   |
|---------------------------|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------|-----------------------------------------------------------------------------------------|
|                           |                                                                                                             |                                                                                                                                                                                                                                                          | Implementation        | Monitoring  |                                                                                         |
| During Construction Phase |                                                                                                             |                                                                                                                                                                                                                                                          |                       |             |                                                                                         |
| Topography                | Change in topography due to construction of steel plant, excavation for reservoir etc.                      | The total project area will be 1769 acres. There shall be expansion due to proposed project from existing 674.765 acres including construction of colony. There will be levelling of land by filling of soil taken out during construction of buildings. | Civil contractor      | DGM (Civil) | Measurement of material handling                                                        |
| Drainage                  | <ul style="list-style-type: none"><li>➤ Disturbance to sheet flow</li><li>➤ Disturbance to drains</li></ul> | <ul style="list-style-type: none"><li>➤ Runoff will be diverted through the man made storm water drainage system within plant to the surface water reservoir and harvesting ponds</li><li>➤ No canal within project. Natural</li></ul>                   | Civil Contractor      | DGM (Civil) | Verification of construction of surface reservoir, rain water harvesting ponds & drains |

| Discipline    | Potential impacts and Source                                                                                                                                                                                                    | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Administrative Aspect |                     | Monitoring Parameters                                                                                                                                                                                                                                                            |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Implementation        | Monitoring          |                                                                                                                                                                                                                                                                                  |
|               |                                                                                                                                                                                                                                 | drains are passing through the project site. Drain volume of which will continue to be conveyed to Lingra Nala                                                                                                                                                                                                                                                                                                                                                                                 |                       |                     |                                                                                                                                                                                                                                                                                  |
| Water quality | <ul style="list-style-type: none"> <li>➤ Suspended solids due to soil run-off during heavy precipitation.</li> <li>➤ Loose soil at construction site.</li> <li>➤ Domestic waste water (sewage) from workers in plant</li> </ul> | <ul style="list-style-type: none"> <li>➤ During monsoon season run off from construction site will be routed to a temporary sedimentation tank for settlement of suspended solids before release of water.</li> <li>➤ Domestic waste water shall be treated in septic tank- soak pit system</li> </ul>                                                                                                                                                                                         | Civil Contractor      | DGM (Environment)   | <ul style="list-style-type: none"> <li>➤ Verification of settling tank &amp; septic tank system installed</li> <li>➤ Water quality from overflow of settlement tank</li> </ul>                                                                                                   |
| Air quality   | Dust concentration due to construction activities, vehicular movement, excavation and material handling activities                                                                                                              | <ul style="list-style-type: none"> <li>➤ Isolating the construction area with flexible enclosures/ curtains so that the air emissions will not spread in the surroundings.</li> <li>➤ Sprinkling of water in the construction area and unpaved roads.</li> <li>➤ Covering material carrying vehicles</li> <li>➤ Periodic maintenance of vehicles shall be done and ensuring PUC</li> <li>➤ Trucks shall be covered with tarpaulin.</li> <li>➤ Vehicles speed shall be restricted on</li> </ul> | ➤ Civil contractor    | ➤ DGM (Environment) | <ul style="list-style-type: none"> <li>➤ Verifying construction of enclosures</li> <li>➤ Verification of log of sprinkling &amp; actual site conditions</li> <li>➤ Verifying cover on trucks and construction of speed breakers</li> <li>➤ Records of PUC of vehicles</li> </ul> |

| Discipline                    | Potential impacts and Source                                                 | Mitigation measures                                                                                                                                                                                                                                                                                            | Administrative Aspect                                 |                     | Monitoring Parameters                                                                         |
|-------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------|
|                               |                                                                              |                                                                                                                                                                                                                                                                                                                | Implementation                                        | Monitoring          |                                                                                               |
|                               |                                                                              | <p>construction roads and vehicles will ply on dedicated construction roads and access points.</p> <p>➤ Visually monitor particulate emissions from diesel vehicles</p>                                                                                                                                        |                                                       |                     |                                                                                               |
| Noise                         | Increase in noise level due to construction equipment.                       | <p>➤ Equipment to be kept in maintained condition to keep the noise level within 90 dB(A).</p> <p>➤ Develop and implement a construction noise management plan.</p> <p>➤ Limit hours of construction where practical. Workers will be provided with necessary protective equipment e.g. earplug, earmuffs.</p> | ➤ Civil contractor                                    | ➤ DGM (Environment) | <p>➤ Noise levels at site</p> <p>➤ Verification of PPE of workers through surprise checks</p> |
| Terrestrial ecology           | Clearing of vegetation due to soil handling activities                       | Landscaping and plantation shall be done as per green belt development plan.                                                                                                                                                                                                                                   | <p>➤ Civil contractor</p> <p>➤ Horticulture staff</p> | ➤ DGM (Environment) | <p>➤ Verification by observation</p> <p>➤ Records of plantation</p>                           |
| Excavated soil                | Loss of excavated top soil                                                   | The top soil shall be temporarily stored in designated area and used in green belt and for leveling in the low lying area within project site                                                                                                                                                                  | <p>➤ Civil contractor</p> <p>➤ Horticulture staff</p> | ➤ DGM (Environment) | Verification by observation and material handling records                                     |
| <b>During Operation phase</b> |                                                                              |                                                                                                                                                                                                                                                                                                                |                                                       |                     |                                                                                               |
| Air quality                   | ➤ PM, SO <sub>2</sub> and NO <sub>2</sub> levels in ambient air due to stack | ➤ The list of pollution control equipment for fugitive and stack emission in steel plant are                                                                                                                                                                                                                   | ➤ Sr. Manager (Instrumentation)                       | ➤ DGM (Environment) | ➤ Continuous and error free operation of online stack                                         |

| Discipline          | Potential impacts and Source                                                                                             | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Administrative Aspect                                                                   |                     | Monitoring Parameters                                                                                                                                                                                                                                                                                                                     |
|---------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                     |                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Implementation                                                                          | Monitoring          |                                                                                                                                                                                                                                                                                                                                           |
|                     | emissions<br>➤ Fugitive dust emission due to material handling<br>➤ Emission due to traffic                              | summarised in Chapter 4<br>➤ The resultant air quality will conform to the stipulated standards.<br>➤ Bag Filters will be installed to control Particulates.<br>➤ Stacks heights as per norms will be provided for the proper dispersion of pollutants.<br>➤ Particulate emission from stacks expected to be below 30 mg/Nm <sup>3</sup><br>➤ Product stock yards will be covered<br>➤ Transport of raw material will be by road through covered trucks<br>➤ Green belt/ green cover development programs will be undertaken within project site over 33% of the area. | ➤ DGM (Mech.) CPP<br>➤ Engineers & Staff of Maintenance departments of respective units |                     | monitoring systems and continuous ambient air quality stations<br>➤ Third party periodical ambient air quality monitoring for PM2.5, PM10, SO <sub>2</sub> , NO <sub>2</sub> , etc<br>➤ Maintenance record of Bag Filters, ESP, dust extraction systems, etc<br>➤ Verification of cover of trucks, dust suppression measures & plantation |
| Terrestrial ecology | ➤ Impact on plant species due to emission from stacks<br>➤ Planting trees within premises<br>➤ Impact on fauna and flora | ➤ Control and disperse emission through APCM and appropriate stack heights.<br>➤ Extensive tree plantation will be carried out and any tree cut will get compensated manifold<br>➤ Boundary wall has already been constructed around the plant area of 674.765 acres (after EC dt. 02.08.2010) so that there is no                                                                                                                                                                                                                                                     | ➤ Horticulture staff (gardeners)                                                        | ➤ DGM (Environment) | ➤ Inventory of trees planted with species and survival rate<br>➤ Area under plantation<br>➤ Height and girth to be annually measured<br>➤ Inspection of boundary wall                                                                                                                                                                     |

| Discipline | Potential impacts and Source                                                   | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Administrative Aspect                                                                                                                                |                                                                       | Monitoring Parameters                                                                                                                                                    |
|------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            |                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Implementation                                                                                                                                       | Monitoring                                                            |                                                                                                                                                                          |
|            |                                                                                | interaction with the fauna of the surrounding except birds and small mammals who make their way into the planted areas of the plant. The boundary wall for the additional area of 10947.235 acres is yet to be constructed and flora and fauna are currently undisturbed. Air emissions shall also reduce to a level so that negligible impact will be there.                                                                                                                                                                                                                                                                                   |                                                                                                                                                      |                                                                       |                                                                                                                                                                          |
| Noise      | Noise levels in the plant area due to equipment in main plant and auxiliaries. | <ul style="list-style-type: none"> <li>➤ Equipment will be designed to conform to noise levels prescribed by regulatory agencies where necessary, high noise generating equipment shall be acoustically treated or housed.</li> <li>➤ Provision of green belt and plantation would further help in attenuating noise. Acoustic system for turbines will be provided. Noise attenuation will be acquired to reduce noise level to 85 dB (A) at 1m distance.</li> <li>➤ Employees working in high noise areas shall be provided with ear plugs/ear muffs as protective device.</li> <li>➤ Maintenance of all equipment as per schedule</li> </ul> | <ul style="list-style-type: none"> <li>➤ Engineers &amp; Staff of Maintenance departments of respective units</li> <li>➤ Manager (Safety)</li> </ul> | <ul style="list-style-type: none"> <li>➤ DGM (Environment)</li> </ul> | <ul style="list-style-type: none"> <li>➤ Noise level</li> <li>➤ Vibration level</li> <li>➤ Tree inventory as in previous point</li> <li>➤ Verification of PPE</li> </ul> |

| Discipline                     | Potential impacts and Source                                                                                                                                                                                                                                                                                                                                                                                               | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                           | Administrative Aspect                                                                                                                            |                   | Monitoring Parameters                                                                                          |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------|
|                                |                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                               | Implementation                                                                                                                                   | Monitoring        |                                                                                                                |
| Traffic impacts                | Impact on infrastructure and impact on air quality and noise due to vehicular movement                                                                                                                                                                                                                                                                                                                                     | Provision of the designated parking area and maintenance of roads and transportation vehicles. Use of covered trucks for transportation of raw material to prevent spillage or fugitive dust.                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>● Sr. Manager (Safety)</li> <li>● DGM (Operation) assisted by Cleaning &amp; Maintenance Staff</li> </ul> | DGM (Environment) | Verification by observation                                                                                    |
| Demography and socio-economics | During the construction phase, no family will displace from the proposed expansion area (1094.235 acres) as there is no habitation now. Major part of the existing land (674.765 acres) already belongs to the company. Previous inhabitants have been compensated and resettled after EC dt. 02.08.2010. Therefore, no impact on demographic profile of the area is foreseen. There will be influx of operating personnel | <ul style="list-style-type: none"> <li>➤ Plant will generate direct employment. Preference will be given to local population for employment in the semi-skilled and unskilled category.</li> <li>➤ Indirect employment will get generated in transportation, helpers, sweepers, service providers, etc</li> <li>➤ Additional facilities will be developed by the project proponent in surrounding villages as part of CSR and CER.</li> </ul> | Plant Head                                                                                                                                       | DGM (Environment) | <ul style="list-style-type: none"> <li>➤ Employment and domicile records</li> <li>➤ CER compliances</li> </ul> |

| Discipline      | Potential impacts and Source                                                                                                                                                                                                                                               | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Administrative Aspect                                                                                                                                                                            |                                                                                                                        | Monitoring Parameters                                                                                                                                                                                                                               |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Implementation                                                                                                                                                                                   | Monitoring                                                                                                             |                                                                                                                                                                                                                                                     |
| Green belt      | Air and noise pollution due to emissions from stack and noise levels due to the equipment.                                                                                                                                                                                 | Green belt will be provided all along the periphery of the project area and vacant areas in the plant, along roads etc. Part of the treated waste water from the plant will be used for greenbelt development.                                                                                                                                                                                                                                                                                               | Horticulture staff                                                                                                                                                                               | DGM (Environment)                                                                                                      | <ul style="list-style-type: none"> <li>➤ Verification by observation</li> <li>➤ Waste water reuse log books</li> </ul>                                                                                                                              |
| Fire and Safety | Accidents/ disasters related to fire and safety                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>➤ Prepare and implement Disaster Management Plan (DMP) or Emergency Preparedness Plan.</li> <li>➤ Firefighting system and fire extinguishers will be installed as per fire safety norms.</li> <li>➤ Regular fire safety training and mock drills will be conducted.</li> </ul>                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>➤ DGM (Operation)</li> <li>➤ Manager (Safety)</li> </ul>                                                                                                  | Plant Head                                                                                                             | <ul style="list-style-type: none"> <li>➤ Verification of approvals from factory inspector</li> <li>➤ Fire fighting approvals</li> <li>➤ Training and mock drill records</li> </ul>                                                                  |
| Solid Waste     | <ul style="list-style-type: none"> <li>➤ Pollution of air due to waste handling</li> <li>➤ Municipal solid waste due to everyday sweeping and canteen</li> <li>➤ Sludge from water and waste water treatment systems</li> <li>➤ Miscellaneous wastes from plant</li> </ul> | <ul style="list-style-type: none"> <li>➤ Municipal solid waste due to everyday sweeping, canteen and domestic activities will be used as manure. Non biodegradable waste shall be sold to recyclable vendor.</li> <li>➤ The sludge from water and waste water treatment systems shall be composted and used as manure in horticulture. Treated waste water will be used for irrigation of green belt in Plant Area.</li> <li>➤ Management of other wastes from the steel plant has been discussed</li> </ul> | <ul style="list-style-type: none"> <li>➤ Manager (Safety)</li> <li>➤ Engineers &amp; Staff of Maintenance departments of respective units</li> <li>➤ Cleaning &amp; maintenance staff</li> </ul> | <ul style="list-style-type: none"> <li>➤ DGM (Environment)</li> <li>➤ Maintenance of respective departments</li> </ul> | <ul style="list-style-type: none"> <li>➤ Log of solid waste handling, reuse and disposal</li> <li>➤ Inspection of solid waste storage site</li> <li>➤ Log books of STP</li> <li>➤ Surprise checks</li> <li>➤ Verification by observation</li> </ul> |



| Discipline        | Potential impacts and Source                                                                                                                                                         | Mitigation measures                                                                                                                                                                                                                                                                                                                                                                                      | Administrative Aspect                                                                                     |                                                                       | Monitoring Parameters                                                                                             |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
|                   |                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                          | Implementation                                                                                            | Monitoring                                                            |                                                                                                                   |
|                   |                                                                                                                                                                                      | in detail in chapter 4                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                           |                                                                       |                                                                                                                   |
| Liquid Effluent   | Pollution of surface and ground water, propagation of vectors, creation of odour due to effluents from water treatment systems, waste water treatment systems, domestic sewage, etc. | <ul style="list-style-type: none"> <li>➤ DM Plant regeneration waste water after passing through neutralization pit shall be used for irrigation of green belt and horticulture.</li> <li>➤ Treated Effluent from various sub-units will be collected common monitoring basin and reused in sprinkling, watering, irrigation of green belt and horticulture, ash quenching, brick plant, etc.</li> </ul> | <ul style="list-style-type: none"> <li>➤ Treatment Unit operators</li> <li>➤ Sr. Manager (Q/C)</li> </ul> | <ul style="list-style-type: none"> <li>➤ DGM (Environment)</li> </ul> | <ul style="list-style-type: none"> <li>➤ Quality parameters</li> <li>➤ Log books</li> <li>➤ Inspection</li> </ul> |
| Health and Safety | Injury                                                                                                                                                                               | <ul style="list-style-type: none"> <li>➤ Working as per approved plans.</li> <li>➤ Periodical Medical Examination.</li> <li>➤ Extensive publicity and propaganda related to safety.</li> </ul>                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>➤ Sr Manager (Safety)</li> <li>➤ Doctor(s)</li> </ul>              | <ul style="list-style-type: none"> <li>➤ Plant Head</li> </ul>        | <ul style="list-style-type: none"> <li>➤ Examination format as given in <b>Annexure XXVIII</b></li> </ul>         |

## 10.2 STRUCTURE AND ADMINISTRATIVE RESPONSIBILITIES OF EMP EXECUTION CELL

Rungta Mines Ltd. is an existing company having qualified and experienced personnel in environmental management and pollution control. The company has existing environmental monitoring cell at head office in Chaibasa for environmental monitoring and legal compliances. Cell for environment management in the proposed project is planned and given in **Fig. 6.1**, Chapter 6. The details of cell are given below:

The overall responsibility of environment management will lie on Plant Head. However, actual responsibility for execution of environmental mitigation measures will be of Deputy General Manager and their subordinates. The responsibilities of various cadre are given below:

**Additional GM (P&A):** This post already exists and duties carried out. It will continue for expansion phase also. He will co-ordinate all the social activities such as finding out the social needs of the study area, collection of statistics of social requirements, budgeting the social needs, plan the activities as per CSR budget, approve the needs from management, execute the activities, look after their successful completion.

**Sr. Manager (Safety):** This post already exists and duties carried out and will continue for expansion phase also. He will develop, implement and monitor occupational health and safety policy, programs and procedures. He will assist the management in complying with current health and safety legislation and/or regulations with the objective of ensuring that all reasonable and proper measures are to be taken to protect the safety and health of workers staff and visitors.

**Dy General Manager (Environment):** This post already exists and duties carried out. It will continue for expansion phase also. He is responsible for legal compliances of the company related to MOEF&CC, CPCB & OSPCB. He will arrange regular monitoring of the proposed pollution control system. He will arrange evaluation environmental performance of the systems and ensure that the stipulated measures are being satisfactorily implemented and operated. He will ensure that there shall not be any adverse impact on air, water, noise and land environment due to construction & operation of proposed project. As per report of DGM (Environment), the management shall take effective steps through the concerned section head to curb the pollution and effective environmental management. He will also be responsible for green belt development within the factory premises as well as within the study area in consultation with the horticulturists within the plant.

## 10.3 PLAN FOR IMPLEMENTATION OF CREP GUIDELINES FOR STEEL PLANT

The CREP guidelines for proposed steel plant, as applicable has been given in **Table 10.2**.

**TABLE 10.2: PLAN FOR IMPLEMENTATION OF RECOMMENDATIONS MENTIONED IN CHARTER ON CORPORATE RESPONSIBILITY FOR ENVIRONMENTAL PROTECTION (CREP) FOR INTEGRATED IRON & STEEL INDUSTRY**

| Sl. No. | Recommendation                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Plan for Implementation                                                                                                                                                                                                                                                                                                                                                                                        |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.      | <b>Coke Oven Plants</b> <ul style="list-style-type: none"> <li>To meet the parameters PLD (% leaking doors), PLL (%leaking lids), PLO (% leaking off take), of the notified standards under EPA within three years (by December 2005). Industry will submit time bound action plan and PERT Chart along with the Bank Guarantee for the implementation of the same.</li> <li>To rebuild at least 40% of the coke oven batteries* in next 10 years (by December 2012).</li> </ul> | As the coke oven plant will be a new plant, it will be implemented with all latest technology to meet the parameters PLD (% leaking doors), PLL (%leaking lids), PLO (% leaking off take)                                                                                                                                                                                                                      |
| 2.      | <b>Steel melting shop</b><br>To reduce 30% fugitive emissions by March 2004 and 100% by March 2008 (including installations of secondary dedusting facilities.)                                                                                                                                                                                                                                                                                                                  | The fugitive emissions will be controlled by installation of de-dusting systems and bag filters. The pollution control systems will be installed at the time of installation of the SMS plant itself                                                                                                                                                                                                           |
| 3.      | <b>Blast Furnace</b><br>Direct inject of reducing agents 55% by June 2013.                                                                                                                                                                                                                                                                                                                                                                                                       | Blast furnace will be installed ensuring that direct injection of reducing agents meets the norms                                                                                                                                                                                                                                                                                                              |
| 4.      | <b>Solid waste/ Hazardous Waste management</b><br>Utilisation of Steel Melting Shop (SMS)/ Blast Furnace (BF) Slag as per the following schedule:<br>By 2004 – 70%<br>By 2006 – 80%<br>By 2007 – 100%                                                                                                                                                                                                                                                                            | 100% of the SMS (from IF & EAF) slag will be given for metal recovery, converted to aggregates (special balls) and used in road making.<br>The BF slag will be ground and used for cement making in the proposed cement plant within the project.                                                                                                                                                              |
| 5.      | <b>Water conservation/ water pollution</b><br>To reduce specific water consumption to 5m <sup>3</sup> /t for long products and 8 m <sup>3</sup> /t for flat products by December 2005.<br>To operate CO-BP effluent treatment plant efficiently to achieve the notified effluent discharge standards- by July 2020.                                                                                                                                                              | <ul style="list-style-type: none"> <li>The specific water requirement for rolling mill output over 350 days will be &lt;5 m<sup>3</sup>/t considering sponge iron unit, MBF, SMS, rolling mills, strip mill and Ductile pipe plant.</li> <li>An neutralising pit and effluent collection sump (called common monitoring basin) will be installed for treating &amp; reusing the effluent generated.</li> </ul> |

| <b>Sl. No.</b> | <b>Recommendation</b>                                                                                                                                                                                                  | <b>Plan for Implementation</b>                                                                                                                                                                                  |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.             | Installation of Continuous Stack Monitoring system and its calibration in major stacks and setting up of the online ambient air quality monitoring stations by June 2005.                                              | The continuous stack monitoring system and ambient air quality stations will be installed.                                                                                                                      |
| 7.             | To operate the existing pollution control equipment efficiently and to keep proper record of run hours, failure time and efficiency with immediate effect. Compliance report in this regard be submitted to CPCB/SPCB. | The pollution control devices will be installed and efficiently operated and regular record will be maintained after commencement of operation. The records will be submitted to the SPCB at regular intervals. |
| 8.             | To implement the recommendations of Life Cycle Assessment (LCA) study sponsored by MoEF by December 2003.                                                                                                              | The recommendations of MoEF&CC shall be implemented on complete installation of all the plant facilities                                                                                                        |
| 9.             | The industry will initiate the steps to adopt the following clean technologies / measures to improve the performance of industry towards production, energy and environment.                                           |                                                                                                                                                                                                                 |
|                | ➤ Energy recovery of top Blast Furnace (BF) gas.                                                                                                                                                                       | WHRB based on BF gas is proposed. A TRT is also proposed.                                                                                                                                                       |
|                | ➤ Use of Tar-free runner linings.                                                                                                                                                                                      | Fire clay bricks are in use for the runners.                                                                                                                                                                    |
|                | ➤ De-dusting of Cast House at tap holes, runners, skimmers ladle and charging points.                                                                                                                                  | De dusting units shall be operational at various locations in cast house                                                                                                                                        |
|                | ➤ Suppression of fugitive emissions using nitrogen gas or other inert gas.                                                                                                                                             | This shall be carried out in the applicable equipment                                                                                                                                                           |
|                | ➤ To study the possibility of slag and fly ash transportation back to the abandoned mines, to fill up the cavities through empty railway wagons while they return back to the mines and its implementation.            | The slag and fly ash will be used to manufacture cement in the proposed cement plant within the project                                                                                                         |
|                | ➤ Processing of the waste containing flux & ferrous wastes through waste recycling plant.                                                                                                                              | Scrap material will be recycled as raw material in induction furnace                                                                                                                                            |
|                | ➤ To implement rainwater harvesting.                                                                                                                                                                                   | Rainwater harvesting scheme is proposed for the plant and will be implemented within first year of operation                                                                                                    |
|                | ➤ Reduction of Green House Gases by:                                                                                                                                                                                   |                                                                                                                                                                                                                 |

| Sl. No. | Recommendation                                                                                                                                                                                                                                              | Plan for Implementation                                                                                                                                                                                                                |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | 1. Reduction in power consumption<br>2. Use of by-products gases for power generation<br>3. Promotion of Energy Optimisation Technology including energy audit                                                                                              | 1. The power use will be reduced through energy conservation measures on commencement of operation<br>2. DRI exhaust, BF gas and coke oven gas will be use for power generation<br>3. Energy auditing will be carried out periodically |
|         | ➤ To set targets for Resource Conservation such as Raw material, energy and water consumption to match International Standards.                                                                                                                             | It shall be aimed at resource conservation for raw material, energy and water as can be seen in the material balances of different sub-units                                                                                           |
|         | ➤ Up-gradation in the monitoring and analysis facilities for air and water pollutants. Also to impart elaborate training to the manpower so that realistic data is obtained in the environmental monitoring laboratories.                                   | A state of the art laboratory will be established for analysis. Elaborate training to the manpower and establishment of laboratory will be carried out as required.                                                                    |
|         | ➤ To Improve overall housekeeping.                                                                                                                                                                                                                          | Good housekeeping shall be ensured                                                                                                                                                                                                     |
| 10.     | <b><i>Sponge Iron Plants</i></b><br>Inventorisation of sponge iron plants to be completed by SPCBs/CPCB by June 2003 and units will be asked to install proper air pollution control equipment by December 2003 to control primary and secondary emissions. | All necessary air pollution control equipments (ESP/ DES) will be installed and it will be ensured that they are working efficiently to control emissions within the permissible limits.                                               |

#### 10.4 BUDGETARY PROVISION FOR ENVIRONMENTAL MANAGEMENT

##### A. Capital cost estimated for EMP

Adequate budgetary provisions have been made by the Company for execution of Environmental Management Plan. **Table 10.3** give overall investment on the environmental safeguards and recurring expenditure for successful monitoring and implementation of control measures.

##### ***Assumptions for cost calculation:***

- Manpower considered- 10% project head (Gr.-I), 100% environmental engineer (Gr-II) (20% in air, 20% in water & 10% in noise pollution control, 40% in monitoring and 10% in misc.), 100% one OHS officer (Gr.-II), 100% one Horticulturist (Grade-III), 4 grade-IV gardeners, 1 Grade-III chemist, 1 Grade-IV (Lab assistant), Grade IV (operators- 5

bag filters, 1 ESP, 1 dust collectors, 1 waste water treatment system, 2 water tanker drivers & their 2 helpers),

- Life of projects – 30 years
- Annual salary of Class I assumed as Rs. 150,000 pm, Class II assumed as Rs. 50,000 pm, Class III assumed as Rs. 25,000 pm, Class IV assumed as Rs. 8,000 pm
- Unit cost of electricity (Rs./kWh)- Rs. 5.5 (self generation), diesel Rs. 73/ litre, Petrol Rs. 72/ litre
- Number of shifts are three with annual 355 working days
- Debt: Equity ratio -zero since the plant will be self funded.

Capital and recurring cost estimated for EMP is given in **Table 10.3**.

**TABLE 10.3: CAPITAL & RECURRING COST**

| Description                                                                                                                                         | Capital cost                   |                |                 | Recurring cost       |               |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------|-----------------|----------------------|---------------|----------------|
|                                                                                                                                                     | Sanctioned as per ECs till day | Additional     | Total           | Sanctioned as per EC | Additional    | Total          |
| Air pollution control                                                                                                                               | 8919.88                        | 4055.12        | 12975.00        | 2096.51              | 13.42         | 2109.93        |
| Water pollution control                                                                                                                             | 277.50                         | 77.00          | 354.50          | 17.13                | 2.63          | 19.76          |
| Noise pollution control                                                                                                                             | 10.00                          | 0.00           | 10.00           | 1.43                 | -0.30         | 1.13           |
| Env. Monitoring and management*                                                                                                                     | 274.10                         | 225.00         | 499.10          | 79.54                | 57.64         | 137.18         |
| Occupational health                                                                                                                                 | 150.00                         | 30.00          | 180.00          | 75.76                | 46.02         | 121.78         |
| Green belt                                                                                                                                          | 225.28                         | 365.57         | 590.85          | 36.88                | 48.74         | 85.62          |
| Others (expert advice, vehicle for environment monitoring & management work, additional for expansion under clause 7 (ii) of EIA Notification 2006) | 10.00+50 <sup>#</sup>          | 0.00           | 10.00           | 7.91+2 <sup>#</sup>  | 0.00          | 7.91           |
| Overheads (3% of dep., energy, R&M & interest)                                                                                                      | 0.00                           | 0.00           | 0.00            | 59.37                | 2.84          | 62.21          |
| <b>Total</b>                                                                                                                                        | <b>9916.76</b>                 | <b>4702.69</b> | <b>14619.45</b> | <b>2376.53</b>       | <b>168.99</b> | <b>2545.52</b> |

\* *Env. Monitoring and management is detailed in chapter 6*

# *for expansion under clause 7 (ii) of EIA Notification 2006 from 2.85 to 3.00 MTPA dated 04.06.2020*

The total capital investment on environmental protection work is envisaged as Rs. 146.19 Crores and recurring expenditure during the Steel production is envisaged as Rs. 25.45 Crores/year.

## CHAPTER 11

### EXECUTIVE SUMMARY

#### 11.1 INTRODUCTION

##### 11.1.1 General background

Rungta Mines Ltd. (R.M.L.) had received an environmental clearance for 3.0 million tonnes per annum steel (M.T.P.A.) and 385 mega watt power plant on 06.04.2020. Now R.M.L. proposes to enhance production capacity from 3.0 to 3.55 million tonnes per annum steel by enhancing capacity of its various sub-units such as D.R.I., M.B.F., S.M.S. (I.F., L.R.F., E.A.F., C.C.M.), rolling mill, strip mill, ductile pipe plant, captive power plant, pelletisation plant, coal washery, oxygen plant, sinter plant, coke oven plant, producer gas plant, and colony. There will be no change in beneficiation plant, lime plant and cement plant. The plant area will expand from 674.765 to 1769.0 acres. Cost of expansion project will be Rs. 13,386.9 crores.

##### 11.1.2 Location and communication

The proposed plant, after expansion will fall in villages Jharbandh, Galpada, Tarkabeda Kothalu, Beruan Pal, Kankalu, Benipathar, Kadala and Badamunda of district Dhenkanal in Odisha. The location of plant is given in **Fig 1.1** of Chapter 1. The outermost coordinates of various parts of the proposed plant, based on google earth, are:

Plant area : 20° 45' 05" to 20° 46' 23" N, 85° 15' 42' to 85° 18' 39' E

Colony area : 20° 45' 51" to 20° 46' 03" N, 85° 18' 39' to 85° 18' 55' E

Water Reservoir area : 20° 46' 14" to 20° 46' 33" N, 85° 18' 58' to 85° 19' 13' E

The proposed plant is accessible by all weather road from the district headquarter Dhenkanal (32 km) and town Angul (18.2 km). The site is located 1.33 km aerielly from NH-55, which connects Bhubaneswar to Angul. The nearest railway station is Meramandali at a distance of 3.4 km. The nearest airport is at Bhubaneswar, which is approximately 77 km from the site.

#### 11.2 PROJECT DESCRIPTION

##### 11.2.1 Plant layout

The existing and proposed steel plant shall be constructed in 1769 acres. Out of this total land, 716.40 acres shall be under plant & facilities, 128 acres under stock yards & railway siding, 116 acres for solid waste management, 584 acres for green belt & plantation, 30 acres for administration & other buildings, 60 acres for water reservoir, 100.6 acres for roads and 34 acres for colony. Green belt will comprise 33% of the project area.

Layout of plant is shown in Fig 2.1 of Chapter 2.

### 11.2.2 Process Description

**Iron ore beneficiation plant (2X2.69 M.T.P.A.):** It mainly involves wet grinding of iron-ore fines and separation of gangue to improve the quality of iron ore. The product from the washery shall be fed into the pellet plant. The rejects will be sent to temporary tailing storage area till further utilisation/disposal.

**Pelletization plant (2.948 to 28.75 M.T.P.A.):** The pellet plant will produce oxide pellets suitable for use in D.R.I. and blast furnace. Pellets are heat hardened balls produced from concentrates and natural iron ores of different mineralogical and chemical composition. The pellets have improved properties for iron making. Pelletization process involves feed preparation, green ball formation, pellet induration and product dispatch.

**Coal washery (4.141 to 5.029 MTPA):** The raw coal needs crushing and washing to reduce the ash content before it can be used in DRI kilns and producer gas plant. Therefore, a three product coal washery has been provided. It consists of a coal crusher, screening station and washing equipment. Raw coal will be fed to the washery. Washed coal recovered will be 50%, middlings will be 42.5% and rejects will be 7.5%.

**Direct reduced iron (D.R.I.) plant (1.6132 to 2.247 M.T.P.A.):** Main raw materials - iron ore, coal and dolomite are fed to the ground hoppers with the help of pay loaders and tippers. They are carried away by belt conveyors to the crusher house and thereafter fed to kiln. Iron ore is reduced by heating with coal in the rotary kiln at a temperature of about 1000°C. After reduction, products are cooled in a drum type rotary cooler. Product is then separated into D.R.I. or sponge iron and char by magnetic separation. In rotary cooler, product is cooled by indirect water spray.

**Mini blast furnace (1.559 to 1.943 M.T.P.A.):** The purpose of a blast furnace is to chemically reduce and physically convert iron oxides into liquid iron called "hot metal". Iron ore, coke and limestone are fed into the top of the blast furnace. Preheated air is blown into the bottom. The raw materials descend to the bottom of the furnace where they become liquid iron (final product) and liquid slag (waste). These are drained from the furnace at regular intervals. The blast furnace flue gas will be passed through Waste Heat Recovery Boilers (W.H.R.B.) for power generation. Thereafter, the gas will be used as fuel in blast furnace stove and elsewhere after cleaning in Gas Cleaning Plant (G.C.P.). Unutilised gas will be flared.

**Steel melting shop (2.618 TO 3.22 M.T.P.A.) :** Steel melting shop will have (1) 15X20 tonne induction furnaces (I.F.) with 4X25 + 3X45 tonne ladle refining furnaces (L.R.F.) and (2) 1X90 + 1X110 tonne electric arc furnaces (E.A.F.) with 1X90 + 1X110 tonne L.R.F. in it. Induction furnace works on the principle of induction melting of scrap/ sponge iron with the help of electric power. In the electric arc furnace, electric arc is generated between



electrodes, which heats the metallic charge. In both furnaces, the melted contents separate into liquid metal and slag. The slag is removed and considered as waste. The liquid metal is sent to the continuous casting machine (C.C.M.) where semi-finished product is made.

**Rolling mill (1.75 to 2.55 M.T.P.A.):** Semi-finished product from the continuous casting machine of induction furnace and electric arc furnace as well as from outside purchase will be reheated and converted into finished products such as TMT, Flat, Round, Wire Rod, Structural and others products.

**Strip Mill (0.85 to 0.5 M.T.P.A.):** Semi finished product from the continuous casting machine of electric arc furnace shall be sent to the strip mill where it will be converted into finished products such as strip, sheet, coil, wire, bar and wire rope. Reheating furnace has also been provisioned at strip mill.

**Ductile Pipe Plant (0.4 to 0.5 M.T.P.A.):** Ductile pipe plant will receive hot metal directly from the mini blast furnace and manufacture finished product comprising of ductile pipes. As a back up measure, provision of reheating furnace has also been made.

**Sinter Plant (1.663 to 2.827 M.T.P.A.):** Sintering is an agglomeration process of iron ore fines/ blue dust, coke breeze and fluxes. The iron ore dusts collected from other units and pollution control equipments will also be utilised as raw material for sinter. Thus, utilising maximum solid waste from within the plant. The sinter generated will be 100% utilised in mini blast furnace.

**Coke oven plant (1.12 to 1.07 M.T.P.A.):** Raw coal will be crushed in a crusher into powdered form and charged in the oven for carbonisation. The volatile matter in raw coal gets released in the form of gas and gets burnt in the oven as well as in the flues. After the completion of the carbonization process, raw coal get converted to coke within 36 to 38 hours. The coke is then pushed out from the oven and quenched by water. Coke will be utilised in mini blast furnace and sinter plant. Balance leftover shall be sold in the market.

**Captive Power Plant (C.P.P.): (1) Waste Heat Recovery Boiler:** 235 MW waste heat recovery boilers based power plant is proposed to utilize the heat from gases exiting DRI kilns, blast furnace and coke oven. **(2) AFBC/ CFBC:** 460 MW power plant based on coal fines, middlings from washery and char from DRI kilns has been proposed. The power generated from the CPP will meet the requirement of the steel plant.

**Cement Plant (1.686 M.T.P.A.):** Limestone will be the primary raw material for clinker making. Along with coal, it will be fed into the clinker kiln and the manufactured clinker will be sent to cement mill. At cement mill, Portland Pozzolana Cement (P.P.C.) using fly ash and Portland Blast Furnace Slag Cement (P.B.F.S.) using blast furnace slag shall be manufactured and sold in the market.

For material handling within plant premises a coal handling system, ash handling system, roads etc shall be provided. Water requirement in various locations within the plant will be supplied through a circulating water system with a cooling tower, make up water system and blow down system.

### 11.2.3 Raw material, power and water

Major raw material and fuel requirement for project will be various grades of iron ore (from own mines/other private mines), non coking coal (domestic/Import) and coking coal (imported). Other raw material required is limestone, dolomite, bentonite, clay, silica component, flocculant, gypsum, quartz, silica, pig iron and semi finished products. Total raw material to be purchased from outside will be 51.37 million tonnes per annum. Fuels required in various units will be coking and non coking coal, coke breeze & fines, low sulphur heavy stock diesel oil/ furnace oil, coke oven gas and MBF gas.

Total power requirement of the plant for operating different facilities is estimated as 694 MW. It shall be sourced from Captive Power Plant. For emergency backup total 24 MVA DG sets are proposed.

The total water requirement for the 3.55 million tonne per annum plant will be 3,752 m<sup>3</sup>/hr. It shall be sourced from Brahmani River.

### 11.2.4 Manpower

The manpower requirement will be 4850 persons for various activities of the 3.55 million tonne plant like plant operation, loading, unloading, handling, transportation, general cleaning, horticulture and other miscellaneous works inside the plant. Three shifts working for 355 days is planned.

### 11.2.5 Site services

Infrastructure facilities such as administrative office, rest rooms, canteen, first aid centre, etc. will be provided to employees.

## 11.3 PRESENT ENVIRONMENTAL SCENARIO

The project area has been referred to as the “core zone” while the area upto 10 km radius of the project has been referred to as the “buffer zone”. Together they comprise the study area which can be seen Fig 3.1.

### 11.3.1 Topography and drainage

**Topography:** The existing project area has a comparatively flat terrain and elevation is approximately 75-95 m above mean sea level. The proposed expansion area has an elevation of 65-100 m in majority area of main plant. The study area has a flat to gentle, undulating sloping topography with few scattered hillocks. The surface elevation in buffer zone varies from 60-312m.

**Drainage:** The proposed project site is located 0.7 km south of Nigra Nadi (or Lingra Nadi) and 4.9 km south west of Brahmani River. As seen on toposheet, five first order seasonal drains and one aquaduct originate from within plant boundary or from its immediate vicinity and flow out from the northern boundary. These drains originate from and connect multiple seasonal ponds before flowing into Nigra Nala. The drainage of the area is controlled by the south-easterly flowing Brahmani river, which is situated in the north-eastern part of the study area. The river is fed by various seasonal sub-parallel nalas like Nigra, Kisinda Jhor, Kusumdor Jhor, Bade Jhor etc.

### 11.3.2 Climate and micro-meteorology

The climate of region is mainly tropical type. Monthly average of minimum temperatures recorded at IMD station Angul from 2001-2011, ranges from 13.02°C to 25.20°C and maximum temperature ranges from 28.32°C to 40.26°C, total of average monthly rainfall is 1216.4 mm and average wind speed is 2 km/hr.

The micro meteorological data of the core zone has been recorded using an automatic weather station from 1<sup>st</sup> March to 31<sup>st</sup> May 2019. The temperature ranged between 20.0°C to 42.0°C and relative humidity ranged between 18.2% to 86.5 % during the monitoring period. The wind speed varied between calm to 39.2 km/hr and the predominant wind direction was observed from South with 12.23% of occurrences (including calm).

### 11.3.3 Ambient air quality

Ambient air quality study was monitored at 8 locations including one location in the core zone (expansion area). Seven locations in the buffer zone are near village Nimidha, Mosonia, Thokar, Nimabahali, Tarkabera, Kadala and Beruanpal. Twenty four hour average PM<sub>10</sub> level was found to range from 40.7 to 70.9 µg/m<sup>3</sup>, PM<sub>2.5</sub> was found to vary from 22.0 to 42.3 µg/m<sup>3</sup>, SO<sub>2</sub> from 6.6 to 16.9 µg/m<sup>3</sup> and NO<sub>2</sub> from 8.2 to 21.5 µg/m<sup>3</sup>. The concentration of carbon monoxide, nickel, arsenic, lead, B(a)P and benzene were also measured.

### 11.3.4 Water resource and quality

Brahmani river and it's tributaries control the drainage of the study area. Brahmani is a perennial river. The drainage pattern is dendritic in nature. Brahmani River (4.9 km), Nigra Nadi (0.7 km), Kisinda Jhor (5.0 km), Kantei nala (4.8 km), Matilia Nadi (7.0 km), Bauli Nadi (6.9 km), Barha Jor (7.8 km), Kusumdor Jor (3.6 km), Agana Nadi (9.3 km), Bangurasingha Nala (8.6 km), Parjang branch canal (7.9 km), Ria Jor (5.9 km), Rengali right main canal (0.7 km), etc. are present within study area in addition to various ponds in villages.

Ground water monitoring during 2019 showed that the ground water level below ground level varied from 8.30-2.0 m (in April-September) at Jharbandh. At Galapada, it varied from 8.90-2.20 m (in April-August). In 18

other locations in buffer zone, it varied from 8.55-0.62 m (in April-August). The ground water estimation of the study area shows that the stage of ground water development is within safe category.

Water samples were collected from 10 ground water sources. These are Nimidha, Tarkabera, Kadala, Beruanpal, Jharbandh, Dhuliamunda, Taltali, Benipathar and Kankalu villages along with a hand pump in existing plant area. It is observed that the physico-chemical parameters present in ground water are within the permissible limits specified by IS: 10500:2012 for drinking purposes in absence of alternate source.

Water samples were collected from 11 surface water sources. These are (1) Brahmani river near Kharhagaprasad village (up stream) (2) Lingra Nadi near plant (up stream), (3) Gandhijharan nala near Tarkabeda village, (4) Brahmani river near Pani Gengutia village (down stream), (5) Lingra nadi near Kankalu village (down stream), (6) Nala Near Beruanpal village, (7) Nala near Nimabahali village, (8) Kusumador Jor near Bishwanath village, (9) Reservoir near Minor irrigation project near boundary, (10) Kantel nala near Gulehi village and (11) Kisinda Jor near Narendrapur village. The analysis of surface water sample shows that all the parameters are within the permissible limits as per IS 10500:2012.

### **11.3.5 Land use pattern and soil quality**

Total land required for the project is 1769 acres. The company has acquired 608.495 acres of land. Out of this 540.705 acres is private land and 67.790 acres is government land. Balance 1160.505 acres is has been recommended for allotment and is under acquisition through Odisha Industrial Infrastructure Development Corporation (IDCO).

The study area has 195 villages 2 census towns. Of total study area land, 5.91% is forest land, 14.96% is area under non-agricultural uses, 56.22 % is net area sown, 4.19% is permanent pastures and other grazing land, 2.39% is current fallows, 10.41% is barren and un-cultivable land, 2.94% is fallows land, 1.40% is culturable waste land and 1.58% is land under miscellaneous tree crops, etc.

Top soil samples were collected and analyzed from 9 locations in and around plant premises. The results indicate that all the soil samples are medium grained sand and have pH between 6.6-7.8. They are deficient in organic carbon except Kadala and Beruanpal.

### **11.3.6 Noise and traffic volume survey**

Noise levels at ten stations (1 within the core area and nine within buffer area) were observed. Leq values observed during day time varied from 48.46 to 51.52 dB (A) and at night time varied from 39.8 to 42.1 dB (A). Traffic volume survey was conducted round the clock during 16-18/04/2019 at Nimabahali Chowk (on NH-55) and on Nimbahali to Jharbandh road.

Total number of motorised vehicles and cycles were found as 13,409 and 459, respectively.

### **11.3.7 Ecology**

7.8 acres (3.156 ha) of forest land is present within the project area. Stage-II forest clearance for the same was received on 02.07.2015 from Ministry of Environment, Forest & Climate Change vide letter No. 5-ORB207/2014-BHU. Forests of the study area are Northern Tropical Semi-evergreen forests based on classification by Champion and Seth. Forest present in the study area, as per toposheet, are Jharbandh RF (adjoining), Ghanthigarhia PF (3.3 km) and Nimidra RF (2.0 km). No wildlife park or sanctuary or eco-sensitive zone exists within 10 km radius.

Flora in the study area comprises 43 tree species, 2 bamboo species, 16 shrubs, 8 herbs, 2 climbers and 4 grass species. Fauna in the study area comprises 25 species comprising 9 species of mammals, 6 species of reptiles and 10 species of birds.

### **11.3.8 Socio-economic conditions**

As on Dec 2018, there is no habitation within proposed expansion area. There were 54 families previously in the existing plant area who have been resettled in village Nimabahali and paid compensation. As per Census 2011, total population within the study area is 219652 persons that include 113644 males and 105918 females.

The SC population is 23.10% and ST population is 5.18%. The average literacy rate is 70.18%.

The literacy amongst women is poorer at 30.38%. 24.02% of the total population are main workers, while 10.39% are marginal workers and the rest 65.58% are non workers.

### **11.3.9 Places of archaeological/ historical/ tourist/ religious importance**

There is no important archaeological (ASI)/ historical place or other place of tourist or religious importance within the study area except village temples and mosques. However, the toposheet shows monuments near Garha Santri-Arahata village road, Pirhasahi-Taltali road, Pirhasahi-Ganthigarhia PF road, Kankinali-Barasingha road and near Kalandapal village, all at distance of 7.5 km and beyond.

## **11.4 ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION**

### **11.4.1 Topography and drainage**

**Impact:** Change in topography is occurring in core zone due to cutting, filling, construction activities such as walls, buildings, stock yards, etc. For the plant sanctioned vide environmental clearances dated 04.06.2020 &

before. The ground is being levelled, where required, due to ongoing construction. One D.R.I., induction furnace, caster and power plant unit is under construction within 674.765 acres. Similarly, in additional 1094.235 acres expansion area, the topography will change permanently due to leveling and establishment of additional buildings. The construction once achieved will not be reversed. There will be no impact on topography of the buffer zone since no construction is proposed except widening and strengthening.

Six first order seasonal streams, seventeen ponds and the sheet flow of rain water shall get affected within the core zone due to installation of buildings. Impact on the drainage in the buffer zone is not anticipated as no construction will be taking place outside plant boundary. However, the volume of water from the plant area going outside the plant will reduce during rainfall as the rainwater will be stored in raw water reservoir / rain water harvesting ponds.

**Mitigation:** The change in topography in the core zone will be permanent and irreversible. Excavated soil will be used in leveling, filling and landscaping to minimise the impact of change in topography. Changes in the sheet flow pattern of rain water will be managed through storm water drains. The impact of the new construction will, therefore, be managed through mitigation measures.

#### **11.4.2 Air quality**

**Impact:** During construction phase, sources of air pollution will be due to vehicle exhausts, excavation work, construction material handling (cement, sand and gravel), vehicle movement on unpaved roads and exhaust from non-mobile construction equipment like compressors. Primary impact will be high dust generation resulting into increased suspended particulate matter levels in the surrounding areas. The secondary impacts of air emissions, dust as well as other emission may affect the health of the labour force working in close vicinity and nearby villagers. During operation phase the air quality impact will be due to emissions from the stacks attached to various units, from stock yards and from transportation. Each of these has been evaluated for potential impact using mathematical models.

**Mitigation:** During construction, dust is anticipated due to levelling, construction and transportation activities. It will be controlled by sprinkling of water and using covers & wind breaks. Construction equipment and transport vehicle will be maintained periodically as per manufacturers norms. All trucks that will be used for transportation of construction material, raw material and finished product will be covered with tarpaulin, kept maintained, be optimally loaded, be spill proof and have Pollution-Under-Check (PUC) certificates. Various pollution control equipment like electrostatic precipitators (E.S.P.), bag filters, dust extraction systems, dry fog systems, gas cleaning plant, scrubber and sprinklers shall be installed as per the requirement of every unit. The air quality prediction exercise was carried out for stack emissions and fugitive dust from stock yards. The

incremental ground level concentrations on expansion from 3.0 to 3.55 M.T.P.A. has been calculated as  $0.125 \mu\text{g}/\text{m}^3$  for PM<sub>10</sub>,  $0.072 \mu\text{g}/\text{m}^3$  for PM<sub>2.5</sub>,  $6.347 \mu\text{g}/\text{m}^3$  for SO<sub>2</sub> and  $0.033 \mu\text{g}/\text{m}^3$  for NO<sub>2</sub>. The impact of the plant will remain within permissible limits.

#### 11.4.3 Noise and traffic density

**Impact:** The noise level during construction will be due to construction machinery. It will be temporary and reversible in nature. The noise level at sources like plant machinery are anticipated to go as high as 90 dB(A). During operation, noise will be generated due to operation of various equipment, machinery, pumps, turbo generators, etc.

**Mitigation:** The equipment shall be provided with acoustic shields or enclosures to limit the sound level within the plant boundary. Vibration dampers shall be used during erection of machinery. Maintenance of machinery and vehicles will be done regularly. The proposed green belt will also help to prevent noise generated within the plant from spreading beyond the plant boundary. Ear muffs or plugs will be provided to the workers in close vicinity of noise source.

#### 11.4.4 Water environment

**Impact:** During construction phase, water will be required for concrete mixing, curing, cooling water for various machineries, sprinkling for dust suppression, irrigation for green belt and lawns. Sewage will be generated from site office and labour camp.

During operation phase, the requirement of water will be for process and sourced from Brahmani river. The withdrawal of water from Bramhani River can also have an impact in absence of mitigation measures.  $764 \text{ m}^3/\text{hour}$  waste water will be generated after expansion from DM unit regeneration; water pre-treatment; discharges from various units like CPP, kilns, furnaces, etc.; plant washings; leakages and sewage from buildings. During monsoon there will be run off from stock yard, solid waste storage area, roads, open areas and roof tops.

**Mitigation:** During construction phase, the sewage from site office and labour camps will be treated in septic tank- soak pit system. During operation, waste water streams from various units, processes and services of the plant will be collected in neutralisation tank (if needed) and common monitoring basin. From common monitoring basin, it will be utilized for dust suppression, sprinkling, ash quenching, fly ash brick plant and green belt watering. The sewage from toilets, washrooms and canteen of plant and colony sewage shall be treated in de-centralised septic tanks and sewage treatment plant.

The rainwater falling within the entire project area will be routed to the raw water reservoir and/or intermediate rainwater harvesting ponds through

storm water drains. This will reduce water demand from the Bramhani river. Rooftop rainwater will be recharged to the ground.

The run off from stock yards and solid waste storage areas will be guided to settling chambers prior to discharge into rainwater harvesting ponds or raw water reservoir.

#### **11.4.5 Land use**

**Impact:** The total plant area of proposed 3.55 million tonne steel plant will be spread over 1769 acres. The construction and development in the existing project area has or is taking place. It comprises of internal roads, water reservoir, buildings, green belt and plantation, etc. During expansion, additional buildings and sheds of the new units will come up along with facilities. The temporary storage of solid wastes like char, ESP & bag filter dusts, sludges, FES dust, various slags from various sub-units, fly ash and other solid wastes on land would also impact the land.

**Mitigation:** The topsoil generated during construction will be preserved and shall be spread over the area where plantation is proposed. Plantation will be carried out at earliest to minimise soil erosion. To prevent contamination of water and soil, the finished product stock yards will be covered. Raw material stock yard and solid waste storage areas will have impervious flooring to prevent seepage of leaching due to rains. Runoff will be collected in a garland drain around the stock yard & solid waste storage areas, settled in settling pond and directed to rain water harvesting ponds or raw water reservoir.

#### **11.4.6 Solid waste**

**Impact:** During construction phase, due to work force deployed for construction, there will be development of temporary establishment of residential and commercial nature. These will generate garbage. In the integrated steel plant operation dust collected from dust collectors, empty barrels (metal and plastic), bags, fly ash, bed ash, dust from air pollution control equipment, dolochar, E.A.F. & I.F. slag, mill scale, scrap, rejected billets, coal fines & rejects, M.B.F. slag, iron ore fines, sinter returns, effluent treatment sludges, sweepings and other biodegradable wastes from the canteen are the solid wastes generated.

**Mitigation:** Sponge iron kilns ESP dust and dolochar will be used as fuel in power plant. The E.A.F. and I.F. slag will be given for metal recovery, converted into aggregates and used for road making. M.B.F. slag will be used for cement manufacturing. Mill scales, coke fines, iron ore fines, sinter returns and various E.S.P. & bagfilter dusts will be used for sinter. Steel scraps and rejects will be recycled by melting. Fly and bottom ash from existing & proposed expansion of power plant shall be used for brick making in house and balance given to cement plants, brick plants, road projects & other users. All stock piles will be laid on top of a stable liner to avoid leaching of materials to ground water.



### 11.4.7 Ecology

**Impact:** During construction and operation phase, negligible impact is anticipated on the flora in the plant area. There is 3.156 ha forest land in the existing plant area of 674.765 acres. Stage II forest clearance has been obtained from MOEF&CC for the same on 02.07.2015. There is no forest land in the expansion area of 442.82. Negligible adverse impact of proposed project is anticipated on the fauna as the density is low in the area immediately surrounding the proposed project. The air quality modeling shows that negligible impact will be caused on the surrounding forests.

**Mitigation:** Under the proposed green belt and plantation programme after expansion, 584 acres of land within premises (33% of total area) shall be provided with green cover. The greenbelt will act as a micro-habitat for small sized mammals and birds. Mitigation measures as suggested in the Wild Life Conservation Plan shall be taken. The plan has been approved by Principal Chief Conservator of Forest (Wildlife), Odisha on 07.04.2015. Company proposes extensive plantation outside plant boundary also. The expenditure for plantation and wildlife conservation plan shall be met through the fund earmarked for Corporate Environment Responsibility (C.E.R.).

### 11.4.8 Socio-economics

**Impact:** There were 54 families within the project boundary at the time the project was conceived prior to the year 2010. After the environmental clearance on 02.08.2010, these families have been resettled & rehabilitated in village Nimabahali at an aerial distance of 2.4 km. As per the directions of Land Acquisition Officer, District Office, Dhenkanal a compensation of Rs. 7 lakhs per family has also been paid. As in Dec 2018, there are no inhabitants within the plant boundary. Hence, there are no displacees for expansion of steel plant. However, there will be land losers and land will be acquired through IDCO.

Most of the work force required for construction and operation of the proposed project will be drawn from the surrounding areas. Once the plant will commence operation, amenities like education, school, health, medical, entertainment, canteen, etc. will get developed in and around the plant. These facilities will inevitably be available to local people also in addition to those directly associated with the plant. During operation phase, 4850 people will be employed at full capacity of 3.55 million tonne.

**Mitigation:** It is proposed to hire the manpower locally in the proposed plant, to the extent possible in order to have a positive socio-economic impact. For the purpose, training for capacity building shall be undertaken by the company. Land owners from whom land has been bought, will be given preference in employment. Other than direct and indirect employment leading to economic growth, the major benefit to the community will be through Corporate Social Responsibility (C.S.R.) and Corporate Environment Responsibility (C.E.R.) activities of the company.

## **11.5 ANALYSIS OF ALTERNATIVES**

Dhenkanal Steel Plant already has an environmental clearance of 3.0 million tonne finished steel dated 04.06.2020. Its construction is underway. Therefore, no alternative site has been selected. It is intended to expand the plant into adjoining or nearby areas and share the resources and facilities of the sanctioned plant. For steel making, the Induction Furnace (I.F.) and Electric Arc Furnace (E.A.F.) technologies have been selected. The Non Recovery type Coke Oven plant has been proposed for use.

For the captive power plant, waste heat recovery boiler & AFBC/ CFBC boiler is proposed. Based on the techno-economic analysis and operating experience of existing pellet plants, straight kiln process has been selected in which drying, preheating, induration & cooling of pellets take place on the same strand.

## **11.6 ENVIRONMENTAL CONTROL AND MONITORING ORGANISATION**

Rungta Mines Ltd. already has an Environment Management Department at the headquarter. It will also be responsible for ensuring the environmental monitoring of the proposed plant. Monitoring of stack emissions, ambient air quality, water quality, water levels, noise levels, soil quality, tree count, etc. shall be carried out periodically at plant level. An environment officer will be appointed at the plant. He will be responsible for the aforementioned plant level monitoring, developing greenbelt, ensuring good housekeeping, ensuring statutory compliances as well as imparting environmental training to work force.

The total capital investment on environmental protection work is envisaged as Rs. 4702.69 Lakhs and recurring expenditure during operation will be Rs. 168.99 Lakhs/year.

## **11.7 DISASTER MANAGEMENT PLAN**

All types of industries face certain types of hazards which can disrupt normal activities abruptly. They can lead to disasters like fires, inundation, failure of machinery, explosion, oil spillage, acid spillage, electrocution and hazardous waste spillage/ exposure, etc. Disaster management plan is formulated with an aim of taking precautions to control hazard propagation and avert disaster. It also instructs to take action after the disaster to limit the damage to minimum. To tackle the situation, a disaster control room will be established having links with all control rooms of the plant. An up-to-date communication facility will be provided to control rooms. The disaster control room shall be headed by emergency leader called Site Main Controller, who will be the plant manager.

## **11.8 PROJECT BENEFIT**

During operation phase, around 4850 persons will be under direct employment of the company, at full capacity. Many more persons will be

indirectly engaged either on contract basis or in transportation of materials or in provision of different services associated with the project. As majority of unskilled and semi-skilled persons will be from the surrounding villages, social & infrastructural benefits will extend to the local population. Improvement is expected in education facilities, health care services, road infrastructure and drinking water facilities through proposed Corporate Social Responsibility (CSR) and Corporate Environment Responsibility (CER) programs. Company will spend 2% of the average annual profit of the previous three years on CSR. For CER, Ministry of Environment, Forest and Climate Changes circular dated 01.05.2018 shall be followed and 0.25% of the total investment shall be spent over ten years. This works out as Rs. 13.75 Crores.

## **11.9 DISCLOSURE OF CONSULTANTS**

The consultants engaged for the preparation of the EIA/EMP of the project are Min Mec Consultancy Pvt. Ltd. Company. It was registered in July 1983 with the Registrar of Companies, Delhi & Haryana, India. In 1994, Min Mec established a modern R&D Laboratory. Min Mec is ISO 9001: 2015 certified under ANZ-JAS. In June 2006, the laboratory received accreditation from NABL (latest certificate no. TC-6337), which has been renewed as per procedure since. In 2012, lab had been accredited under Environment Protection Act (EPA) by Ministry of Environment, Forest & Climate Change, Government of India and has been renewed till 2024. Min Mec has prepared the EIA/EMP based on the permission granted from Delhi High Court vide LPA 110/2014 and CM No. 2175/2014 (stay) and in W.P.(C) 3665/2016.

## CHAPTER 12

### DISCLOSURE OF CONSULTANTS ENGAGED

Min Mec provides services in the field of environmental impact assessment and management for all types of industries (chemical/ cement/ steel industries, power stations, infrastructure projects, mines, etc), risk analysis, disaster management, environmental health and safety auditing, socio-economic studies, R&R studies, mine planning and engineering software development. Min Mec conducts studies as per international requirements such as those for IFC (World Bank) and CIDA sponsored projects and of national standards of MoEF&CC.

Min Mec Consultancy Pvt. Ltd was registered in July 1983 with the Registrar of Companies, Delhi & Haryana, India. In 1994, Min Mec established a modern R & D laboratory. On 02.02.2003, Min Mec received ISO 9001 certification under ANZ-JAS which is renewed periodically. In June 2006, the laboratory received accreditation from NABL for compliance to ISO 17025 and is recognised by MoEF&CC (Gazette Notification No. S.O. 3744 (E) dated 17.10.2019) Copy of the latest valid certificate is given in **Annexure XXI**. The laboratory also received IS/ISO 14001 and OHSAS 18001 (Revised to IS/ISO 45001) certifications in the year 2011, which have been renewed regularly.

#### **Services and expertise**

Services are provided to the following sectors

- Mines-surface and under ground for all minerals and metals
- Infrastructure projects such as jetties, highways, water supply pipelines projects, power stations, canals, minor dams, etc.
- Industries such as cement plants, smelters, steel, chemicals, pharmaceuticals, petrochemicals, salt works, pesticides and other hazardous and polluting industries.

As on 01.03.2019, the following projects have been executed:

| Studies                                                                                                             | Numbers |
|---------------------------------------------------------------------------------------------------------------------|---------|
| EIA/EMP, Environmental Studies, obtaining ECs & NOCs, EC amendments, validity extensions, EC/ NOC compliances, etc. | 370     |
| Risk Analysis & Disaster Management Plan                                                                            | 17      |
| EHS audits                                                                                                          | 4       |
| Socio Economics surveys & studies                                                                                   | 13      |
| Feasibility studies (sponge iron & power plants)                                                                    | 40      |
| Pre Feasibility studies/Techno Economic Feasibility reports (coal blocks)                                           | 62      |
| Market surveys                                                                                                      | 8       |
| Mine Planning and Mine Closure Plans(Coal/non coal)                                                                 | 130     |
| Regional Studies                                                                                                    | 2       |

| Studies                                                                  | Numbers    |
|--------------------------------------------------------------------------|------------|
| Hydro- geological & hydrological studies                                 | 68         |
| Others (due diligence, satellite imagery interpretation, softwares etc.) | 25         |
| Traffic Impact Assessment Studies                                        | 16         |
| Wildlife conservation plan                                               | 11         |
| Satellite Imagery Interpretation                                         | 11         |
| <b>Total</b>                                                             | <b>777</b> |

### **Personnel**

Min Mec has a strong team of in-house experts in EIA, EMP, DMP, RA, EHS, mining, socio economics and software development. The team of experts is supported by a panel of experts in various fields with an average experience of over 30 years.

### **Declaration**

I, Marisha Sharma, hereby, confirm that the below mentioned experts prepared the **EIA/EMP for Expansion of Dhenkanal Steel Plant, Odisha of M/s Rungta Mines Ltd.**

I also confirm that the consultant organization shall be fully accountable for any mis-leading information mentioned in this statement.

It is certified that no unethical practice like 'copy and paste', and use of external data / text without proper acknowledgement has been done, while preparing this EIA report.

I, hereby, certify that I was a part of the EIA team in the capacity of EIA coordinator that developed the above EIA.



Date : 20.10.2020

Name: Marisha Sharma, Director (Technical), Min Mec Consultancy Pvt. Ltd.

Period of involvement: Various months (of 2018-2020)

Contact information: Mobile- 9811077603

As per Circular no. F. No. J-11013/77/2004-IA II (I), dated 30<sup>th</sup> September 2011 of MoEF&CC, Min Mec is listed at serial no. 7 in List 'B'. Min Mec is preparing and presenting reports as per the High Court of Delhi orders in LPA 110/2014 and CM No.2175/2014 (stay) and in W.P.(C) 3665/2016 (Copy given in **Annexure XXII**).

### **Team engaged**

The team of Min Mec Consultancy Pvt. Ltd. and Min Mec R&D Laboratory involved in EIA preparation was as follows:

| <b>Role</b>                        | <b>Expert Name</b> | <b>Qualifications</b>                                                                       | <b>Experience</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Involvement in EIA report</b>                                                                                                                                                                                                                             |
|------------------------------------|--------------------|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Team leader & EC                   | Dr. Marisha Sharma | Ph.D., M. Plan (Env.), BE (Civil)                                                           | Since 2001, experienced in preparation of EIA/EMP for mines, thermal power plants, steel plants, new construction projects, townships, etc.                                                                                                                                                                                                                                                                                                                                                                            | Water balance calculation for the project, prediction of impacts & proposed mitigation measures,                                                                                                                                                             |
| Core FAE- WP, SE, SHW, SC          |                    | PG Certificate in participatory management of displacement, resettlement and rehabilitation | Certified Energy auditor & visiting faculty to School of Planning & Architecture.                                                                                                                                                                                                                                                                                                                                                                                                                                      | Identified source, quantity and propose management measures of all solid wastes from project.                                                                                                                                                                |
| Supporting FAE- AP, AQ, LU, NV, HG |                    |                                                                                             | Expertise provided in water balance, water budgeting, water conservation, waste water treatment, supervising water and waste water sample collection and analysis, impact on water resources, overseeing census data processing, site surveys, R&R planning (if applicable), impact on soil and its management, municipal and industrial solid waste management.                                                                                                                                                       | Soil conservation and protection measures.                                                                                                                                                                                                                   |
|                                    |                    |                                                                                             | Guidance in land use analysis, mathematical modelling of air, hydrogeological studies, impact on noise and air.                                                                                                                                                                                                                                                                                                                                                                                                        | Evaluation of socio-economic status of the area, need based assessment for CSR/ CER, socio-economic impact & management & contribution in EIA documentation                                                                                                  |
| Core FAE- AP, AQ, HG, RH           | B. D. Sharma       | M. Tech (Hons), B. Tech (Min.), PG Diploma (Env. & Ecology)                                 | Since, 1973 active in mining sector and allied activities (washeries, beneficiation, pit head industries like cement, power, etc.) with 29 years in environmental impact assessment, management and planning with over 300 projects executed. Identifying and assessing quantum of emissions and guiding computer based modelling, impact on ground water, water budgeting, water balancing, identification of hazards and hazardous substances, risk analysis and preparation of on-site emergency preparedness plan. | Interpretation of baseline condition of air environment. Evaluation of results of Ambient Air Quality Monitoring and air quality prediction modelling, suggesting control measures, risk analysis and disaster management. Contribution in EIA documentation |
| Supporting FAE- SHW, NV, GEO       |                    |                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Verifying & approving hydrogeological assessment of the study area.                                                                                                                                                                                          |

| <b>Role</b>                                                         | <b>Expert Name</b>          | <b>Qualifications</b>                         | <b>Experience</b>                                                                                                                                                                                                                                          | <b>Involvement in EIA report</b>                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------|-----------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Core FAE-<br>EB, AP,<br>WP, SC<br><br>Supporting<br>FAE- SHW,<br>NV | Rashmi<br>Gupta             | M.Sc.<br>(Environment)                        | Since 2006, experienced in ecology and biodiversity, ecological surveys and preparation of flora - fauna lists, wildlife conservation plan (if required), environmental data interpretation and preparation of EIA/EMP report.                             | Ecology study, review of greenbelt development requirement of the project-suggestion for species, type of plantation and contribution in EIA documentation<br><br>Planning of meteorology station, air and water quality stations, noise & soil sampling locations and monitoring program, analysis data verification and approval.                 |
| Core FAE-<br>AP, AQ, NV<br><br>Supporting<br>FAE- EB                | M.S.<br>Yadav               | M. Sc.<br>(Environment)                       | Since 1995, experienced in survey data processing, Census data analysis, identifying and assessing quantum of emissions, computer based impact prediction modelling for air (including GLC mapping), noise modelling, meteorological data processing, etc. | Meteorology data processing, air quality models run using meteorology data, identifying source and receptor, calculating emissions, prediction of GLC & plotting isopleths for various scenarios of with & without control measures.<br><br>Processing of Noise data from field and interpretation<br><br>Prediction of noise levels due to project |
| Core FAE-<br>GEO, LU,<br>HG, SC<br><br>Supporting<br>FAE-WP         | Santosh<br>Kumar<br>Sadangi | M.Sc.<br>(Geology)                            | Since 2006, experienced in geomorphological & geological survey, hydrogeology, land use analysis through GIS, soil conservation and soil analysis.                                                                                                         | Satellite image interpretation and preparation of land use map of study area, prediction of impact on land use pattern, suggest mitigation measures, soil analysis, representing geology & ground water condition, preparing ground water balance of study area, identification of seismicity and contribution to EIA                               |
| Core FAE-<br>EB, WP,<br>SC                                          | Gaurav<br>Yadav             | M.Sc. (Env.<br>Sc.), B.Sc. (Life<br>sciences) | Since 2012, research in bioremediation of water pollutants, water & soil quality analysis, ecological studies, microbiology studies and impact of pollutants on environment                                                                                | Water, microbiology & soil quality analysis, ecological studies and report writing under guidance of various FAEs                                                                                                                                                                                                                                   |

| Role          | Expert Name   | Qualifications             | Experience                                                                                                                                                                                                                                                           | Involvement in EIA report                                                                                    |
|---------------|---------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Core FAE - WP | Santosh Kumar | B.Sc. (Chem)               | Since 2007, analysis of water, soil, air, wastes, raw materials etc                                                                                                                                                                                                  | Laboratory analysis for water, soil, air, etc                                                                |
| FAA           | Nitesh Dalal  | B. Tech (Env. Engineering) | Since 2016, assisting in preparation of documentation for environmental clearance, water quality data analysis, air quality data analysis, selection of air quality stations, air quality modelling, water resource calculations, coordination with laboratory, etc. | Lab work, report writing under guidance of various FAEs related to material balancing, water balancing, etc. |
| FAA           | Pappu Kumar   | B. Tech (Env. Engineering) | Since 2017, assisting in preparation of documentation for environmental clearance, water quality data analysis, air quality data analysis, water resource calculations, coordination with laboratory, etc.                                                           | Traffic analysis, prediction and management proposal, report writing under guidance of various FAEs          |

### **Laboratory:**

Environmental monitoring and testing has been done by Min Mec R&D Laboratory, NABL accredited (Certificate No. TC-6337 valid till 20.11.2021) and is recognised by MoEF&CC (Gazette Notification No. S.O. 3744 (E) dated 17.10.2019 valid for 5 years).



# ***ANNEXURES***

No.J-11011/309/2018-IA.II(I)

Government of India

Minister of Environment, Forest and Climate Change

Impact Assessment Division

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Indira Paryavaran Bhavan,  
Vayu Wing, 3rd Floor, Aliganj,  
Jor Bagh Road, New Delhi-110003  
19 Sep 2020

To,

M/s RUNGTA MINES LTD  
RUNGTA MINES LIMITED, MAIN ROAD, BARBIL, KEONJHAR, ODISHA,  
Keonjhar-758035  
Orissa

Tel.No.676-276891; Email:rml.forest@gmail.com

Sir/Madam,

This has reference to the proposal submitted in the Ministry of Environment, Forest and Climate Change to prescribe the Terms of Reference (TOR) for undertaking detailed EIA study for the purpose of obtaining Environmental Clearance in accordance with the provisions of the EIA Notification, 2006. For this purpose, the proponent had submitted online information in the prescribed format (Form-1 ) along with a Pre-feasibility Report. The details of the proposal are given below:

- |                                         |                                                                                                                                    |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. Proposal No.:</b>                 | IA/OR/IND/172347/2020                                                                                                              |
| <b>2. Name of the Proposal:</b>         | Expansion of Integrated Steel Plant (Dhenkanal Steel Plant)                                                                        |
| <b>3. Category of the Proposal:</b>     | Industrial Projects - 1                                                                                                            |
| <b>4. Project/Activity applied for:</b> | 2(b) Mineral beneficiation<br>3(a) Metallurgical industries (ferrous & non ferrous)<br>3(b) Cement plants<br>4(b) Coke oven plants |
| <b>5. Date of submission for TOR:</b>   | 11 Sep 2020                                                                                                                        |

In this regard, under the provisions of the EIA Notification 2006 as amended, the Standard TOR for the purpose of preparing environment impact assessment report and environment management plan for obtaining prior environment clearance is prescribed with public consultation as follows:

**STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR  
PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE**

**2(b):STANDARD TERMS OF REFERENCE FOR CONDUCTING  
ENVIRONMENT IMPACT ASSESSMENT STUDY FOR MINERAL  
BENEFICIATION PROJECTS AND INFORMATION TO BE  
INCLUDED IN EIA/EMP REPORT**

- 1) The alternate sites considered, the relative merits and demerits and the reasons for selecting the proposed site for the Beneficiation Plant should be indicated.
- 2) Details of the technology and process involved for beneficiation should be given. .
- 3) Location of the proposed Plant w.r.t. the source of raw material and mode of transportations of the ore from mines to the beneficiation plant should be justified.
- 4) Treatment of run of mine (ROM) and or of the fines/waste dump should be spelt out.
- 5) Estimation of the fines going into the washings should be made and its management described.
- 6) Details of the equipment, settling pond etc. should be furnished.
- 7) Detailed material balance should be provided.
- 8) Sources of raw material and its transportation should be indicated. Steps proposed to be taken to protect the ore from getting air borne should be brought out.
- 9) Management and disposal of tailings and closure plan of the tailing pond, if any after the project is over, should be detailed in a quantified manner.
- 10) The water requirement for the project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the project should also be indicated.
- 11) A copy of the document in support of the fact that the Proponent is the rightful lessee of the unit should be given.
- 12) All documents including EIA and public hearing should be compatible with one another in terms of the production levels, waste generation and its management and technology and should be in the name of the lessee.
- 13) All corner coordinates of the Unit, superimposed on a High Resolution Imagery/Toposheet should be provided. Such an Imagery of the proposed Unit should clearly show the land use and other ecological features of the study area (core and buffer zone).
- 14) It should be clearly indicated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of

**STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/  
ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE**

- environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.
- 15) Issues relating to Safety should be detailed. The proposed safeguard measures in each case should also be provided. Disaster management plan shall be prepared and included in the EIA/EMP Report.
  - 16) The study area will comprise of 10 km zone around the Plant.
  - 17) Cumulative impact study of both Beneficiation Plant with suggested mitigation measures as per the study should be described.
  - 18) Location of Railway siding with its handling capacity and safety measures should be indicated.
  - 19) Option to provide only silo for storage of minerals instead of open stacking to avoid fugitive dust should be explored and arrangements finalized justified.
  - 20) Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.
  - 21) Details of the land for any Over Burden Dumps outside the lease, such as extent of land area, distance from lease, its land use, R&R issues, if any, should be given.
  - 22) A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the Project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.
  - 23) Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.
  - 24) Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.
  - 25) The vegetation in the RF / PF areas in the study area, with necessary details, should be given.
  - 26) A study shall be got done to ascertain the impact of the Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted.
  - 27) Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.

- 28) A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan alongwith budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.
- 29) Proximity to Areas declared as 'Critically Polluted' shall also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB/CPCB shall be secured and furnished to the effect that the proposed activities could be considered.
- 30) Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the unit w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).
- 31) R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects, should be discussed in the report.
- 32) One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the unit in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.
- 33) Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.

- 34) The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.
- 35) Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be secured and copy furnished. .
- 36) Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.
- 37) Impact of the project on the water quality, both surface and groundwater should be assessed and necessary safeguard measures, if any required, should be provided.
- 38) Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.
- 39) A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the project. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to the pollution.
- 40) Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered.
- 41) Details of the onsite shelter and facilities to be provided to the workers should be included in the EIA report.
- 42) Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area should be detailed.
- 43) Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.
- 44) Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

- 45) Public hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.
- 46) Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the project should be given.
- 47) The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
- 48) A brief background of the Project, its financial position, Group Companies and legal issues etc should be provided with past and current important litigations if any.
- 49) Benefits of the Project, if the project is implemented should be outlined. The benefits of the projects shall clearly indicate environmental, social, economic, employment potential, etc.
- 50) Besides the above, the below mentioned general points are also to be followed:-
  - a) All documents to be properly referenced with index and continuous page numbering.
  - b) Where data are presented in the report especially in Tables, the period in which the data were collected and the sources should be indicated.
  - c) Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the project.
  - d) Where the documents provided are in a language other than English, an English translation should be provided.
  - e) The Questionnaire for environmental appraisal of project as devised earlier by the Ministry shall also be filled and submitted.
  - f) While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should also be followed.
  - g) Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.
  - h) As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified Report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project by the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.

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## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

### 3(a):STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR METALLURGICAL INDUSTRIES (FERROUS & NON FERROUS) PROJECTS AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

#### A. STANDARD TERMS OF REFERENCE (TOR)

##### 1) Executive Summary

##### 2) Introduction

- i. Details of the EIA Consultant including NABET accreditation
- ii. Information about the project proponent
- iii. Importance and benefits of the project

##### 3) Project Description

- i. Cost of project and time of completion.
- ii. Products with capacities for the proposed project.
- iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.
- iv. List of raw materials required and their source along with mode of transportation.
- v. Other chemicals and materials required with quantities and storage capacities
- vi. Details of Emission, effluents, hazardous waste generation and their management.
- vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)
- viii. Process description along with major equipments and machineries, process flow sheet (quantative) from raw material to products to be provided
- ix. Hazard identification and details of proposed safety systems.
- x. Expansion/modernization proposals:
  - a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing Iexisting operation of the project from SPCB shall be attached with the EIA-EMP report.

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

- b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

### 4) Site Details

- i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.
- ii. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)
- iii. Details w.r.t. option analysis for selection of site
- iv. Co-ordinates (lat-long) of all four corners of the site.
- v. Google map-Earth downloaded of the project site.
- vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.
- vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.
- viii. Landuse break-up of total land of the project site (identified and acquired), government/private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)
- ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area
- x. Geological features and Geo-hydrological status of the study area shall be included.
- xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)
- xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.
- xiii. R&R details in respect of land in line with state Government policy

### 5) Forest and wildlife related issues (if applicable):

- i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)
- ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

- iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.
- iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon
- v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area
- vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife

### 6) Environmental Status

- i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.
- ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.
- iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQPM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.
- iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.
- v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.
- vi. Ground water monitoring at minimum at 8 locations shall be included.
- vii. Noise levels monitoring at 8 locations within the study area.
- viii. Soil Characteristic as per CPCB guidelines.
- ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.
- x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.
- xi. Socio-economic status of the study area.

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

### 7) Impact and Environment Management Plan

- i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.
- ii. Water Quality modelling - in case of discharge in water body
- iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.
- iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.
- v. Details of stack emission and action plan for control of emissions to meet standards.
- vi. Measures for fugitive emission control
- vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.
- viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.
- ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.
- x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.
- xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.
- xii. Action plan for post-project environmental monitoring shall be submitted.

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

- xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

### 8) Occupational health

- i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers
- ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.
- iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,
- iv. Annual report of health status of workers with special reference to Occupational Health and Safety.

### 9) Corporate Environment Policy

- i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.
- ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.
- iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.
- iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report

- 10) Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

### 11) Enterprise Social Commitment (ESC)

- i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

bound action plan shall be included. Socio-economic development activities need to be elaborated upon.

- 12) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.
- 13) 'A tabular chart with index for point wise compliance of above TOR.

### B. SPECIFIC TERMS OF REFERENCE FOR EIA STUDIES FOR METALLURGICAL INDUSTRIES (FERROUS & NON FERROUS)

- 1) Complete process flow diagram describing each unit, its processes and operations, along with material and energy inputs & outputs (material and energy balance).
- 2) Details on blast furnace/ open hearth furnace/ basic oxygen furnace/ladle refining, casting and rolling plants etc.
- 3) Details on installation/activation of opacity meters with recording with proper calibration system
- 4) Details on toxic metals including mercury, arsenic and fluoride emissions
- 5) Details on stack height requirement for integrated steel
- 6) Details on ash disposal and management -Non-ferrous metal
- 7) Complete process flow diagram describing production of lead/zinc/copper/ aluminium, etc.
- 8) Raw materials substitution or elimination
- 9) Details on smelting, thermal refining, melting, slag fuming, and Waelz kiln operation
- 10) Details on Holding and de-gassing of molten metal from primary and secondary aluminum, materials pre-treatment, and from melting and smelting of secondary aluminium
- 11) Details on solvent recycling
- 12) Details on precious metals recovery
- 13) Details on composition, generation and utilization of waste/fuel gases from coke oven plant and their utilization.
- 14) Details on toxic metal content in the waste material and its composition and end use (particularly of slag).
- 15) Trace metals Mercury, arsenic and fluoride emissions in the raw material.
- 16) Trace metals in waste material especially slag.
- 17) Plan for trace metal recovery
- 18) Trace metals in water

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

### C. ADDITIONAL TOR FOR INTEGRATED STEEL PLANT

- 1). Iron ore/coal linkage documents along with the status of environmental clearance of iron ore and coal mines
- 2). Quantum of production of coal and iron ore from coal & iron ore mines and the projects they cater to. Mode of transportation to the plant and its impact
- 3). For Large ISPs, a 3-D view i.e. DEM (Digital Elevation Model) for the area in 10 km radius from the proposal site. MRL details of project site and RL of nearby sources of water shall be indicated.
- 4). Recent land-use map based on satellite imagery. High-resolution satellite image data having 1m-5m spatial resolution like quickbird, Ikonos, IRS P-6 pan sharpened etc. for the 10 Km radius area from proposed site. The same shall be used for land used/land-cover mapping of the area.
- 5). Respirable Suspended particulate matter (RSPM) present in the ambient air must be analysed for source analysis - natural dust/RSPM generated from plant operations (trace elements). The RSPM shall also be analysed for presence of poly-aromatic hydrocarbons (PAH), i.e. Benzene soluble fraction, where applicable. Chemical characterization of RSPM and incorporating of RSPM data.
- 6). All stock piles will have to be on top of a stable liner to avoid leaching of materials to ground water.
- 7). Plan for the implementation of the recommendations made for the steel plants in the CREP guidelines.
- 8). Plan for slag utilization
- 9). Plan for utilization of energy in off gases (coke oven, blast furnace)
- 10). System of coke quenching adopted with justification.

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**STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR  
PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE**

**3(b):STANDARD TERMS OF REFERENCE FOR CONDUCTING  
ENVIRONMENT IMPACT ASSESSMENT STUDY FOR CEMENT  
PLANTS PROJECTS AND INFORMATION TO BE INCLUDED IN EIA/  
EMP REPORT**

**A. STANDARD TERMS OF REFERENCE (TOR)**

**1) Executive Summary**

**2) Introduction**

- i. Details of the EIA Consultant including NABET accreditation
- ii. Information about the project proponent
- iii. Importance and benefits of the project

**3) Project Description**

- i. Cost of project and time of completion.
- ii. Products with capacities for the proposed project.
- iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.
- iv. List of raw materials required and their source along with mode of transportation.
- v. Other chemicals and materials required with quantities and storage capacities
- vi. Details of Emission, effluents, hazardous waste generation and their management.
- vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)
- viii. Process description along with major equipments and machineries, process flow sheet (quantative) from raw material to products to be provided
- ix. Hazard identification and details of proposed safety systems.
- x. Expansion/modernization proposals:
  - a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing Iexisting operation of the project from SPCB shall be attached with the EIA-EMP report.
  - b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification

**STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/  
ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE**

2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

**4) Site Details**

- i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.
- ii. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)
- iii. Details w.r.t. option analysis for selection of site
- iv. Co-ordinates (lat-long) of all four corners of the site.
- v. Google map-Earth downloaded of the project site.
- vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.
- vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.
- viii. Landuse break-up of total land of the project site (identified and acquired), government/private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)
- ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area
- x. Geological features and Geo-hydrological status of the study area shall be included.
- xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)
- xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.
- xiii. R&R details in respect of land in line with state Government policy

**5) Forest and wildlife related issues (if applicable):**

- i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)
- ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

- iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.
- iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon.
- v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area
- vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife

### 6) Environmental Status

- i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.
- ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.
- iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.
- iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.
- v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.
- vi. Ground water monitoring at minimum at 8 locations shall be included.
- vii. Noise levels monitoring at 8 locations within the study area.
- viii. Soil Characteristic as per CPCB guidelines.
- ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.
- x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.
- xi. Socio-economic status of the study area.

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

### 7) Impact and Environment Management Plan

- i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.
- ii. Water Quality modelling - in case of discharge in water body
- iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.
- iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.
- v. Details of stack emission and action plan for control of emissions to meet standards.
- vi. Measures for fugitive emission control
- vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.
- viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.
- ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.
- x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.
- xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.
- xii. Action plan for post-project environmental monitoring shall be submitted.

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

- xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

### 8) Occupational health

- i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers
- ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.
- iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,
- iv. Annual report of health status of workers with special reference to Occupational Health and Safety.

### 9) Corporate Environment Policy

- i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.
- ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.
- iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.
- iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report

- 10) Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

### 11) Enterprise Social Commitment (ESC)

- i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

bound action plan shall be included. Socio-economic development activities need to be elaborated upon.

- 12) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.
- 13) A tabular chart with index for point wise compliance of above TOR.

### B. SPECIFIC TERMS OF REFERENCE FOR EIA STUDIES FOR CEMENT PLANTS

- 1. Limestone and coal linkage documents along with the status of environmental clearance of limestone and coal mines
- 2. Quantum of production of coal and limestone from coal & limestone mines and the projects they cater to;
- 3. For large Cement Units, a 3-D view i.e. DEM (Digital Elevation Model) for the area in 10 km radius from the proposal site.
- 4. Present land use shall be prepared based on satellite imagery. High-resolution satellite image data having 1m-5m spatial resolution like quickbird, Ikonos, IRS P-6 pan sharpened etc. for the 10 Km radius area from proposed site. The same shall be used for land used/land-cover mapping of the area.
- 5. If the raw materials used have trace elements, an environment management plan shall also be included.
- 6. Plan for the implementation of the recommendations made for the cement plants in the CREP guidelines must be prepared.
- 7. Energy consumption per ton of clinker and cement grinding
- 8. Provision of waste heat recovery boiler
- 9. Arrangement for use of hazardous waste

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## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

### 4(b):STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR COKE OVEN PLANTS PROJECTS AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

#### A. STANDARD TERMS OF REFERENCE

##### 1) Executive Summary

##### 2) Introduction

- i. Details of the EIA Consultant including NABET accreditation
- ii. Information about the project proponent
- iii. Importance and benefits of the project

##### 3) Project Description

- i. Cost of project and time of completion.
- ii. Products with capacities for the proposed project.
- iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.
- iv. List of raw materials required and their source along with mode of transportation.
- v. Other chemicals and materials required with quantities and storage capacities
- vi. Details of Emission, effluents, hazardous waste generation and their management.
- vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)
- viii. Process description along with major equipments and machineries, process flow sheet (quantative) from raw material to products to be provided
- ix. Hazard identification and details of proposed safety systems.
- x. Expansion/modernization proposals:
  - a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing Iexisting operation of the project from SPCB shall be attached with the EIA-EMP report.
  - b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

#### 4) Site Details

- i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.
- ii. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)
- iii. Details w.r.t. option analysis for selection of site
- iv. Co-ordinates (lat-long) of all four corners of the site.
- v. Google map-Earth downloaded of the project site.
- vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.
- vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.
- viii. Landuse break-up of total land of the project site (identified and acquired), government/private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)
- ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area
- x. Geological features and Geo-hydrological status of the study area shall be included.
- xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)
- xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.
- xiii. R&R details in respect of land in line with state Government policy

#### 5) Forest and wildlife related issues (if applicable):

- i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

- ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (*in case of projects involving forest land more than 40 ha*)
- iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.
- iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon
- v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area
- vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife.

### 6) Environmental Status

- i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.
- ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.
- iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQPM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.
- iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.
- v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.
- vi. Ground water monitoring at minimum at 8 locations shall be included.
- vii. Noise levels monitoring at 8 locations within the study area.
- viii. Soil Characteristic as per CPCB guidelines.
- ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.
- x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.
- xi. Socio-economic status of the study area.

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

### 7) Impact and Environment Management Plan

- i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.
- ii. Water Quality modelling - in case of discharge in water body
- iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.
- iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.
- v. Details of stack emission and action plan for control of emissions to meet standards.
- vi. Measures for fugitive emission control
- vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.
- viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.
- ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.
- x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.
- xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

- xii. Action plan for post-project environmental monitoring shall be submitted.
  - xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.
- 8) Occupational health**
- i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers
  - ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.
  - iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved.
  - iv. Annual report of health status of workers with special reference to Occupational Health and Safety.
- 9) Corporate Environment Policy**
- i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.
  - ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.
  - iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.
  - iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report
- 10)** Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

## STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

- 11)** Enterprise Social Commitment (ESC)
- i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.
- 12)** Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.
- 13)** 'A tabular chart with index for point wise compliance of above TOR.
- B. SPECIFIC TERMS OF REFERENCE FOR EIA STUDIES FOR COKE OVEN PLANTS**
- 1. Justification for selecting recovery/non-recovery (beehive) type batteries with the proposed unit size.
  - 2. Details of proposed layout clearly demarcating various facilities such as coal storages, coke making, by-product recovery area, etc within the plant.
  - 3. Details of coke oven plant (recovery/non-recovery type) including coal handling, coke oven battery operations, coke handling and preparation.

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F.No. J-110/10241/2009-IA II (II)  
Government of India  
Ministry of Environment and Forests  
(I.A. Division)

Paragyan Bhawan  
CBO Complex, Lodhi Road  
New Delhi - 110 003  
E-mail: mca.industry-reg@nic.in  
Telephone: 011-2338 2673  
Bt/Bk, August 2, 2010

To  
✓ Mrs. Rungta Mukherjee, in-charge  
Rungta House, Chongee-833 201  
Jharkhand

Sub: Integrated Steel Plant (1.9 MTPA), WHRB (100MW) and AFBC (200 MW) at Village Jharbanih Galspada and Tarakaboda District Dhanbad. Orissa by M/s Rungta Mineral Limited. - Environmental Clearance req.

This is in reference to your letter no. MOEF/BHE/10 dated 19 March 2010 along with copies of final EIA report and public hearing reports seeking environmental clearance under the provisions of E.A. Notification, 2006.

2. The Ministry of Environment and Forests has examined your application. It is noted that M/s Rungta Mineral Limited have proposed to set up an Integrated Steel Plant (1.9 MTPA) and 100MW WHRB and 200MW AFBC power plant at Village Jharbanih Galspada and Tarakaboda, District Dhanbad, Orissa. Out of total land required (667.39 acres) for the proposed project, 600.24 acres is already occupied. Land use at present is agricultural land (under private ownership) (540.705 acres) and government land (126.685 acres). The proposed informed final report will be displacement of 16 houses (55 families) which will be rehabilitated and resettled as per the R & R policy, Government of Orissa. Distances RF (6.5 km E), Garthgarha PH (30.0 km NW), Nandia RF (4.0 km NE), Hindol RF (5 km S), Vardina L (14.0 km RF S), Pasa RF (3.5 km SE), Daberk RF (14.5 km NW) and Gansol RF (14.0 km NE) are located within 10 km radius of the proposed site. Dhanbad River flows at a distance of 7.30 km from the proposed site. Application seeking permission for setting up of proposed plant was submitted to DFO Dhanbad. Total cost of the project will be Rs. 6,150 cr. Orissa (Rs. 2,063.58 Crores for Phase-I and Rs. 2,087.45 Crores for Phase II). Rs. 40.0 Crores and Rs. 6.00 Crores will be sanctioned towards non-capital cost and recurring cost/ annum for various environmental control measures.

3. Following facilities will be installed in the proposed plant:

| S.N. | Facility          | Production Capacity Phase-I      | Phase-II                         | Total Capacity (MTPA) |
|------|-------------------|----------------------------------|----------------------------------|-----------------------|
| 1    | Refining Plant    | 2.1 MTPA                         | 2.1 MTPA                         | 4.2                   |
| 2    | Polishing Plant   | 1.2 MTPA                         | 1.2 MTPA                         | 2.4                   |
| 3    | Sponge Iron Plant | 0.75 MTPA (5x500 TPD)            | 0.75 MTPA (5x500 TPD)            | 1.50                  |
| 4    | Sinter Plant      | 0.375 MTPA (1x2 m <sup>2</sup> ) | 0.375 MTPA (1x2 m <sup>2</sup> ) | 0.750                 |
| 5    | Blast Furnace     | 0.3 MTPA (1x350 m <sup>2</sup> ) | 0.3 MTPA (1x350 m <sup>2</sup> ) | 0.6                   |
| -    | Steel Melt Shop   | 0.15 MTPA                        | 0.15 MTPA                        | 0.30                  |

|    |                                                  |                           |                           |            |
|----|--------------------------------------------------|---------------------------|---------------------------|------------|
| 6  | Induction Furnace                                | 0.575 MTPA (3x23 T)       | 0.575 MTPA (3x23 T)       | 1.152      |
| 7  | Ladle Refining Furnace for LF                    | 0.575 MTPA (1x40 T)       | 0.575 MTPA (1x40 T)       | 1.152      |
| 8  | Flotrol Air Furnace                              | 0.448 MTPA (1x70 T)       | 0.448 MTPA (1x70 T)       | 0.896      |
| 9  | Ladle Refining Furnace for A/F                   | 0.448 MTPA (1x70 T)       | 0.448 MTPA (1x70 T)       | 0.896      |
| 10 | Slit-Caster, Blooms, Sub-caster                  | 0.95 MTPA (3x11 m radius) | 0.95 MTPA (3x11 m radius) | 1.90       |
| 11 | Power, Red and Shaft and mill                    | 0.95 MTPA                 | 0.95 MTPA                 | 1.90       |
| 12 | Coal Washery                                     | 2.1 MTPA                  | 2.1 MTPA                  | 4.2        |
| 13 | Captive Power Plant                              | 150 MW                    | 150 MW                    |            |
| 14 | WHRB                                             | 50 MW (5x40 TPH)          | 50 MW (5x40 TPH)          | 100 MW     |
| 15 | AFBC                                             | 100 MW (1x370 TPH)        | 100 MW (1x370 TPH)        | 200 MW     |
| 16 | Core Oven Plant Dry Quenching, Hot-Waterway type | 0.176 MTPA                | 0.176 MTPA                | 0.350 MTPA |

4. Following will be the products from the proposed plant:

| Product                | Phase-I Captive use (TPA) | Outside sale (TPA) | Phase-II Captive use (TPA) | Outside sale (TPA) |
|------------------------|---------------------------|--------------------|----------------------------|--------------------|
| Refined Iron Pellets   | 12,60,000                 | Nil                | 12,60,000                  | Nil                |
| Sponge Iron            | 7,50,000                  | Nil                | 7,50,000                   | Nil                |
| Sinter                 | 3,25,000                  | Nil                | 3,25,000                   | Nil                |
| Pig Iron               | 57,000                    | 8,085              | 57,000                     | 8,085              |
| Billets, blooms, slabs | 5,64,855                  | Nil                | 5,64,855                   | Nil                |
| Roller products        | Nil                       | 3,28,210           | Nil                        | 3,28,210           |
| Clean coal             | 10,50,000                 | Nil                | 10,50,000                  | Nil                |
| Middlings              | 8,40,000                  | Nil                | 8,40,000                   | Nil                |

5. It is noted that hot gases from DRI kiln will be successively passed through Dual Settling Chamber (DSC), after Burning Chamber (ABC) WHRB are cleaned in a CSP before discharging through a chimney of adequate height. Hot gases from blast furnace will be passed through a Gas Cleaning Plant (GCP) comprising of dust catcher and wet scrubber. Part of the clean gas will be utilized for blast furnace stove and the balance will be used in boiler. Dust extraction system comprising of suction hood, cyclone, wet scrubber etc. will be provided to Induction Furnace. A fume extraction and cleaning system consisting of bag filters, ID fan and chimney will be provided to Ladle Refining Furnace. Dust and fume extraction system with bag filters will be provided to Slab caster. Bag filters and dust collectors will be provided to Iron ore preparation, grinding, mixing and blending section of Pelletization Plant. Flue gas and dust extraction system consisting of multi-cyclone, ESP, will be Caste-Kiln-Cooler system of pellet plant. Bag filters will be provided to coke and flux grinding system of Pellet Plant. Dust taken out from Sinter Plant will be sucked through a hood and cleaned in an ESP before discharging through a stack. ESP will be provided to FBO boiler of CSP. Dust suppression will be carried out by water sprinkling on the raw material stock pile. Dust extraction with bag filters will be provided at material transfer points.

6. Fresh water requirement for the plants and the colony will be 1,475 m<sup>3</sup>/hr for Phase I and 1,475 m<sup>3</sup>/hr for Phase II. Therefore, the total water requirement of 2,950 m<sup>3</sup>/hr will be



not from the River Ganges. Through make well. Application seeking permission for drawing the water required has been submitted to the State Government which is in the advanced stages of processing. Cooling water flow down will be used for dust suppression. Waste effluents from LHM Plant will be neutralized in a neutralization pond. Effluent discharge will be pre-treated. Industrial effluent from the plant will be treated in STP and the domestic effluent will be separately treated in the STP. The treated water will be reused for plantation, ash quenching, dust suppression etc. Oil and grease will be removed by means of oil traps and skimming devices. Effluent from beneficiation plant will be treated in a thickener. Thickener underflow will be pumped to a settling tank in the downstream part site and the overflow will be recycled to process. Cool waterway effluent will be treated in a thickener. The thickener effluent will be dewatered in a belt press while the clear water will be recycled back in the process itself.

7. Regarding solid/hazardous waste management, granulated UF slag will be sold to cement plants. Other waste materials which cannot be reused will be dumped in an area of 10552 sq.m. Landfill drain will be constructed around the solid waste yard which will be made impermeable with lining and leachate collection system. Mudflats from coal washery, clay from CRI as well as RSM coal will be used as fuel in AFRC boiler. SMS slag will be used for land filling. Fly ash will be disposed off to brick manufacturing plants/cement plants. Sludge from GCH, fine dust from coke furnace will be disposed in a dump yard. Sinter dust must will be recycled back to sinter plant. Underburnt oil will be sold to the CIOCB authorized representatives / recyclers. Green belt will be maintained in 33% of total plant area. Noise control measures include provision of silencers, vibration isolators in noise generating equipments. Ear muffs/ear plugs will be provided to workers working in noise prone areas. Total power requirement of 300 MW (150 MW in each phase) will be met from captive power plant and in case of shortage from GCH. Fuel oil (250 KLPA for each phase) will be used for start-up/stabilization of boiler, CR plant and SMS.

8. All the proposed steel plants are listed in S.No. 31(a) under Primary Metallurgical Industries under category 'A' and are listed at the Central level.

9. The proposal was considered by the Expert Appraisal Committee (Industry) in its meeting held during 24-26<sup>th</sup> June, 2010 (1437-4585). The Committee recommended the proposal for further study / clearance subject to stipulation of specific conditions along with other environmental conditions. Public hearing/Public consultation meeting was conducted by the District Pollution Control Board on 12<sup>th</sup> March, 2010.

10. Based on the information furnished by you, presentation made by you and your Consultant, Mr. Mee Consultants, Pvt. Ltd., Delhi, the Ministry of Environment and Forests hereby issues an environmental clearance to the above project under the provisions of E.A. Notification dated 14<sup>th</sup> March 2000 subject to strict compliance of the following Specific and General conditions.

#### A. SPECIFIC CONDITIONS :

Efforts shall be made to reduce RSPM levels in the ambient air. Online ambient air quality monitoring and continuous stack monitoring facilities for all the stacks shall be provided and sufficient air pollution control devices viz. Electrostatic precipitator (ESP), gas cleaning plant, cyclone multi-stage wet scrubber, bag filters etc. shall be provided to keep the emission levels below 50 mg/Nm<sup>3</sup> by installing energy efficient technology.

- ii. As proposed, Electrostatic precipitator (ESP) shall be provided to sinter plant, WARE, CRUC, CRH plants, bag house to blast furnace and ESP & bag filters to agitated rotary type of coke oven to control RSPM levels within 50 mg/Nm<sup>3</sup>. Fine extraction system with bag filters shall be provided to electric arc furnace and sinter furnace.

All the standards prescribed for the coke oven plants shall be followed as per the latest guidelines. Proper and full utilization of coke oven gases in power plant using heat

recovery steam generation shall be ensured and no fugitive gases should be discharged into the air.

- iv. Naphthalene scrubbing unit shall be provided to remove residual naphthalene from coke oven gas. Ammonia released in de-sulfurization section of coke oven plant shall be suitably cracked to Nitrogen and Hydrogen. BF top gas shall be cleaned in dust collector and gas cleaning plant (GCCP) comprising of bag filters and used in furnace of JF. FAF sinter plant, lime & coke plant. Bag filters with adequate stack height shall be provided to lime and coke plant. Proper and full utilization of coke oven gases in power plant using heat recovery steam generation should be ensured and no fugitive gases should be discharged into the air.
- v. The National Ambient Air Quality Standards issued by the Ministry of S.R. No. 528(E) dated 10<sup>th</sup> November 2009 should be followed.
- vi. Gaseous emission levels including secondary fugitive emissions from all the sources shall be controlled within the local permissible limits issued by the Ministry and regularly monitored. Guidelines/Code of Practice issued by the CPCB should be followed. New standards for the sponge iron plant issued by the Ministry vide G.S.R. 414(E) dated 20<sup>th</sup> May 2009 should be followed.
- vii. The After Burning Chamber in the CRH units, sinter plant, Blast Furnace and coke ovens for burning of CO shall be provided. Hot gases from CRH units shall be passed through Dust Settling Chamber (DSC) to remove coarse solids and After Burning Chamber (ABC) to burn CO completely and used in waste heat recovery boiler (WHRB). Hot gases then shall be cleaned in ESP before leaving out into the atmosphere through 30m stack.
- viii. Vapour pollution due to transportation of raw material and finished products shall be controlled. Proper arrangements should also be made to control dust emissions during loading and unloading of the raw material and finished product.
- ix. For environmental monitoring of stack emissions, online stack monitoring system shall be installed.
- x. Total water requirement from River B. Gharti shall not exceed 2450 m<sup>3</sup>/hr. Efforts should further be made to use maximum water from the rain water harvesting sources. As proposed, dry quenching system shall be provided to coke oven plant. Air cooled condensers and closed circuit cooling system shall be provided to reduce water consumption and water requirement shall be modified accordingly. All the effluent should be treated and used for ash handling, dust suppression and green belt development. No effluent shall be discharged and zero discharge should be adopted. Sanitary sewage should be treated in septic tank followed by soak pit.
- xi. Effluent treatment plant (ETP) shall be provided for the treatment of Phenolic effluent from coke oven plant and the treated water shall be used for washing of coke stockpile. Clarifier/sediment pond and filter press shall be provided in new water treatment plant. WAF plant water shall be neutralized in neutralization pond and the treated water shall be used for ash handling. Process wastewater shall be recycled / reused in the plant. Cooling tower blow down shall be recycled in the plant for dust suppression and slag granulation, bag coating machine etc. Provision of separate stream for the process and storm water shall be kept.
- xii. Efforts shall be made to make use of rain water harvested. If needed, capacity of the reservoir shall be increased to meet the maximum water requirement. Only balance water requirement would be met from other sources.
- xiii. Measures shall be taken to prevent impact or compensate environment / fugitive emissions, if any from the proposed plant, on the surrounding reserve forests viz. Harbandh RI (30.5 km E), Ganthiparha RF (5.0 km NW), Nankar RI (3.0 km NW), H. col RF (8.5 km S).



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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p>Nandna RF (14.0 km SE), Patana RF (5.0 km SE), Barsani RF (14.0 km NE) and Karkali RF (14.5 km NE) located within 15 km radius of the project site. A monitoring station to monitor the S&amp;Q at the nearest RF viz. Bhalkhand RF shall be installed. Further, Conservation Plan for the conservation of wild fauna in consultation with the State Forest Department should be prepared and implemented.</p>                                                                                                 | <p>XXIV. As proposed, green belt shall be developed in 33 % of the plant area as per the C-CU guidelines in consultation with DFO.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p>XXV. All the recommendations made in the Charter on Corporate Responsibility for Environmental Protection (CREP) to the Steel Plants should be implemented.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <p>XIV. Regular monitoring of influent and effluent surface, sub-surface and ground water shall be ensured and treated wastewater shall meet the norms prescribed by the State Pollution Control Board or described under the ETP/ AOT whichever are more stringent. Two years study for the effluent generation and analysis should also be regularly carried out and report submitted to the Ministry's Regional Office at Bhubaneswar, OSPCB and CPCB. The Company shall monitor the fluoride level in the ground water and also submitted to the Ministry's Regional Office at Bhubaneswar, OSPCB and CPCB.</p>                                                                                                                                          | <p>XV. All the wastewater from the coke oven plant containing cyanide, phenol and COD etc. shall be properly treated in the LDU plant. Continuous monitoring of Total Organic Compounds (TOC) should be done at the outlet of ETP/ LDU plant and recovery of all products like tar, ammonia, naphthalene etc. should be ensured.</p>                                                                                                                                                                              | <p>XXVI. At least 5 % of the total cost of the project should be earmarked towards the corporate social responsibility and bar-wise details along with time bound action plan should be prepared and submitted to the Ministry's Regional Office at Bhubaneswar. Implementation of such program should be ensured accordingly in a time bound manner.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p>XVI. The water consumption shall not exceed 18 m<sup>3</sup>/ton of Steel as per prescribed standards.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <p>XVII. Iron and fines, process dust, and mill scales shall be recycled in a later plant to produce sinter. Sludge and slag from acidification furnace (FAF) shall also be recycled in the water plant.</p>                                                                                                                                                                                                                                                                                                      | <p>XXVIII. Rehabilitation and Resettlement Plan for the project affected population including tribals shall be implemented as per the policy of the State Govt. in consultation with the State Govt. of Orissa. Compensation paid in any case should not be less than the norms prescribed under the National Resettlement and Rehabilitation Policy, 2007.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p>XVIII. All the solid waste other than TDR plant and washing rejects shall be utilized in A-DU order of power plant and no dust should be used for bonquette raising or disposed off Anywhere else. AFBC boiler should be installed in immediately along with the TDR plant to ensure full utilization of coal from the beginning. Scrap metal be used in steel making shop (SMS). FAF &amp; SMS slag and kiln waste must be properly utilized. All the other solid waste including broken refractory material be properly disposed off in environment friendly manner. Tar sludge from coke oven decanter, waste oil and oil sludge should be properly disposed as per Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008.</p> | <p>XX. All the slag shall be used for land filling inside the plant or used as building material after passing through Toxic Chemical Leachability Potential (TCLP) test. Toxic slag should be disposed in secured landfill as per CPCB guidelines. Other toxic hazardous substances should be recovered from the slag and output waste and be disposed in secured landfill as per CPCB guidelines.</p>                                                                                                           | <p>XXIX. The company shall provide housing for construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, canteen etc. The housing may be in the form of temporary structures to be removed after the completion of the project.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p>XX. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 1986 and subsequent amendment in 2002. All the fly ash generated shall be fully utilized in manufacturing of Pozzolona Portland Cement (PPC) and BF slag in shall be ensured.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>XXI. The Company shall ensure that coal which is being supplied by the supplier does not contain trace metals and certificate in this regard shall be obtained and submitted to the Ministry. Proper handling, storage, utilization and disposal of all the solid waste should be ensured and regular report regarding toxic metal content in the waste material and its composition and use of solid hazardous waste shall be submitted to the Ministry's Regional Office at Bhubaneswar, OSPCB and CPCB.</p> | <p>B. GENERAL CONDITIONS:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p>XXII. A time bound action plan shall be submitted to reduce solid waste, its proper utilization and disposal.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>XXIII. Risk and Disaster Management Plan along with the mitigation measures should be prepared and a copy submitted to the Ministry's Regional Office at Bhubaneswar, OSPCB and CPCB within 3 months of issue of environment clearance letter.</p>                                                                                                                                                                                                                                                             | <p>i. The project authorities must strictly adhere to the stipulations made by the Orissa State Pollution Control Board and the State Government.</p> <p>ii. No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment and Forests.</p> <p>iii. The gaseous emissions from various process units shall conform to the load-based standards notified by the Ministry on 15<sup>th</sup> May, 1993 and standards prescribed from time to time. The State Board may specify more stringent standards for the relevant parameters keeping in view the nature of the industry and its area and operation.</p> <p>iv. At least four ambient air quality monitoring stations shall be established in the downward direction as well as where maximum ground level concentration of PM10, SO<sub>2</sub> and NO<sub>2</sub> are anticipated in consultation with the SPCB. Data on ambient air quality and stack emission shall be regularly submitted to this Ministry including its Regional Office at Bhubaneswar and the SPCB/CPCB once in six months.</p> <p>v. Industrial wastewater shall be properly collected, treated so as to conform to the standards prescribed under GSR 422 (C) dated 18<sup>th</sup> May 1996 and 31<sup>st</sup> December 1993 or as amended from time to time. The treated wastewater shall be utilized for plantation purpose.</p> <p>vi. The overall noise levels in and around the plant area shall be kept well within the standards (85 dBA) by providing noise control measures including Acoustic Hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels should conform to the standards prescribed under EPA Rules, 1980 viz. 75 dBA (daytime) and 70 dBA (nighttime).</p> |

- vi Occupational health surveillance of the workers should be done on a regular basis and records maintained as per the Factories Act.
- vii. The company shall develop surface water harvesting structures to harvest the rain water for utilization in the lean season besides recharging the ground water table.
- viii. The project proponent shall also comply with all the environmental protection measures and safeguards recommended in the EIA/EMP report. Further, the company must undertake socio-economic development activities in the surrounding villages like community development programmes, educational programmes, drinking water supply and health care etc.
- ix. As proposed, Rs 40 Crores and Rs. 5 Crores shall be earmarked towards capital cost and recurring cost/annum for environment pollution control measures to implement the conditions stipulated by the Ministry of Environment and Forests as well as the State Government. An implementation schedule for implementation of the conditions stipulated herein shall be submitted to the Regional Office of the Ministry at Bhubaneswar. The funds so provided shall not be diverted for any other purpose.
- x. A copy of clearance letter shall be sent by the proponent to concerned Panchayat, Zila Parishad/Municipal Corporation/Urban Local Body and the local NGOs if any, from whom suggestions/representations, if any, were received while processing the proposal. The clearance letter shall also be put on the web site of the company by the proponent.
- xi. The project proponent shall upload the status of compliance of the stipulated environmental clearance conditions including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of the MOEF at Bhubaneswar, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely: PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>x</sub> (ambient) as well as stack emissions or critical ecological parameters indicated for the project shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.
- xii. The project proponent shall also submit six monthly reports on the status of the compliance of the stipulated environmental conditions including results of monitored data both in hard copies as well as by email to the Regional Office or MOEF, the respective Zonal Office of CPCB and the SPCB. The Regional Office or the Ministry at Bhubaneswar/ CPCB / SPCB shall monitor the stipulated conditions.
- xiii. The environmental statement for each financial year ending 31<sup>st</sup> March in Form IV as mandated to be submitted by the project proponent to the concerned State Pollution Control Board as provided under the Environment Protection Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental conditions and shall also be sent to the respective Regional Office of the MOEF at Bhubaneswar by e-mail.
- xiv. The Project Proponent shall inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the SPCB and may also be seen at Website of the Ministry of Environment and Forests at <http://mhfr.nic.in>. This shall be advertised within seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which and shall be in the vernacular language of the locality concerned and a copy of the same should be forwarded to the Regional Office at Bhubaneswar.

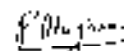
- xv. Project authorities shall inform the Regional Office as well as the Ministry the date of financial closure and final shutdown of the project by the concerned authorities and the date of commencing the back-due payment work.

10. The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.

11. The Ministry reserves the right to stipulate additional conditions if found necessary. The Company at the bound manner shall implement these conditions.

12. Any appeal against this environmental clearance shall lie with the National Environment Appellate Authority if preferred within a period of 30 days as prescribed under Section 11 of the National Environment Appellate Act, 1997.

13. The above conditions shall be enforced in-situ under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous Wastes (Management, Handling and Transboundary) Rules, 2000 and the Public (Insurance) Liability Act, 1991 along with the amendments and rules.

  
(Dr. P.L. Ahuja)  
Secretary - F

Copy to:-

1. The Secretary, State Department of Environment, Govt. of Orissa, Bhubaneswar, Orissa
2. Chairman, Central Pollution Control Board, Harvesh Bhawan, CDD cum Office Complex, Laxmi Nagar, New Delhi-110 032.
3. Chairman, Orissa Zonal Pollution Control Board, Harvesh Bhawan, A-110, Nalbari Bazar, Unit-8, Bhubaneswar - 751 012 Orissa
4. The Chief Conservator of Forests (Eastern), Regional Office (F2) A3, Chandrasekharpur, Bhubaneswar- 751 025 Orissa
5. Monitoring Cell, Ministry of Environment and Forests, Harvash Bhawan, CDD Complex, New Delhi
6. Govt. File
7. Return File

  
(Dr. P.L. Ahuja)  
Secretary - F

F. No. J-11011/241/2009-IA II (II)  
 Government of India  
 Ministry of Environment and Forests  
 (I.A. Division)

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 E-mail: m.e.industry-mef@nic.in  
 Telefax: 011 - 2436 3873  
 Dated: 25<sup>th</sup> January, 2010

2

To:   
 M/s Rungta Mines Limited  
 Rungta House, Chaibasa - 835 221  
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Ph: 06582 - 256861 Fax: 06582 - 256442  
 E-mail: [rungtas@satyanet.in](mailto:rungtas@satyanet.in)

Sub: Integrated Steel Plant at Village Jharbandh Galpade and Farukabandh District Dhanbad in Orissa by M/s Rungta Mines Limited- regarding Amendment in Environmental Clearance

Sr. This is in continuation of this Ministry's letter of even no. dated 28/4/2010 and your communication no. RVT/402BHJ-Jarbandh/12/1-238 dated 25<sup>th</sup> September, 2009 requesting the Ministry to amend the environmental clearance accorded vide this Ministry's even no. dated 2/08/2009.

2. The proposal has been examined. It is noted that for production of quality steel with lower gas content, vacuum degassing unit is a technological necessity in phase-I and phase-II for production of steel grades such as electrode quality, cold heading quality, spring steel, bearing steel and free cutting steel. To improve the lining life of the Electric Arc Furnace (EAF) and for desulphurization and dephosphorisation, dolomite and limestone is added as a flux in electric arc furnace. Similarly oxygen is required to decarburize the steel in electric arc furnace.

3. It is proposed to install following additional units to produce good quality steel through EAF route with following capacities:

| S. No. | Particulars           | Total Capacity |
|--------|-----------------------|----------------|
| 1      | Time slant            | 1x300 TFD      |
| 2      | Cold Plant            | 1x300 TFD      |
| 3      | Clayton Plant         | 1x200 TFD      |
| 4      | Vacuum Degassing Unit | 1x70 TFD       |

4. The proposal was placed before the Expert Appraisal Committee in its 17<sup>th</sup> meeting held on 12<sup>th</sup> - 14<sup>th</sup> December, 2009. The Committee noted that there is no increase in the pollution load and the proposed additional unit would reduce sulphur and phosphorus in the product.

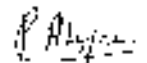
5. The Committee recommends for amendment in Environmental Clearance dated 02.08.2010 with the following additions: Specific Condition

- The existing pollution load shall not increase and the individual components should be environmentally compliant.

6. The Ministry accepts the recommendations of the Expert Appraisal Committee. The environmental clearance accorded on 2/08/2010 may be amended subject to the following additional conditions:

- i. The above units shall be installed within the existing plant area.
- ii. There shall be no increase in the water and power requirement.
- iii. The company shall comply all the conditions stipulated in the Ministry's letter of even no. dated 2/08/2010.
- iv. There shall be no increase in the pollution load due to installation of lime, dolomite and oxygen plant and vacuum degassing unit.
- v. In case of change of scope of the project, the company shall obtain fresh environmental clearance.
- vi. This issued with the approval of the Competent Authority.

Yours faithfully

  
 (Dr. P. L. Ahuja)  
 Scientist 'B'

Copy to:-

1. The Secretary, State Department of Environment, Government of Orissa, Bhubaneswar, Orissa.
2. The Chairman, Central Pollution Control Board, Parvash Bhawan, CPO Complex, East Anand Nagar, New Delhi - 110 052.
3. The Chairman, Orissa Pollution Control Board, Parvash Bhawan, A-118, Neelkant Mahanagar, Unit-8, Bhubaneswar - 751 012, Orissa.
4. The Chief Conservator of Forests (Eastern), Regional Office (F-2), A-6, Chandrasekharpur, Bhubaneswar - 751 023, Orissa.
5. Monitoring Cell, Ministry of Environment and Forests, Parvash Bhawan, CPO Complex, New Delhi.
3. Guard File.
7. Record File.

  
(Dr. P.L. Ahujara)  
Scientist -I

P. No. J-11011/2402009-IA II (I)  
Government of India  
Ministry of Environment, Forest and Climate Change  
(C.A. Division)

Jindal Polygraph House  
Jai Singh Road, Aligarh,  
New Delhi - 110003  
E-mail: jindalpolygraph@rediffmail.com  
Tel: 011-24695316

Dated: 27<sup>th</sup> August, 2015

To :  
M/s Rungta Mines Ltd.,  
Jharkhand, P.O. Khatuhal,  
Via-Murumunda, Dhanbad,  
Jharkhand-726021

Email: N/A; Fax: No. 91 6562 22576

Subject: Integrated Seta Plant (L9 MTTA) WJRR (100MW) and ALPC (200MW) at  
Village Jharkhand, Gajapati and Taroke Road, District Dibrugarh, Assam  
by M/s Rungta Mines Ltd. - Extension of validity of EC regarding

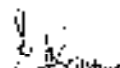
Sir,

This is with reference to your letter No. NRM/ECSP/14-15/886 dated 10.02.2015 regarding Extension of validity of the Environmental Clearance for the project mentioned above.

2. It has been noted that the project was accorded Environmental Clearance by the Ministry of Environment, Government of India on 08.02.10. The above proposal was considered by the Regional/Expert Appraisal Committee (Induragi) in its 37<sup>th</sup> EAC meeting held during 30<sup>th</sup> April-01 May, 2015.

3. It may be observed that an amendment in the EIA Notification, 2006 was issued by the Ministry vide Notification No. S.O. 1141(I) dated 08<sup>th</sup> April, 2015, extending the period of validity of Environmental Clearance from 5 years to 7 years. Therefore the EC issued in the Project vide letter of even No. C2.06/2010 is still valid upto 01.08.2017. In case of seeking for Extension of Environment Clearance beyond 01.08.2017, an application as per the provisions of EIA Notification, 2006 as amended may be submitted along with online to the Ministry.

Therefore with the approval of the competent Authority,

  
(Dr. Satish C. Garkatti)  
Scientist 'F'

Copy to:

1. The Secretary, Department of Environment, Govt. of India.
2. The Chairman, Central Pollution Control Board, Panchsheel Bhawan, 110029-Office Complex, Connaught Place, New Delhi, 110022.

3. The Additional Principal Chief, Conservator of Forests (C) Ministry of Forest And Forest Regional Office (FRO), A-2, Chaudhary Charan Singh, Bhubaneswar-751022, Orissa.
4. The Chairman, Orissa Pollution Control Board, "Parvati Bhawan", A-218, Nalanda Nagar, Unit-VIII, Bhubaneswar-751012.
5. Guard File/Record File/Monitoring File.

(Dr. Satish C. Garkatti)  
Scientist 'F'

S. No. 4-11011-2413009-IA.11(f)  
Government of India  
Ministry of Environment, Forest and Climate Change  
(Impact Assessment Division)

India Paymaster Division  
Bar Bhai Road, Aizawl,  
New Delhi - 110015  
E-mail: shreekrishna@moef.gov.in  
Tel: 011-24-693319

Date: 21 Jan 2017

To  
MS Rungta Mines Limited,  
Rungta House, Chhindwa - 431 201  
Jharkhand

Subj: Integrated steel plant (1.9 MTPA), WHRR (100 MW) and AFDC (200 MW) at village Jharbandh, Gulpada and Tarakheda, District Dhenkanal, Odisha by MS Rungta Mines Limited. Extension of validity of environmental clearance regarding.

Sir,

This was reference to your online application No. 15AOR/IND/2009/1020 dated 22.01.2017 and copy to Addl. Secy, Jharkhand dated 28. June 2017 for extension of validity of environmental clearance granted vide J-110111-2413009 dated 11. June 2016 dated 03.06.2016 for Integrated Steel Plant (1.9 MTPA), WHRR (100 MW) and AFDC (200 MW) at village Jharbandh, Gulpada and Tarakheda, District Dhenkanal, Odisha of MS Rungta Mines Limited and submitted on 25.01.2016. The Project Environment Impact Assessment of Village Jharbandh, Gulpada and Tarakheda, District Dhenkanal, Odisha was considered in the 37<sup>th</sup> EAC (Ind-Reg) meeting held during 29<sup>th</sup> April - 1<sup>st</sup> May, 2016 and informed that the EC will be valid for 3 years from the date of issue as per the provision of MO 1141 dated 27<sup>th</sup> Apr. 2016.

2.6. Consent to Discharge was granted by State Pollution Control Board, Odisha on 05.01.2017 and submitted on 22.01.2017, the validity of which has been extended till 05.01.2021 vide letter No. 159537/1-17/NO/55224 dated 29.08.2016.

3.0. Inform that the reasons such as the entire "over-sold" market cancellation of coal contracts and the supply of coal to this project by the Ministry of Coal, Govt. of India in 2016, uncertainty about the availability of coal, delayed coal supply from private mines, issues raised by the bankers due to non-availability of coal, coal shortage, rehabilitation of villages did not start on time as villages did not move from the "red" and green was completed in December 2016. Land acquisition through HHO for approach road is pending for approval. Government of India is in acquisition for 10% of the total land of the project area for project. All the work completed in April 2017 etc.

3.0. The progress of the various activities of the project informed after the include 510.25 acres of private land and 29,449 acres of Government land has been acquired approximately 90% of total project area, balance is Government land. Award is pending with Tahsildar cum I.A.S. Hindal and Tahsildar Gulpada, MDCB has been granted as per plan, to prepare plan layout. The layout has been completed, detailed engineering is being carried out by ITC. Repair to over a 1000 damaged or displaced homes as per HHO & policy, Govt. of Odisha through HHO & District Administration. Estimated cost Rs. 142 lakhs.

employment from the affected families. The training is being in Indian Institute of Open University. The skills and experience in addition to the candidates have successfully passed in all Odisha Trade Test (OAT) and other all candidates have also been sponsored for the course for 2014-15 & 2015-16. The management is also establishing its own ITC in the locality for providing training to local development and employability, and Rs. 30.75 lakhs have been included in the project.

3.0. The project was considered in the 37<sup>th</sup> EAC meeting held during 29<sup>th</sup> April - 1<sup>st</sup> May 2016 and the committee decided to allow the completion of the schedule of completion of the project. Accordingly, PP has submitted the implementation schedule for completion of the construction activity, component wise (plan layout vide 22<sup>nd</sup> April, No. 15AOR/IND/2009/1020 dated 22<sup>nd</sup> March 2016). It is noted that the project will be completed by July 2016. However, the same has been approved by the committee for the completion of the project by 30<sup>th</sup> March 2016.

3.0. After taking into consideration of the above factors, the Committee has decided to extend the validity of environmental clearance to a further period of three years.

3.0. The Ministry of Environment, Forest and Climate Change has considered the application based on the recommendations of the Expert Appraisal Committee that strictly and fully complied with the extension of validity of Environmental Clearance for further period of three years up to 30<sup>th</sup> March 2021 vide following letter forwarded to you.

(i) PP shall provide a time schedule for completion of all the activities related to the project within extended time limit.

3.0. As per conditions stipulated in the environmental clearance granted vide J-110111-2413009-IA.11 dated 11.06.2016 shall remain the same.

3.0. The project shall remain in compliance with all the conditions of any change in the scope of the project.

This is done with the approval of the Competent Authority.

(Shriyath Kumar Pallerla)  
Scientist (P) / Director

Copy to:

1. Secretary, Department of Environment, Government of Odisha, Santalana, Bhubaneswar.
2. The Chairman, Central Pollution Control Board, Panchsheel Bhawan, CR-2, P.O. Office Complex, East A, Janpuri, Delhi - 110002.
3. The Additional Principal Officer, Department of Forests (G), Ministry of Environment, Forest and Climate Change, Regional Office (G), A.S. Chandrasekharan, Bhubaneswar - 751024.
4. The Chairman, Odisha State Pollution Control Board, Dr. J. Jayesh Dhwani, A-118, Sakinaka Bazar, Unit VII, Bhubaneswar - 751016.
5. The District Collector, Dhenkanal District, State of Odisha.
6. Chief Technical Officer Monitoring, File.
7. MoEF&CC Website.

(Shriyath Kumar Pallerla)  
Scientist (P) / Director

P. No. J-11011/241/2009-LA-II(D)  
Government of India  
Ministry of Environment, Forest and Climate Change  
(Impact Assessment Division)

India Paryavaran Bhawan  
Jio Bagh Road, Adjacent,  
New Delhi-110003  
E-mail: eia@moef.gov.in  
Tel: 011-24695319

Dated: 20<sup>th</sup> September, 2018

To,

M/s Rungta Mines Limited,  
Shingra House, Chudawa - 533 301  
Jharkhand

Subject: Integrated steel plant (1.9 MTPA), WHRB (100 MW) and AFBC (200 MW) at village Jharbanda, Gelpada and Tarakbeda, District Bhanu, Odisha by M/s Rungta Mines Limited - Extension of validity of environmental clearance and amendment in Environmental clearance for change in configurations.

Sir,

Thus has reference to online application vide proposal no. IA/OR/MD/20091/2010 dated 19<sup>th</sup> July 2018 seeking amendment and extension of validity of the environmental clearance granted for the integrated steel plant (1.9 MTPA), WHRB (100 MW) and AFBC (200 MW) at village Jharbanda Gelpada and Tarakbeda, District Bhanu, Odisha.

2.0 Environmental clearance for the integrated steel plant (1.9 MTPA), WHRB (100 MW) and AFBC (200 MW) at village Jharbanda Gelpada and Tarakbeda, District Bhanu, Odisha was granted vide P. No. J-11011/241/2009-LA-II(D) dated 2<sup>nd</sup> August, 2010 and subsequently amended for installation of 1X300 TPD Lime Plant; 1X300 TPD Dolomite Plant; 1X200 TPD Oxygen Plant; and 1X70 TPD Vacuum Degassing Plant was granted vide P. No. J-11011/241/2009-LA-II(D) dated 25<sup>th</sup> January 2011. Extension of validity of the environmental clearance was obtained under clause (9) of EIA Notification, 2006 up to 31<sup>st</sup> March 2020 vide letter number dated 04 July, 2017. The details of the facilities for which EC was granted are given below:

| Production Facility | Phase I (MTPA)                      | Phase II (MTPA)                     | Total (MTPA) |
|---------------------|-------------------------------------|-------------------------------------|--------------|
| Reduction plant     | 2.1                                 | 2.1                                 | 4.2          |
| Refining Plant      | 1.9                                 | 1.9                                 | 3.8          |
| Sponge Iron Plant   | 0.75                                | 0.75                                | 1.50         |
| Water plant         | 1X550 TPD<br>(1x12 m <sup>3</sup> ) | 1X500 TPD<br>(1x12 m <sup>3</sup> ) | 1.050        |

|                               |                                 |                                 |        |
|-------------------------------|---------------------------------|---------------------------------|--------|
| Plant Capacity                | 0.30<br>(1x350 m <sup>3</sup> ) | 0.30<br>(1x350 m <sup>3</sup> ) | 0.60   |
| Steel Making Shop             | 0.30                            | 0.30                            | 0.60   |
| Reduction Furnace (RF)        | 1X20 T<br>(1x20 T)              | 1X20 T<br>(1x20 T)              | 1.152  |
| Slab Refining Furnace for IF  | 1X20 T<br>(1x20 T)              | 1X20 T<br>(1x20 T)              | 1.152  |
| Electric Arc Furnace (EAF)    | 0.448<br>(1x70 T)               | 0.448<br>(1x70 T)               | 0.896  |
| Slab Refining Furnace for EAF | 0.448<br>(1x70 T)               | 0.448<br>(1x70 T)               | 0.896  |
| Billet caster, Bloom & Slab   | 0.95<br>(1x11 m radius)         | 0.95<br>(1x11 m radius)         | 1.9    |
| Hot and Structural mill       | 0.95                            | 0.95                            | 1.9    |
| Coal washer                   | 2.1                             | 2.1                             | 4.2    |
| Captive Power plant           | 50 MW<br>(1x45 TPD)             | 50 MW<br>(1x45 TPD)             | 100 MW |
| AFBC                          | 100 MW<br>(1x375 TPD)           | 100 MW<br>(1x375 TPD)           | 200 MW |
| Coal Oven Plant               | 0.175                           | 0.175                           | 0.350  |

3.0 The project could have been initiated in 2017. However, the delay occurred due to various reasons such as weak market scenario of steel for the past few years, de-allocation of coal block, delay in land acquisition and Raw taxes and levies, problems at green field project at the new location and also due to investment cost escalations in the intervening period since grant of EC in 2010 and still partly unstable market for steel. The company has begun construction with lesser number of DRI kilns i.e., one out of five DRI kilns envisaged for phase-I at the time of EC. Presently the following facilities are under implementation:

| S.L | Facilities                                    | Configuration | Production |
|-----|-----------------------------------------------|---------------|------------|
| 1   | Sponge Iron Plant                             | 1X300 TPD     | 0.15 MTPA  |
| 2   | Slab Making Shop comprising RF along with CCS | 2X 20 T       | 0.136 MTPA |
| 3   | Captive power plant WHRB                      | 1x45 TPD      | 50 MW      |

4.0 At the time of EC dt. 02.08.2010, an AFBC of 100 MW (1X375 TPD) was proposed based on dolomite & coal fines from DRI kiln and mudflings from washery. With one DRI kiln now proposed initially, the boiler will also have to be downsized. Due to re-allocation of coal block, no washery will be established in near future and consequently no mudflings will be available for boiler. Therefore, the construction of dolomite will take place along with purchased coal in the boiler. Hence, it necessitates change of technology from AFBC to CFBC now.

5.0 Furthermore, the total requirement of power to run the units under implementation (1X500 TPD DRI kiln and SMS) will be 35 MW of which 10 MW will be met through the concurrently constructed WHRB. The remaining will have to be met through proposed CFBC. Thus, initially a 25 MW CFBC

is proposed and hence the proposed amendment in configuration & technology [against that mentioned in EC dated 02.08.2010] as given below:

| AFBC | Phase | As per sanctioned in EC dated 02.08.2010 | Proposed change                                         |
|------|-------|------------------------------------------|---------------------------------------------------------|
|      | Ph-1  | 700 MW (1X375 TPH)                       | 2 X 75 MW + 1X50 MW, all proposed to be changed to CPBC |
|      | Ph-2  | 100 MW (1X375 TPH)                       | 100 MW (1X375 TPH)                                      |
|      | Total | 200 MW                                   | 200 MW                                                  |

6.0 The furnace height is much higher in a CPBC boiler, when compared to AFBC boiler. The combustion temperature is lower and the steps combustion takes place. Consequently, CPBC boiler offers many significant advantages over AFBC boiler, which include increased combustion efficiency, lower ash (bottom & flyash), lower un burnt carbon carry over to ESP due to increased residence time, fuel flexibility (w.r.t. size, low CV, low VM, high ash, fuel type), low NOx emissions, higher sulphur capture, lower turn down ratios, lower tube erosion and lower bed agglomeration. Hence the residence time of fuel in a CPBC boiler is much higher. The un-burnt content of CPBC boiler ash (bottom and fly ash) is lower (2%), when compared to AFBC boiler ash (4%).

7.0 The construction of the phase-1 of the steel plant, as sanctioned in EC, has commenced in 2017 and will be completed by July 2020. In case of power plant, the change in technology will not have any impact on construction but the change in configuration will require construction of smaller units and accordingly more civil work as required in the earlier - one large boiler & turbine (to generate 100 MW). Now it is proposed to install 2X75 MW + 1X50 MW i.e., three smaller boilers and turbines. The area shall remain the same.

8.0 There will be no increase in the overall production, area, raw material, water consumption, waste water generation, energy requirement from grid or solid waste generation of the integrated steel plant due to proposed change in configuration of CPP. Fresh water requirement as per EC dated 02.08.2010 is 2950 cum/d which will remain unchanged. There will be no change in effluent treatment systems & solid waste handling systems. The ash from CPBC will be of better quality and more easily utilisable for cement plants. The air pollution control equipments like ESP shall be upgraded as the previous design was for AFBC at an emission level of 50 mg/Nm<sup>3</sup>, which will now be improved for CPBC to 30 mg/Nm<sup>3</sup>.

9.0 Certificate of compliance was obtained from Regional Officer, Bhadrachalam vide letter No. 101.539/EPB/392 dated 27.06.2017.

10.0 Now, it was requested for amendment in configuration & technology for power plant as give above and extension of validity of EC up to 1<sup>st</sup> August 2020.

11.0 The proponent has mentioned that there is no court case or violation under EIA Notification to the project or related activity.

12.0 Name of the Consultant: Min. Env. Consultancy Pvt. Ltd., New Delhi with permission from High Court of Delhi vide its LRA 110/2014 and CM No.2170/2014 (stay) and W.P.(C) 3665/2016

13.0 The proposal was considered in 34<sup>th</sup> EAC meeting held during 6<sup>th</sup> - 7<sup>th</sup> August 2018. After detailed deliberations, the committee recommended the extended the validity of environmental clearance upto 1<sup>st</sup> August, 2020 with the revised configuration of power plant as below:

| Particulars         | Existing     | Modified Proposed   |
|---------------------|--------------|---------------------|
| Captive Power Plant | 100 MW, AFBC | 2X75MW+1X50MW, CPBC |

14.0 The Ministry has considered the recommendation of the EAC and hereby decided to extend the validity of environmental clearance vide letter No. P.No.J-11011/241/2009-Ia(I) dated 2<sup>nd</sup> August, 2010, for further period upto 1<sup>st</sup> August 2020 with the revised configuration of power plant as above in para 13 above.

15.0 All other conditions stipulated in the environmental clearance granted vide P.No.J-11011/241/2009-Ia(I) dated 2<sup>nd</sup> August, 2010 shall remain the same.

16.0 The Ministry may revoke or suspend the clearance if implementation of any of the above conditions is not satisfactory.

17.0 The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.

18.0 The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report and that during their presentation to the EAC. The commitment made by the project proponent to the issue raised during Public Hearing shall be implemented by the proponent.

19.0 The above conditions shall be enforced, inter alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and rules.

20.0 Any appeal against this EC shall lie with the National Green Tribunal, if preferred, within a period of 90 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.

This issues with the approval of Competent Authority:

  
(Shashi Kumar Palleria)  
Scientist 'F' / Director



Copy to:-

1. **The Secretary**, Department of Environment, Government of Odisha, Secretariat, Bhubaneswar
2. **The Secretary**, Department of Forests, Government of Odisha, Secretariat, Bhubaneswar
3. **The Additional Principal Chief Conservator of Forests**(C), Ministry of Environment, Forest and Climate Change, Regional Office (R2), A/3, Chandrasekharpur, Bhubaneswar - 751023.
4. **The Chairman**, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110032.
5. **The Chairman**, Odisha State Pollution Control Board, Parivesh Bhawan, A/118 Nilakantha Nagar, Unit-VIII, Bhubaneswar-751012.
6. **The Member Secretary**, Central Ground Water Authority, A 2, W3, Curzon Road Barrack, K.G. Marg, New Delhi-110001.
7. **The District Collector**, Keonjhar District, Odisha.
8. **Guard File / Record file / Monitoring file.**
9. **MOEF&CC Website.**

  
(Sharath Kumar Pallaris)  
Scientist F / Director

T. No. J 11011/309/2018-LA-III  
Government of India  
Ministry of Environment, Forest and Climate Change  
(Impact Assessment Division)

Indira Park, Vasant Vihar,  
New Delhi - 110068

E-mail: dirind-environ@gov.in  
Tel: 011-23465366

Dated: 11<sup>th</sup> September, 2019

To

Shri. Hink Mazumder,  
Director,  
Mrs. Rungta Mines Limited,  
Main Road, Jorhat,  
Kamrup,  
Assam - 781035.

Tel: 0676-276157; E-mail: [runl.dasg@runl.com](mailto:runl.dasg@runl.com)

Subject: Integrated Steel Plant (2.85 MTPA) Study of Mrs. Rungta Mines Limited located at Village, Jorhat, Kamrup and Dibrugarh, District Dibrugarh, Assam - Environmental Clearance - regarding.

Sir,

1. This refers to the application of Mrs. Rungta Mines Limited made vide proposed Lr/OR/END/8884/2018 dated 19<sup>th</sup> March, 2019 along with copies of EIA/EMP report and Form - 1 seeking Environmental Clearance (EC) under the provisions of the EIA Notification, 2006 for the project mentioned above. The proposed project activity is listed at Sl. No. 3(a) Metallurgical Industries (Ferrous and Non-ferrous) under Category 'A' in the Notification, 2006 and the project is appraised at the Central level.

2. The proposal and above was considered during the 6<sup>th</sup> meeting of Re-Constituted Expert Appraisal Committee (EAC) (Industry-I) held on 24<sup>th</sup> April, 2019 and further reconsidered in the 7<sup>th</sup> meeting of Re-Constituted Expert Appraisal Committee (EAC) (Industry-I) held on 29-31<sup>st</sup> May, 2019. The EAC proceedings of the proposal is furnished as below.

#### Details submitted by the Project Proponent

3. The proposal for Integrated Steel Plant of Mrs. Rungta Mines Limited located in Village, Jorhat, Kamrup and Dibrugarh, District Dibrugarh, Assam was initially received in the Ministry on 30.09.2018 for obtaining Terms of Reference (TOR) as per EIA Notification, 2006. The project was appraised by the Expert Appraisal Committee (Industry-I) during its meeting held on 26-28<sup>th</sup> November, 2018 and prescribed TORs in the project for undertaking detailed EIA study for the purpose of obtaining Environmental Clearance. Accordingly, the Ministry of Environment, Forest and Climate Change had prescribed TORs to the project on 18.12.2018 vide letter no. J-11011/309/2018-LA-III(f).

For the Ministry of Environment, Forest and Climate Change, Government of India, New Delhi-110068

For the Ministry of Environment, Forest and Climate Change, Government of India, New Delhi-110068

4. Based on the TOR prescribed for the project, public hearing has been held on 07.03.2019. After public hearing, the project proponent submitted an application for environmental clearance to the Ministry on 19.03.2019 vide application no. LA/OR/END/8884/2018. The project is for 2.85 million TPA (Phase I)-1.45 MTPA, Phase II 1.40 MTPA) production capacity from an Integrated Steel Plant. The project previously had an Environmental Clearance vide Letter No. J-11011/241/2009-LA-III(f) dated 02.08.2010 for a capacity of 1.9 MTPA, the validity of which will lapse on 1<sup>st</sup> August, 2020 while the construction of the units within it would be still acquiring till the expiry of the validity period. The validity extension of Environmental Clearance was accepted by the Ministry vide Letter no. J-11011/241/2009-LA-III(f) dated 26.06.2018. Hence, the project proponent decided to apply for fresh TOR for a larger production of 2.85 MTPA.

5. The Status of compliance of earlier EC was obtained from Regional Office, Bhubaneswar vide Lr. No. 191-639/CE dated 25.02.2019. It states that status of compliance of the stipulated EC conditions could not be ascertained as the major project work is yet to be started. However, observations made by the Regional Office and the corrective action taken by the project proponent are summarized as follows:

| S.No | Observations of Regional Office of MoEF&CC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Corrective action by the Project Proponent (PP)                                                                                                                                                                                                                                            |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| i.   | It has been found that PP is in process to construct one water storage pond, which will also be using for the storage of surface runoff rain water coming out from the reserved forest (RF) hilllock, which is situated near North west side of the project. Therefore, it is requested to construct one or more rain water collection post near the existing hilllock for easy collection and storage of rain water during water coming out from the existing hilllock during rainy time, which will be used for various activities including development of green belt etc. | PP will construct one more rain water harvesting pond for easier collection and storage of rain water runoff from the existing hilllock during rain time and stored water shall be used for development of green belt, sprinkling and process after settlement/ treatment...               |
| ii.  | It is requested to take consultation/ approval from various competent authorities (including CGWA etc) for the collection and utilization of the huge quantity of the rain water coming out from the RF hilllocks, which is situated near west/south side of the project.                                                                                                                                                                                                                                                                                                     | PP has already employed M/s Skylock, Bangalore for hydro-geological survey for entire plant area to assess total rain water / storm water during rainy season. Based on their report, the submission will be made to Irrigation Department for approval of over storm water drainage plan. |

For the Ministry of Environment, Forest and Climate Change, Government of India, New Delhi-110068

| S.No | Observations of Regional Office of MoEF&CC                                                                                                                                                                                                                                            | Corrective action by the Project Proponent (PP)                                                                                                                                                                                                                                                                   |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| iii. | It is also requested to provide significant quantity of rain water to local farmers for cultivation of paddy.                                                                                                                                                                         | PP is creating passes for rain water to pass from plant side to villagers for cultivation of paddy, hence, there will be no decline in rain water availability to farmers. Additionally, ponds will be constructed as par. of C&A & CSR in the agricultural fields, if desired by the respective Gram Panchayats. |
| iv.  | It has been found that PAs have not yet started plantation work on this project side, therefore, it is requested to conduct massive plantation drive during coming monsoon period. Detailed information on development of green belt should also be submitted to this regional office | PP is planning for plantation on 48 acres land covering 40,000 plantation of land before start of monsoon season                                                                                                                                                                                                  |
| v.   | It is required to constitute Environment Management cell (EMC) at project level.                                                                                                                                                                                                      | PP is in the process of establishing full-fledged Environment Management cell (EMC) before operation of the plant. The personnel will be hired as per organization chart proposed in EMP                                                                                                                          |
| vi.  | It is required to conserve top soil of the project side use it for the development of green belt.                                                                                                                                                                                     | During construction, PP is removing top soil & keeping in separate pile for use in plantation purposes.                                                                                                                                                                                                           |

6. After detailed deliberations, the Committee satisfied with the corrective action of the project is proposed.

7 The proposed capacity for different products of the 2.85 MTPA Integrated Steel Plant is given below:

| Sl. No. | Plant facilities                                 | Units | Phase 1               | Phase 2       | Total                    |
|---------|--------------------------------------------------|-------|-----------------------|---------------|--------------------------|
| 1       | Beneficiation Plant                              | MTPA  | 2.7                   | 2.7           | 5.4                      |
|         | Configuration                                    |       | 1 X 2.69 MTPA         | 1 X 2.69 MTPA | 2 X 2.69 MTPA            |
| 2       | Pelletisation Plant                              | MTPA  | 1.47                  | 1.47          | 2.94                     |
|         | Configuration                                    |       | 1 X 1.2 MTPA          | 1 X 1.2 MTPA  | 2 X 1.2 MTPA             |
|         | (with additional 30% extra capacity utilisation) |       |                       |               |                          |
| 3       | Coal Washery                                     | MTPA  | 2.616                 | 1.524         | 4.14                     |
|         | Configuration                                    |       | 1 X 400 TPH           | 1 X 25 TPH    | 1 X 400 TPH - 1 X 25 TPH |
|         |                                                  |       |                       |               | II                       |
| 4       | Trial Plant                                      | MTPA  | 1.001                 | 0.546         | 1.547                    |
|         | Configuration                                    |       | 2 X 500 - 2 X 600 TPD | 2 X 600 TPD   | 2 X 500 - 4 X 600 TPD    |
|         | (with additional 30% extra capacity utilisation) |       |                       |               |                          |
| 5       | Mini Heat Furnace                                | MTPA  | 0.567                 | 0.992         | 1.559                    |

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| Nl. No. | Plant Facilities                                                                          | Units | Phase 1                  | Phase 2                   | Total                                     |
|---------|-------------------------------------------------------------------------------------------|-------|--------------------------|---------------------------|-------------------------------------------|
|         | Configuration                                                                             |       | 1X604 CUM                | 1X1250 CUM                | 1X604+1X1250 CUM                          |
| 6       | Sinter Plant                                                                              | MTPA  | 0.612                    | 1.051                     | 1.663                                     |
|         | Configuration                                                                             |       | 1X64 sq. m               | 1X110 sq. m               | 1X64+1X110 sq. m                          |
| 7       | Coke Oven Plant                                                                           | MTPA  | 0.420                    | 0.700                     | 1.12                                      |
|         | Configuration                                                                             |       | 6 batteries X 70,000 TPA | 10 batteries X 70,000 TPA | 15 batteries X 70,000 TPA                 |
| 8       | Steel Making Shop                                                                         | MTPA  | 1.252                    | 1.232                     | 2.484                                     |
| 8.1     | Steel Making via MTPA                                                                     |       | 0.539                    | -                         | 0.539                                     |
|         | Induction Furnace Route                                                                   |       |                          |                           |                                           |
| 8.2     | Configuration                                                                             |       | 7X20TIF+4X20 T LRF       | -                         | 7X20TIF+4X20 T LRF                        |
|         | Steel Making via Electric Arc Furnace Vacuum Degassing-Argon Oxygen Decarburization Route | MTPA  | 0.693                    | 1.232                     | 1.925                                     |
|         | Configuration                                                                             |       | 1X50T EAF+1X50T LRF      | 1X160T EAF and 1X160T LRF | 1X20T + 1X160T EAF and 1X50T + 1X160T LRF |
| 8.3     | Continuous Casting Machine (H Heats Bloom Caster Slab)                                    | MTPA  | 1.207                    | 1.307                     | 2.515                                     |
|         | Configuration                                                                             |       | 1 nos. X 3 strands       | 2 nos. X 3 strands        | 3 nos. X 3 strands                        |
| 9       | Finished Product Facilities                                                               | MTPA  | 1.150                    | 1.100                     | 2.250                                     |
| 9.1     | Rolling Mill (XCL Flat/ Round/ Wire Rod/ Structural Mill others)                          | MTPA  | 0.800                    | 0.800                     | 1.600                                     |
|         | Configuration                                                                             |       | 4X0.2 MTPA               | 1X0.24X0.4 MTPA           | 5X0.24X0.2 MTPA                           |
| 9.2     | Strip Mill/ Sheet Coil/ Wire & Bar Mill/ Wire Rope                                        | MTPA  | 0.450                    | 0.400                     | 0.8500                                    |
|         | Configuration                                                                             |       | 1X0.45 MTPA              | 1X0.4 MTPA                | 1X0.45+1X0.4 MTPA                         |
| 9.3     | Drivile Pipe Plant                                                                        | MTPA  | 0.400                    | 0.200                     | 0.600                                     |
|         | Configuration                                                                             |       | 1X0.2 MTPA               | 1X0.2 MTPA                | 2X0.2 MTPA                                |

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| Sl. No. | Raw materials                    | Total      |            |                          | Stock days | Area in acre |
|---------|----------------------------------|------------|------------|--------------------------|------------|--------------|
|         |                                  | Required   | Own source | From outside (purchased) |            |              |
| 1       | Bentonite & Clay Component       | 67,543     | 0          | 67,543                   | 15         | 0.12         |
| 2       | Char                             | 285,248    | 285,248    | 0                        | 7          | 0.12         |
| 3       | Clinker                          | 777,443    | 777,443    | 0                        | 30         | 0.94         |
| 4       | Coal fines when Lusher coal used | 4,844,956  | 1,731,894  | 4,576,808                | 5          | 2.69         |
| 5       | Coking Coal                      | 1,691,200  | 0          | 1,691,200                | 10         | 1.99         |
| 6       | Coke                             | 831,143    | 831,143    | 0                        | 5          | 0.56         |
| 7       | Coke breeze & fines              | 216,373    | 0          | 216,373                  | 10         | 0.25         |
| 8       | Dolomite                         | 537,581    | 0          | 537,581                  | 7          | 0.80         |
| 9       | DRG                              | 1,547,000  | 1,547,000  | 0                        | 5          | 1.82         |
| 10      | Flintrock                        | 270        | 0          | 270                      | 10         | 0.00         |
| 11      | Fly Ash from Middlings & Char    | 356,055    | 356,055    | 0                        | 10         | 0.21         |
| 12      | Gypsum                           | 33,412     | 0          | 33,412                   | 10         | 0.10         |
| 13      | Hot metal                        | 1,559,250  | 1,559,250  | 0                        |            |              |
| 14      | Iron ores & fines (all types)    | 12,523,824 | 5,526,956  | 6,996,868                | 5          | 11.18        |
| 15      | Iron Ore BF Gases                | 657,195    | 0          | 657,195                  | 10         | 1.94         |
| 16      | Limestone                        | 1,934,689  | 0          | 1,934,689                | 10         | 3.69         |
| 17      | Liquid Metal from Furnace        | 2,464,000  | 2,464,000  | 0                        |            |              |
| 18      | Middlings from Coal Washery      | 1,759,908  | 1,759,908  | 0                        | 5          | 1.04         |
| 19      | Mill scale (from LCM/RM/SM/DPP)  | 23,323     | 23,323     | 0                        | 15         | 0.21         |
| 20      | Others                           | 7,774      | 0          | 7,774                    | 10         | 0.07         |
| 21      | Pig iron                         | 78,222     | 0          | 78,222                   | 10         | 0.69         |
| 22      | Quartz                           | 81,081     | 0          | 81,081                   | 10         | 0.74         |
| 23      | Semi-finished products           | 2,500,900  | 2,414,720  | 85,280                   | 10         | 0.75         |
| 24      | Sinter                           | 1,662,570  | 1,662,570  | 0                        | 5          | 1.06         |
| 25      | Steel Scrap                      | 29,293     | 0          | 29,293                   | 10         | 0.26         |
| 26      | Slag Generation from MRF         | 467,775    | 467,775    | 0                        | 10         | 0.83         |
| 27      | Silica component                 | 31,098     | 0          | 31,098                   | 10         | 0.09         |
|         | Total                            | 37,888,776 | 21,527,785 | 17,024,656               |            | 74.54        |

AI

14. The make up fresh water requirement for the project is estimated to be 2950 m<sup>3</sup>/hr for industrial & drinking uses, which will be obtained from Bramhani River. Water of maximum sum that has recommended the draw of surface water from Bramhani River as per recommendation of 54<sup>th</sup> Water Allocation Committee, Office of The Engineer in Chief, Water Resources, Bhubaneswar, Odisha. The waste water generated within the plant will be 545.4 m<sup>3</sup>/hr, which will be suitably treated and reused for green belt, dust suppression, ash conveying and brick plant.

15. The power requirement for the project is estimated to be around 385 MW, all of which will be available from the captive power plant comprising of WHRR (135 MW) and APBKK-PHC (250 MW).

16. Base line Environmental Studies were conducted during summer season, i.e. from March to May 2018. Ambient Air quality monitoring has been carried out at 8 locations and the data summarized indicated: PM<sub>10</sub> (39.5 to 71.6 µg/m<sup>3</sup>), PM<sub>2.5</sub> (22.5 to 42.7 µg/m<sup>3</sup>), SO<sub>2</sub> (6.3 to 19.1 µg/m<sup>3</sup>) and NO<sub>x</sub> (0.34 to 21.7 µg/m<sup>3</sup>).

17. The results of the modelling study for stack emissions indicates that the maximum increase of GJ/C for the proposed project is 54.49 µg/m<sup>3</sup> with respect to the PM<sub>10</sub>, 54.55 µg/m<sup>3</sup> with respect to the SO<sub>2</sub> and 25.18 µg/m<sup>3</sup> with respect to NO<sub>x</sub>.

18. Ground water quality has been monitored at 8 locations in the study area and results indicate pH in range of 6.6-7.5, total hardness between 349-646 mg/l, Chloride between 27-245 mg/l, Fluoride between 0.2-0.73 mg/l and Heavy metal are within the permissible limits. Surface water samples have been monitored in 11 locations in the study area. pH was in range of 7.4-7.9, DO between 5.7-6.9 mg/l, BOD between 5.25 mg/l and COD between 14.99 mg/l.

19. Noise level are in the range of 48.12 to 52.16 dBA for day time and 39.17 to 42.51 dBA for night time.

20. It has been reported that there is displacement of 54 families which have been rehabilitated & resettled as per R&R Policy, Government of Odisha. Compensation has already been paid through DIC.

21. It has been reported that a total of 8 MTPA of waste will be generated due to the project, out of which 5.5 MTPA will be re-used within and outside the plant. Middlings, char, dums from pollution control systems, various slags, mill scales and ash will be reused. Only 2.5 MTPA comprising beneficiated tailing, washery reject and sila sediment will be dumped in the earmarked dump yard. It has been envisaged that an area of 40 ha will be developed as green belt around the project to attenuate the noise levels and trap the dust generated due to the project development activities.

22. The Public Hearing of the project was held on 09.03.2019 at Tehsil Office, Chikil, under the Administration of Additional District Magistrate for production of 2.85 m<sup>2</sup>/km TPA of finished steel. The major issues raised during public hearing are related to employment opportunity, education, drinking water facility, development of village roads, cleaning of village ponds, provision for senior citizen, adequate air pollution and water pollution control measures, provision of primary health center facility, water supply and other facilities etc.

E



| Sector                | Proposed Intervention                                                                                                                                                       | Capital cost in CRR (Rs. Lakhs) |     |      |     |      |              |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----|------|-----|------|--------------|
|                       |                                                                                                                                                                             | Year                            |     | Year |     | Year |              |
|                       |                                                                                                                                                                             | 1                               | 2   | 3    | 4   | 5    | Total        |
|                       | a) Training in people for improvement of agriculture and construction of training centre                                                                                    |                                 |     |      |     | 5    | 5            |
|                       | a) Soil laboratory for local farmers, soil quality improvement works, soil moisture conservation works and rain water harvesting near agriculture land                      |                                 | 15  | 15   | 20  | 20   | 70           |
|                       | <b>Sub Total 3</b>                                                                                                                                                          |                                 |     |      |     |      | <b>385.0</b> |
| <b>4. Education</b>   | a) Expansion of existing of schools to higher levels (middle/ High) as per requirement. Jharbandh-3 nos, Gintapada-2 No, Taknagar-03 nos                                    | 10                              |     | 10   |     | 30   | 90           |
|                       | b) Construction (phase-wise) of primary school in Charsimulchikapur in consultation with government scheme.                                                                 |                                 | 35  |      | 35  | 35   | 105          |
|                       | c) Development of infrastructure in school by construction of boundary walls, para/ playground, toilet & any new classroom/ building, maintenance of the same.              | 10                              |     | 10   |     | 12   | 32           |
|                       | d) plantation & beautification in and around school premises                                                                                                                | 2                               | 2   | 2    |     |      | 6            |
|                       | e) Providing sets of desk, bench with back rest and shelf, blackboard, and other furniture                                                                                  | 2                               | 2.5 | 2.5  | 2.5 | 3.5  | 14           |
|                       | f) Art and education centre                                                                                                                                                 | 2                               |     |      |     |      | 5            |
|                       | g) Distribution of Bags, Study Material (Saree, Globe, Maps, Chans, Exercise Book, Diaries, Chalk etc.) as per requirement of school                                        | 1                               | 1   | 1.6  | 1.6 | 2.2  | 7.4          |
|                       | <b>Sub Total 4</b>                                                                                                                                                          |                                 |     |      |     |      | <b>259.4</b> |
| <b>5. Health Care</b> | a) Construction of 20 bedded hospital in consultation with statutory regulatory bodies/ government scheme                                                                   |                                 |     | 300  | 330 | 750  | 1680         |
|                       | b) Provision of ambulance.                                                                                                                                                  | 15                              |     | 15   |     | 15   | 45           |
|                       | c) Provision of veterinary doctor and centre for animal health                                                                                                              |                                 |     |      |     | 20   | 20           |
|                       | d) Conducting mobile health awareness camp for protection against prevalent common diseases/ family planning camp (Doctor, para-medical staff and free supply of medicines) | 5                               | 5   | 9    | 9   | 9    | 37           |
|                       | <b>Sub Total 5</b>                                                                                                                                                          |                                 |     |      |     |      | <b>1702</b>  |

| Sector | Proposed intervention   | Capital cost in CER (Rs. Lakhs) |        |        |        |        |       |
|--------|-------------------------|---------------------------------|--------|--------|--------|--------|-------|
|        |                         | Year 1                          | Year 2 | Year 3 | Year 4 | Year 5 | Total |
|        | Grand Total (1+2+3+4+5) | 545                             | 581    | 1044   | 1089   | 1458   | 4719  |

*Note: Annual C.A.M. expenditure will be commensurate with actual investment in project construction in permit/holdings year.*

25. Green belt will be developed in 222.67 acres (90.11 ha) which is about 51% of the total area. A 10 m wide green belt, consisting of at least 5 rows around boundary will be developed as per national green cover as per CPCBN guidelines. Local and native species will be planted with a density of 2500 trees per ha. and 2.25 lakh trees will be planted and nurtured in 90.11 ha in 3 years.
26. The proponent has mentioned that there is no court case or violation under EIA Notification to the project or related activity.
27. Name of consultant: M/s Min Mee Consultancy Private Limited, New Delhi. Min Mee is preparing and presenting reports as per the High Court of Delhi orders in LPA 116/2014 and CM No.7/75/2014 (conservation) W.P.(C) 3665/2018.

#### Observations and recommendations of the Committee

- 18 The proposed silviculture was considered during the 6<sup>th</sup> meeting of Re-Constituted Expert Appraisal Committee (EAC) (Regency - 1) on 24-30<sup>th</sup> April, 2019 and further reconsidered in its 7<sup>th</sup> meeting of Re-Constituted Expert Appraisal Committee (EAC) (Reg-3) held on 29.1.<sup>st</sup> May, 2019. After detailed deliberations, the Committee recommended the project viz silviculture for grant of environmental clearance, take the procedure of EIA Notification, 2006 subject to biennial renewal of silviculture.

## Decisions of M&amp;E&amp;CC

- 29 The Ministry of Environment, Forest and Climate Change has considered the application based on the recommendations of the Expert Appraisal Committee (Industry-II) and hereby decided to grant Environmental Clearance for project cited above under the provisions of EIA Notification, 14<sup>th</sup> September, 2006, as amended, subject to strict compliance of the following Specific and General Conditions

#### A. Specific conditions

- i. Project proponent shall ensure that SPM Sulphur is removed from the coke oven waste gases from the heat recovery boiler. PP shall also prepare an SGM for monitoring the removal and reduction of Sulphur in coke oven.
- ii. Greenbelt development shall be completed in 5 years by the project proponent by using local indigenous tree species.
- iii. Project proponent shall ensure that the railway siding is established within a period of 5 years or before commissioning of the full capacity of the plant, whichever is earlier.
- iv. Project proponent shall ensure that the proportion of hot charging in rolling mill is not be less than 80 %.

- CBR activities shall be completed within a timeline of 3 years by the project proponent.

## B. General conditions

### i. Statutory compliance

- The project proponent shall prepare a Site-Specific Conservation Plan & Wildlife Management Plan and approved by the Chief Wildlife Warden. The recommendations of the approved Site-Specific Conservation Plan / Wildlife Management Plan shall be implemented in consultation with the State Forest Department. The implementation report shall be furnished along with the six-monthly compliance report.
- The project proponent shall obtain Consent to Establish / Operate under the provisions of Air (Prevention & Control of Pollution) Act, 1986 and the Water (Prevention & Control of Pollution) Act, 1974 from the concerned State Pollution Control Board/Committee.
- The project proponent shall obtain the necessary permission from the Central Ground Water Authority, in case of draw of ground water / from the competent authority concerned in case of draw of surface water required for the project.
- The project proponent shall obtain authorization under the Hazardous and other Waste Management Rules, 2016 as amended from time to time.

### II. Air quality monitoring and preservation

- The project proponent shall install 24x7 continuous emission monitoring system at process stacks to monitor stack emission with respect to standards prescribed in Environment (Protection) Rules 1986 vide G.S.R. 277 (E) dated 11<sup>th</sup> March 2012 (Integrated Iron & Steel); G.S.R. 114 (E) dated 30<sup>th</sup> May 2008 (Sponge Iron) as amended from time to time; S.O. 3408 (E) dated 29<sup>th</sup> December 2015 (Thermal Power Plants) as amended from time to time and connected to MPCB and CPCB on-line servers and calibrate these system from time to time according to equipment supplier specifications through labs recognised under Environment (Protection) Act, 1986 or NABL accredited laboratories.
- The project proponent shall monitor fugitive emissions in the plant premises at least once in every quarter through labs recognised under Environment (Protection) Act, 1986.
- The project proponent shall install system to carry out Continuous Ambient Air Quality monitoring for ambient Air quality parameters relevant to the main pollutants released (e.g. PM<sub>10</sub> and PM<sub>2.5</sub> in reference to PM emission, and SO<sub>2</sub> and NO<sub>x</sub> in reference to SO<sub>2</sub> and NO<sub>x</sub> emissions) within and outside the plant area at least at four locations (one within and three outside the plant area at an angle of 120° each), covering upwind and downwind directions.
- The cameras shall be installed at suitable locations for 24x7 recording of battery emissions on the both sides of coke oven batteries and videos shall be preserved for at least one-month recordings.
- Sampling facility at process stacks and at stackhead towers shall be provided as per CPCB guidelines for annual monitoring of emissions.

Environment (Protection) Act, 1986 and Environment (Protection) Rules, 1986 and Environment (Protection) Act, 1986 and Environment (Protection) Rules, 1986

- The project proponent shall submit monthly summary report of air toxics stack emission and air quality monitoring and results of annual stack monitoring and annual monitoring of air quality / fugitive emissions to Regional Office of Ministry of Environment and Forests and Regional Office of CPCB and Regional Office of SPCB along with six-monthly monitoring report.
- Appropriate Air Pollution Control (APC) system shall be provided for all the dust generating points including fugitive dust from all vulnerable sources, so as to comply prescribed stack emission and fugitive emission standards.
- The project proponent shall provide leakage detection and mechanised bag cleaning facilities for better maintenance of bags.
- Secondary emission control system shall be provided at SMS L to workers.
- Pollution control system in the steel plant shall be provided as per the CIEP Guidelines of CPCB.
- Sufficient number of mesh or emergency vacuum cleaners shall be provided to clean plant roads, shop floor, roofs, regularly.
- Box-cle and rotary over one lines, coal and coke lines, lime lines and other other lines collected in the pollution control devices and vacuum cleaning devices in the process after requesting agglomeration.
- The project proponent use leak proof truck/dumpers carrying coal and other raw materials and cover them with tarpaulin.
- Facilities for spillage collection shall be provided for coal and coke on wharf of coke oven batteries (Coke conveyors, land based industrial vacuum cleaning facility).
- Land-based APC system shall be installed to control coke pushing emissions.
- Monitor CO, HC and O<sub>2</sub> in flue gases of the coke oven battery to detect combustion efficiency and cross leakages in the combustion chamber.
- Vapour absorption system shall be provided in place of vapour compression system for condensing of coke oven gas in case of recovery type coke ovens.
- In case venturi scrubber system is implemented, adopt high temperature oxidation to destroy Dioxins and Furans. Suitable NO<sub>x</sub> control facility shall be provided to meet the prescribed standards.
- The coke oven gas shall be subjected to desulphurisation if the sulphur content in the coal exceeds 1%.
- Wind shelter fence and chemical spraying shall be provided on the raw material stock piles.
- Design the ventilation system for adequate air changes as per ACGIH document for all tunnels, water houses, etc. Cellars.
- The project proponent shall install Dry Gas Cleaning Plant with bag filter for Blast Furnace and SMS converters.
- Dry quenching (CDO) system shall be installed along with power generation facility from waste heat recovery from hot coke.



Environment (Protection) Act, 1986 and Environment (Protection) Rules, 1986 and Environment (Protection) Act, 1986 and Environment (Protection) Rules, 1986



**III. Water quality monitoring and preservation**

- i. The project proponent shall install 24x7 continuous effluent monitoring system with respect to standards prescribed in Environment (Protection) Rules 1986 vide G.S.R.277 (E) dated 31<sup>st</sup> March 2012 (Integrated Iron & Steel) G.S.R. 414 (E) dated 30<sup>th</sup> May 2008 (Sponge Iron) as amended from time to time; S.O. 3305 (E) dated 7<sup>th</sup> December 2015 (Thermal Power Plants) as amended from time to time and connected to SPURB and CPCB online servers and calibrate these system from time to time according to equipment supplier specification through labs recognised under Environment (Protection) Act, 1986 or NABL accredited laboratories.
- ii. The project proponent shall monitor regularly ground water quality at least twice a year (pre and post monsoon) at sufficient numbers of piezometer/sampling wells in the plant and adjacent areas through labs recognised under Environment (Protection) Act, 1986 and NABL accredited laboratories.
- iii. The project proponent shall submit monthly summary report of continuous effluent monitoring and results of manual effluent testing and manual monitoring of ground water quality to Regional Office of MOEF&CC, Zonal office of CPCB and Regional Office of SPURB along with six-monthly monitoring report.
- iv. The project proponent shall provide the ETP for coke oven and by-product to meet the standards prescribed in G.S.R.277 (E) dated 31<sup>st</sup> March 2012 (Integrated Iron & Steel) G.S.R. 414 (E) dated 30<sup>th</sup> May 2008 (Sponge Iron) as amended from time to time; S.O. 3305 (E) dated 7<sup>th</sup> December 2015 (Thermal Power Plants) as amended from time to time.
- v. Address to 'Zero Liquid Discharge'
- vi. Sewage Treatment Plant shall be provided for treatment of domestic wastewater to meet the prescribed standards.
- vii. Gas treatment and collection pits shall be provided for each smoke pile to arrest the run-off in the event of heavy rains and to check the water pollution due to surface run off.
- viii. Tyre washing facilities shall be provided at the entrance of the plant gates.
- ix. CO<sub>2</sub> injection shall be provided in GCP of SMS to reduce pH in circulating water to ensure optimal recycling of treated water for converter gas cleaning.
- x. The project proponent shall practice rainwater harvesting to maximum possible extent.
- xi. Treated water from ETP of COHP shall not be used for coke quenching.
- xii. Water meter shall be provided in the inlet to all unit processes in the steel plants.
- xiii. The project proponent shall make efforts to minimise water consumption in the steel plant complex by segregation of used water, practicing cascade use and by recycling treated water.

**IV. Noise monitoring and prevention**

- i. Noise level survey shall be carried as per the prescribed guidelines and report in this regard shall be submitted to Regional Office of the Ministry as a part of six monthly compliance report.
- ii. The ambient noise levels should conform to the standards prescribed under JEPPIA Rules, 1986 viz. 75 dB(A) during day time and 70 dB(A) during night time.

**V. Energy Conservation measures**

- i. The project proponent shall provide TRTs to recover energy from top gases of Blast furnaces.
- ii. Coke Dry Quenching (CDQ) shall be provided for coke quenching for both recovery and non-recovery type coke ovens.
- iii. Wastewater shall be recovered from Sinter Plants coolers and Sinter Machines.
- iv. Use topcoke baffle for hot metal transfer as far as possible. If ladles are used, provide covers for open top ladles.
- v. Use hot charging of slabs and billets/blooms as far as possible.
- vi. Waste heat recovery systems shall be provided in all units where the flue gas or process gas exceeds 300°C.
- vii. Explore feasibility to install WEIRS at Waste Gases from BF above Sinter Machines, Sinter Cooler, and air reheating furnaces and if feasible shall be installed.
- viii. Recover Gas Flaring to < 1%.
- ix. Provide solar power generation on rooftops of buildings, or solar light system for all common areas - street lights, parking around project area and maintain the same regularly.
- x. Provide LED lights in their offices and residential areas.
- xi. Ensure installation of regenerative type burners on all reheating furnaces.

**VI. Waste management**

- i. Auxiliary grinding unit to improve the bulk density of DRI granulated slag from 1.0 to 1.5 Kg/ cu.ft to be used as river sand in construction industry.
- ii. In case of Non-Recovery coke ovens, the gas main carrying hot flue gases to the boiler, shall be insulated to conserve heat and to maintain heat recovery.
- iii. Tar Sludge and waste oil shall be blended with coal charges in coke ovens (applicable only to recovery type coke ovens).
- iv. Carbon recovery plant to recover the elemental carbon present in GCP slurries for use in Sinter plant shall be installed.
- v. Waste Recycling Plant shall be installed to recover scrap, metallic and flux for recycling to sinter plant and SMS.
- vi. Used refractories shall be recycled as far as possible.
- vii. SMS slag after metal recovery in waste recycling facility shall be utilised and used for road making, railway track ballast and other applications. The project proponent shall install a waste recycling facility to recover metallic and flux for recycle to sinter plant. The project proponent shall establish linkage for 100% reuse of rejects from Waste Recycling Plant.
- viii. 100% utilization of fly ash shall be ensured. All the fly ash shall be provided to cement and brick manufacturers for further utilization and Manufacturers of fly ash standing in this regard shall be submitted to the Ministry's Regional Office.

Project proponent shall ensure that the effluent treatment and disposal system is designed to meet the standards prescribed in the Environmental Protection Act, 1986 and the rules thereunder.

- ix. Oil Collection pits shall be provided in oil tanks to collect and reuse/recycle spilled oil. Oil collection trays shall be provided under or in oil tank saddles in cold rolled coil storage area.
- x. The waste oil, grease and other hazardous waste like waste sludge from pickling, galvanizing, chrome plating, mills etc shall be disposed off as per the Hazardous & Other Waste (Management & Transboundary Movement) Rules, 2016. Coal tar sludge / residue shall be recycled to coke ovens.
- xi. Kitchen waste shall be composted or converted to biogas for further use.

#### VII. Green Belt

- i. Green belt shall be developed in an area equal to 12% of the plant area with a native tree species in accordance with CPCB guidelines. The greenbelt shall inter alia cover the entire periphery of the plant.
- ii. The project proponent shall prepare GRTS rules and inventory for the plant and shall submit the programme for collection of the same including action sequential including plantation.

#### VIII. Public hearing and Human health issues

- i. Emergency preparedness plan based on the Hazard Identification and Risk Assessment (HIRA) and Disaster Management Plan shall be implemented.
- ii. The project proponent shall carry out heat stress analysis for the workmen who work in high temperature work zone and provide Personal Protection Equipment (PPE) as per the norms of Factory Act.
- iii. Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as food for cooking, mobile toilets, mobile STD, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.
- iv. Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.

#### IX. Corporate Environment Responsibility

- i. The project proponent shall comply with the provisions contained in this Ministry's OMD vide F.No. 22-6520/2-IA.11 dated 1<sup>st</sup> May 2018, as applicable, regarding Corporate Environmental Responsibility.
- ii. The company shall have a well laid down environmental policy duly approved by the Board of Directors. The environmental policy should prescribe the standard operating procedures to ensure proper checks and balances and to bring into focus any infra-governance/violation of the environmental / forest / wildlife norms / environment. The company shall have defined system of reporting infra-governance / violation of the environmental / forest / wildlife norms / conditions and / or environmental / water balance. The copy of the board resolution in this regard shall be submitted to the MoEF&CC as part of its monthly report.
- iii. A separate Environmental Cell both at the project and company head-quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly report to the head of the organization.

Approved: Director, Environment, Forest and Climate Change, Government of India, New Delhi, India. Date: 26.06.2024

- iv. Action plan for implementing EMO and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Compliance Report.
- v. Self-environmental audit shall be conducted annually. Every three years third party environmental audit shall be carried out.
- vi. All the recommendations made in the Charter on Corporate Responsibility for Environmental Protection (CCREP) for the Iron and Steel plants shall be implemented.

#### X. Miscellaneous

- i. The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent's website permanently.
- ii. The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in turn have to display the same for 30 days from the date of receipt.
- iii. The project proponent shall upload the status of compliance of the stipulated environmental clearance conditions, including results of monitored data on their website and update the same on half-yearly basis.
- iv. The project proponent shall monitor the criteria pollutants level namely: PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>x</sub> (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the projects and display the same at a convenient location for disclosure to the public and put on the website of the company.
- v. The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the Ministry of Environment, Forest and Climate Change or environment clearance portal.
- vi. The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.
- vii. The project proponent shall inform the Regional Office as well as the Ministry the date of financial closure and final approval of the project by the concerned authorities, commencing the land development work and start of production operation by the project.
- viii. The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.
- ix. The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.

Approved: Director, Environment, Forest and Climate Change, Government of India, New Delhi, India. Date: 26.06.2024

10. This issues with the removal of the Government Agency

(A.K. Agrawal)  
Director

1. The Secretary, Department of Forests, Government of Odisha, Secy., Bhubaneswar.
2. The Chairman, Central Pollution Control Board, Parvesh Bhawan, CPO-ann-Office Complex, East Arjun Nagar, Delhi-110032.
3. The Deputy Director General (Bioshed), Ministry of Environment, Forest and Climate Change, Regional Office (Ec.), A-3, Chandra Shekhar, Bhubaneswar - 751023.
4. The Chairman, Odisha State Pollution Control Board, Parvash Bhawan, A-128, Nilakantha Nagar, Unit-VIII, Bhubaneswar-751012.
5. The Member Secretary, Central Ground Water Authority, West Block -II, W-3, Sector I, R.K.Puram, New Delhi - 110056.
6. The District Collector, Bhubaneswar District, Odisha.
7. Grand Filling Road/Fill Monitoring Site, Bhubaneswar, Odisha.



J.K. Agrawal  
Director

P.O. No. 100/201979-5434(HQ)  
Government of India  
Ministry of Environment, Forest and Climate Change  
( Impact Assessment Division)

Industrial Park Sectoral Division  
Jor Bagh Road, Aliganj,  
New Delhi - 110004

E-mail: [industrialpark@moef.gov.in](mailto:industrialpark@moef.gov.in)  
Tel: 011-2366369

Dated: 13<sup>th</sup> April, 2020

To

Smt. Hink Mazumder,  
Director,  
M/s. Rungta Mines Limited,  
Main Road, Bafel,  
Koraput,  
Odisha - 759025,  
Tel: 0674-256 2511, [info@rml.co.in](mailto:info@rml.co.in)

Subject: Integrated Steel Plant (2.85 MTPA) of M/s. Rungta Mines Limited located at Village Barvanti, Gilpana area, Sukurana, District Bhenkanal, Odisha – Amendment in Environment Clearance (EC) for change in configuration of pellet plant from 2x1.47 MTPA to 1x2.945 MTPA regarding.

Re:

- This refers to online application of M/s. Rungta Mines Limited made vide proposal no. 14/DR/IND/199686/2020 dated 28/12/2020 along with Form 4 seeking for amendment in the Environment Clearance sanctioned by the Ministry vide letter no. 100/201979-5434(HQ) dated 11/09/2019 regarding change in configuration of pellet plant from 2x1.47 MTPA to 1x2.945 MTPA.
- In response to a letter was considered during the 10<sup>th</sup> meeting of Restored State Expert Appraisal Committee (EAC) (Industries) held on 24-25<sup>th</sup> February, 2020. The EAC proceedings of the proposal cited above is given as below.

#### Details submitted by the Project Proponent

- Operational Steel Plant of M/s. Rungta Mines Limited obtained environment clearance from MoEF & CC vide letter no. 100/201979-5434(HQ) dated 11/09/2019. The operational capacity of the different units is assigned in the EC dated 11/09/2019 along with its configuration is furnished as below:

| Sl. No. | Plant Facilities                                                                 | Units | Phase 1      | Phase 2      | Total        |
|---------|----------------------------------------------------------------------------------|-------|--------------|--------------|--------------|
| 1       | Beneficiation Plant                                                              | MTPA  | 2.5          | 2.5          | 5.0          |
| 2       | Pelletization Plant Configuration with additional 10% extra capacity utilization | MTPA  | 1x2.945 MTPA | 1x2.945 MTPA | 2x2.945 MTPA |
|         |                                                                                  |       | 1.47 MTPA    | 1.47 MTPA    | 2x1.47 MTPA  |
| 3       | Coil Slabbing                                                                    | MTPA  | 2x0.6        | 1.524        | 2.744        |

| Sl. No. | Plant Facilities                                                       | Units | Phase 1      | Phase 2      | Total                 |
|---------|------------------------------------------------------------------------|-------|--------------|--------------|-----------------------|
| 4       | DRP Plant Configuration with additional 10% extra capacity utilization | MTPA  | 1.001        | 0.545        | 1.547                 |
|         |                                                                        |       | 2x0.60       | 2x0.602 MTPA | 2x0.60 + 4x0.602 MTPA |
| 5       | Hot Metal Furnace Configuration                                        | MTPA  | 0.567        | 0.691        | 1.258                 |
|         |                                                                        |       | 1x0.602 MTPA | 1x0.602 MTPA | 2x0.602 MTPA          |
| 6       | Strip Plant Configuration                                              | MTPA  | 0.602        | 1.524        | 2.126                 |
|         |                                                                        |       | 0.602 MTPA   | 1x1.524 MTPA | 2x0.602 MTPA          |
| 7       | Coil Oven Plant Configuration                                          | MTPA  | 0.420        | 0.790        | 1.210                 |
|         |                                                                        |       | 0.420 MTPA   | 0.790 MTPA   | 1.210 MTPA            |
| 8       | Steel Rolling Plant                                                    | MTPA  | 1.142        | 1.937        | 3.079                 |
|         |                                                                        |       | 0.569        | 0.569        | 1.138                 |
| 9       | Steel Rolling Plant Configuration                                      | MTPA  | 0.569        | 1.423        | 1.992                 |
|         |                                                                        |       | 0.569        | 1.423        | 1.992                 |
| 10      | Continuous Casting Machine (Billet Beam Casser) Configuration          | MTPA  | 1.001        | 1.207        | 2.208                 |
|         |                                                                        |       | 1.001        | 1.207        | 2.208                 |
| 11      | Finished Product Batches                                               | MTPA  | 1.450        | 1.400        | 2.850                 |
|         |                                                                        |       | 0.500        | 0.500        | 1.000                 |
| 12      | Hot Rolling Mill (TMT) Plant, including Re-rolling of TMT              | MTPA  | 0.500        | 0.500        | 1.000                 |
|         |                                                                        |       | 0.500        | 0.500        | 1.000                 |
| 13      | Hot Metal Slabbing Configuration                                       | MTPA  | 0.450        | 0.400        | 0.850                 |
|         |                                                                        |       | 0.450        | 0.400        | 0.850                 |
| 14      | Hot Metal Slabbing Configuration                                       | MTPA  | 0.450        | 0.400        | 0.850                 |
|         |                                                                        |       | 0.450        | 0.400        | 0.850                 |
| 15      | Hot Metal Slabbing Configuration                                       | MTPA  | 0.450        | 0.400        | 0.850                 |
|         |                                                                        |       | 0.450        | 0.400        | 0.850                 |
| 16      | Hot Metal Slabbing Configuration                                       | MTPA  | 0.450        | 0.400        | 0.850                 |
|         |                                                                        |       | 0.450        | 0.400        | 0.850                 |

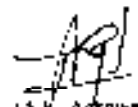
Signature of the Project Proponent: \_\_\_\_\_  
Name of the Project Proponent: \_\_\_\_\_

Signature of the Project Proponent: \_\_\_\_\_  
Name of the Project Proponent: \_\_\_\_\_



ANNEXURE : II(g) Contd..

4. Chairman, Odisha State Pollution Control Board, Bhubaneswar, Odisha, Bhubaneswar-751013  
Sl. No. 100/2011, Dtd: 28.08.2011
5. Member Secretary, Central Ground Water Authority, West Block-II, Wing-2, Sector-1,  
R K P. Yam, New Delhi-110086.
6. District Collector, Districtal District, Odisha
7. Guard File/Record File/Under filing file.
8. By FAX/ e-mail.

  
(A.K. Agrawal)  
Director

E.No. J-11911/2020 & IA-1111  
Government of India  
Ministry of Environment, Forest and Climate Change  
(Impact Assessment Division)

Indira Paryavaran Bhawan  
for Bagh Road, Aizawl,  
New Delhi - 110003

E-mail: [india-muel@gov.in](mailto:india-muel@gov.in)  
Tel: 011-24695368

Dated: 21 June, 2020

To

Shri. P.K.Chaturvedi,  
Joint Vice President,  
M/s. Rungta Mines Limited,  
Main Road, Barhi,  
Keonjhar,  
Odisha - 753001  
E-mail: [runl@rediffmail.com](mailto:runl@rediffmail.com)

Subject: Expansion of Integrated Steel Plant from 2.85 MTPA to 4.0 MTPA by M/s. Rungta Mines Limited located at Villages Jharbandh, Galspada and Tarkabeda, District Dhenkanal, Odisha - Environment Clearance under para 7(ii) of EIA Notification, 2006 regarding.

Sir,

1. This refers to the application of M/s. Rungta Mines Limited made vide proposal no. [A/004/NM/5/1347020 dated 22/04/2020 along with Form - 2, pre-feasibility report and Addendum to the EIA report seeking Environment Clearance (EC) under para 7(i) of the EIA Notification, 2006 for the project mentioned above. The proposed project activity is listed at Sl. No. 3(a) Metallurgical Industries (Ferrous and Non ferrous) under Category 'A' EIA Notification, 2006 and the project is appraised at the Central level.
2. The aforesaid proposal was considered in the 18<sup>th</sup> meeting of the Reconstituted Expert Appraisal Committee meeting held during 29-30<sup>th</sup> April 2020. The EAC proceedings of the proposal is furnished as below:

#### Details submitted by the Project Proponent

3. MoEF&CC has originally provided Environment Clearance (EC) to M/s. Rungta Mines Limited vide letter no. J-11011/241/2019 IA-1111 dated 2/8/2019 for setting up of 1.9 MTPA Integrated Steel Plant along with auxiliary facilities at Villages Jharbandh, Galspada and Tarkabeda, District Dhenkanal, Odisha. Subsequently, Ministry vide letter dated 20/9/2018 extended the validity of the EC till 10/9/2020. Since the facilities envisaged under the EC dated 2/8/2019 could not be implemented within the validity period and further the project proponent intended to add certain additional units, PP requested fresh EC from MoEF&CC for setting up of 2.85 MTPA Integrated Steel Plant vide letter no. J-11011/241/241/2019 IA-1111 dated 11/09/2019 followed by amendment in EC on 13/04/2020 pertaining to the configuration of the pellet plant.

4. The units sanctioned as per EC dated 11/09/2019 and its subsequent amendment dated 13/04/2020 are as follows:

| Sl. No. | Plant facilities                                                                           | Configuration                                 | Capacity as per the EC dated 11/09/2019 & 13/04/2020 |
|---------|--------------------------------------------------------------------------------------------|-----------------------------------------------|------------------------------------------------------|
| 1       | Beneficiation Plant                                                                        | 2X2.69 MTPA                                   | 5.4 MTPA                                             |
| 2       | Pelletisation Plant                                                                        | 1X2.948 MTPA                                  | 2.948 MTPA                                           |
| 3       | Coal Washery                                                                               | 1X400 TPH + 1X235 TPH                         | 4.141 MTPA                                           |
| 4       | DR1 Plant                                                                                  | 2X500 + 1X600 TPD                             | 1.247 MTPA                                           |
| 5       | Mini Blast Furnace                                                                         | 1X600 + 1X1050 CUM                            | 1.539 MTPA                                           |
| 6       | Sinter Plant                                                                               | 1X64 + 1X110 sqm.                             | 1.663 MTPA                                           |
| 7       | Unike Oven Plant                                                                           | 16 batteries X 70,000 TPA                     | 1.12 MTPA                                            |
| 8       | Steel Melting Shop                                                                         |                                               | 2.464 MTPA                                           |
| 8.1     | Steel Melting via Induction Furnaces Route                                                 | 7X 20 T LF + 3X20 T LRF                       | 0.539 MTPA                                           |
| 8.2     | Steel Melting via Electric Arc Furnace-vacuum Degassing-Angon Oxygen Decarburization Route | 1X90 T + 1X160 T EAF and 1X90 T + 1X160 T LRF | 1.925 MTPA                                           |
| 8.3     | Continuous Casting Machine (Billets/ Bloom/Caster/ Slab)                                   | 3 nos. X 3 strands                            | 0.314 MTPA                                           |
| 9       | Finished Product Facilities                                                                |                                               | 2.350 MTPA                                           |
| 9.1     | Rolling Mill (TMT/ Flat/ Round/ Wire Rod/ Structural Mill/ others)                         | 5X0.2 + 2X0.3 MTPA                            | 1.600 MTPA                                           |
| 9.2     | Strip Mill/ Sheet/ Coil/ Wire & Bar Mill/ Wire Rops                                        | 1X0.45 + 1X0.4 MTPA                           | 0.85 MTPA                                            |
| 9.3     | Ductile Pipe Plant                                                                         | 2X0.7 MTPA                                    | 0.400 MTPA                                           |
| 10      | Producer Gas Plant                                                                         | 20X1000 Nm <sup>3</sup> /h                    | 480 Million Nm <sup>3</sup> Annum                    |
| 11      | Oxygen Plant                                                                               | 1 X 1100 + 1 X 180 TPD                        | 0.096 MTPA                                           |
| 12      | Lime Plant                                                                                 | 1 X 300 + 1 X 570 TPD                         | 0.3045 MTPA                                          |
| 13      | Cement Plant                                                                               | 1X2600 + 1X2300 TPD                           | 1.666 MTPA                                           |
| 14      | Captive Power Plant                                                                        |                                               | 385 MW                                               |
| 14.1    | Waste Heat Recovery Boiler (WHRB) based Captive Power Plant (CPP)                          |                                               | 135 MW                                               |
| 14.2    | DR1 Kiln exhaust gas based MBH Gas based                                                   | 2X50 + 2X60 TPH                               | 68 MW                                                |
| 14.3    | Colse Oven Exhaust based                                                                   | 1X50 + 1 X 90 TPH                             | 31                                                   |
| 14.4    | Colse Oven Exhaust based                                                                   | 1X 60 + 1X100 TPH                             | 36                                                   |
| 14.5    | WABCO/CFBC based CPP                                                                       | 2X125 + 4X250 TPH                             | 250                                                  |

5. Presently, the following facilities are under construction as on 24<sup>th</sup> April, 2020 after obtaining EC from MoEF&CC followed by the LTR from Odisha Pollution Control Board.

| S.No. | Facilities                      | Sanctioned production capacity |
|-------|---------------------------------|--------------------------------|
| 1.    | Sponge Iron plant (2 X 500 TPD) | 0.455 MTPA                     |
| 2.    | Steel Melting Shop (F 6x20-T)   | 0.308 MTPA                     |
| 3.    | Captive power plant             | 50 MW                          |
|       | WTRLS                           | 25 MW                          |
|       | AFBC/CFBC                       | 25 MW                          |

6. The Status of compliance of original EC was obtained from Regional Office, Bhubaneswar vide Lr. No. 161-619/EPE dated 25.03.2019. It is stated in the report that compliance status of the stipulated EC conditions could not be ascertained as the major project work is yet to be started. However, observations made by the Regional Office and the corrective action taken by the project proponent as per the Action Taken Report submitted to RO are summarized as below:

| S.No. | Observations of Regional Office of MoEF&CC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Corrective action taken by the Project Proponent (PP)                                                                                                                                                                                                                                                                |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| i.    | It has been found that PAs are in process to construct one water storage pond, which will also be using for the storage of surface runoff / rain water coming out from the reserved forest (RF) hillock, which is situated near North west side of the project. Therefore, it is requested to construct one or more rain water collection pond near the existing hillock for easy collection and storage of rain water / surface water coming out from the existing hillock during rainy time, which will be used for various activities including development of green belts etc. | One water storage pond (30 acres, 5 m depth) has been constructed and has full life water for use in the construction work and development of green belt etc. in the project. The additional pond desired will be constructed inside the project area to collect the rain water from the hillock prior to operation. |
| ii.   | It is requested to take competent approval from various competent authorities (including CGWA etc) for the collection and utilization of the huge quantity of the rain water coming out from the RF hillocks, which is situated near west north side of the project.                                                                                                                                                                                                                                                                                                               | Hydro geological survey report has been prepared by Sishark, Bhubaneswar to assess total groundwater availability and approval will be obtained from the competent authority.                                                                                                                                        |
| iii.  | It is also requested to provide significant quantity of rainwater to local farmers for cultivation of paddy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | PP is creating gullies for rainwater to pass from place side to villagers for cultivation of paddy, hence, there will be no decline in rain water availability to farmers. Additionally, ponds will be constructed as part of CBR & CSR in the agricultural fields, if desired by the respective Gram Panchayats.    |

Reference and Comments: The project is in compliance with the conditions of the EC issued by MoEF&CC, Bhubaneswar. The project is in compliance with the conditions of the EC issued by MoEF&CC, Bhubaneswar.

| S.No. | Observations of Regional Office of MoEF&CC                                                                                                                                                                                                                                       | Corrective action taken by the Project Proponent (PP)                                                                                         |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| i.    | It has been found that PAs have not yet started plantation work on the project side, therefore, it is requested to conduct massive plantation drive during coming monsoon period, details Inter-crop or development of green belt should also submitted to this regional office. | PP has carried out plantation in 40 acres land covering 40,000 plants.                                                                        |
| ii.   | It is required to constitute Environment Management cell (EMC) at project level.                                                                                                                                                                                                 | Environment management cell has been constituted at project level to take up the responsibility of day to day environment related activities. |
| iii.  | It is required to conserve top soil of the project and use it for the development of green belt.                                                                                                                                                                                 | During construction PP is removing top soil & keeping in separate pile for use in plantation purpose.                                         |

7. The present proposal of M/s. Rungta Mines Limited for seeking Environment Clearance under the provisions of para 7(ii) of EPA Notification, 2006 for the following:

- Change in configuration of Ladle Refining Furnace, Continuous Casting Machine and Rolling Mill
- Capacity enhancement of DRI, SMC Vag IF Route, Billets/Slab/Tilfer, Caster and FTM/Round/Wire Rod/Flat Structural orders one to change in configuration followed by the usage of superior coal quality with better Fixed Carbon content and increase in feed of iron ore pellets.

8. The details of the proposed change in configuration and enhancement in production quantities are furnished as below:

| S.No. as per EC | Plant facilities                                         | Capacity as per the EC dated 11.09.2019 & 13.04.2020 | Proposed Estimated Capacity & Configuration | Increment Quantity       | % Increase |
|-----------------|----------------------------------------------------------|------------------------------------------------------|---------------------------------------------|--------------------------|------------|
| 4               | DRI Plant Configuration:                                 | 1,547 MTPA<br>2X300 + 4X600 TPD                      | 1,613 MTPA<br>2X300 + 4X600 TPD             | 6,66 MTPA<br>(No change) | 4.27       |
| 5               | Steel Melting Shop                                       | 2,464 MTPA                                           | 2,618 MTPA                                  | 1,54 MTPA                | 6.25       |
| 6               | Steel Melting via Induction Furnace Route                | 0,529 MTPA                                           | 0,693 MTPA                                  | 0,164 MTPA               | 21.37      |
|                 | Configuration                                            | 4 X 300 T + 4 X 600 T LRF                            | 4 X 300 T + 4 X 600 T LRF                   | 4 Config change          |            |
| 6.3             | Continuous Casting Machine (Billets/ Bloom/Caster/ Slab) | 2,115 MTPA                                           | 2,566 MTPA                                  | 4,51 MTPA                | 6.25       |

Reference and Comments: The project is in compliance with the conditions of the EC issued by MoEF&CC, Bhubaneswar. The project is in compliance with the conditions of the EC issued by MoEF&CC, Bhubaneswar.



| S.No. as per EC | Plant facilities                                            | Capacity as per the EC dated 11/09/2019 & 13/04/2020 | Proposed Enhanced Capacity & Configuration | Increment Quantity | % increase |
|-----------------|-------------------------------------------------------------|------------------------------------------------------|--------------------------------------------|--------------------|------------|
| 9               | Finished Product facilities                                 | 2,850 MTPA                                           | 3,2 MTPA                                   | 0.15 MTPA          | 5.2%       |
| 9.1             | Coiling Mill (WT: 1 Ind. Room + Wire Rod Shop + Mill stand) | 1.50 MTPA                                            | 1.75 MTPA                                  | 0.15 MTPA          | 10%        |
|                 | Configuration                                               | 1X100 + 2X100 V.P.A                                  | 1X100 + 1X100 + 1X100 V.P.A                | (Config change)    |            |

9. The consolidated product slate after change in configuration and enhancement in production quantities are furnished as below:

| S.No. | Plant facilities                | Capacity as per the EC dated 11/09/2019 & 13/04/2020                    | Proposed Capacity & Configuration                                       | Increment Quantity                | Increment |
|-------|---------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------|-----------|
| 1     | Overall finished steel capacity | 1.85 MTPA                                                               | 3.0 MTPA                                                                | 0.15 MTPA                         | 5.23%     |
| 2     | Beneficiation Plant             | 5.4 MTPA (2X2.69 MTPA)                                                  | 5.4 MTPA (2X2.69 MTPA)                                                  | Nil                               | 0%        |
| 3     | Reduction Plant                 | 1.94 MTPA (1X2.948 MTPA)                                                | 2.448 MTPA (1X2.948 MTPA)                                               | Nil                               | 0%        |
| 4     | Cold Chiller                    | 4.14 MTPA (1X4.14 MTPA) + 1X215 TPH                                     | 4.14 MTPA (1X4.14 MTPA) + 1X215 TPH                                     | Nil                               | 0%        |
| 5     | DRI Plant                       | 1.547 MTPA (1X500 + 4X600 TPD)                                          | 1.547 MTPA (2X500 + 4X500 TPD)                                          | 0.05 MTPA (No change)             | 4.23%     |
| 6     | Mini Blast Furnace              | 1.550 MTPA (1X500 + 1X1000 TPD)                                         | 1.550 MTPA (1X500 + 1X1000 TPD)                                         | Nil                               | 0%        |
| 7     | Slab Plant                      | 1.401 MTPA (1X401 + 1X1000 TPD)                                         | 1.401 MTPA (1X401 + 1X1000 TPD)                                         | Nil                               | 0%        |
| 8     | Coke Oven Plant                 | 1.12 MTPA (1X1000 + 1X100 TPD)                                          | 1.12 MTPA (1X1000 + 1X100 TPD)                                          | Nil                               | 0%        |
| 9     | Steel Making Shop               | 2.463 MTPA                                                              | 2.463 MTPA                                                              | 0.154 MTPA                        | 6.25%     |
| 9.1   | Steel Making via Induction      | 2.350 MTPA (1X1800 + 1X1500 TPD)                                        | 0.063 MTPA (1X1800 + 1X1500 TPD)                                        | 0.154 MTPA (Configuration change) | 38.51%    |
| 9.2   | Steel Making via Electric Arc   | 1.113 MTPA (1X300 T + 1X160 T LNF and 1X300 T Furnace Vacuum Degassing) | 1.052 MTPA (1X300 T + 1X160 T LNF and 1X300 T Furnace Vacuum Degassing) | Nil                               | 0%        |

Capacity as per the proposed system EC dated 11/09/2019 & 13/04/2020 is given in the table for the proposed system.

| S.No. | Plant facilities                                                   | Capacity as per the EC dated 11/09/2019 & 13/04/2020              | Proposed Capacity & Configuration                                 | Increment Quantity                | Increment |
|-------|--------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------|-----------|
|       | Oxygen Decarbonization Reactor                                     |                                                                   |                                                                   |                                   |           |
| 9.3   | Continuous Casting Machine (Roller/Bloom/Caster Shop)              | 2.415 MTPA (1X1000 + 1X1000 + 1X1000 TPD)                         | 2.560 MTPA (1X1000 + 1X1000 + 1X1000 TPD)                         | 0.151 MTPA (Configuration change) | 6.25%     |
| 9.4   | Finished Product Facilities                                        | 2.850 MTPA                                                        | 3.0 MTPA                                                          | 0.15 MTPA                         | 5.23%     |
| 9.5   | Rolling Mill (WT: Flat/Round/Wire Rod/Structural Mill others)      | 1.50 MTPA (1X100 + 2X100 V.P.A)                                   | 1.75 MTPA (1X100 + 1X100 + 1X100 V.P.A)                           | 0.15 MTPA (Configuration change)  | 9.34%     |
| 9.6   | Strip Mill/Sheet Coil Wire & Bar Mill Wire Rope                    | 0.85 MTPA (1X100 + 1X100 MTPA)                                    | 0.85 MTPA (1X100 + 1X100 MTPA)                                    | Nil                               | 0%        |
| 9.7   | Ductile Pipe Plant                                                 | 0.400 MTPA (2X0.2 MTPA)                                           | 0.400 MTPA (2X0.2 MTPA)                                           | Nil                               | 0%        |
| 10    | Producer Gas Plant                                                 | 480 Million Nm <sup>3</sup> Annually (2X2400 Nm <sup>3</sup> /hr) | 480 Million Nm <sup>3</sup> Annually (2X2400 Nm <sup>3</sup> /hr) | Nil                               | 0%        |
| 11    | Oxygen Plant                                                       | 0.098 MTPA (1X100 + 1X100 TPD)                                    | 0.098 MTPA (1X100 + 1X100 TPD)                                    | Nil                               | 0%        |
| 12    | Slab Plant                                                         | 0.3645 MTPA (1X360 + 1X100 TPD)                                   | 0.3645 MTPA (1X360 + 1X100 TPD)                                   | Nil                               | 0%        |
| 13    | Coke Plant                                                         | 1.080 MTPA (1X360 + 1X100 TPD)                                    | 1.080 MTPA (1X360 + 1X100 TPD)                                    | Nil                               | 0%        |
| 14    | Electric Power Plant                                               | 385 MW                                                            | 385 MW                                                            | Nil                               | 0%        |
| 14.1  | Waste Heat Recovery Boiler (WHRB) based Electric Power Plant (EPP) | 135 MW                                                            | 135 MW                                                            | Nil                               | 0%        |
| 14.2  | DRI Kiln exit gas based                                            | 68 MW (2X340 TPD)                                                 | 68 MW (2X340 TPD)                                                 | Nil                               | 0%        |
| 14.3  | Boiler based                                                       | 31 MW (1X30 + 1X10 TPD)                                           | 31 MW (1X30 + 1X10 TPD)                                           | Nil                               | 0%        |
| 14.4  | Coke Oven Gas based                                                | 36 MW (1X36 + 1X10 TPD)                                           | 36 MW (1X36 + 1X10 TPD)                                           | Nil                               | 0%        |
| 14.5  | (AFBC/CFBC) based CPP                                              | 250 MW (2X125 + 4X125 TPD)                                        | 250 MW (2X125 + 4X125 TPD)                                        | Nil                               | 0%        |

10. The justification furnished for the proposed enhancement in production capacities due to various units is furnished as below:

Capacity as per the proposed system EC dated 11/09/2019 & 13/04/2020 is given in the table for the proposed system.

**A. DRI Unit**

- Detailed engineering has led to minor changes leading to increase in capacity with same configuration of DRI Kiln
- In EC dated 11.09.2019, kiln operation days were 350 which are proposed to be increased to 355 days.
- Superior quality of coal with better Fixed Carbon of 53% is proposed to be used.
- Company will purchase 1 no. Break machine for acceleration cutting to minimize the acceleration cutting days.
- Constant quality of feed raw material will be maintained with engineering teams as finalized.
- Process control in the operational parameters possible after detailed engineering and by deploying additional manpower.

**B. Induction furnace**

- Replacement of the presently used silica based acidic lining (life-20 heats) by Alumina based neutral lining (life-100 heats) in induction furnaces.
- Furthermore, 1000 heat life of neutral lining can be further increased to 350 heat by hot patching.
- Therefore, as compared to present utilization of 50% every pair of 2X20T working, 2X20T standby undergoing re-lining, in future we can utilize 75% (1X20T working, 1X20T standby undergoing re-lining) due to increased life of lining.

**C. Ladle refining furnace**

- Based on experience better leverage (higher freeboard volume for slag accommodation) for refining of the liquid metal.
- As the average quantity of liquid metal per heat varies extra refining capacity will be advantageous.
- Sequence matching of the furnaces for the effective and optimum production planning.

**D. Rolling mill**

- Increase in number of heats of operation every day from 20 heats to 22 heats

11. The land required for the plant is 273.07 ha, out of which 218.82 ha is private agricultural land and 54.25 ha is Government land comprising of 22.53 ha leaseable, 13.95 ha grant, 14.61 concessional and 11.16 ha forest land. Forest land is involved, 88% of forest clearance has been obtained from MOCI & CC vide letter no. 5-ORR/2014-RRI, dated 02.07.2015. 90% of land (246.255 ha) is in possession of company and balance of 26.819 ha is pending with Tehsilidhar, Hindal. No river passes through the project area.

12. The topography of the project is flat and reported to lie between 22°45'14" to 22°46'24" N Latitude and 85°17'12" to 85°18'45" E Longitude in Survey of India Open Series Maps No. F4511. The average ground elevation of the project area is 75-95 m AMSL. The ground water table is reported to range 1.42 m to 8.61 below the land surface during the pre-monsoon season and 2.01 m to 8.32 m below the land surface during the post-monsoon season.

13. National park/wildlife sanctuary/biosphere reserve/tiger reserve/elephant reserve etc. are reported to be located in the core and buffer zone of the project. The Salkasia Gorge WLS is located at a distance of 40 km from the site. Site specific wildlife conservation plan

has been prepared and approved by PCCF (WL) Government of Odisha vide letter no. 3188/WL-asp-10/2015 dated 09.04.2015.

14. The existing baseline status based on the data collected during the post project monitoring for the existing EC is given as below:

- Ambient air quality monitoring: PM<sub>10</sub> (49.1 to 70.09 µg/m<sup>3</sup>), PM<sub>2.5</sub> (28.8 to 39.6 µg/m<sup>3</sup>), SO<sub>2</sub> (7.0 to 9.5 ppb/m<sup>3</sup>) and NO<sub>x</sub> (10.2 to 12.6 in µg/m<sup>3</sup>).
- Ground water quality has been monitored in 4 locations in the study area and results indicate pH in range of 6.4-7.3, TSS between 4-14 mg/l, TDS between 164-712 mg/l, total hardness between 275-490 mg/l, Chloride between 19-115 mg/l, Fluoride between 0.14-0.46 mg/l and iron as below detection limit.
- Noise level are in the range of 49.06 to 51.48 dBA for day time and 40.18 to 41.34 dBA for night time.

15. The resource requirement and the pollution load assessment for the enhancement in ISP capacity from 2.85 MTPA to 3.0 MTPA is furnished as below:

| Sl. No. | Item                                   | As per EC dated 11.09.2019                                          | Proposed Increase | Total                     | % change                                      |
|---------|----------------------------------------|---------------------------------------------------------------------|-------------------|---------------------------|-----------------------------------------------|
|         | Production of finished steel           | 2.85 MTPA                                                           | 0.15 MTPA         | 3.0 MTPA                  | +5.3%                                         |
| 1       | Raw Material (in house & outside), TPA | 37,055,387                                                          | 312,772           | 37,368,159                | +1%                                           |
| 1.1     | Coal, TPA                              | 4,844,936                                                           | -89301            | 4,755,635 (1.4% decrease) | -1.4%                                         |
| 1.2     | Iron Ore & fines, TPA                  | 12,523,824                                                          | 0                 | 12,523,824 (no change)    | No change                                     |
| 1.3     | Dolomite, TPA                          | 517,581                                                             | 15,7436           | 533,327                   | +2.5%                                         |
| 1.4     | Steel Scrap, TPA                       | 26,294                                                              | 43222             | 69,516                    | +154%                                         |
| 2       | Finished Product                       |                                                                     |                   |                           |                                               |
| 2.1     | Coilables                              | 627,900                                                             | -99200            | 528,700                   | -16%                                          |
|         |                                        |                                                                     |                   |                           | (part load will be utilized in house in DRIL) |
| 2.4     | Roll Finished Product                  | 1,607,000                                                           | 150000            | 1,757,000                 | +9.4%                                         |
| 3       | Electricity                            | 2650                                                                | 50                | 2700                      | +1.9%                                         |
| 4       | Power, kW                              | 376                                                                 | 18                | 394                       | +4.7%                                         |
| 5       | Water & waste water                    |                                                                     |                   |                           |                                               |
| 5.1     | Fresh water consumption (cum/hr)       | 2950                                                                | 21                | 2971                      | +1%                                           |
| 5.2     | Waste water generation (cum/hr)        | 54%                                                                 | 2                 | 548                       | +0.5%                                         |
| 5.3     | Utilization of waste water (%)         | 100% in Ash quenching, dust suppression, brick plant, fertilization |                   |                           |                                               |

As per company's statement, the requirement of electricity is 2650 kW, the requirement of power is 376 kW, the requirement of water is 2950 cum/hr, the requirement of waste water is 54% of fresh water, the requirement of finished product is 1,757,000 cum/hr, the requirement of coilables is 528,700 cum/hr, the requirement of steel scrap is 69,516 cum/hr, the requirement of dolomite is 533,327 cum/hr, the requirement of coal is 4,755,635 cum/hr, the requirement of iron ore & fines is 12,523,824 cum/hr, the requirement of raw material is 37,368,159 cum/hr, the requirement of finished product is 1,757,000 cum/hr, the requirement of coilables is 528,700 cum/hr, the requirement of steel scrap is 69,516 cum/hr, the requirement of dolomite is 533,327 cum/hr, the requirement of coal is 4,755,635 cum/hr, the requirement of iron ore & fines is 12,523,824 cum/hr, the requirement of raw material is 37,368,159 cum/hr.

| Sl. No | Item                                | As per EC dated 11.09.2019                           | Proposed Increase     | Total           | % change |
|--------|-------------------------------------|------------------------------------------------------|-----------------------|-----------------|----------|
| 6      | Common monitoring basin             | 40x20x8m                                             | N/A                   | 40x30x8m        |          |
| 7      | Transformer, mva. per hour          | 107                                                  | 2                     | 109             | 1.9%     |
| 8      | Air Quality                         | Terrain based AAQ2 modelling carried out using ISC3D | Revised for expansion | Stack emissions |          |
|        | GI <sub>1</sub> , mg/m <sup>3</sup> | PM <sub>10</sub>                                     | 16.13                 | 16.24           | 0.7%     |
|        |                                     | SO <sub>2</sub>                                      | 41.87                 | 46.43           | 7.88%    |
|        |                                     | NO <sub>2</sub>                                      | 17.90                 | 17.53           | -3%      |

16. There will be increase in solid waste generation by 130.296 TPA. The solid waste generation is increase in Chlor from DRI Kiln (4,511 TPA), ESP dust from DRI Kiln (102,624 TPA), Kiln Aeration from DRI Kiln (17,053 TPA), Bag filter dust from Induction furnace (10,346 TPA), Mill scale from SMS caster (3,080 TPA) and Mill Scale from Rolling Mill (2,818 TPA). While the solid waste generation will reduce in Slag in Induction Furnace (29,909 TPA) and Reject from RMS-SMTOPP at Rolling Mill (166 TPA).

17. The capital cost of the proposed amendment and enhancement is Rs. 30 crore and the capital cost for environmental management is proposed as Rs. 50 lakhs. The amount recurring and towards the environmental protection measures is proposed as Rs. 2 lakhs per annum. The funds allocated towards CRR is Rs. 50 lakhs.

18. The total green area will be 90.11 ha, which is about 33% of the total area. A 10 m wide green belt, consisting of at least 3 tiers around boundary will be developed as green belt and green cover as per CPCB/ MUDH&CE, New Delhi guidelines. Total 2.25 lakh trees will be planted and total funds allocated is Rs. 1.26 crore.

19. Public hearing like the existing EC held on 07.03.2019 as per the provisions laid down in the EIA Notification, 2006.

20. The proponent has mentioned that there is no court case or violation under EIA Notification to the project or related activity.

21. Name of consultant: M/s. Mec Consultancy Private Limited, New Delhi. The consultant is preparing and presenting reports as per the High Court of Delhi order in L.P.A. 110/2014 and CM No.2175/2014 (stay) and W.P.(C) 3660/2016.

#### Observations of the Committee

22. The Committee noted the following:

- As per the records made available by the project proponent, the capacity of Integrated Steel Plant is increasing from 2.35 MTPA to 3.0 MTPA by change in configuration of the units followed by the usage of superior coal quality with hemi-fixed Carbon content and increase in feed of iron ore-pellet. There will be no

change in land requirement and reduction in anticipated emission level due to the adoption of higher configuration units. Therefore, the Committee consider the instant proposal under para 7(i) (a) of the EIA Notification, 2006 and dispense with the requirement of conducting fresh public consultation. Further, noted that PP has taken corrective action to the observations made in the inspection report of R.O.

- The committee also taken note of the issues stated in the public representation dated 28/04/2020 of Shri.V.P.L.padhyay against the instant project under consideration and was of the view that any change in configuration of the plant during execution of the project after detailed engineering is permitted under clause 7(i) of the EIA Notification, 2006.

#### Recommendations of the Committee

23. In view of the foregoing and after detailed deliberations, the committee recommended the project for grant of Environment Clearance under para 7(ii) of EIA Notification, 2006 in supersession of the existing EC dated 11/09/2019 subject to the following specific condition as in addition to the applicable general conditions as per the Ministry's Office Memorandum No. 22-34/2018-II dated 9/8/2018 pertaining to integrated steel plants.

- An affidavit shall be submitted to the Ministry stating that observations made in the inspection report of Regional Office has been complied with in three months from date of issue of the Environment Clearance.
- Use of high grade coal with maximum ash content of 28% in DRI shall be ensured.
- Increase in green belt and plantation within and outside the plant area by 2 ha over and above stipulated 2.1 ha shall be carried out with a minimum 10-metre-wide by using local broadleaved tree species.
- ESP and bag filters shall be designed to reduce FSI below 30 mg/Nm<sup>3</sup> compared to earlier proposal of 50 mg/Nm<sup>3</sup>.
- Advanced controllers to improve efficiency of bag filters shall be installed.
- PP shall control the fugitive emissions by installing fixed water sprinklers and operation of mobile industrial vacuum cleaner.
- No additional water shall be abstracted for the instant project.
- No Tailing ponds for iron ore fines and coal washery rejects shall be permitted. Instead the classifiers and belt filters shall be installed to make slimes and rejects useful for sale.
- Only one-year storage is permitted for scrap metal storage.
- Project proponent shall ensure that 80% Sulphur is removed from the coke oven waste gases from the hot gas recovery boiler. PP shall also prepare an SOP for monitoring the removal and reduction of Sulphur in coke oven.
- Project proponent shall ensure that the railway siding is established within a period of 5 years or before commissioning of the full capacity of the plant, whichever is earlier.
- Project proponent shall ensure that the proportion of hot charging in rolling mill is not to be less than 80 %.
- CRR activities shall be completed within a timeframe of 3 years as per the action plan submitted by the project proponent.

For more details, please refer to the project report and the public hearing report. The project is a large scale project and the capacity of the plant is increasing from 2.35 MTPA to 3.0 MTPA.

**Decision of MoEF/CPCB**

24. The Ministry of Environment, Forest and Climate Change has considered the application based on the recommendations of the Expert Appraisal Committee (Industry-I) and hereby decided to grant Environment Clearance for project cited above under the provisions of para 7(2) of the EIA Notification, 14<sup>th</sup> September, 2006 in supersession of the existing EC dated 11/09/2019 subject to strict compliance of the following Specific and General Conditions:

**A. Specific Conditions**

- i. An affidavit shall be submitted to the Ministry stating that observations made in the Inspection report of Regional Office has been complied within three months from date of issue of the Environment Clearance.
- ii. Use of high grade coal with maximum ash content of 28% in fuel shall be ensured.
- iii. Increase in green belt and plantation within and outside the plant area by 2 ha over and above stipulated 35 % shall be carried out with a minimum 10-meter-wide by using local broadleaved tree species.
- iv. ESP and bag filters shall be designed to reduce PM below 30 mg/Nm<sup>3</sup> compared to earlier proposal of 50 mg/Nm<sup>3</sup>.
- v. Advanced technologies to improve efficiency of bag filters shall be installed.
- vi. PP shall control the fugitive emissions by installing fixed water sprinklers and operation of mobile industrial vacuum cleaner.
- vii. No additional water shall be abstracted for the ongoing project.
- viii. No Tailing ponds for iron ore fines and coal washery rejects shall be permitted. Instead the classifiers and belt filters shall be installed to make slimes and rejects useful for sale.
- ix. Only one-year storage is permitted for accretion material storage.
- x. Project proponent shall ensure that 80% Sulphur is recovered from the coke oven waste gases from the heat recovery boiler. PP shall also prepare an SOP for monitoring the recovery and reduction of Sulphur in coke oven.
- xi. Project proponent shall ensure that the railway siding is established within a period of 3 years or before commissioning of the full capacity of the plant, whichever is earlier.
- xii. Project proponent shall ensure that the proportion of hot charging or rolling mill is not to be less than 80 %.
- xiii. CER activities shall be completed within a timeframe of 3 years as per the action plan submitted by the project proponent.

**B. General conditions**

- i. **Shoreline compliance**
- ii. The project proponent shall prepare a Site-Specific Conservation Plan & Wildlife Management Plan and approved by the Chief Wildlife Warden. The recommendations of the appraisal Site-Specific Conservation Plan / Wildlife Management Plan shall be implemented in consultation with the State Forest Department. The implementation report shall be filed along with the six-monthly compliance report.
- iii. The project proponent shall obtain Consent to Establish / Operate under the provisions of Air (Prevention & Control of Pollution) Act, 1981 and the Water (Prevention & Control of Pollution) Act, 1974 from the concerned State Pollution Control Board Committee.

For the concerned Committee for clearance of projects in India, the project shall be subject to the following conditions: For the concerned Committee for clearance of projects in India, the project shall be subject to the following conditions: For the concerned Committee for clearance of projects in India, the project shall be subject to the following conditions:

- iv. The project proponent shall obtain the necessary permission from the Central Ground Water Authority, in case of draw of ground water from the competent authority concerned in case of draw of surface water required for the project.
- v. The project proponent shall obtain authorization under the Hazardous and other Waste Management Rules, 2016 as amended from time to time.

**II. Air quality monitoring and preservation**

- i. The project proponent shall install 24x7 continuous emission monitoring system to process stacks to monitor stack emission with respect to standards prescribed in Environment (Protection) Rules 1986 vide G.S.R. 277 (E) dated 3<sup>rd</sup> March 2012 (Integrated Iron & Steel), G.S.R. 414 (E) dated 30<sup>th</sup> May 2018 (Spillage from as amended from time to time: S.O. 3365 (E) dated 7<sup>th</sup> December 2011 (Thermal Power Plants) as amended from time to time and connected to SPCB and CPCB online servers and calibrate these system from time to time according to equipment supplier specification through labs recognised under Environment (Protection) Act, 1986 or NABL accredited laboratories.
- ii. The project proponent shall monitor fugitive emissions in the plant premises at least once in every quarter through labs recognised under Environment (Protection) Act, 1986.
- iii. The project proponent shall install system to capture Continuous Ambient Air Data by monitoring for common carbon monoxide, relevant to the major pollutants released (e.g. PM10 and PM2.5 in reference to PM emission, and SO<sub>2</sub> and NO<sub>x</sub> in reference to SO<sub>2</sub> and NO<sub>x</sub> emissions) within and outside the plant stack at least in four locations (two within and three outside the plant area at an angle of 135° each), covering upwind and downwind directions.
- iv. The cameras shall be installed at suitable locations for 24x7 recording of battery emissions on the both sides of coke oven batteries and videos shall be preserved for at least one-month recordings.
- v. Sampling Gas dry at process stacks and at quenching towers shall be provided as per CPCB guidelines for manual monitoring of emissions.
- vi. The project proponent shall submit monthly summary report of continuous stack emission and air quality monitoring and results of manual stack monitoring and manual monitoring of air quality (fugitive emissions to Regional Office of MoEF/C, Zonal office of CPCB and Regional Office of SPCB along with six-monthly monitoring report.
- vii. Appropriate Air Pollution Control (APC) system shall be provided for all the dust generating points including fugitive dust from all vulnerable sources, so as to comply prescribed stack emission and fugitive emission standards.
- viii. The project proponent shall provide leakage detection and mechanical bag cleaning facilities for better maintenance of bags.
- ix. Secondary emission control system shall be provided at SMS Converter.
- x. Pollution control system in the steel plant shall be provided as per the CEEP Guidelines of CPCB.
- xi. Sufficient number of mobile or stationary vacuum cleaners shall be provided to clean plant roads, shop floors, roads regularly.

For the concerned Committee for clearance of projects in India, the project shall be subject to the following conditions: For the concerned Committee for clearance of projects in India, the project shall be subject to the following conditions: For the concerned Committee for clearance of projects in India, the project shall be subject to the following conditions:

- xii. Recycle and reuse iron ore fines, coal and coke fines, lime fines and such other fines collected in the pollution control devices and vacuum cleaning devices in the process after briquetting/agglomeration.
- xiii. The project proponent use leak proof trucks/dumpers carrying coal and other raw materials and cover them with tarpaulin.
- xiv. Facilities for spillage collection shall be provided for coal and coke on wharf of coke oven batteries (Chain conveyors, land based industrial vacuum cleaning facility).
- xv. Land-based APC system shall be installed to control coke pushing emissions.
- xvi. Monitor CO, H<sub>2</sub> and O<sub>2</sub> in flue gases of the coke oven battery to detect combustion efficiency and avoid leakage in the combustion chamber.
- xvii. Vapour absorption system shall be provided in place of vapour compression system for cooling of coke oven gas in case of recovery type coke ovens.
- xviii. In case unwanted ammonia liquor is generated, adopt high temperature incineration technology (Incinerators and Furnaces). Suitable NO<sub>x</sub> control facility shall be provided to meet the prescribed standards.
- xix. The coke oven gas shall be subjected to desulphurisation if the sulphur content in the coal exceeds 1%.
- xx. Wind shelter fence and chemical spraying shall be provided on the raw material stock piles.
- xxi. Design the ventilation system for adequate air changes as per ACGIH document for all tunnels, motor houses, Oil Ref. etc.
- xxii. The project proponent shall install Dry Gas Cleaning Plant with two, Filter for Blast Furnace and SMS converters.
- xxiii. Dry quenching (CDQ) system shall be installed along with power generation facility from waste heat recovery from hot coke.

### III. Water quality monitoring and preservation

- i. The project proponent shall install 24x7 continuous effluent monitoring system with respect to standards prescribed in Environment (Protection) Rules 1986 vide G.S.R. 377 (E) dated 31<sup>st</sup> March 2012 (Integrated Iron & Steel); G.S.R. 414 (E) dated 30<sup>th</sup> May 2008 (Sponge Iron) as amended from time to time, S.O. 3305 (E) dated 7<sup>th</sup> December 2015 (Thermal Power Plants) as amended from time to time and connected to SPCB and CPCB online servers and calibrate these system from time to time according to equipment supplier specification through labs recognised under Environment (Protection) Act, 1986 or NABL accredited laboratories.
- ii. The project proponent shall monitor regularly ground water quality in three times a year (pre and post monsoon) at sufficient numbers of piezometer/sampling wells in the plant and adjacent areas through labs recognised under Environment (Protection) Act, 1986 and NABL accredited laboratories.
- iii. The project proponent shall submit monthly summary report of continuous effluent monitoring and results of annual effluent testing and manual monitoring of ground water quality to Regional Office of MoEF&CC, Zonal Office of CPCB and Regional Office of SPCB along with six-monthly monitoring report.

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- iv. The project proponent shall provide the LTP for coke oven and by-product to meet the standards prescribed in G.S.R. 377 (E) dated 31<sup>st</sup> March 2012 (Integrated Iron & Steel); G.S.R. 414 (E) dated 30<sup>th</sup> May 2008 (Sponge Iron) as amended from time to time, S.O. 3305 (E) dated 7<sup>th</sup> December 2015 (Thermal Power Plants) as amended from time to time.
  - v. Adherence to 'Zero Liquid Discharge'.
  - vi. Sewage Treatment Plant shall be provided for treatment of domestic wastewater to meet the prescribed standards.
  - vii. Overflow drains and collection pits shall be provided for each stock pile to arrest the run-off in the event of heavy rains and to check the water pollution due to surface run-off.
  - viii. Tyre washing facilities shall be provided at the entrance of the plant gates.
  - ix. CDD Injection shall be provided in CRP or SMS to reduce pH in circulating water to ensure optimal recycling of treated water for converter gas cleaning.
  - x. The project proponent shall maximise rainwater harvesting to maximum possible extent.
  - xi. Treated water from ETP or CRP shall not be used for coke quenching.
  - xii. Water meters shall be provided at the inlet to all unit processes in the steel plants.
  - xiii. The project proponent shall make efforts to minimise water consumption in the steel plant complex by segregation of used water, providing cascade use and by recycling treated water.
- ### IV. Noise monitoring and prevention
- i. Noise level survey shall be carried as per the prescribed guidelines and report in this regard shall be submitted to Regional Office of the Ministry as a part of six-monthly compliance report.
  - ii. The ambient noise levels should conform to the standards prescribed under E(P)A Rules, 1986 viz. 75 dB(A) during day time and 70 dB(A) during night time.
- ### V. Energy Conservation measures
- i. The project proponent shall provide TRTs to recover energy from top gases of Blast Furnaces.
  - ii. Coke Dry Quenching (CDQ) shall be provided for coke quenching for loss recovery and non-recovery type coke ovens.
  - iii. Waste heat shall be recovered from Sinter Plant coolers and Sinter Machines.
  - iv. Use torpedos ladles for hot metal transfer as far as possible. TC ladles not used, provide covers for open top ladles.
  - v. Use hot charging of slabs and billets/blooms as far as possible.
  - vi. Waste heat recovery systems shall be provided in all units where the flue gas or process gas exceeds 300°C.
  - vii. Explore feasibility to install WJRS at Waste Gases from BF stoves; Sinter Machine; Sinter Cooler; and all reheating furnaces and if feasible shall be installed.
  - viii. Restrict Gas flaring to < 1%.

- ix. Provide solar power generation on roof tops of buildings. For solar light system for all common areas, street light, parking around project area and maintain the same regularly.
- x. Provide LED lights in their offices and residential areas.
- xi. Ensure installation of regenerative type burners on all reheating furnaces.

#### VI. Waste management

- i. A saturation grinding unit to improve the bulk density of BP granulated slag from 1.1 to 1.3 Kgf shall be installed to use slag as river sand in construction industry.
- ii. In case of Non-Returnary coke ovens, the gas main carrying hot gas to the boiler, shall be insulated to conserve heat and to maximize heat recovery.
- iii. Tar Sludge and waste oil shall be blended with coal charged in coke ovens (applicable only to recovery type coke ovens).
- iv. Carbon recovery plant to recover the elemental carbon present in GCP slumurs for use in Sinter plant shall be installed.
- v. Waste recycling Plant shall be installed to recover scrap, metallic and flux for recycling to sinter plant and SMC.
- vi. Used refractories shall be recycled as far as possible.
- vii. SMC slag after metal recovery in waste recycling facility shall be conditioned and used for road marking, railway track ballast and other applications. The project proponent shall install a waste recycling facility to recover metallic and flux for recycle to sinter plant. The project proponent shall establish linkage for 100% reuse of rejects from Waste Recycling Plant.
- viii. 100% utilization of fly ash shall be ensured. All the fly ash shall be provided to cement and brick manufacturers for further utilization and Memorandum of Understanding in this regard shall be submitted to the Ministry's Regional Office.
- ix. Oil Collection pits shall be provided in oil cellars to collect and reuse/recycle spilled oil. Oil collection trays shall be provided under roofs on saddles in cold oil cell storage area.
- x. The waste oil, grease and other hazardous waste like acidic sludge from pickling, galvanizing, chrome plating etc. shall be disposed of as per the Hazardous & Other waste (Management & Transboundary Movement) Rules, 2016. Cold tar sludge / decanter shall be recycled to coke ovens.
- xi. Kitchen waste shall be composted or converted to biogas for further use.

#### VII. Green Belt

- i. Green belt shall be developed in an area equal to 33% of the plant area with a native tree species in accordance with CPCB guidelines. The greenbelt shall cover the entire periphery of the plant.
- ii. The project proponent shall prepare GHG emissions inventory for the plant and shall submit the programme for reduction of the same including carbon sequestration including plantation.

#### VIII. Public hearing and Human health issues

- i. Emergency preparedness plan based on the Hazard Identification and Risk Assessment (HIRA) and Disaster Management Plan shall be implemented.
- ii. The project proponent shall carry out health stress and jaw for the workers who work in high temperature work area and provide Personal Protection Equipment (PPE) as per the norms of Territory Act.
- iii. Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile SLP, safe drinking water, medical health care, canteen etc. The housing may be in the form of temporary structures to be removed after the completion of the project.
- iv. Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the Factories Act.

#### IX. Corporate Environmental Responsibility

- i. The project proponent shall comply with the provisions contained in this Ministry's OM vide F.No. 22-60/2017-IA.III dated 1<sup>st</sup> May 2018, as applicable, regarding Corporate Environment Responsibility.
- ii. The company shall have a well laid down environmental policy duly approved by the Board of Directors. The environmental policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infractions / violation / violation of the environmental / forest / wildlife norms / regulations / deviations. The company shall have defined system of reporting infractions / deviation / violation of the environmental / forest / wildlife norms / regulations and / or shareholders / stake holders. The copy of the board resolution in this regard shall be submitted to the MoEF&OC as a part of six-monthly report.
- iii. A separate Environmental Cell both at the project and company head quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly report to the head of the organization.
- iv. Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Comp. Unit Report.
- v. Self-environmental audit shall be conducted annually. Every three years third party environmental audit shall be carried out.
- vi. All the recommendations made in the Charter on Corporate Responsibility for Environment Protection (CREP) for the Iron and Steel plants shall be implemented.

#### X. Miscellaneous

- i. The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent's website permanently.

- ii. The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies: Panchayats and Municipalities. Besides, in addition, to the relevant offices of the Government who in turn has to display the same for 30 days from the date of receipt.
- iii. The project proponent shall upload the status of compliance of the stipulated environmental clearance conditions, including results of monitored data on their website and update the same on half yearly basis.
- iv. The project proponent shall monitor the critical pollutants like, namely; PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>x</sub> (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the projects and display the same at a convenient location for disclosure to the public and put on the website of the company.
- v. The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the Ministry of Environment, Forest and Climate Change at environment clearance portal.
- vi. The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.
- vii. The project proponent shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities, commencing the land development work and start of production operation by the project.
- viii. The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.
- ix. The project proponents shall abide by all the commitments and recommendations made in the EIA/EMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.
- x. No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (MoEF&CC).
- xi. Concealing factual data or submission of falsified data may result in revocation of this environmental clearance and strict action under the provisions of Environment (Protection) Act, 1986.
- xii. The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.
- xiii. The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.
- xiv. The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer(s) of the Regional Office by furnishing the requisite data / information/monitoring reports.
- xv. The above conditions shall be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other

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Wastes (Management and Transboundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India; High Courts and any other Court of Law relating to the subject matter.

- xvi. Any appeal against this EC shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.

24. This issues with the approval of the Competent Authority

(A.K. Agrawal)  
Director

Copy 004-

1. Secretary, Department of Forests, Government of Odisha, Secretariat, Bhubaneswar.
2. Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-um-Office Complex, East Arjun Nagar, Delhi-110032.
3. Deputy Director General (Central), Ministry of Environment, Forest and Climate Change, Regional Office (EZ), A-1, Chandrasekharpur, Bhubaneswar - 751023.
4. Chairman, Odisha State Pollution Control Board, Parivesh Bhawan, A/118 Nilakantha Nagar, East-VIII, Bhubaneswar-751013.
5. Member Secretary, Central Ground Water Authority, West Block - II, Wing -3, Sector 3, R.K.Puram, New Delhi - 110086.
6. District Collector, Dhenkanal District, Odisha.
7. Guard File/Record File/Monitoring File.
8. MoEF&CC website.

(A.K. Aggarwal)  
Director



**F. No. J-11015/107/2018-TA-II (M)**  
**Government of India**  
**Ministry of Environment, Forest and Climate Change**  
**Impact Assessment Division**  
 \*\*\*\*\*

[India Paryavaran Bhawan  
 Agn. Wing, 1<sup>st</sup> Floor, Allgaaj,  
 Jor Bagh Road, New Delhi-110 003]

**Dated: 11 September 2019**

To:

**M/s Rungta Sons Pvt. Ltd.**  
 Main Road, Barbil-758035  
 District-Kandujhar  
 Odisha

**Subject: Saindipur Iron & Bauxite Mine with Enhancement of production capacity of Iron Ore from 4.50 million TPA (2.85 million TPA ROM Iron ore + 1.65 million TPA low grade iron ore from old low grade ore stacks & dumps) to 8.06 million TPA (7.0 MTPA ROM Iron Ore + dry screening and crushing of 1.06 MTPA low grade iron ore from old dumps/stacks within lease area) of M/s Rungta Sons Pvt. Ltd., located at villages Saindipur & Oraghat, Tehsil - Koiras, District - Sundargarh, Odisha (MLA 147.10ha). (Consultant: Ecomen Laboratories Pvt. Ltd)- Environmental Clearance Regarding.**

**Ref.: Project proposal no. IA/OR/MIN/77060/2016; Old File No.-J-11015/206/2012-TA-II (M); Old Proposal No. IA/OR/MIN/90577/2012.**

Sir,

This is with reference to your above mentioned proposal of M/s Rungta Sons Pvt. Ltd. for enhancement of production capacity of Iron Ore from 4.50 million TPA (2.85 MTPA ROM Iron ore + 1.65 MTPA of low grade iron ore from old low grade ore stacks & dumps) to 8.06 million TPA (7.0 million TPA Iron ore (ROM) + dry screening and crushing of 1.06 million TPA low grade iron ore from old dumps/stacks within lease area) in the mine lease area of 147.10 ha. The mine lease area is located in village(s) Saindipur and Oraghat, Koiras Tehsil, Sundargarh District, Odisha. The mine lease area is bounded by Latitude and Longitude of 21° 55' 16.114" to 21° 55' 54.912" N & 85° 17' 19.494" to 85° 18' 29.368" E in the Survey of India Toposheet No 73G/5 (F45N5).

2. Project proponent (PP) submitted that the proposal of TOR was earlier considered by the Expert Appraisal Committee in its meeting held during September 28-29, 2013 and the TOR was issued by the Ministry vide letter no. J-11015/107/2018-TA-II (M) dated: 21<sup>st</sup> October 2018. PP submitted the EIA/EVP Report to Ministry for seeking environmental clearance.

3. PP submitted that the total lease area is 147.10 hectares. Out of 147.10 ha, 126.374 ha is forest land and 20.726 ha is non-forest land. PP has obtained forest clearance for 68.135 ha (57.742 ha + 10.393 ha). The forest clearance for

57.742 ha (including 36.591 ha of protected forest + 13.731 ha DFO forest and 0.260 ha PRI) was obtained vide Ministry's letter no. S-135/2003-FC dated 19.06.2006 and further for 10.393 ha (including 4.020 ha of forest land to be maintained as safety zone) vide Ministry's letter No. S-135/2003-FC (vol.), dated 24.10.2013. The remaining 58.185 ha (126.374 ha - 68.135 ha) of forest land and 20.726 ha of non-forest land (total 58.261 ha) was proposed for surrender by the lessee in the application for 1<sup>st</sup> renewal of mining lease for reduced area over 60.727 ha (147.10 - 58.363 ha). However, in accordance to Section 6-A(5) of MMOR Amendment Act, 2015 the period of the original mining lease has been extended up to 05.09.2035 over the entire mining lease of 147.10 ha by execution of supplementary lease deed on 14.07.2016. Therefore, the PP has applied online for obtaining forest clearance vide Proposal No. IP/OR/MIN/35045/2018, dated 30.07.2018 for the balance 50.109 ha of Undeclared forest land (earlier proposed for surrender) as well as 14.7 ha of forest land for mining purpose which was earlier diverted for safety zone i.e., total forest area to be diverted is 59.606 ha (58.185 ha + 1.417 ha) notified under the existing mining lease area over 147.10 ha. Out of 59.606 ha forest land 57.515 ha will be used for mining and ancillary activities and 2.091 ha will be maintained as safety zone. The forest clearance for 59.606 ha is still under process. However, PP submitted that the MPP amount for the total forest land was paid by PP to JFO, Bonga Division, Bonga, District-Sundargarh. PP submitted the site specific wild life conservation plan for 114 Lekhs from the office of the PCCF and Chief Wildlife Warden vide letter no.6443 dated 31.12.2019. PP further submitted that the list of Schedule I species such as Elephant, Sloth Bear & Gaur is included in the earlier approved letter dated 31.10.2009. However, the PP vide letter no. RSP/FP/FC/2019-20/155A dated 17.04.2019 submitted that the Site Specific conservation plan for Schedule I species such as Elephant, Sloth Bear & Gaur is submitted to Divisional Forest Officer, Bonga, District-Sundargarh for approval and the same is under process.

4. PP submitted that the lease deed was granted on 05.09.1985 for 20 years which was valid up to 05.09.2005 and the PP had continued to conduct mining operation in the said lease under the deemed extension provisions of section 8 of the MMOR Act, 1957 with the permission from the Government. Now, the supplementary lease deed was executed on 14.07.2016 as per the Amended MMOR Act, 2015 and the lease validity is extended up to 05 September 2035. The PP submitted that the Modified mining plan including progressive mine closure plan over an area of 147.10 ha has been approved by BEM, Bilaspur vide letter no. MPP/FH/10-ORJ/S&U/2016-19 dated 14.07.2018 which is valid up to 31.03.2020.

5. PP reported that the mine was accorded environmental clearance by the Ministry, vide letter no. J-11015/206/2012-TA-II (M), dated 19.11.2013 for 7.85 MTPA of ROM Iron ore, 1.65 MTPA of low grade iron ore from old low grade ore stacks & dumps (total handling 4.5 million TPA) and installation of wet beneficiation plant of 1.44 MTPA capacity over mining lease area of 98.91 ha (68.135 ha forest area for which FC is available) + 20.726 ha (non forest area). Now it is proposed to increase the production of ROM from 4.50 million TPA to total handling of 8.06 million TPA which includes 7.0 million ROM excavation from mine + dry screening and crushing of 1.06 million TPA low grade iron ore from old dumps/stacks within lease area. FC for wet beneficiation plant with throughput capacity of 1.44 MTPA has already been accorded in the

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environmental clearance by the Ministry, vide letter no. L-11015/206/2017 (A.O. (M), dated 19.11.2013 and the same will continue. PP further submitted that at present, the production of the mine is from excavation of iron ore (ROM) from the mine and then dry screening and crushing of iron ore for different grade and size of ore. Low grade ore from old stacks and dumps within mine lease area are also crushed and screened to obtain different fractions of ore. The low grade ore produced from the dry crushing and screening process is upgraded through wet beneficiation unit. PP also mentioned that there is no production of Bauxite at present and also not proposed in future. PP submitted the existing land use patterns which are area excavated (27.85 ha), Over burden/dump (16.13 ha), Mineral storage (2.84 ha), Infrastructure (2.10 ha), Roads (1.20 ha), Green belt & plantation (7.0 ha), Mineral processing plant (2.518 ha), Mine Camp (0.60 ha), Beneficiation plant & Tailing pond (5.92 ha), other purpose (0.65 ha) and Unutilized land (80.262 ha), respectively. PP also submitted the proposed end use pattern which are area excavated (90.92 ha), Over burden/dumps (14.11 ha), Mineral storage (4.67 ha), Infrastructure (2.688 ha), Roads (2.961 ha), Green belt & plantation (10.465 ha), Mineral processing plant (0.856 ha), Mine Camp (0.60 ha), Beneficiation plant & Tailing pond (13.25 ha), and other purpose (0.65 ha), respectively.

c. PP submitted that the total geological reserve of iron ore as per approved mining scheme is 65.17 million tonnes and life of the mine is around 8 years. PP further submitted that the mining method will be open cast mining with mechanized drilling with 110 mm drill machine, deep hole blasting, excavation by excavator of capacity 3.2 m<sup>3</sup>/2.5 m<sup>3</sup> and stacking by loader at 1.7 m<sup>3</sup> will be done. The existing in-situ crushing & screening of iron ore will continue. During the mining Scheme period 2019-20, major production will be obtained from C-Top Quarry. The target production will be achieved by developing the benches of 6-9 m height with width upto 10-20 m. The ROM and low grade ore produced will be hauled through trucks/dumpers to dry screening & crushing plants as well as wet beneficiation plants. After processing, the finished iron ore products will be carried to the Railway sidings by trucks and loaded into Rail wagons and dispatched mainly to the steel, pelletization, sponge, sinter plants throughout India and also to port for export. The Overburden waste materials to be generated consists of banded, silty laterite/shale/BHQ/BHQ having less than 45% Fe content. The existing over burden material lying in dumps A, B, & C is 2550546 m<sup>3</sup>. During 2018-19 & 2019-20 overburden waste material of 2366700 m<sup>3</sup> / 4613580 tonnage (MT) will be generated which will be dumped on waste dumps i.e. Dumps 'B' and Dump 'C' within the mining lease area, which after stabilization will be rehabilitated with native plant species. Further, the overburden waste material of 6253410 m<sup>3</sup>/12306820 MT to be generated after 2019-20. Life of the mine will be backfilled in the exhausted quarries and will be rehabilitated by native plant species. Out of proposed production of 3.06 MTPA of iron ore in the year 2019-20 the ROM iron ore production/excavation will be 7.0 MTPA for which the total excavation for 2019-20 will be 4252579 m<sup>3</sup>/2004980 MT, out of which 1507480 m<sup>3</sup>/3014500 MT will be overburden material/waste. There will be no ore production from the overburden waste to be generated from 2018-19 till life of the mine. PP further submitted that at the end of life of the mine, 50.21 hectare of exhausted quarry area will be back filled and developed for plantation.

7. PP submitted that the total water requirement at present is 1260 KLD (1178 KLD of surface water for industrial use/environmental maintenance + 111 KLD of ground water for drinking and domestic use only). PP further submitted that at present, the permission from Department of Water Resources (DWR), Govt. of Odisha for draw of 1178 KLD of surface water from Suna Nadi and 110 KLD of ground water is available with the PP. Total water requirement after expansion will be 3089 KLD (2839 KLD from surface water and 250 KLD from ground water). PP submitted that the NOC for withdrawal of 250 KLD of ground water was obtained from CGWA vide letter no. ZI-4(2017)/SER/CGWA/2005-1832 dated 13 December 2015. PP further submitted the renewal of NOC for ground water withdrawals vide NOC No: CGWA/NOC/414/CRIG/2019/1993 dated 29.05.2019.

8. PP submitted that the mine is in operation since 1986. Presently the mine is in operation with due compliance of the order dated 02.08.2017 in CWP No. 114/2014 of Hon'ble Supreme Court. The details are as follows:

| S. No. | Issues                                                                                                                         | PP submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Compliance of the order dated 02.08.2017 in CWP No. 114/2014 of Hon'ble Supreme Court                                          | The Deputy Director of Mines, Govt. of Odisha, vide Memo No. 1555/Mines, dated 09.01.2018 has issued a certificate that presently the mine is working with all valid the statutory clearances and in compliance of the Hon'ble Supreme Court Order dated 02.08.2017 in WP (C) 114/2014.                                                                                                                                                                                                                                                                                                                                                                             |
| 2      | Details of demand of levy raised by Department of Mining & Geology, Govt. of Odisha.                                           | Demarc. No. 5064/Mines dated 02.06.2017 for Rs. 309,26,17,667.00/- (Rupees One Hundred Nine Crore Twenty Six Lakhs Seventeen Thousand Six Hundred Sixty Seven & Four paise only) was issued by Deptt. of Mines, Govt. of Odisha vide letter No. 5064/Mines, dated 02.06.2017, amount compensation under section 21(5) of MMR Act, 1957 for production beyond EC limit prescribed under E.P. Act, 1986.                                                                                                                                                                                                                                                              |
| 3      | Details of payment of levy made to Department of Mines & Geology, Govt. of Odisha.                                             | Project Proponent reported that the payment of Rs. 109,26,17,667.00/- (Rupees One Hundred Nine Crore Twenty Six Lakhs Seventeen Thousand Six Hundred Sixty eight Only) has been made online to Deptt. of Steel & Mines, Govt. of Odisha vide C- Chalan No. 8443/94, dated 27.12.2017. E Record of 2017 which was issued for the remittance of Rs. 109,26,17,666/- in Treasury Chalan Ref No. 2700899-194, dt. 25.12.2017.                                                                                                                                                                                                                                           |
| 4      | Details of past production of mine since its inception. July authentication by Department of Mines & Geology, Govt. of Odisha. | The details of the past production figure from 1986 to 2016-17 is duly authenticated by the DMR, Koraput since its inception. July authentication by Department of Mines & Geology, Govt. of Odisha. The Committee noted that as per the Certificate provided by the Govt. of Odisha dated 08.04.2018, the PP has not enhanced the production capacity after grant of EC on 19.11.2013 and mine and the mine within the EC capacity of 4.5 million TPA of Iron Ore. The PP has submitted an affidavit dated 15.05.2018 in compliance of Ministry's OH dated 05.05.2018 in respect of the order of Hon'ble of Supreme Court dated 14.9.2017 in W.P.(C) No. 114/2014. |

5. PP submitted that the baseline data have been carried during March-May, 2010 for 2 Months. PP further submitted that the Micro-topography, Ambient air quality, Water quality, Water flow measurement, Noise level, So<sub>2</sub> quality, Socio-economic & Biodiversity study was carried out within 10 km radius of the lease area. The Ambient Air quality was monitored at 8 locations. Out of 8 locations the maximum PM<sub>10</sub> found within lease (Mining area) was 65.50 µg/m<sup>3</sup> and minimum value 50.50 µg/m<sup>3</sup> was found in Sagarahi village. Similarly the maximum PM<sub>10</sub> found within lease (Mining area) was 55.13 µg/m<sup>3</sup> and the minimum value 25.70 µg/m<sup>3</sup> was found in Sagarahi village. Highest SO<sub>2</sub> value (16.85 µg/m<sup>3</sup>) value was within lease (Mining area) and lowest SO<sub>2</sub> value (0.61 µg/m<sup>3</sup>) was in Deoghar. Similarly, the highest NO<sub>2</sub> (28.87 µg/m<sup>3</sup>) value was found in Mine Area (Within lease) and lowest NO<sub>2</sub> value (11.80 µg/m<sup>3</sup>) was recorded at Sana Indpur. The PP further submitted that the air quality modelling namely ISCST (Industrial Source Complex-Short Term) SC-3 model has been used for increased capacity production (including total excavation, number of trips etc.) and the incremental values for 1. Terrestrial pollutants were assessed. Incremental values for PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub> and SO<sub>2</sub> assessed through model and post project concentrations were estimated and found to be 94.74 µg/m<sup>3</sup> (Sarggarh), 55.62 µg/m<sup>3</sup> (Sarggarh), 24.83 µg/m<sup>3</sup> (Deoghar) and 8.80 µg/m<sup>3</sup> (Gharbuhari), respectively. PP further submitted that post project exposure concentrations are also within prescribed limit. PP further submitted the water quality was monitored at 7 locations. The surface water (3 samples) and ground water (4 samples) samples analysis revealed that all the parameters are well within the prescribed limit of 15: 22500 and 15: 10500. The noise level survey was carried out at 8 locations. The ambient noise level within Lease were found to be 64.5 & 65.23 dBA in day time and 61.30 & 61.20 dBA in night time respectively. PP further submitted that all the values are well within the prescribed limit of 75 and 70 dBA for industrial area in day and night time respectively. Similarly, at Sana Indpur, Sarggarh village, Gharbuhari village, Sagarahi village, Deoghar village and Silghora village the noise levels were also within the prescribed limit 55 dBA/45 dBA for residential area in day and night time respectively.

10. PP submitted that the Public Hearing was conducted by State Pollution Control Board on 28.12.2018 at open ground near Sarindpur Chawk at Sarindpur Village, Taluk Kuma, Sundargarh District. The Public Hearing was chaired by the Sri Bhaskar Chandra Triuk, Additional District Magistrate, Sundargarh. About 450 participants had attended the public hearing meeting. About 235 persons have put their signature in the attendance sheet, 43 persons took part in the deliberation and 23 written statements have been received from various stake holders on the day of public hearing. The major points raised by the public are Peripheral development of the area including infrastructural development, environmental protection and pollution control, Employment generation, drinking water, Education/skill development, medical/health care facilities and promotion of Agriculture /Plantation. PP has submitted the detail public hearing compliance with budgetary provision and time bound action plan. The Committee deliberated the issues raised during the PH and its action plan.

11. PP submitted the compliance report from MoEF&CC Regional Office Bhubaneswar, vide letter no. 121 B&B/EPF dated 18.07.2018 for case no. EC J-11013/2012/2012-10-11 (M) dated 19.11.2013. The Committee has deliberated the point wise compliance or Environmental Clearance. The report, inter-alia, mentioned that the project authority has complied or are in process of complying

with the conditions stipulated by the Ministry. The certain information /action plan have been sought on the following points (i) It is required to increase the green belt area by planting more plants during monsoon period and also put stress to achieve optimum plantation density i.e. 2500 plant per ha in plantation area/for plantation area including safety zone, (ii) It is required to maintain the density of the plantation on the boundary of Mine area towards Sona river and (iii) It is required to clean all the rain water harvesting structure/plot before and after the monsoon. PP further submitted the updated compliance report from RO MoEF&CC, Bhubaneswar, vide letter no. 121 B&B/EPF/1075 dated 26.06.2019 which mentioned that the PP is complied or are in process of complying the conditions stipulated by the Ministry.

12. It is informed to the Committee that the Ministry of Mines, vide Notification No.S.O.2017 (E) dated 22nd November, 2010 had appointed a Commission of Inquiry consisting Justice M.S. Shah, retired Judge of the Supreme Court of India, for the purpose of making an inquiry in to mining of iron ore and manganese ore in contravention of the provision of various Statutes and the rules and regulations issued there under, in various States including the State of Odisha. In view of Justice Shah Commission report (2013), the Ministry of Environment, Forest and Climate Change (MoEF&CC) has entrusted the work to CSIR-NEERI to conduct a Carrying Capacity Study with an objective to develop (i) a sustainable development plan for mining activities in the impact area of about 1000 sq.km. in the State of Odisha and (ii) an environmental management plan for current as well as future developmental scenarios. CSIR-NEERI has conducted the study encompassing collection of primary data for various environmental components (viz. air, noise, water, soil, etc.), biological and socio-economic aspects), collection and analysis of environmental quality data by different means in the region, modelling for transport, scenario and infrastructure need assessment, and meetings/workshops with different stakeholders (like Department of Mines & Metals, Directorate of Mines, JBM-HQ Bhubaneswar Office, SPCB, GSI, MoEF&CC, State Forest Dept. etc. as well as senior executives from respective mines). NEERI has submitted the report along with the recommendations. PP has made the point-wise presentation with the recommendations of CSIR-NEERI report on carrying capacity study which was included in the TOR condition w.r.t. mining lease of Iron Ore and/or manganese in the State of Odisha. The Committee deliberated the response submitted by PP.

13. PP submitted that the 2 cases are pending against the project. First, the 2(c) C.C. Case No. 54/2013 has been filed in the name of S.O.M, Bana, Sundargarh, for violation of Section 15 of the Environment (Protection) Act, 1986. The said case has been stayed on 20.01.2014 by the Hon'ble High Court of Orissa in CRLMP NO. 106/2014 in Misc. Case No. 20/2014. Last hearing of this case was held on 20.06.2018 with remarks that interim order passed earlier shall continue till the next case of listing. Second, the Revision Application bearing No. 27/(65)/2012/RC-1 has been filed by the lessee before the Mines Tribunal, Ministry of Mines, Govt. of India, New Delhi against the demand notice dated 28.10.2012 in H/S 21(5) of the MMDR Act, 1957, which has been disposed of by Mines Tribunal, Ministry of Mines, Govt. of India, New Delhi on 16.08.2017.

14. PP submitted that presently 350 nos. of people are directly employed & 400 nos. of persons are indirectly employed in the mine. After the proposed

production enhancement, 444 nos. of people will get direct employment and 530 no. of persons will get indirect employment. Indirect employments will be generated through handling of material, transportation etc. which will improve socio. & economic standing of the people in the locality. PP further submitted that total cost of the project is Rs. 400 Crores, funds allocated for environment management (capital) is 2,0377 Crores, funds allocated for CER is 2,3455 Crores and funds allocated for environment management plan (recurring per annum) is 0,3253 Crores.

15. The project proposal was considered in the 2<sup>nd</sup> EAC meeting held during March 25-26, 2019 wherein the Committee deferred the proposal and asked the PP to submit requisite information. Accordingly, PP submitted the requisite information and the same examined and the proposal considered again in 3<sup>rd</sup> LAC meeting held during June 27-28, 2019. The Committee asked the PP to present the responses, PP replied to the certain clarifications raised by the Committee during deliberation on some of the responses provided by the PP Committee. Based on the presentation made by PP and the discussion held, the Committee recommended the proposal for granting environmental clearance for enhancement of production capacity of Iron Ore from 4.50 million TPA (2.85 MTPA ROM Iron ore + 1.65 MTPA of low grade iron ore from old low grade ore stacks & dumps) to 8.06 million TPA (7.0 million TPA Iron ore (ROM) + dry screening and crushing of 1.06 million TPA low grade iron ore from old dumps/stacks within lease area) along with specific conditions.

16. The Ministry has examined the proposal in accordance with the Environmental Impact Assessment Notification, 2006 and further amendments thereon; and after accepting the recommendation of LAC, hereby decided to accord the environmental clearance under the provisions thereof to the above mentioned proposal of M/s Rungta Sons Pvt. Ltd. for enhancement of production capacity of Iron Ore from 4.50 million TPA (2.85 MTPA ROM Iron ore + 1.65 MTPA of low grade iron ore from old low grade ore stacks & dumps) to 8.06 million TPA (7.0 million TPA Iron ore (ROM) + dry screening and crushing of 1.06 million TPA low grade iron ore from old dumps/stacks within lease area) in the min lease area of 147.10 ha with the following **Specific conditions** and **Standard conditions** subject to compliance of the following terms and conditions and environmental safeguards mentioned below:

#### **A. Specific Conditions**

- (i). The mining activity will be restricted to the mine lease area of 38.311 ha (68.135 ha (forest area for which FC is available) + 20.775 ha (non-forest area)). Furthermore, no mining activity will be allowed in remaining forest land (59,605 ha) till PP get the forest clearance.
- (ii). PP shall provide a budget of Rs. 3 Crore (0.75% of project cost of Rs. 400 Crores) on CER as per the provisions of OM No. 1, No. 22-03/2017-IA-III dated 01 May 2018.
- (iii). PP submitter that the total geological reserve of iron ore as per approved mining scheme is 65.17 million tonnes and according to the life of mine is 8 years as per the present reserve.

- (iv). PP shall adhere with the permitted quantity for water withdrawal as specified by OIWA and ODWR, Govt. of Odisha. Additionally, PP requires to adopt best water conservation and harvesting measures to reduce its water requirement.
- (v). PP mentioned that there is no production of Bauxite at present and also not proposed in future. PP should achieve the same.
- (vi). PP mentioned that the Site Specific Conservation Plan for Schedule I species is submitted for approval. PP should adhere with the Site Specific Conservation Plan for Schedule I species as approved by the Competent Authority.
- (vii). This EC for expansion proposal (Iron Ore from 4.50 million TPA (2.85 MTPA ROM Iron ore + 1.65 MTPA of low grade iron ore from old low grade ore stacks & dumps) to 8.06 million TPA (7.0 million TPA Iron ore (ROM) + dry screening and crushing of 1.06 million TPA low grade iron ore from old dumps/stacks within lease area)) shall be operational after submission of an undertaking through affidavit to MoEF& CC within 15 days of receipt of this letter, for compliance of all the conditions prescribed herein.

**B. Recommendation of CSIR-NERI Report on "Carrying Capacity Study for Environmentally Sustainable Iron and Manganese Ore Mining Activity in Keonjhar, Sundergarh and Mayurbhanj districts of Odisha State:** The Committee has also deliberated the various specific recommendations of carrying capacity study report conducted by CSIR-NERI w.r.t. mining proposal of Iron Ore and/or manganese in the State of Odisha. There are recommendations which needs to be implemented by the State Govt. of Odisha and Project Proponent. Based on detailed deliberations on the recommendations of the carrying capacity study report, the Committee has also recommended the following specific conditions viz.

- 1) Project Proponent and Department of Steel & Mines, Govt. of Odisha shall ensure the implementation of recommendations of carrying capacity study report conducted by CSIR-NERI w.r.t. mining proposal of Iron Ore and/or manganese in the State of Odisha.
- 2) Department of Steel & Mines, Govt. of Odisha should prepare 5 years regional plan for annual iron ore requirement from the state, which in turn shall be met from different mines/zones (e.g. Joda, Korai) in the state. Accordingly, sustainable annual production (SAP) for each mine/mine may be followed adopting necessary environmental protection measures.
- 3) Project Proponent shall construct the cement concrete road from mine entrance and exit to the main road with proper drainage system and green belt development along the roads and also construction of road with minimum 300 m inside the mine. This should be done with one year for existing mines and new mine should have since beginning. The



Department of Steel & Mines, Govt. of Odisha should ensure the camp area and should not issue the Mining Permits, if mine lease holder has not constructed proper cement concrete road as suggested. **This Environmental Clearance for the expansion project shall be operated only after the compliance of the above mentioned specific condition.**

- 4) The Committee observed that as per the recommendations of NEERI report the PH needs to do regular vacuum cleaning of all mineral carrying roads aiming at "zero dust re-suspension" within 3 months. **This Environmental Clearance for the expansion project shall be operated only after the compliance of the above mentioned specific condition.**
- 5) Project Proponent shall monitor the environmental quality parameters as per EC and CTE/CTD conditions, and implementation of suggested measures for control of road dust and air pollution. Odisha State Pollution Control Board has to ensure the compliance of CTE/CTD. Regional office of the MoEF&CC, Bhubaneswar shall monitor the compliance at the EC conditions. Regional Office of the Indian Bureau of Mines (IBM) shall monitor the compliance of mining plan and progressive mine closure plan. Any violation by mine lease holder may invite actions per the provisions of applicable Acts.
- 6) Project Proponent shall ensure the compliance of Suggested Ore Transport Mode (SOTM) with consultation of the State Government of Odisha. A existing mines should ensure adoption of SOTM within next 5 years. New mines or mines seeking expansion should incorporate provision of SOTM in the beginning itself, and should have system in place within next 5 years.
- 7) The State Govt. of Odisha shall ensure dust free roads in mining areas whenever the road transportation of mineral is involved. The road shoulders shall be paved with tarmac besides compliance with JQC guidelines. All the roads should have proper drainage system and apart from paving of entire carriage width the remaining right of way should have native plantation (fast capturing species). Further, regular maintenance should also be ensured by the Govt. of Odisha. Progress or development of dust free roads, implementation of SOTM, increased use of existing rail network, development of additional railway network/conveyor belt/pipe network shall be submitted periodically to Regional office of the MoEF&CC.
- 8) Project Proponent shall develop the parking places for trucks with proper basic amenities/ facilities inside the mine. This should be done within one year for existing mines and new mines should have since beginning. **This Environmental Clearance for the expansion project shall be operated only after the compliance of the above mentioned specific condition.**

9) Department of Steel & Mines shall ensure the construction of NH 213 as minimum 4 lane road with proper drainage system and plantation and subsequent regular maintenance of the road as per JQC guidelines. Construction of other mineral carrying roads with proper width and drainage system along with road side plantation to be carried out. This shall be completed within 2 Years.

10) Regular vacuum cleaning of all mineral carrying roads aiming at "Zero Dust Re-suspension" shall be adopted by PWD / BHAJ Mine Lease Holders within a time Period of 3 months for existing roads. **This Environmental Clearance for the expansion project shall be operated only after the compliance of the above mentioned specific condition.**

11) In case the total requirement of iron ore exceeds the suggested limit for that year, permission for actual production by an individual mine may be decided depending on approved EC capacity (for total actual dispatch) and actual production rate of individual mine during last year or any other criteria set by the State Govt., i.e. Dept. of Steel & Mines, Department of Steel and Mines in consultation with Indian Bureau of Mines-RO should prepare in advance mine-wise annual production scenario so that demand for iron ore can be anticipated, and actual production/dispatch does not exceed the suggested annual production.

12) R&D studies towards utilization of low-grade iron ore should be conducted through research/academic institutes like IIMT, Bhubaneswar, IIT, Jamshedpur, and concerned metallurgical departments in IITs, NITs etc., targeting full utilization of low grade iron ore (Fe content upto 45% by 2020 and upto 40% by 2025). In fact, life cycle assessment of whole process including environmental considerations should be done for techno-economic and environmental viability. R&D studies on utilization of mine wastewater having high concentration of Fe content for different commercial applications in industries such as cosmetics, pharmaceutical, paint industry should also be explored. Responsibility: IBM, Dept. of Steel & Mines, Individual Mine Lease Holders.

13) The mining activity in Joda Koria sector is expected to continue for another 50 years, therefore, it will be desirable to develop proper rail network in the region. Rail transport shall not only be an attractive mode but also will be much economical option for iron ore transport. The rail network and/or conveyor belt system upto public railway siding needs to be created. The total length of the conveyor belt system/ rail network to be developed from mines to nearest railway sidings by 11 mines in Joda region is estimated to be about 64 km. Similarly, in Koria region, total length of rail network/ conveyor system for 8 mines (under SOTM 1 & 2) is estimated to be around 95 km. Further, it is suggested to develop a rail network connecting Binspur (Joda region) and Ruxy railway sidings in Koria region. Responsibility: Dept. of Steel & Mines, Govt. of Odisha and Concerned Places along with Indian Railways. Time Period: Maximum 7 years (by 2025). The Department of Steel & Mines, Govt. of Odisha should follow-up with the concerned

Departments and railways so that proposed proper rail network is in place by 2025.

- 14) State Govt. of Odisha shall make all efforts to ensure exhausting all the Iron & manganese ore resources in the existing working mines and from disturbed mining leases/zones in Joda and Kalra region. The criteria suggested shall be applicable while suggesting appropriate lease area and sustainable mining rate. Responsibility: Dept. of Steel & Mines, Govt. of Odisha.

- 15) **Mining Operations/Process Related:** Project Proponent shall implement the following mitigation measures: (i) Appropriate mining process and machinery (viz. right capacity, fuel efficient) should be selected to carry out various mining operations that generate minimal dust/air pollution, noise, wastewater and solid waste. e.g. drills should either be operated with dust extractors or equipped with water injection system. (ii) After commencement of mining operation, a study should be conducted to assess and quantify emission/loss generation (in terms of air pollution, noise, waste water and solid waste) from each of the mining activity (including transportation) on annual basis. Efforts should be made to further eliminate/ minimize generation of air pollution/dust, noise, wastewater, solid waste generation in successive years through use of better technology. This shall be ensured by the respective mine lease holders. (iii) Various machineries/equipment selected (viz. dumpers, excavators, crushers, screen plants etc.) and transport means should have optimum fuel/power consumption, and their fuel/power consumption should be monitored on monthly basis. Further, inspection and maintenance of all the machineries/ equipment/ transport vehicles should be followed as per manufacturer's instructions/ recommendations. Line schedule and record should be maintained by the respective mine lease holders. (iv) Digital processing of the entire case area using remote sensing technique should be carried out regularly once in 3 years for monitoring land use pattern and mining activity taken place. Further, the extent of pit area excavated should also be demarcated based on remote sensing analysis. This should be done by ORSAC (Odisha Space Applications Centre, Bhubaneswar) or an agency of national repute or if done by a private agency, the report shall be vetted/ authenticated by ORSAC, Bhubaneswar. Expenses towards the same shall be borne by the respective mine lease holders. Responsibility: Individual Mine Lease Holders.

- 16) **Air Environment Related:** Project Proponent shall implement the following mitigation measures: (i) Fugitive dust emissions from all the sources should be controlled regularly on daily basis. Water spraying arrangement on haul roads, loading and unloading and at other transfer points should be provided and properly maintained. Further, it will be desirable to use water fogging system to minimize water consumption. It should be ensured that the ambient air quality parameters conform to the norms prescribed by the CPCB in this regard. (ii) The core zone of mining activity should be monitored on daily basis. Minimum four ambient air quality monitoring stations should be established in the core zone for SPM, PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub> and CO monitoring. Location of air

quality monitoring stations should be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets and frequency of monitoring should be undertaken in consultation with the State Pollution Control Board (based on Emission Load Assessment Study). The number of monitoring locations may be more for larger capacity mines and working in larger area. Out of four stations, one should be online monitoring station in the mines having more than 3 MTPA EC Capacity. (iii) Monitoring in buffer zone should be carried out by SPCB or through NABET accredited agency. In addition, air quality parameters (SPM, PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub> and CO) shall be regularly monitored at locations of nearest human habitation including schools and other public amenities located nearer to source of the dust generation as applicable. (iv) Emissions from vehicles as well as heavy machinery should be kept under control and regularly monitored. Measures should be taken for regular maintenance of vehicles used in mining operations and in transportation of minerals. (v) The vehicles shall be covered with a tarpaulin and should not be overloaded. Further, possibility of closed container trucks should be explored for direct to destination movement of minerals. Air quality monitoring at one location should also be carried out along the transport route within the mine (periodically, near truck entry and exit gate). Responsibility: Individual Mine Lease Holders and SPCB.

- 17) **Noise and Vibration Related:** Project Proponent shall implement the following mitigation measures: (i) Blasting operation should be carried out only during daytime. Controlled blasting such as Vented, should be practiced. The mitigation measures for control of ground vibrations are to arrest fly rocks and boulders should be implemented. (ii) Appropriate measures should be taken for control of noise levels below 85 dBA in the work environment. Workers engaged in operations of HEMM, etc. should be provided with ear plugs/muffs. (iii) Noise levels should be monitored regularly (on weekly basis) near the major sources of noise generation within the core zone. Further, date, time and distance of measurement should also be indicated with the noise levels in the report. The data should be used to map the noise generation from different activities and efforts should be made to maintain the noise levels within the acceptable limits of CPCB (CPCB, 2008). (iv) Similarly, vibration at various sensitive locations should be monitored atleast once in month, and mapped for any significant changes due to successive mining operations. Responsibility: Individual Mine Lease Holders.

- 18) **Water/Wastewater Related:** Project Proponent shall implement the following mitigation measures: (i) In general, the mining operations should be restricted to above ground water table and should not intersect groundwater table. However, if enough measures are estimated below the ground water table, the same may be explored after conducting detailed geological studies by GSI and Hydro-geological studies by CGWB or MWH or Institute of national repute, and ensuring that no damage to the land stability/ water aquifer system shall happen. The details/ outcome of such study may be reflected/ incorporated in the LIA/EMP report of the mine appropriately. (ii) Natural watercourse and/or water resources should not be obstructed due to any mining operations.

Regular monitoring of the flow rate of the springs and perennial nallas should be carried out and records should be maintained. Further, regular monitoring of water quality of nallas and river passing through the mine lease area (upstream and downstream locations) should be carried out on monthly basis. (iii) Regular monitoring of ground water level and its quality should be carried out within the mine lease area by establishing a network of existing wells and constructing new piezometers during the mining operation. The monitoring should be carried out on monthly basis. (iv) In order to optimize water requirement, suitable conservation measures to augment ground water resources in the area should be undertaken in consultation with Central Ground Water Board (CGWB). (v) Suitable rainwater harvesting measures on long term basis should be planned and implemented in consultation with CGWB, to recharge the ground water source. Further, CGWB can prepare a comprehensive plan for the whole region. (vi) Appropriate mitigation measures (viz. ETP, STP, garland drains, retaining walls, cultivation of runoff etc.) should be taken to prevent pollution of nearby downstream water bodies. Water quality monitoring study should be conducted by State Pollution Control Board to ensure quality of surface and ground water sources on regular basis. The study can be conducted through NABL/ NABET approved water testing laboratory. However, the report should be vetted by SPCB. (vii) Industrial wastewater (workshop and wastewater from the mine) should be properly collected, treated in ETP as per standards to the discharge standards applicable. (viii) Oil and grease trap should be installed before discharge of workshop effluents. Further, sewage treatment plant should be installed for the employees/colony, wherever applicable. (ix) Mine lease holder should ensure that no silt originating due to mining activity is transported in the surface water course or any other water body. Appropriate measures for prevention and control of soil erosion and management of silt should be undertaken. Quantity of silt/soil generated should be measured on regular basis for its better utilization. (x) Erosion from dumps site should be protected by providing geo textile matting or other suitable material, and thick plantation of native trees and shrubs should be carried out at the dump areas. Further, dumps should be protected by retaining walls. (xi) Trenches / garland drain should be constructed at the foot of dumps to arrest silt from being carried to water bodies. Adequate number of check dams should be constructed across seasonal/perennial nallas (if any) flowing through the mine lease areas and silt be arrested. De-silting at regular intervals should be carried out and quantity should be recorded for its better utilization, after proper soil quality analysis. (xii) The water so collected in the reservoir within the mine should be utilized for the sprinkling on hauls roads, green belt development etc. (xiii) There should be zero waste water discharge from the mine. Based on actual water withdrawal and consumption/ utilization in different activities, water balance diagram should be prepared on monthly basis, and efforts should be made to optimize consumption of water per ton of ore production in successive years. Responsibility: Individual Mine Lease Holders, SPCB and CGWB.

19) **Land/ Soil/ Overburden Related:** Project Proponent shall implement the following mitigation measures: (i) The top soil should temporarily be

stored at earmarked site(s) only and it should not be kept unutilized for long (not more than 3 years or as per provisions mentioned in the mine plan/ scheme). The topsoil should be used for land reclamation and plantation appropriately. (ii) Fodder plots should be developed in the non-mineralised area in lieu of use of grazing land, if any. (iii) Over burden/ low grade ore should be stacked at earmarked dump area(s) only and should not be kept active for long period. The dump height should be decided on case to case basis, depending on the size of mine and quantity of waste material generated. However, slope stability study should be conducted for larger heights, as per IBM approved mine plan and DGVS guidelines. The OB dumps should be scientifically vegetated with suitable native species to prevent erosion and surface run off. In critical areas, use of geo textiles should be undertaken for stabilization of the dumps. Monitoring and management of rehabilitated areas should continue until the vegetation becomes self-sustaining. Proper records should be maintained regarding species, their growth, and coverage etc. (iv) Gabion chains and siltation ponds of appropriate size should be constructed to arrest silt and sediment flows from mine operation, soil, OB and mineral dumps. The water so collected can be utilized for watering the mine area, roads, green belt development etc. The drains should be regularly de-silted, particularly after monsoon and should be maintained properly. Appropriate documents should be maintained. Garland drain of appropriate size, gradient and length should be constructed for mine pit, soil, OB and mineral dumps and sump capacity should be designed with appropriate safety margin based on long term rainfall data. Sump capacity should be provided for adequate retention period to allow proper settling of silt material. Sedimentation pits should be constructed at the corners of the garland drains and de-silted at regular intervals. (v) Backfilling should be done as per approved mining plan/scheme. There should be no OB dumps outside the mine lease area. The reclaimed area should be afforested, aiming to restore the normal ground level. Monitoring and management of rehabilitated areas should continue till the vegetation is established and becomes self-generating. (vi) Hazardous waste such as, waste oil, lubricants, resin, and dyes etc. should be disposed off as per provisions of Hazardous Waste Management Rules, 2016, as amended from time to time. Responsibility: Individual Mine Lease Holders.

20) **Ecology/Biodiversity (Flora-Fauna) Related:** Project Proponent shall implement the following mitigation measures: (i) A precautionary measures should be taken during mining operation for conservation and protection of endangered fauna namely elephant, sloth bear etc. spotted in the study area. Action plan for conservation of flora and fauna should be prepared and implemented in consultation with the State Forest and Wildlife Department within the mine lease area, whereas outside the mine lease area, the same should be maintained by State Forest Department. (ii) Afforestation is to be done by using local and mixed species species within and outside the mining lease area. The reclamation and afforestation is to be done in such a manner like including the growth of fruit bearing trees which will attract the fauna and thus maintaining the biodiversity of the area. As afforestation come so far is very less, forest commitment needs to identify adequate

land and do afforestation by involving local people in a time bound manner. (iii) Green belt development carried out by mines should be monitored regularly in every season and parameters like area under vegetation/plantation, type of plantation, type of tree species / grass species/shrubs etc., distance between the plants and survival rate should be recorded. (iv) Green belt is an important sink of air pollutants including noise. Development of green cover in mining area will not only help reducing air and noise pollution but also will improve the ecological conditions and prevent soil erosion to a greater extent. Further, selection of tree species for green belt should constitute dust removal/cum capturing plants since plants can act as efficient biological filters removing significant amounts of particulate pollution. Thus, the indigenous native trees in the mine area may be encouraged for plantation. Tree species having small leaf area, dense hair on leaf surface (rough surface), deep channels on leaves should be included for plantation. (v) Vetiver plantation on inactive dumps may be encouraged as the grass species has high strength of anchoring besides medicinal value. (vi) Details of compensatory afforestation done should be recorded and documented by respective forest divisions, and State Forest Department should present mine wise annual status, along with expenditure details. Responsibility: Individual Mine Lease Holders and State Forest & Wildlife Department.

**21) Socio-Economic Related:** Project Proponent shall implement the following mitigation measures: (i) Public interaction should be done on regular basis and social welfare activities should be done to meet the requirements of the local communities. Further, basic amenities and infrastructure facilities like education, medical, roads, safe drinking water, sanitation, employment, skill development, training institute etc. should be developed to alleviate the quality of life of the people of the region. (ii) Land outcrops and land losers/affected people, if any, should be compensated and rehabilitated as per the national/state policy on Resettlement and Rehabilitation. (iii) The socio-economic development in the region should be focused and aligned with the guidelines/initiatives of Govt. of India/ NITI Aayog around prosperity, equality, justice, cleanliness, transparency, employment, respect to women, etc. This can be achieved by providing adequate and quality facilities for education, medical and developing skills in the people of the region. District administration in association with mine lease holders should plan for "Samagra Vikas" of these blocks well as other blocks of the district. While planning for different schemes in the region, the activities should be prioritized as per Pradhan Mantri Kisan Kalyan Yojana (PMKKKY), notified by Ministry of Mines, Govt. of India, vide letter no. 16/7/2017 MVT (Part), dated September-16, 2015. Responsibility: District Administration and Individual Mine Lease Holders.

**22) Road Transport Related:** Project Proponent shall implement the following mitigation measures: (i) All the mine lease holders should follow the suggested ore transport mode (SOTM), based on its RC capacity within next 5 years. (ii) The mine lease holders should ensure construction of cement road of appropriate width from end to the entry and exit gate of the mine. Further, maintenance of all the roads should

be carried out as per the requirement to ensure dust free road transport. (iii) Transportation of ore should be done by covering the trucks with tarpaulin or other suitable mechanism so that no spillage of ore/dust takes place. Further, air quality in terms of dust, PM10 should be monitored near the roads towards entry & exit gate on regular basis, and be maintained within the acceptable limits. Responsibility: Individual Mine Lease Holders and Dept. of Steel & Mines.

**23) Occupational Health Related:** Project Proponent shall implement the following mitigation measures: (i) Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects periodically. (ii) Occupational health surveillance program for all the employees/workers (including casual workers) should be undertaken periodically (on annual basis) to observe any changes due to exposure to dust, and corrective measures should be taken immediately, if needed. (i) Occupational health and safety measures related awareness programs including identification of work related health hazard, training on malaria eradication, HIV and health effects on exposure to mineral dust etc., should be carried out for all the workers on regular basis. A full time qualified doctor should be engaged for the purpose. Periodic monitoring (on 6 monthly basis) for exposure to respirable minerals dust on the workers should be conducted, and record should be maintained including health record of all the workers. Review of impact of various health measures undertaken (at an interval of 3 years or less) should be conducted followed by follow-up of actions, wherever required. Occupational health centre should be established near mine site itself. Responsibility: Individual Mine Lease Holders and District Administration (District Medical Officer).

### C. Standard conditions

#### I. Statutory compliance

- 1) This Environmental Clearance (EC) is subject to orders/ judgment of Hon'ble Supreme Court of India, Hon'ble High Court, Hon'ble NGT and any other Court of Law, Common Cause Conditions as may be applicable.
- 2) The Project proponent complies with all the statutory requirements and judgment of Hon'ble Supreme Court dated 2nd August, 2017 in Writ Petition (Civil) No. 114 of 2014 in matter of Common Cause versus Union of India & Ors before commencing the mining operations.
- 3) The State Government concerned shall ensure that mining operation shall not be commenced till the entire compensation levied, if any, for illegal mining paid by the Project Proponent through their respective Department of Mining & Geology in strict compliance of Judgment of Hon'ble Supreme Court dated 2nd August, 2017 in Writ Petition (Civil) No. 114 of 2014 in matter of Common Cause versus Union of India & Ors.
- 4) This Environmental Clearance shall become operational only after receiving formal NSWL Clearance from MoEF&CC subsequent to the



recommendations of the Standing Committee at National Board for Wildlife, if applicable to the Project.

- 5) This Environment Clearance shall become operational only after receiving formal Forest Clearance (FC) under the provision of Forest Conservation Act, 1980, if applicable to the Project.
- 6) Project Proponent (PP) shall obtain Consent to Operate after grant of FC and effectively implement all the conditions stipulated therein. The mining activity shall not commence prior to obtaining Consent to Establish / Consent to Operate from the concerned State Pollution Control Board/Committee.
- 7) The PP shall adhere to the provision of the Mines Act, 1957, Mines and Mineral (Development & Regulation) Act, 2015 and rules & regulations made there under. PP shall adhere to various orders issued by Directorate General Mines Safety (DGMS) and Indian Bureau of Mines from time to time.
- 8) The Project Proponent shall obtain consents from all the concerned land owners, before start of mining operations, as per the provisions of MMDR Act, 1957 and rules made there under in respect of lands which are not owned by it.
- 9) The Project Proponent shall follow the mitigation measures provided in MoEFCC's Office Memorandum No. 2-11013/57/2014-JA (I) (M), dated 29th October, 2014, titled "Impact of mining activities on Habitations-Issues related to the mining Projects wherein Habitations and villages are the part of mine lease areas or habitations and villages are surrounded by the mine lease area".
- 10) The Project Proponent shall obtain necessary prior permission of the competent authorities for draw of excessive quantity of surface water and from CGWA for withdrawal of ground water for the project.
- 11) A copy of EC letter will be marked to concerned Panchayat / local NGO etc. if any, from whom suggestion / representation has been received while processing the proposal.
- 12) State Pollution Control Board/Committee shall be responsible for display of the EC letter at its Regional Office, District Industries Centre and Collector's Office/ Tehsildar's Office for 30 days.
- 13) The Project Proponent should widely advertise about the grant of this EC letter by printing the same in at least two local newspapers, one of which shall be in vernacular language of the concerned area. The advertisement shall be done within 7 days of the issue of the clearance. After mentioning that the instant project has been accorded EC and copy of the EC letter is available with the State Pollution Control Board/Committee and web site of the Ministry of Environment, Forest and Climate Change ([www.pwvsnr.in](http://www.pwvsnr.in)). A copy of the advertisement may be forwarded to the concerned MoEFCC Regional Office for compliance and record.

- 14) The Project Proponent shall inform the MoEFCC for any change in ownership of the mining lease. In case there is any change in ownership or mining lease is transferred then mining operation shall only be carried out after transfer of EC as per provisions of the para 11 of EIA Notification, 2006 as amended from time to time.

### 13. Air quality monitoring and preservation

- 15) The Project Proponent shall install a minimum of 3 (three) online Ambient Air Quality Monitoring Stations with 1 (one) in upwind and 2 (two) in downwind direction based on long term climatological data about wind direction such that an angle of 120° is made between the monitoring locations to monitor critical parameters, relevant for mining operations, of air pollution viz. PM10, PM2.5, SO2, CO and SO2 etc. as per the methodology mentioned in NAAQS Notification No. B-23016/20/90/PC/VT, dated 18.11.2009 covering the aspects of transportation and use of heavy machinery in the impact zone. The ambient air quality shall also be monitored at prominent places like office building, canteen etc. as per the site condition to ascertain the exposure characteristics at specific places. The above data shall be digitally displayed within 33 months in front of the main Gate of the mine site.
- 16) Effective safeguard measures for prevention of dust generation and subsequent suppression (like regular water sprinkling, matted road construction etc.) shall be carried out in areas prone to air pollution where a high level of PM10 and PM2.5 are evident such as haul road, loading and unloading point and transfer points. The fugitive dust emissions from all sources shall be regularly controlled by installation of required equipments/ machineries and preventive maintenance. Use of suitable water soluble chemical dust suppressing agents may be explored for better effectiveness of dust control system. It shall be ensured that air pollution level conform to the standards prescribed by the MoEFCC/ Central Pollution Control Board.

### 14. Water quality monitoring and preservation

- 1) In case, immediate mining scheme involves intersection of ground water table, then Environment Clearance shall become operational only after receiving formal clearance from CGWA. In case, mining operation involves intersection of ground water table at a later stage, then PP shall ensure that prior approval from CGWA and MoEFCC is in place before such mining operations. The permission for intersection of ground water table shall essentially be based on detailed hydro-geological study of the area.
- 2) Regular monitoring of the flow rate of the springs and perennial streams flowing in and around the mine lease shall be carried out and records maintained. The natural water bodies and/or streams which are flowing in or around the village, should not be disturbed. The Water Table should be monitored so as not to go down below the pre-mining period. In case of any water scarcity in the area, the Project Proponent has to provide water to the villagers for their use. A provision for regular monitoring of water



table in open dug well located in village should be incorporated to ascertain the impact of mining over ground water table. The Report on changes in Ground water level and quality shall be submitted on six-monthly basis to the Regional Office of the Ministry, CGWA and State Groundwater Department / State Pollution Control Board.

- 3) Project Proponent shall regularly monitor and maintain records w.r.t. ground water level and quality in and around the mine lease by establishing a network of existing wells as well as new piezo-meter installers during the mining operation in consultation with Central Ground Water Authority/ State Ground Water Department. The Report on changes in Ground water level and quality shall be submitted on six-monthly basis to the Regional Office of the Ministry, CGWA and State Groundwater Department / State Pollution Control Board.
- 4) The Project Proponent shall undertake regular monitoring of natural water course/ water resources/ springs and perennial as also existing/ flowing in area around the mine lease and maintain its records. The project proponent shall undertake regular monitoring of water quality upstream and downstream of water bodies passing within and nearby/ adjacent to the mine lease and maintain its records. Sufficient number of gauges shall be provided at appropriate places within the lease for management of water. PP shall carryout regular monitoring w.r.t. pH and in addition the same in monitoring plan. The parameters to be monitored shall include their water quality vis-à-vis suitability for usage as per CPCB criteria and flow rate. It shall be ensured that no obstruction and/or alteration be made to water bodies during mining operations without justification and prior approval of MoEF&CC. The monitoring of water courses/ bodies existing in lease area shall be carried out four times in a year viz. pre-monsoon (April-May), monsoon (August), post monsoon (November) and winter (January) and the record of monitored data may be sent regularly to Ministry of Environment, Forest and Climate Change and its Regional Office, Central Ground Water Authority and Regional Director, Central Ground Water Board, State Pollution Control Board and Central Pollution Control Board. Clearly showing the trend analysis on six-monthly basis.
- 5) Quality of polluted water generated from mining operations which include Chemical Oxygen Demand (COD), in mines run-off, acid mine drainage and metal contamination in runoff shall be monitored along with Total Suspended Solids (TSS), Dissolved Oxygen (DO), pH and Total Suspended Solids (TSS). The monitored data shall be uploaded on the website of the company as well as displayed at the project site in public domain, on a display board, at a suitable location near the main gate of the Company. The circular No. J- 20012/1/2005-LA,II (P) dated 27.05.2009 issued by Ministry of Environment, Forest and Climate Change may also be referred in this regard.
- 6) Project Proponent shall plan, develop and implement rainwater harvesting measures on long term basis to augment ground water resources in the area in consultation with Central Ground Water Board/ State Groundwater Department. A report on amount of water recharged needs to be submitted to Regional Office MoEF&CC annually.

- 7) Industrial waste water (workshop and waste water from the mine) should be properly collected and treated so as to conform to the notified standards prescribed from time to time. The standards shall be prescribed through Consent to Operate (CTO) issued by concerned State Pollution Control Board (SPCB). The workshop effluent shall be treated after its initial passage through Oil and grease trap.
- 8) The water balance/water auditing shall be carried out and measure for reducing the consumption of water shall be taken up and reported to the Regional Office of the MoEF&CC and State Pollution Control Board/Committee.

#### **IV. Noise and vibration monitoring and prevention**

- 9) The peak particle velocity at boom distance or within the nearest habitation, whichever is closer shall be monitored periodically as per applicable DGMS guidelines.
- 10) The illumination and sound at night at project sites disturb the villages in respect of both human and animal population. Consequent sleeping disorders and stress may affect the health in the villages located close to mining operations. Habitations have a right for darkness and minimal noise levels at night. PPs must ensure that the biological clock of the villages is not disturbed by orienting the flood lights/ masks away from the villagers and keeping the noise level well within the prescribed limits for day/night hours.
- 11) The Project Proponent shall take measures for control of noise levels below 85 dBA in the work environment. The workers engaged in operations of ICMM, etc. should be provided with ear plugs /muffs. All personnel including laborers working in dusty areas shall be provided with protective respiratory devices along with adequate training, awareness and information on safety and health aspects. The PP shall be held responsible in case it has been found that workers/ personals/ laborees are working without personal protective equipment.

#### **V. Mining plan**

- 12) The Project Proponent shall adhere to the working parameters of mining plan which was submitted at the time of EC appraisal wherein year-wise plan was mentioned for: total excavation i.e. quantum of mineral, waste, over burden, inter burden and top soil etc. No change in basic mining proposal like mining technology, total excavation, mineral & waste production, lease area and scope of working (viz. method of mining, overburden & dump management, O.B & dump mining, mineral transportation mode, ultimate depth of mining etc.) shall not be carried out without prior approval of the Ministry of Environment, Forest and Climate Change, which may involve adverse environmental impacts, even if it is a part of approved mining plan modified after grant of EC or granted by State Govt. in the form of Short Term Permit (STP). Query license or any other name.

- 13) The Project Proponent shall get the Final Mine Closure Plan along with Financial Assurance approved from Indian Bureau of Mines/Department of Mining & Geology as required under the Provision of the MMOR Act, 1957 and Rules/ Guidelines made there under. A copy of approved final mine closure plan shall be submitted within 2 months of the approval of the same from the competent authority to the concerned Regional Office of the Ministry of Environment, Forest and Climate Change for record and verification.
- 14) The land-use of the mine lease area at various stages of mining scheme as well as at the end-of-life shall be governed as per the approved Mining Plan. The excavation vis-à-vis backfilling in the mine lease area and corresponding afforestation to be raised in the reclaimed area shall be governed as per approved mining plan. PP shall ensure the monitoring and management of rehabilitated areas until the vegetation becomes self-sustaining. The compliance status shall be submitted half-yearly to the MoEFCC and its concerned Regional Office.

#### **VI. Land reclamation**

- 15) The Overburden (O.B.) generated during the mining operations shall be stacked at earmarked OB dump site(s) only and it should not be kept active for a long period of time. The physical parameters of the OB dumps like height, width and angle of slope shall be governed as per the approved Mining Plan as per the guidelines/circulars issued by DGMS w.r.t. safety in mining operations shall be strictly adhered to maintain the stability of top soil/OB dumps. The topsoil shall be used for land reclamation and plantation.
- 16) The reject/waste generated during the mining operations shall be stacked at earmarked waste dump site(s) only. The physical parameters of the waste dumps like height, width and angle of slope shall be governed as per the approved Mining Plan as per the guidelines/circulars issued by DGMS w.r.t. safety in mining operations shall be strictly adhered to maintain the stability of waste dumps.
- 17) The reclamation of waste dump sites shall be done in scientific manner as per the Approved Mining Plan cum Progressive Mine Closure Plan.
- 18) The sides of dumps shall be vegetated in scientific manner with suitable native species to maintain the slope stability, prevent erosion and surface run off. The selection of local species regulates local climatic parameters and helps in adaptation of plant species to the microclimate. The gullies formed on slopes should be adequately taken care of as it impacts the overall stability of dumps. The dump mass should be consolidated with the help of dozer/ compactors thereby ensuring proper filling/ leveling of dump mass. In critical areas, use of geotextiles/geomembranes / Geyners / Bentonite etc. shall be undertaken for stabilization of the dump.

- 19) The Project Proponent shall carry out slope stability study in case the dump height is more than 30 meters. The slope stability report shall be submitted to concerned regional office of MoEF&CC.
- 20) Catch drains, settling tanks and siltation ponds of appropriate size shall be constructed around the mine working, mineral yards and Top Soil/OB/Waste dumps to prevent run off of water and flow of sediments directly into the water bodies (Nallathu River/ Pond etc.). The collected water should be utilized for watering the mine area, roads, green belt development, plantation etc. The drains/ siltation sumps etc. shall be de-silted regularly, particularly after monsoon season, and maintained properly.
- 21) Check dams of appropriate size, gradient and length shall be constructed around mine pit and OB dumps to prevent storm run-off and sediment flow into adjoining water bodies. A safety margin of 50% shall be kept for designing of dump structures over and above peak rainfall (uses on 50 years data) and maximum discharge in the mine and its adjoining areas which shall also help in providing adequate retention time period thereby allowing proper settling of sediments/ silt material. The siltation ponds/ sumps shall be constructed at the corners of the earthen drains.
- 22) The top soil, if any, shall temporarily be stored at earmarked site(s) within the mine lease only and should not be kept unutilized for long. The physical parameters of the top soil dumps like height, width and angle of slope shall be governed as per the approved Mining Plan and as per the guidelines framed by DGMS w.r.t. safety in mining operations shall be strictly adhered to maintain the stability of dumps. The topsoil shall be used for land reclamation and plantation purpose.

#### **VII. Transportation**

- 23) No Transportation of the minerals shall be allowed in case of roads passing through villages/ habitations. In such cases, PP shall construct a 'bypass' road for the purpose of transportation of the minerals leaving an adequate gap (say at least 200 meters) so that the adverse impact of sound and dust along with chances of accidents could be mitigated. All costs relating to widening and strengthening of existing public road network shall be borne by the PP in consultation with local State Govt. Department. Transportation of minerals through road movement in case of existing village/ rural roads shall be allowed in consultation with local State Govt. Department only after required strengthening such that the carrying capacity of roads is increased to handle the traffic load. The pollution due to transportation load on the environment will be effectively controlled and water sprinkling will also be done regularly. Vehicular emissions shall be kept under control and regularly monitored. Project should obtain Pollution Under Control (PUC) certificate for all the vehicles from authorized pollution testing centers.
- 24) The Main haulage road within the mine lease should be provided with a permanent water sprinkling arrangement for dust suppression. Other roads within the mine lease should be wetted regularly with tanker.



mounted water sprinkling system. The other areas of dust generation like crushing zone, material transfer points, material yards etc. should invariably be provided with dust suppression arrangements. The air pollution control equipments like bag filters, vacuum suction hoods, dry fogging system etc. shall be installed at Crushers, belt-conveyors and other areas prone to air pollution. The belt conveyor should be fully covered to avoid generation of dust while transportation. PP shall take necessary measures to avoid generation of fugitive dust emissions.

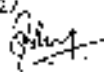
### **VIII. Green Belt**

- 25) The Project Proponent shall develop greenbelt in 7.5m wide safety zone along the mine lease boundary as per the guidelines of CPCB in order to arrest pollution emanating from mining operations within the lease. The whole Green belt shall be developed within first 5 years starting from windward side of the active mining area. The development of green-belt shall be governed as per the EC granted by the Ministry irrespective of the stipulation made in approved mine plan.
- 26) The Project Proponent shall carryout plantation/ afforestation in backfilled and reclaimed area of mining lease, around water body, along the roadsides, in community areas etc. by planting the native species in consultation with the State Forest Department/ Agriculture Department/ Rural development department/ Tribal Welfare Department/ Gram Panchayat such that only those species be selected which are of use to the local people. The CPCB guidelines in this respect shall also be adhered. The density of the trees should be around 2500 seedlings per Hectare. Adequate budgetary provision shall be made for protection and care of trees.
- 27) The Project Proponent shall make necessary alternative arrangements for livestock feed by developing grazing land with a view to compensate those areas which are coming within the mine lease. The development of such grazing land shall be done in consultation with the State Government. In this regard, Project Proponent should essentially implement the directions of the Hon'ble Supreme Court with regard to acquisition of grazing land. The sparse trees on such grazing ground, which provide mid-day shelter from the scorching sun, should be scrupulously guarded/ protected against felling and plantation of such trees should be promoted.
- 28) The Project Proponent shall undertake all precautionary measures for conservation and protection of endangered flora and fauna and Schedule I species during mining operation. A Wildlife Conservation Plan shall be prepared for the same clearly delineating action to be taken for conservation of flora and fauna. The Plan shall be approved by Chief Wild Life Warden of the State Govt.
- 29) And implemented in consultation with the State Forest and Wildlife Department. A copy of Wildlife Conservation Plan and its implementation status (annual) shall be submitted to the Regional Office of the Ministry.

### **IX. Public hearing and human health issues**

Environmental Clearance to M/s Rungta Sons Pvt. Ltd.

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- 30) The Project Proponent shall appoint an Occupational Health Specialist for Regular as well as Periodical medical examination of the workers engaged in the mining activities, as per the DGMS guidelines. The records shall be maintained properly. PP shall also carryout Occupational health check-ups in respect of workers who are having ailments like BP, diabetes, habitual smoking, etc. The check-ups shall be undertaken once in six months and necessary remedial/ preventive measures be taken. A status report on the same may be sent to MoEFCC Regional Office and DGMS on half-yearly basis.
- 31) The Project Proponent must demonstrate commitment to work towards 'Zero Harm' from their mining activities and carry out Health Risk Assessment (HRA) for identification workplace hazards and assess their potential risks to health and determine appropriate control measures to protect the health and wellbeing of workers and nearby community. The proponent shall maintain accurate and systematic records of the HRA. The HRA for neighborhood has to focus on Public Health Problems like Malaria, Tuberculosis, HIV, Anemia, Diarrhoea in children under five, respiratory infections due to bio mass smoking. The proponent shall also create awareness and educate the nearby community and workers for Sanitation, Personal Hygiene, Hand washing, not to defecate in open, Women Health and Hygiene (Providing Sanitary Napkins), hazard of tobacco and alcohol use. The Proponent shall carryout base line HRA for all the category of workers and thereafter every five years.
- 32) The Proponent shall carry out Occupational health surveillance which be a part of HRA and include Biological Monitoring where practical and feasible, and the tests and investigations relevant to the exposure (e.g. for Dust a X-Ray chest; For Noise Audiometric; for Lead Exposure Blood Lead, For Welders Full Ophthalmologic Assessment; for Manganese Miners a complete Neurological Assessment by a Certified Neurologist, and Manganese (Mn) Estimation in Blood; For Inorganic Chromium- Fortnightly skin inspection of hands and forearms by a responsible person. Except routine tests all tests would be carried out in a Lab accredited by NABL. Records of Health Surveillance must be kept for 30 years, including the results of and the records of Physical examination and tests. The record of exposure due to materials like Asbestos, Hard Rock Mining, Silica, Gold, Kaolin, Aluminium, Iron, Manganese, Chromium, Lead, Uranium need to be handed over to the Mining Department of the State in case the life of the mine is less than 30 years. It would be obligatory for the State Mining Departments to make arrangements for the safe and secure storage of the records including X-Ray. Only conventional X-Ray will be accepted for record purposes and not the digital one). X-Ray must meet ILO criteria (17 x14 inches and of good quality).
- 33) The Proponent shall maintained a record of performance indicators for workers which includes (a) there should not be a significant decline in their Body Mass Index and it should stay between 18.5 -24.9, (b) the Final Chest X-Ray compared with the base line X-Ray should not show any capacities, (c) At the end of their leaving job there should be no Diminution in their Lung Functions Forced Expiratory Volume in one

Environmental Clearance to M/s Rungta Sons Pvt. Ltd.

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second (FEV1), Forced Vital Capacity (FVC), and the ratio) unless they are smokers which has to be adjusted, and the effect of age; (d) their hearing should not be affected. As a proof an Audiogram (first and last need to be presented); (e) they should not have developed any Persistent Back Pain, Neck Pain, and the movement of the Hip, Knee and other joints should have normal range of movement; (f) they should not have suffered loss of any body part. The record of the same should be submitted to the Regional Office, MoEFCC annually along with details of the relief and compensation paid to workers having above notations.

- 34) The Project Proponent shall ensure that Personnel working in dusty areas should wear protective respiratory devices and they should also be provided with adequate training and information on safety and health aspects.
- 35) Project Proponent shall make provision for the housing for workers/labors or shell construct labor camps within/outside (company owned land) with necessary basic infrastructure/ facilities like fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, canteen for cots etc. The housing may be provided in the form of temporary structures which can be removed after the completion of the project related infrastructure. The domestic waste water should be treated with STP in order to avoid contamination of underground water.
- 36) The activities proposed in Action plan prepared for addressing the issues raised during the Public Hearing shall be completed as per the budgetary provisions mentioned in the Action Plan and within the stipulated time frame. The Status Report on Implementation of Action Plan shall be submitted to the concerned Regional Office of the Ministry along with District Administration.

#### **X. Corporate Environmental Responsibility (CER)**

- 37) The activities and budget earmarked for Corporate Environmental Responsibility (CER) as per Ministry's O.M No 22-65/2017-IA, II (M) dated 11.05.2018 or as proposed by EAC should be kept in a separate bank account. The activities proposed for CER shall be implemented in a time bound manner and annual report of implementation of the same along with documentary proof viz. photographs, purchase documents, attitude & longitude of infrastructure developed & road constructed needs to be submitted to Regional Office MoEF&CC annually along with audited statement.
- 38) Project Proponent shall keep the funds earmarked for environmental protection measures in a separate account and refrain from diverting the same for other purposes. The Year wise expenditure of such funds should be reported to the MoEF&CC and its concerned Regional Office.

#### **XI. Miscellaneous**

- 39) The Project Proponent shall prepare digital map (land use & land cover) of the entire lease area once in two years purpose of monitoring land use pattern and submit a report to concerned Regional Office of the MoEF&CC.

- 40) The Project Authorities should inform to the Regional Office regarding date of financial closure and final approval of the project by the concerned authorities and the date of start of land development work.
- 41) The Project Proponent shall submit six monthly compliance reports on the status of the implementation of the stipulated environmental safeguards to the MoEF&CC its concerned Regional Office, Central Pollution Control Board and State Pollution Control Board.
- 42) A separate 'Environmental Management Cell' with suitable qualified manpower should be set up under the control of a Senior Executive. The Senior Executive shall directly report to Head of the Organization. Adequate number of qualified Environmental Scientists and Mining Engineers shall be appointed and submit a report to RO, MoEF&CC.
- 43) The concerned Regional Office of the MoEF&CC shall randomly monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the MoEF&CC officer(s) by furnishing the requisite data / information / monitoring reports.

#### **D. Standard EC conditions for Mineral Beneficiation Plants:**

- (i) PP submitted that the LC for wet beneficiation plant with the capacity of 1.44 MTPA has been accorded by the Ministry, vide letter no. J-11015/206/2017-IA, II (M), dated 19.11.2018 and the same will continue. Therefore, the standard EC conditions for mineral beneficiation plants which are mentioned in Ministry's OM No. 22-234/2018-IA-III dated 09<sup>th</sup> August 2018 will be applicable to this project and PP need to comply the same. In view of this, PP needs to submit the affidavit as mentioned in para 16 A (vii) above.

17. The Ministry or any other competent authority may alter/modify the above conditions or stipulate any further condition in the interest of environment protection.

18. Concealing factual data or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attracts action under the provisions of Environment (Protection) Act, 1986.

19. The above conditions will be enforced inter-alia, under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and the Public Liability Insurance Act, 1991 along with their amendments and rules made there under and also any other orders passed by the Hon'ble Supreme Court of India/ High Court of Odisha and any other Court of Law relating to the subject matter.

20. Any appeal against this environmental clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 15 of the National Green Tribunal Act, 2010.

21. This issues with the approval of Competent Authority.

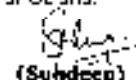
Yours faithfully,

  
(Siddhant)

Director/Scientist 'F'

**Copy to:**

1. **The Secretary,** Ministry of Mines, Government of India, Shastri Bhawan, Dr. Rajendra Prasad Road, New Delhi 110 001.
2. **The Chief Secretary,** Government of Odisha, Secretariat, Bhubaneswar.
3. **The Secretary,** Department of Environment, Government of Odisha, Secretariat, Bhubaneswar.
4. **The Secretary,** Department of Mines and Geology, Government of Odisha, Secretariat, Bhubaneswar.
5. **The Secretary,** Department of Forests, Government of Odisha, Secretariat, Bhubaneswar.
6. **The Member Secretary,** Odisha State Pollution Control Board, Parivesh Bhawan, A/118 Nilakantha Nagar, Unit-VIC, Bhubaneswar-751012.
7. **The Additional Principal Chief Conservator of Forests (C),** Ministry of Environment, Forest and Climate Change, Regional Office (F7), A/3, Chandrosekharpur, Bhubaneswar - 751023.
8. **The Chief Wildlife Warden,** Pradeep Bhawan, 5th floor, BDA Apartment Nilakanthanagar, Vayapal, Bhubaneswar-751012, Odisha.
9. **The Chairman,** Central Pollution Control Board, Parvati Bhawan, CBD-Cum-Office Complex, East Arjun Nagar, Delhi-110032.
10. **The Controller General,** Indian Bureau of Mines, Indira Bhawan, Civil Lines, Nagpur-440 001.
11. **The Member Secretary,** Central Ground Water Board Ministry of Agriculture and Irrigation, 12/1 Jai Nagar House, Stanjapur Road, New Delhi 110011.
12. **The District Collector,** Sundergarh District, Government of Odisha.
13. **Guard File.**
14. **PARIVESH PORTAL.**

  
(Siddhant)

Director/Scientist 'F'

Sd/- GM  
--- Mr. [Signature] Jyoti Sengupta  
--- Mr. [Signature]  
(Date)  
Government of Odisha  
Department of Water Resources  
  
No. 22055- /N/A Dtd: 03/10/2019  
Mr. SAJIB KISHOR DEB BARUA, Joint Secretary,  
Govt. of Assam, Dispur, Shillong

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4. M/s Rungta Mines Ltd. shall own, own shall install a flow Meter in suitable measuring device for measurement of water drawn off and by him from open ground water source as per the procedure laid down in rule 20-A (b). The Executive Engineer shall visit the location of descent or lifting of water, verify the accuracy of water drawn off by M/s Rungta Mines Ltd. and ensure such control as may be necessary for administering the descent or lifting of water. Assessment of water rate shall be made as per the capacity of water drawn or lifted whichever is higher. In case of any defect or non-functioning of the Flow Meter, the Licensee shall bring this to the notice of the Executive Engineer forthwith and take appropriate steps to remove the defects in the Meter or for replacement thereof within a period of three months and in such cases the fee shall be charged on the quantity of water allocated for the said period of three months. If the defect in the Meter is persistent, the Meter replaced, as the case may be, within a period of three months, where the licensee fails to bring the defect or non-functioning of the Meter to the notice of the Executive Engineer or fails to remove the defects in the Meter or to replace the same, as the case may be, within a period of three months, the agreement shall be liable to termination and thereafter the water supply shall be stopped.
5. M/s Rungta Mines Ltd. shall construct full proof effluent discharge plant before commissioning of the project. For proper test of such effluent there shall be computerized testing system and M/s Rungta Mines Ltd. shall give details of effluent discharged in the natural source (in liter or m<sup>3</sup>/hr).
6. For reconstruction of head works and control structures (i.e. intake well, pump house and other related facilities, M/s Rungta Mines Ltd. will get the land leased in their favor through IDCO as is done in respect of any other governmental land acquired by the industry. IDCO will make available land on long term lease to industry/ Estate of water applicant. The continuation of the lease agreement will subject to the condition that the industry shall pay water rates as per prevailing water rate and all other duties of Government and IDCO from time to time.

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7. M/s Rungta Mines Ltd. would be responsible to pay 1 (one) month advance water charges in favour of Executive Engineer concerned in shape of Bank Draft of FDR duly dishonoured by the company as non-interest bearing security deposit of Rs 10 (ten) lakhs, a Bank Guarantee duly pledged in favour of concerned Executive Engineer. Duty of maintaining the Bank Guarantee lies with the company.
8. In case of water supply for M/s Rungta Mines Ltd. is to be met from a common source through a distribution system, such source, including the for drawal of water will be constructed, maintained and operated either by IDCO or Special Purpose Vehicle (SPV) after taking due clearance from IDCO. Water will be supplied to industry by IDCO / SPV and they would also be liable for payment of water rate to the Govt. and will in turn have arrangements as similar to those in clause (b) and (c) detailed earlier.
9. M/s Rungta Mines Ltd. will not disturb the natural flow of water so that riparian rights in the downstream will be affected and the M/s Rungta Mines Ltd. shall have no claim on the account.
10. The descent mechanism for raw water and disposal system of effluent to be established by the M/s Rungta Mines Ltd. without disturbing existing sea system and existing water set up.
11. The Rehabilitation and Resettlement Action Plan Welfare Action Plan, if so required will be prepared in conformity with the current Orissa Rehabilitation and Resettlement policy and executed by the company at its own cost under the supervision of the Water Resources Department and the Collector of the District.
12. M/s Rungta Mines Ltd. shall not claim as a matter of right to get the desired quantity of water every non monsoon season, which would meet their full industrial use and the M/s Rungta Mines Ltd. has to make adequate storage facility in their own land for supply of water to their plant during such period.
13. The safety design of all the structures lies with the industry / Resettlement / Applicant.
14. In case of any dispute / intervention required, the decision of the Government or Water Resources Department shall be final.

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15. Any surplus water from the Captive Power Plant shall be sold by M/s Ranga Mines Ltd. to GRIDCO or any other entity to be notified by the State Government under mutual consultation terms & conditions.
16. The allocation of water will automatically lapse if the M/s Ranga Mines Ltd. does not use the water for the purpose applied for within three years of allotment.
17. This agreement shall be valid for a period of three years from the date of execution subject to the renewal of agreement by the Executive Engineer. For renewal of the agreement, the concerned licensee has to apply, minimum three months before the expiry of the agreement.
18. If it is found that the industry is drawing water unauthorisedly before signing the agreement/ installation of flow-meter, the Executive Engineer will charge a penal rate of six times the normal rate as provided in Schedule III of the Rules.
19. Government shall be at liberty to review the water allocation multilaterally in case of exigencies.
20. The Executive Engineer or his authorized representative reserves the right to inspect all installations of drawal and disposal mechanism during and after construction including intake structures, flow meter and treatment plant.
21. M/s Ranga Mines Ltd. will have to show clearly in water management plan as to what storage facility the company will create for the lean season and to what extent and how the water is going to be recycled which shall be a part of the project report of the unit.
22. M/s Ranga Mines Ltd. may engage at their own cost consultant(s) experienced in the field to take up field investigations, prepare design and drawing to set up the water supply scheme for drawing water from the Govt. water source/ irrigation works for their proposed plant. The actual work will start after approval of the scheme by the competent authority of Water Resources Department who can inspect work during the construction.
23. The exact place for liftup will be decided in consultation with the competent authority of Water Resources Department.

24. To protect outfall Water Resources Department will be responsible for non-availability of water due to any accident at plant, repair & maintenance of River.
25. The agreement to be executed by the industry/ commercial establishment with local authority/ Executive Engineer must be approved by the DEWR before drawal of water.
26. For complying the water use M/s Ranga Mines Ltd. will have to adopt rain water harvesting, recycling water in cooling process, water re-usage and recycling of waste water measures in its plant & submit to per the approved water management plan.
27. M/s Ranga Mines Ltd. shall follow the state of the art discharge, effluent and safety State Pollution Control Board (SPCB) norms and obtain requisite permission from the SPCB, Pollute.
28. The Company shall deposit Rs. 25 crores towards water allocated to the industry in the form annual installments in within five years beginning with the next financial year towards Water Conservation Fund (WCF) for construction of Manganga Creek Dams to improve the water storage capacity in the area. For next three years with the concerned Executive Engineer, this Department Resolution No.243 of W.R. Dept. 03/11/2016. The industry shall enter into an agreement for the purpose of drawal of water and get a license which contribution towards Water Conservation Fund (WCF) shall be paid.
29. License, M/s Ranga Mines Ltd. for bulk supply to the population, Notified Area Councils other notified authorities and cluster of villages such 'baramati', 'baramati' or other areas wherever shall install separate Flow Meter or measuring device as the case may be at a suitable place along the pipeline to ensure equitable of water supply to such notified area/ notified Area Councils, other notified authorities and cluster of villages for drinking and washing etc. in addition to installation of the Flow Meter at a place 24-4 (1) (b) which shall be suitable for domestic and commercial use and license fee for such industrial or commercial use shall be at the rate double the existing rate as provided in item 14 (ii) of Schedule III.

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30. M/s Rungta Mines Ltd. shall abide by the conditions laid down by the competent authority of DWR during approval of scheme of layout.
31. M/s Rungta Mines Ltd. shall undertake water conservation audit in every three years and make the report available or available by the competent authority of DWR.
32. License fees shall be on a flat rate basis of the rate as specified in the schedule III per unit or quantity of water actually drawn or allocated whichever is higher and shall be assessed at the rate of ten percent per annum with effect from the first day of April.
33. The industry shall have to pay commercial charges which is equivalent to 5% of the cost of utilized water (Allocated quantity - quantity of water utilized) in addition to payment of usual water rate for quantity of water being utilized as per DWR Notification No-13251/WR dated 06.06.2013.
34. M/s Rungta Mines Ltd. shall register the project in the WRCIM website within 7 days of entry after the execution of agreement with the competent Executive Engineer of DWR.

Yours faithfully,

Special Secretary to Government

Memo No. 22056 / Dt. 03/10/2019

Copy forwarded to EIC, WR, / Chief Engineer, Water Services / CS. &amp; BM, BRB, Dispur for information &amp; necessary action.

Special Secretary to Government

Memo No. 22057 / Dt. 03/10/2019

Copy forwarded to Industries Department / Sec. &amp; Min. Department / CMD, IFCC, / CMD, IECO for information &amp; necessary action.

Special Secretary to Government

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Memo No. 22058 / Dt. 03/10/2019

Copy forwarded to Secretary, State Pollution Control Board, Dispur for information &amp; necessary action.

Special Secretary to Government

Memo No. 22059 / Dt. 03/10/2019

Copy forwarded to the Collector &amp; District Magistrate, Tinsukia for information and necessary action.

Special Secretary to Government

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COMSUNAR/MIL - 225/19 / 216/2

Date: 24.08.2020

To  
The Special Secretary to Government  
Department of Water Resources  
Rajbhawan  
Bhubaneswar

Subj. Allocation of additional water requirement of 7.88 cusec from river Brahmani in favour of M/s Rungta Mines Ltd (RML) for expansion of its Integrated Steel Plant to 2.85 MTPA capacities at Jharbanda, Chhiknadi.

Madam,

In having reference to the above subject, I am directed to inform you that the High Level Clearance Authority (HLCA) in its 23rd meeting held on 20.04.2020 had approved in principle the proposal of M/s. Rungta Mines Ltd for expansion of its Integrated Steel Plant to 2.85 MTPA capacities at Jharbanda, Chhiknadi with an investment of Rs. 4826.20 crore.

RML had requested for additional 7.88 cusec of water from river Brahmani in addition to the existing allocation of 28.94 cusec by DWR to meet the water requirement for its expansion, thus making the total water requirement as 36.82 cusec.

The SLFC Sub-Committee examined the request of RML w.r.t water requirement of the new plant and compared with Bench Marking Reports of similar capacities and assessed the total water requirement as 36.80 cusec including the earlier allocation of 28.94 cusec. SLFC in its 148th meeting dated 21.04.2020 approved the water assessment as 36.80 cusec.

In view of the above, it is now recommended for allocation of 7.88 cusec of water from river Brahmani in addition to the existing allocation of 28.94 cusec by DWR in favour of M/s Rungta Mines Ltd for expansion of Integrated Steel Plant to

**Industrial Promotion & Investment Corporation of Odisha Limited (IPICOL)**

(A Government of Odisha Undertaking)

IPICOL House, Jangpali, Bhubaneswar-751022, Odisha, India

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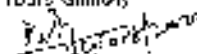
2.85 MTPA capacities at Jharbanda, Chhiknadi. The company has represented to draw water from 01.04.2020 onwards.

The recommendation is subject to the following special terms and conditions in addition to the conditions of DWR:

1. The company will bear entire cost of any, of any Government Department before allotment of line for the project.
2. The company has to obtain all statutory clearances/approvals for the 32G2B services under the GO SWIFT portal as mentioned in the HLCA approval letter dated 20.04.2020.
3. The company should strictly adhere to the terms and conditions as laid down in the HLCA approval letter dated 20.04.2020.

Thanking you

Yours faithfully

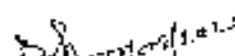
  
(K.G. Mohanty)

CCM (S. NA)

Memo no. 216/2 dt. 24.08.2020

Copy forwarded to

- i) The Director, Rungta Mines Limited, Rungta House, Chinara-733201, Jharbanda for information.
- ii) The Executive Engineer, DWR & Member SLFC, IPICOL for information and necessary action.

  
CCM (S. NA)

**Industrial Promotion & Investment Corporation of Odisha Limited (IPICOL)**

(A Government of Odisha Undertaking)

IPICOL House, Jangpali, Bhubaneswar-751022, Odisha, India

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CIN: U65999OR1978NCO00585, Tel Free No: 0674-254111

**ANNEXURE : V****CLIMATOLOGICAL TABLE OF DATA RECORDED AT IMD STATION ANGUL, ORISSA****MONTHLY AVERAGE MAXIMUM TEMPERATURE (°C)**

| YEAR | JAN.  | FEB.  | MAR   | APR   | MAY   | JUNE  | JULY  | AUG   | SEP   | OCT   | NOV   | DEC   | AVG.  |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 2001 | 29.60 | 34.70 | 36.80 | 38.50 | 42.30 | 32.20 | 29.10 | 31.30 | -     | -     | -     | -     | 34.31 |
| 2002 | 28.50 | 33.50 | 37.90 | 40.50 | 41.00 | 32.30 | 35.10 | 31.60 | 32.60 | 34.20 | 31.30 | 29.60 | 34.01 |
| 2003 | 28.70 | 31.70 | 35.80 | 40.50 | 41.60 | 38.10 | 33.60 | 31.90 | 31.60 | 31.10 | 29.60 | 26.90 | 33.43 |
| 2004 | 27.50 | 32.00 | 37.30 | 39.70 | 39.10 | 37.70 | 33.00 | 31.20 | 32.80 | 31.40 | 29.30 | 29.00 | 33.33 |
| 2005 | 28.70 | 32.80 | 36.60 | 39.00 | 41.30 | 40.00 | 33.70 | 32.50 | 32.30 | 32.30 | 28.90 | 26.60 | 33.73 |
| 2006 | 29.40 | 35.70 | 35.80 | 39.20 | 38.20 | 36.00 | 32.70 | 30.90 | 32.70 | 33.60 | 28.70 | 29.40 | 33.53 |
| 2007 | 29.80 | 32.20 | 35.60 | 39.90 | 39.20 | 36.10 | 33.60 | 32.80 | 32.00 | 32.20 | 30.00 | 29.10 | 33.54 |
| 2008 | 28.70 | 29.40 | 35.60 | 38.80 | 40.70 | 33.20 | 31.90 | 31.70 | 31.50 | 32.60 | 29.80 | 29.20 | 32.76 |
| 2009 | 31.30 | 34.40 | 37.50 | 42.10 | 40.50 | 40.40 | 31.30 | 33.50 | 33.60 | 32.20 | 30.10 | 28.10 | 34.58 |
| 2010 | 27.60 | 33.10 | 38.40 | 42.90 | 39.40 | 38.00 | 33.50 | 31.60 | 32.50 | 32.00 | 30.60 | 26.00 | 33.80 |
| 2011 | 25.50 | 30.80 | 37.00 | 37.30 | 39.60 | 34.80 | 33.00 | 31.80 | 30.80 | 33.50 | 32.00 | 29.30 | 32.95 |
| AVG. | 28.66 | 32.75 | 36.75 | 39.85 | 40.26 | 36.25 | 32.77 | 31.89 | 32.24 | 32.51 | 30.03 | 28.32 | 33.53 |

**MONTHLY AVERAGE MINIMUM TEMPERATURE (°C)**

| YEAR | JAN.  | FEB.  | MAR   | APR   | MAY   | JUNE  | JULY  | AUG   | SEP   | OCT   | NOV   | DEC   | AVG.  |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 2001 | 11.90 | 16.40 | 21.10 | 23.90 | 25.60 | 23.90 | 23.20 | 23.60 | -     | -     | -     | -     | 21.20 |
| 2002 | 13.90 | 15.50 | 19.90 | 23.60 | 24.70 | 22.60 | 24.70 | 23.00 | 22.60 | 20.50 | 15.30 | 11.90 | 19.85 |
| 2003 | 14.10 | 15.70 | 17.80 | 22.40 | 24.10 | 23.60 | 22.50 | 21.90 | 21.70 | 20.10 | 13.60 | 10.70 | 19.02 |
| 2004 | 15.10 | 11.80 | 17.10 | 20.90 | 23.30 | 23.60 | 21.50 | 21.90 | 20.80 | 18.50 | 13.30 | 10.50 | 18.19 |
| 2005 | 10.90 | 14.20 | 18.20 | 22.20 | 26.90 | 28.50 | 23.30 | 25.30 | 24.60 | 21.80 | 20.70 | 14.10 | 20.89 |
| 2006 | 13.30 | 15.00 | 22.10 | 26.40 | 27.50 | 22.60 | 21.00 | 19.60 | 21.00 | 14.40 | 18.30 | 16.00 | 19.77 |
| 2007 | 14.60 | 16.30 | 16.90 | 24.20 | 25.60 | 25.90 | 25.20 | 24.90 | 24.50 | 20.50 | 17.00 | 13.00 | 20.72 |
| 2008 | 13.10 | 15.60 | 20.30 | 23.50 | 25.90 | 24.50 | 24.70 | 24.00 | 24.00 | 21.70 | 17.10 | 14.20 | 20.72 |
| 2009 | 13.90 | 17.90 | 19.30 | 24.60 | 25.20 | 26.30 | 24.40 | 25.00 | 24.50 | 19.70 | 17.20 | 12.40 | 20.87 |
| 2010 | 11.40 | 15.30 | 21.20 | 25.50 | 24.90 | 23.50 | 22.00 | 21.30 | 22.40 | 21.20 | 20.00 | 13.90 | 20.22 |
| 2011 | 11.30 | 15.40 | 20.10 | 21.20 | 23.50 | 23.50 | 23.50 | 22.00 | 22.20 | 20.70 | 16.20 | 13.50 | 19.43 |
| AVG. | 13.05 | 15.37 | 19.45 | 23.49 | 25.20 | 24.41 | 23.27 | 22.95 | 22.83 | 19.91 | 16.87 | 13.02 | 19.99 |

**CLIMATOLOGICAL TABLE OF DATA RECORDED AT IMD STATION ANGUL, ORISSA****MONTHLY AVERAGE RELATIVE HUMIDITY (%) AT 8.30 HRS**

| YEAR | JAN. | FEB. | MAR | APR | MAY | JUNE | JULY | AUG | SEP | OCT | NOV | DEC | AVG. |
|------|------|------|-----|-----|-----|------|------|-----|-----|-----|-----|-----|------|
| 2001 | 74   | 71   | 73  | 60  | 63  | 80   | 88   | 86  | -   | -   | -   | -   | 74   |
| 2002 | 74   | 70   | 74  | 64  | 66  | 71   | 75   | 76  | 78  | 69  | 58  | 61  | 70   |
| 2003 | 68   | 66   | 65  | 63  | 67  | 69   | 81   | 83  | 83  | 85  | 73  | 74  | 73   |
| 2004 | 76   | 61   | 73  | 65  | 61  | 65   | 82   | 82  | 71  | 71  | 56  | 55  | 68   |
| 2005 | 57   | 62   | 66  | 68  | 65  | 61   | 79   | 76  | 76  | 74  | 61  | 60  | 67   |
| 2006 | 58   | 43   | 51  | 60  | 68  | 64   | 68   | 80  | 69  | 59  | 62  | 51  | 61   |
| 2007 | 64   | 61   | 61  | 57  | 50  | 71   | 88   | 81  | 78  | 73  | 58  | 65  | 67   |
| 2008 | 82   | 83   | 77  | 69  | 62  | 59   | 77   | 82  | 80  | 75  | 77  | 81  | 75   |
| 2009 | 80   | 69   | 68  | 68  | 68  | 59   | 79   | 77  | 75  | 77  | 76  | 79  | 73   |
| 2010 | 72   | 78   | 80  | 76  | 75  | 78   | 74   | 70  | 74  | 72  |     | 71  | 75   |
| 2011 | 62   | 69   | 69  | 73  | 77  | 81   | 88   | 91  | 92  | 85  | 93  | 84  | 80   |
| AVG. | 70   | 67   | 69  | 66  | 66  | 69   | 80   | 80  | 78  | 74  | 68  | 68  | 71   |

**MONTHLY AVERAGE RELATIVE HUMIDITY (%) AT 17.30 HRS**

| YEAR | JAN. | FEB. | MAR | APR | MAY | JUNE | JULY | AUG | SEP | OCT | NOV | DEC | AVG. |
|------|------|------|-----|-----|-----|------|------|-----|-----|-----|-----|-----|------|
| 2001 | 43   | 37   | 45  | 41  | 47  | 79   | 84   | 84  | -   | -   | -   | -   | 58   |
| 2002 | 57   | 45   | 45  | 46  | 46  | 62   | 62   | 79  | 80  | 65  | 56  | 51  | 58   |
| 2003 | 51   | 43   | 33  | 42  | 45  | 56   | 77   | 77  | 81  | DNA | 61  | 57  | 57   |
| 2004 | 54   | 49   | 54  | 39  | 45  | 64   | 83   | 80  | 77  | 68  | 51  | 53  | 60   |
| 2005 | 54   | 41   | 48  | 51  | 44  | 51   | 81   | 74  | 81  | 77  | 60  | 60  | 60   |
| 2006 | 52   | 40   | 52  | 46  | 54  | 58   | 62   | 65  | 62  | 54  | 47  | 47  | 53   |
| 2007 | 58   | 61   | 50  | 45  | 48  | 70   | 66   | 74  | 77  | 75  | 62  | 62  | 62   |
| 2008 | 74   | 74   | 73  | 58  | 61  | 52   | 71   | 79  | 74  | 66  | 72  | 78  | 69   |
| 2009 | 75   | 54   | 59  | 54  | 55  | 58   | 75   | 70  | 73  | 73  | 70  | 64  | 65   |
| 2010 | 62   | 56   | 55  | 47  | 63  | 63   | 67   | 67  | 70  | 65  |     | 74  | 63   |
| 2011 | 63   | 67   | 56  | 56  | 52  | 70   | 79   | 86  | 80  | 67  | 65  | 64  | 67   |
| AVG. | 58   | 52   | 52  | 48  | 51  | 62   | 73   | 76  | 76  | 68  | 60  | 61  | 61   |

**CLIMATOLOGICAL TABLE OF DATA RECORDED AT IMD STATION ANGUL, ORISSA****MONTHLY RAINFALL (MM)**

| YEAR  | JAN. | FEB. | MAR   | APR  | MAY   | JUNE  | JULY  | AUG   | SEP   | OCT   | NOV  | DEC  | TOTAL  |
|-------|------|------|-------|------|-------|-------|-------|-------|-------|-------|------|------|--------|
| 2001  | 0.0  | 0.0  | 22.3  | 14.4 | 49.8  | 293.3 | 558.0 | 353.6 | -     | -     | -    | -    | 1291.4 |
| 2002  | 8.8  | 0.0  | 1.8   | 45.8 | 74.7  | 89.2  | 70.6  | 203.0 | 230.9 | 13.6  | 5.6  | 0.0  | 744.0  |
| 2003  | 0.0  | 4.4  | 6.7   | 23.8 | 43.4  | 221.6 | 209.2 | 328.4 | 180.4 | 254.5 | 23.8 | 32.2 | 1328.4 |
| 2004  | 11.2 | 8.4  | 33.0  | 66.4 | 81.8  | 142.4 | 351.6 | 175.4 | 113.9 | 132.0 | 0.0  | 0.0  | 1116.1 |
| 2005  | 36.8 | 0.8  | 54.6  | 44.6 | 78.2  | 161.2 | 525.2 | 39.8  | 226.6 | 222.2 | 6.0  | 1.0  | 1397.0 |
| 2006  | 0.0  | 0.0  | 15.2  | 24.4 | 78.2  | 153.8 | 252.7 | 449.1 | 112.6 | 27.6  | 8.0  | 0.0  | 1121.6 |
| 2007  | 1.6  | 25.2 | 15.2  | 46.4 | 64.7  | 195.4 | 198.3 | 113.5 | 366.9 | 11.8  | 0.0  | 0.0  | 1039.0 |
| 2008  | 69.4 | 7.4  | 9.2   | 24.6 | 30.9  | 277.2 | 231.4 | 333.2 | 409.4 | 0.4   | 0.0  | 0.0  | 1393.1 |
| 2009  | 0.0  | 0.0  | 2.9   | 0.0  | 57.2  | 48.5  | 589.1 | 186.2 | 59.4  | 136.4 | 36.4 | 0.0  | 1116.1 |
| 2010  | 2.0  | 1.2  | 108.4 | 0.0  | 119.1 | 142.2 | 280.2 | 282.4 | 140.2 | 119.2 | 24.0 | 46.0 | 1264.9 |
| 2011  | 0.0  | 38.2 | 13.8  | 44.6 | 57.8  | 150.6 | 89.0  | 384.2 | 418.0 | 33.2  | 0.0  | 0.0  | 1229.4 |
| TOTAL | 11.8 | 7.8  | 25.7  | 30.5 | 66.9  | 170.5 | 305.0 | 259.0 | 225.8 | 95.1  | 10.4 | 7.9  | 1216.4 |

**DAILY AVERAGE OF MICRO-METEOROLOGICAL MONITORED DATA [1 MARCH, 2019 TO 31 MAY, 2019]**

| Date       | Calm     | DIRECTION WISE AVERAGE WIND SPEED (km/hr) EXCLUDING CALM |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       | Temp<br>(°c) | Rel_Hum<br>(%) | Cloud<br>(Octa) |
|------------|----------|----------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------|----------------|-----------------|
|            | <1.8kmph | E                                                        | ENE   | NE    | NNE   | N     | NNW   | NW    | WNW   | W     | WSW   | SW    | SSW   | S     | SSE   | SE    | ESE   |              |                |                 |
| 01-03-2019 | 0.00     | 0.00                                                     | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 8.73  | 6.55  | 8.02  | 7.59  | 9.07  | 0.00  | 8.75  | 0.00  | 0.00  | 0.00  | 28.40        | 38.00          | 0.00            |
| 02-03-2019 | 0.94     | 0.00                                                     | 0.00  | 0.00  | 13.50 | 8.40  | 0.00  | 0.00  | 0.00  | 6.37  | 6.30  | 7.10  | 7.90  | 7.40  | 13.50 | 0.00  | 0.00  | 27.65        | 45.00          | 0.00            |
| 03-03-2019 | 0.00     | 0.00                                                     | 29.10 | 0.00  | 0.00  | 0.00  | 37.50 | 7.10  | 0.00  | 6.90  | 5.75  | 6.90  | 14.10 | 11.38 | 9.23  | 10.20 | 10.50 | 28.11        | 50.00          | 0.00            |
| 04-03-2019 | 0.00     | 7.00                                                     | 0.00  | 0.00  | 0.00  | 7.00  | 9.70  | 11.15 | 14.38 | 0.00  | 10.00 | 6.90  | 5.40  | 0.00  | 10.70 | 13.27 | 8.65  | 28.42        | 52.00          | 0.00            |
| 05-03-2019 | 0.93     | 0.00                                                     | 0.00  | 0.00  | 10.60 | 9.20  | 10.55 | 6.90  | 6.45  | 14.60 | 5.30  | 6.26  | 2.70  | 5.30  | 0.00  | 0.00  | 0.00  | 28.62        | 51.00          | 0.00            |
| 06-03-2019 | 0.90     | 10.90                                                    | 0.00  | 8.10  | 8.70  | 11.42 | 0.00  | 0.00  | 8.35  | 6.15  | 6.67  | 5.73  | 2.50  | 6.13  | 9.10  | 0.00  | 0.00  | 29.31        | 48.00          | 0.00            |
| 07-03-2019 | 0.00     | 11.30                                                    | 9.40  | 7.00  | 7.30  | 8.95  | 0.00  | 7.65  | 9.87  | 6.00  | 7.13  | 6.53  | 9.90  | 4.20  | 0.00  | 6.70  | 0.00  | 29.48        | 48.00          | 0.00            |
| 08-03-2019 | 1.58     | 0.00                                                     | 0.00  | 11.70 | 10.90 | 8.50  | 8.48  | 8.10  | 0.00  | 6.28  | 8.12  | 7.50  | 0.00  | 0.00  | 4.50  | 0.00  | 0.00  | 29.47        | 44.00          | 0.00            |
| 09-03-2019 | 1.17     | 10.73                                                    | 13.35 | 0.00  | 0.00  | 5.10  | 8.10  | 8.20  | 0.00  | 6.30  | 1.90  | 7.40  | 10.60 | 10.20 | 9.50  | 0.00  | 0.00  | 29.20        | 39.00          | 0.00            |
| 10-03-2019 | 1.10     | 11.50                                                    | 8.10  | 0.00  | 0.00  | 0.00  | 0.00  | 3.80  | 0.00  | 7.70  | 4.00  | 8.45  | 9.80  | 7.45  | 12.90 | 7.90  | 10.55 | 30.02        | 48.00          | 0.00            |
| 11-03-2019 | 1.08     | 0.00                                                     | 0.00  | 0.00  | 7.15  | 8.63  | 5.60  | 0.00  | 12.50 | 0.00  | 7.33  | 8.63  | 0.00  | 3.50  | 13.00 | 0.00  | 7.27  | 30.39        | 48.00          | 0.00            |
| 12-03-2019 | 1.00     | 11.10                                                    | 5.60  | 0.00  | 6.80  | 0.00  | 0.00  | 5.50  | 9.60  | 9.98  | 9.80  | 5.28  | 2.40  | 9.07  | 13.40 | 7.60  | 6.40  | 30.41        | 53.00          | 0.00            |
| 13-03-2019 | 1.40     | 10.20                                                    | 9.40  | 8.60  | 7.10  | 10.90 | 2.50  | 7.70  | 8.10  | 6.50  | 0.00  | 7.65  | 16.63 | 6.55  | 0.00  | 15.35 | 8.20  | 30.39        | 53.00          | 0.00            |
| 14-03-2019 | 0.20     | 0.00                                                     | 15.40 | 0.00  | 0.00  | 11.43 | 14.90 | 16.30 | 4.07  | 7.95  | 6.06  | 14.90 | 5.70  | 6.65  | 0.00  | 7.30  | 0.00  | 30.40        | 49.00          | 0.00            |
| 15-03-2019 | 1.60     | 11.30                                                    | 0.00  | 10.70 | 11.00 | 10.80 | 0.00  | 0.00  | 0.00  | 7.90  | 2.70  | 13.93 | 11.52 | 12.90 | 4.60  | 0.00  | 8.55  | 30.98        | 37.00          | 0.00            |
| 16-03-2019 | 0.00     | 7.00                                                     | 4.90  | 0.00  | 12.45 | 0.00  | 10.05 | 4.80  | 3.00  | 13.17 | 11.00 | 6.90  | 7.20  | 14.65 | 0.00  | 7.40  | 5.00  | 31.88        | 39.00          | 0.00            |
| 17-03-2019 | 0.75     | 0.00                                                     | 5.85  | 0.00  | 18.90 | 0.00  | 0.00  | 0.00  | 8.17  | 10.40 | 3.30  | 8.68  | 8.90  | 9.70  | 9.30  | 8.45  | 6.65  | 31.26        | 52.00          | 0.00            |
| 18-03-2019 | 0.00     | 22.30                                                    | 0.00  | 7.60  | 14.13 | 12.60 | 11.80 | 0.00  | 14.97 | 0.00  | 0.00  | 10.60 | 0.00  | 0.00  | 14.13 | 13.93 | 21.38 | 29.55        | 56.00          | 0.00            |
| 19-03-2019 | 1.10     | 6.90                                                     | 6.10  | 0.00  | 0.00  | 0.00  | 20.40 | 26.10 | 15.95 | 5.97  | 3.40  | 15.40 | 12.15 | 14.20 | 8.45  | 11.30 | 7.80  | 28.31        | 43.00          | 0.00            |
| 20-03-2019 | 1.57     | 5.10                                                     | 0.00  | 7.30  | 0.00  | 0.00  | 8.13  | 0.00  | 12.83 | 14.40 | 5.50  | 10.52 | 8.73  | 9.20  | 10.25 | 0.00  | 0.00  | 32.93        | 45.00          | 0.00            |
| 21-03-2019 | 1.05     | 0.00                                                     | 0.00  | 0.00  | 0.00  | 17.20 | 7.30  | 9.25  | 5.00  | 6.15  | 32.50 | 13.15 | 17.58 | 10.38 | 8.80  | 11.00 | 0.00  | 33.99        | 47.00          | 0.00            |
| 22-03-2019 | 0.00     | 0.00                                                     | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 22.05 | 13.45 | 10.00 | 10.68 | 10.64 | 13.56 | 9.40  | 0.00  | 10.80 | 34.01        | 46.00          | 0.00            |
| 23-03-2019 | 1.10     | 8.43                                                     | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 7.27  | 6.38  | 7.50  | 26.85 | 9.77  | 11.90 | 9.20  | 32.04        | 56.00          | 0.00            |
| 24-03-2019 | 0.00     | 0.00                                                     | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 4.26  | 6.00  | 16.05 | 15.92 | 9.76  | 16.90 | 0.00  | 30.95        | 64.00          | 0.00            |
| 25-03-2019 | 0.40     | 21.60                                                    | 11.20 | 0.00  | 16.10 | 0.00  | 0.00  | 9.90  | 12.35 | 13.40 | 3.10  | 10.65 | 2.30  | 0.00  | 6.20  | 5.47  | 8.97  | 29.41        | 69.00          | 0.00            |
| 26-03-2019 | 1.65     | 7.20                                                     | 6.10  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 5.60  | 0.00  | 3.03  | 12.82 | 8.17  | 6.44  | 10.75 | 7.10  | 29.40        | 63.00          | 0.00            |
| 27-03-2019 | 1.80     | 0.00                                                     | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 5.10  | 4.73  | 11.10 | 5.42  | 6.69  | 9.80  | 3.60  | 8.50  | 30.24        | 61.00          | 0.00            |
| 28-03-2019 | 1.25     | 8.93                                                     | 10.95 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 3.40  | 4.60  | 2.10  | 11.05 | 12.18 | 0.00  | 12.75 | 11.98 | 30.84        | 63.00          | 0.00            |
| 29-03-2019 | 0.70     | 10.30                                                    | 5.40  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 8.60  | 10.07 | 8.53  | 9.74  | 11.30 | 9.20  | 31.86        | 57.00          | 0.00            |
| 30-03-2019 | 1.00     | 0.00                                                     | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 2.40  | 5.10  | 0.00  | 9.50  | 6.67  | 9.15  | 12.50 | 7.90  | 7.02  | 32.50        | 54.00          | 0.00            |
| 31-03-2019 | 1.70     | 0.00                                                     | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 10.95 | 13.18 | 7.48  | 7.87  | 6.20  | 0.00  | 14.30 | 14.60 | 0.00  | 0.00  | 32.79        | 44.00          | 0.00            |
| 01-04-2019 | 0.70     | 0.00                                                     | 0.00  | 0.00  | 5.35  | 13.00 | 13.13 | 16.35 | 4.10  | 11.50 | 4.90  | 12.27 | 8.43  | 10.77 | 9.70  | 7.90  | 0.00  | 33.11        | 48.00          | 0.00            |
| 02-04-2019 | 1.20     | 6.00                                                     | 0.00  | 5.80  | 6.80  | 0.00  | 5.40  | 12.90 | 9.10  | 7.55  | 8.10  | 8.10  | 11.60 | 12.13 | 12.85 | 6.50  | 12.80 | 32.95        | 46.00          | 0.00            |
| 03-04-2019 | 0.00     | 8.30                                                     | 0.00  | 0.00  | 0.00  | 9.80  | 14.05 | 13.23 | 14.73 | 11.80 | 9.05  | 6.20  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 32.93        | 36.00          | 0.00            |
| 04-04-2019 | 0.87     | 0.00                                                     | 0.00  | 11.00 | 0.00  | 0.00  | 0.00  | 0.00  | 4.02  | 5.60  | 9.32  | 9.80  | 7.40  | 0.00  | 0.00  | 4.40  | 0.00  | 32.72        | 37.00          | 0.00            |
| 05-04-2019 | 1.50     | 12.60                                                    | 9.10  | 15.20 | 0.00  | 0.00  | 4.60  | 6.70  | 6.20  | 1.80  | 9.70  | 5.15  | 7.23  | 6.10  | 13.08 | 10.80 | 0.00  | 32.71        | 47.00          | 0.00            |
| 06-04-2019 | 1.25     | 6.70                                                     | 0.00  | 0.00  | 0.00  | 0.00  | 13.60 | 9.35  | 0.00  | 0.00  | 0.00  | 5.87  | 15.40 | 15.65 | 9.10  | 6.30  | 0.00  | 32.03        | 34.00          | 0.00            |
| 07-04-2019 | 1.45     | 4.60                                                     | 0.00  | 0.00  | 0.00  | 0.00  | 3.30  | 0.00  | 10.03 | 13.80 | 5.45  | 5.30  | 6.90  | 6.83  | 11.80 | 0.00  | 0.00  | 32.43        | 46.00          | 0.00            |
| 08-04-2019 | 1.70     | 0.00                                                     | 0.00  | 0.00  | 0.00  | 0.00  | 21.90 | 15.85 | 15.24 | 26.30 | 13.70 | 14.15 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 29.48        | 61.00          | 0.00            |
| 09-04-2019 | 0.00     | 0.00                                                     | 7.90  | 9.90  | 0.00  | 0.00  | 14.87 | 9.77  | 12.32 | 7.30  | 11.70 | 8.65  | 9.40  | 0.00  | 0.00  | 0.00  | 6.90  | 32.38        | 50.00          | 0.00            |
| 10-04-2019 | 0.90     | 3.60                                                     | 9.20  | 0.00  | 11.10 | 0.00  | 8.65  | 10.65 | 10.45 | 14.60 | 8.20  | 6.82  | 14.10 | 13.00 | 7.20  | 0.00  | 0.00  | 32.72        | 46.00          | 0.00            |
| 11-04-2019 | 0.90     | 0.00                                                     | 8.80  | 0.00  | 12.00 | 0.00  | 8.70  | 9.15  | 7.87  | 18.60 | 7.80  | 11.60 | 0.00  | 12.23 | 0.00  | 14.10 | 0.00  | 31.45        | 49.00          | 0.00            |
| 12-04-2019 | 0.55     | 0.00                                                     | 0.00  | 0.00  | 0.00  | 11.90 | 0.00  | 9.10  | 7.20  | 6.95  | 34.90 | 14.60 | 16.98 | 10.90 | 7.80  | 7.65  | 0.00  | 34.02        | 47.00          | 0.00            |
| 13-04-2019 | 1.07     | 0.00                                                     | 0.00  | 0.00  | 0.00  | 11.10 | 7.30  | 8.90  | 0.00  | 7.70  | 0.00  | 19.03 | 16.24 | 9.18  | 7.90  | 11.20 | 0.00  | 33.80        | 47.00          | 0.00            |
| 14-04-2019 | 0.00     | 0.00                                                     | 7.60  | 9.10  | 11.40 | 17.10 | 0.00  | 0.00  | 0.00  | 0.00  | 36.50 | 14.46 | 16.62 | 11.17 | 12.70 | 0.00  | 8.60  | 32.56        | 48.00          | 0.00            |
| 15-04-2019 | 0.00     | 0.00                                                     | 0.00  | 0.00  | 9.70  | 10.65 | 11.32 | 8.65  | 15.00 | 11.10 | 9.20  | 11.23 | 11.65 | 0.00  | 0.00  | 0.00  | 16.20 | 32.35        | 50.00          | 0.00            |
| 16-04-2019 | 1.60     | 0.00                                                     | 0.00  | 0.00  | 0.00  | 11.70 | 22.00 | 23.85 | 11.85 | 0.00  | 9.38  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 31.90        | 39.00          | 0.00            |

**DAILY AVERAGE OF MICRO-METEOROLOGICAL MONITORED DATA [1 MARCH, 2019 TO 31 MAY, 2019]**

| Date       | Calm<br><1.8kmph | DIRECTION WISE AVERAGE WIND SPEED (km/hr) EXCLUDING CALM |      |       |       |       |       |       |       |       |       |       |       |       |       |       | Temp<br>(°c) | Rel_Hum<br>(%) | Cloud<br>(Octa) |
|------------|------------------|----------------------------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------|----------------|-----------------|
|            |                  | E                                                        | ENE  | NE    | NNE   | N     | NNW   | NW    | WNW   | W     | WSW   | SW    | SSW   | S     | SSE   | SE    | ESE          |                |                 |
| 17-04-2019 | 1.40             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 10.85 | 17.87 | 15.40 | 9.45  | 6.20  | 13.30 | 8.13  | 0.00  | 8.70  | 0.00  | 0.00  | 0.00         | 31.71          | 36.00           |
| 18-04-2019 | 0.00             | 0.00                                                     | 0.00 | 14.70 | 13.40 | 12.30 | 13.67 | 7.05  | 0.00  | 7.10  | 9.30  | 9.23  | 0.00  | 0.00  | 6.30  | 0.00  | 0.00         | 31.78          | 33.00           |
| 19-04-2019 | 0.00             | 0.00                                                     | 8.80 | 13.30 | 0.00  | 0.00  | 7.95  | 8.80  | 9.97  | 5.00  | 6.40  | 4.27  | 9.70  | 8.07  | 8.00  | 0.00  | 11.00        | 31.99          | 39.00           |
| 20-04-2019 | 1.35             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 8.13  | 11.60 | 9.70  | 8.25  | 5.15  | 9.15  | 11.10 | 7.50  | 14.00 | 0.00  | 0.00  | 0.00         | 32.22          | 41.00           |
| 21-04-2019 | 1.80             | 0.00                                                     | 0.00 | 8.00  | 8.10  | 0.00  | 0.00  | 11.60 | 9.10  | 5.75  | 7.70  | 10.13 | 7.45  | 12.33 | 16.05 | 8.85  | 9.80         | 32.92          | 46.00           |
| 22-04-2019 | 1.20             | 5.00                                                     | 0.00 | 0.00  | 6.90  | 8.80  | 0.00  | 0.00  | 0.00  | 12.92 | 6.70  | 8.53  | 11.56 | 0.00  | 11.00 | 10.20 | 0.00         | 33.65          | 49.00           |
| 23-04-2019 | 1.00             | 7.70                                                     | 6.20 | 0.00  | 0.00  | 0.00  | 19.25 | 20.10 | 11.44 | 5.20  | 11.30 | 6.20  | 8.50  | 8.10  | 9.60  | 10.40 | 5.90         | 34.74          | 43.00           |
| 24-04-2019 | 1.10             | 5.60                                                     | 0.00 | 8.70  | 0.00  | 0.00  | 10.17 | 0.00  | 12.40 | 12.80 | 6.65  | 9.95  | 4.30  | 13.20 | 7.40  | 0.00  | 0.00         | 34.90          | 45.00           |
| 25-04-2019 | 0.98             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 12.80 | 0.00  | 7.87  | 2.20  | 5.80  | 33.90 | 19.20 | 15.90 | 11.58 | 6.80  | 11.30 | 0.00         | 34.14          | 47.00           |
| 26-04-2019 | 0.00             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 25.90 | 15.88 | 16.18 | 12.21 | 11.10 | 11.50 | 7.50         | 33.94          | 49.00           |
| 27-04-2019 | 0.00             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 28.90 | 0.00  | 0.00  | 16.23 | 0.00  | 20.40 | 18.10 | 11.80 | 14.80 | 14.38 | 17.30 | 0.00         | 32.94          | 49.00           |
| 28-04-2019 | 0.00             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 24.65 | 18.87 | 11.25 | 20.10 | 12.37 | 13.22 | 12.88 | 10.17 | 0.00         | 33.30          | 47.00           |
| 29-04-2019 | 0.00             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 6.90  | 19.00 | 10.62 | 14.60 | 7.13  | 17.48 | 22.75 | 0.00  | 0.00         | 33.48          | 48.00           |
| 30-04-2019 | 0.90             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 7.23  | 9.07  | 18.60 | 22.10 | 2.20  | 15.20 | 15.90 | 0.00  | 0.00         | 33.47          | 47.00           |
| 01-05-2019 | 0.20             | 22.20                                                    | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 11.25 | 13.48 | 24.20 | 13.98 | 11.50 | 10.00 | 16.52 | 22.33        | 33.78          | 47.00           |
| 02-05-2019 | 0.00             | 11.78                                                    | 0.00 | 0.00  | 25.90 | 0.00  | 0.00  | 16.35 | 16.50 | 14.23 | 18.75 | 0.00  | 14.30 | 0.00  | 15.70 | 0.00  | 9.60         | 33.22          | 51.00           |
| 03-05-2019 | 0.00             | 0.00                                                     | 0.00 | 22.90 | 21.75 | 7.65  | 0.00  | 6.55  | 6.10  | 0.00  | 20.70 | 26.20 | 16.74 | 9.37  | 22.00 | 0.00  | 0.00         | 33.15          | 47.00           |
| 04-05-2019 | 0.00             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 19.65 | 18.95 | 12.55 | 0.00  | 12.69 | 11.68 | 6.60  | 7.80  | 0.00         | 33.85          | 48.00           |
| 05-05-2019 | 0.00             | 4.70                                                     | 0.00 | 0.00  | 7.87  | 0.00  | 0.00  | 0.00  | 10.10 | 10.03 | 14.40 | 7.10  | 14.50 | 16.87 | 8.40  | 0.00  | 2.80         | 33.10          | 42.00           |
| 06-05-2019 | 0.00             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 10.90 | 17.20 | 17.85 | 15.34 | 9.87  | 14.34 | 0.00  | 0.00         | 33.64          | 37.00           |
| 07-05-2019 | 1.25             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 22.60 | 0.00  | 29.45 | 0.00  | 0.00  | 15.85 | 14.78 | 20.14 | 15.50 | 20.80 | 0.00         | 33.76          | 46.00           |
| 08-05-2019 | 0.00             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 10.70 | 12.20 | 9.70  | 12.05 | 11.60 | 13.87 | 21.28 | 20.45 | 0.00         | 33.82          | 53.00           |
| 09-05-2019 | 0.00             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 5.40  | 11.70 | 15.40 | 11.66 | 12.44 | 10.87 | 14.00 | 0.00  | 0.00         | 33.02          | 52.00           |
| 10-05-2019 | 0.70             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 7.50  | 9.98  | 17.12 | 21.77 | 12.30 | 19.78 | 12.53 | 9.90  | 0.00         | 33.01          | 52.00           |
| 11-05-2019 | 0.00             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 7.30  | 0.00  | 17.58 | 13.33 | 14.30 | 11.06 | 12.53 | 18.23 | 0.00  | 0.00         | 33.46          | 54.00           |
| 12-05-2019 | 0.00             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 12.90 | 9.60  | 7.78  | 7.20  | 9.99  | 9.86  | 10.20 | 0.00  | 0.00         | 33.52          | 48.00           |
| 13-05-2019 | 1.60             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 6.30  | 11.20 | 9.90  | 0.00  | 5.75  | 3.43  | 3.77  | 3.40  | 0.00         | 33.42          | 54.00           |
| 14-05-2019 | 1.00             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 8.35  | 10.30 | 7.47  | 6.53  | 4.90  | 7.32  | 6.00  | 0.00  | 0.00         | 33.45          | 49.00           |
| 15-05-2019 | 0.00             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 10.30 | 11.70 | 14.60 | 9.65  | 6.40  | 5.95  | 0.00  | 0.00         | 33.84          | 63.00           |
| 16-05-2019 | 1.80             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 9.30  | 8.06  | 6.73  | 6.20  | 8.75  | 4.60  | 3.00  | 0.00         | 34.17          | 68.00           |
| 17-05-2019 | 0.00             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 8.80  | 8.13  | 8.93  | 6.33  | 6.80  | 6.40  | 0.00  | 0.00         | 32.31          | 58.00           |
| 18-05-2019 | 1.22             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 6.65  | 5.70  | 5.10  | 11.60 | 10.50 | 2.00  | 9.60  | 6.20         | 34.14          | 63.00           |
| 19-05-2019 | 1.12             | 3.53                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 4.85  | 5.16  | 4.57         | 34.87          | 59.00           |
| 20-05-2019 | 1.20             | 10.60                                                    | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 10.88 | 7.74  | 7.07         | 35.15          | 53.00           |
| 21-05-2019 | 1.60             | 8.24                                                     | 5.03 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 9.16  | 10.44 | 0.00  | 0.00         | 33.43          | 44.00           |
| 22-05-2019 | 0.00             | 0.00                                                     | 2.70 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 8.00  | 14.50 | 13.80 | 8.76  | 3.10  | 3.73  | 10.40        | 33.71          | 48.00           |
| 23-05-2019 | 0.00             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 9.70  | 8.60  | 8.77  | 6.43  | 6.31  | 14.13 | 17.00        | 32.68          | 46.00           |
| 24-05-2019 | 1.53             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 4.10  | 5.89  | 10.31 | 16.46        | 33.08          | 39.00           |
| 25-05-2019 | 1.08             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 1.80  | 6.80  | 4.89  | 6.28  | 5.97  | 6.60         | 32.90          | 39.00           |
| 26-05-2019 | 1.25             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 2.90  | 0.00  | 7.85  | 5.67  | 9.23  | 8.13  | 4.20  | 2.00  | 0.00  | 2.50  | 1.90  | 0.00         | 32.80          | 49.00           |
| 27-05-2019 | 1.40             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 9.00  | 0.00  | 4.60  | 4.91  | 4.15  | 0.00  | 6.23  | 3.00  | 9.70  | 9.75  | 0.00         | 33.10          | 48.00           |
| 28-05-2019 | 0.00             | 10.36                                                    | 6.30 | 0.00  | 0.00  | 16.87 | 10.40 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 9.87  | 7.95  | 0.00         | 32.58          | 47.00           |
| 29-05-2019 | 0.00             | 5.22                                                     | 8.83 | 8.90  | 19.60 | 16.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 12.53 | 0.00  | 3.80         | 32.43          | 48.00           |
| 30-05-2019 | 1.40             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 4.05  | 8.23  | 6.88  | 7.00         | 33.84          | 47.00           |
| 31-05-2019 | 1.55             | 0.00                                                     | 0.00 | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 8.10  | 5.72  | 6.95  | 6.87         | 33.12          | 44.00           |

**Note : The above daily averages have been arrived after processing the hourly readings monitored by automatic weather station**

### AIR QUALITY TEST RESULTS (Expansion of Dhenkanal Steel Plant to 3.55 MTPA steel)

| Sl. No. | Date of sampling     | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NO <sub>2</sub><br>µg/m <sup>3</sup> | NH <sub>3</sub><br>µg/m <sup>3</sup> | BaP<br>ng/m <sup>3</sup> | C <sub>6</sub> H <sub>6</sub><br>µg/m <sup>3</sup> | CO*<br>mg/m <sup>3</sup> | Pb<br>µg/m <sup>3</sup> | As<br>ng/m <sup>3</sup> | Ni<br>ng/m <sup>3</sup> | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NO <sub>2</sub><br>µg/m <sup>3</sup> | CO*<br>mg/m <sup>3</sup> | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NO <sub>2</sub><br>µg/m <sup>3</sup> | CO*<br>mg/m <sup>3</sup> |
|---------|----------------------|---------------------------------------|----------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------|----------------------------------------------------|--------------------------|-------------------------|-------------------------|-------------------------|---------------------------------------|----------------------------------------|--------------------------------------|--------------------------------------|--------------------------|---------------------------------------|----------------------------------------|--------------------------------------|--------------------------------------|--------------------------|
|         | <b>LOCATION:</b>     | <b>Proposed Core Zone</b>             |                                        |                                      |                                      |                                      |                          |                                                    |                          |                         |                         |                         | <b>Mosonia Village</b>                |                                        |                                      |                                      |                          | <b>Tarkabera Village</b>              |                                        |                                      |                                      |                          |
| 1       | 1-02-03-2019         | 65.0                                  | 34.7                                   | 10.7                                 | 17.6                                 | BDL                                  | N.D                      | N.D                                                | 0.573                    | BDL                     | BDL                     | BDL                     | 67.2                                  | 38.9                                   | 14.6                                 | 16.9                                 | 0.527                    | 47.6                                  | 25.4                                   | 8.0                                  | 11.9                                 | 0.388                    |
| 2       | 5-06-03-2019         | 66.1                                  | 36.2                                   | 10.0                                 | 16.3                                 | BDL                                  | N.D                      | N.D                                                | 0.527                    | BDL                     | BDL                     | BDL                     | 70.7                                  | 40.5                                   | 16.6                                 | 19.4                                 | 0.750                    | 47.4                                  | 26.3                                   | 8.6                                  | 13.1                                 | 0.382                    |
| 3       | 9-10-03-2019         | 70.2                                  | 39.5                                   | 11.3                                 | 15.0                                 | BDL                                  | N.D                      | N.D                                                | 0.544                    | BDL                     | BDL                     | BDL                     | 69.9                                  | 38.7                                   | 12.6                                 | 16.3                                 | 0.527                    | 55.9                                  | 30.8                                   | 9.3                                  | 10.0                                 | 0.336                    |
| 4       | 12-13-03-2019        | 69.4                                  | 38.9                                   | 10.7                                 | 13.8                                 | BDL                                  | N.D                      | N.D                                                | 0.447                    | BDL                     | BDL                     | BDL                     | 69.3                                  | 38.9                                   | 16.6                                 | 18.2                                 | 0.790                    | 50.3                                  | 27.5                                   | 7.3                                  | 11.3                                 | 0.249                    |
| 5       | 16-17-03-2019        | 69.0                                  | 38.0                                   | 12.0                                 | 16.3                                 | BDL                                  | N.D                      | N.D                                                | 0.521                    | BDL                     | BDL                     | BDL                     | 68.2                                  | 38.4                                   | 14.6                                 | 19.4                                 | 0.590                    | 53.3                                  | 28.3                                   | 10.0                                 | 13.8                                 | 0.324                    |
| 6       | 20-21-03-2019        | 67.3                                  | 38.7                                   | 10.0                                 | 13.2                                 | BDL                                  | N.D                      | N.D                                                | 0.487                    | BDL                     | BDL                     | BDL                     | 69.3                                  | 37.5                                   | 14.7                                 | 20.1                                 | 0.699                    | 48.9                                  | 29.3                                   | 8.0                                  | 13.8                                 | 0.318                    |
| 7       | 24-25-03-2019        | 65.2                                  | 39.1                                   | 11.5                                 | 17.6                                 | BDL                                  | N.D                      | N.D                                                | 0.355                    | BDL                     | BDL                     | BDL                     | 70.1                                  | 40.1                                   | 16.9                                 | 20.8                                 | 0.705                    | 44.4                                  | 27.1                                   | 8.4                                  | 13.6                                 | 0.353                    |
| 8       | 28-29-03-2019        | 68.0                                  | 40.3                                   | 10.2                                 | 15.6                                 | BDL                                  | N.D                      | N.D                                                | 0.401                    | BDL                     | BDL                     | BDL                     | 69.3                                  | 39.2                                   | 12.7                                 | 18.9                                 | 0.682                    | 45.9                                  | 25.8                                   | 8.5                                  | 11.7                                 | 0.307                    |
| 9       | 1-02-04-2019         | 70.5                                  | 40.3                                   | 12.1                                 | 13.7                                 | BDL                                  | N.D                      | N.D                                                | 0.596                    | BDL                     | BDL                     | BDL                     | 68.6                                  | 37.7                                   | 14.5                                 | 15.0                                 | 0.596                    | 56.2                                  | 32.6                                   | 8.4                                  | 12.4                                 | 0.301                    |
| 10      | 5-06-04-2019         | 66.2                                  | 37.5                                   | 12.0                                 | 14.3                                 | BDL                                  | N.D                      | N.D                                                | 0.538                    | BDL                     | BDL                     | BDL                     | 67.8                                  | 40.0                                   | 16.3                                 | 21.4                                 | 0.556                    | 40.8                                  | 24.2                                   | 9.1                                  | 13.0                                 | 0.307                    |
| 11      | 9-10-04-2019         | 66.9                                  | 39.2                                   | 10.9                                 | 16.3                                 | BDL                                  | N.D                      | N.D                                                | 0.344                    | BDL                     | BDL                     | BDL                     | 67.2                                  | 38.8                                   | 16.3                                 | 20.8                                 | 0.55                     | 53.2                                  | 29.7                                   | 7.2                                  | 9.8                                  | 0.342                    |
| 12      | 12-13-04-2019        | 67.8                                  | 36.2                                   | 10.8                                 | 15.6                                 | BDL                                  | N.D                      | N.D                                                | 0.464                    | BDL                     | BDL                     | BDL                     | 68.8                                  | 40.8                                   | 13.9                                 | 18.2                                 | 0.63                     | 52.3                                  | 28.8                                   | 8.4                                  | 12.3                                 | 0.295                    |
| 13      | 16-17-04-2019        | 65.7                                  | 36.7                                   | 12.0                                 | 17.5                                 | BDL                                  | N.D                      | N.D                                                | 0.579                    | BDL                     | BDL                     | BDL                     | 69.9                                  | 41.8                                   | 14.5                                 | 18.2                                 | 0.533                    | 57.3                                  | 32.9                                   | 9.7                                  | 13.7                                 | 0.400                    |
| 14      | 20-21-04-2019        | 69.0                                  | 38.8                                   | 11.4                                 | 16.3                                 | BDL                                  | N.D                      | N.D                                                | 0.573                    | BDL                     | BDL                     | BDL                     | 66.9                                  | 35.7                                   | 13.2                                 | 17.5                                 | 0.705                    | 40.7                                  | 22.6                                   | 7.8                                  | 10.4                                 | 0.377                    |
| 15      | 24-25-04-2019        | 70.5                                  | 41.7                                   | 9.7                                  | 14.3                                 | BDL                                  | N.D                      | N.D                                                | 0.475                    | BDL                     | BDL                     | BDL                     | 69.9                                  | 40.2                                   | 15.1                                 | 20.8                                 | 0.756                    | 46.7                                  | 25.4                                   | 7.2                                  | 13.7                                 | 0.400                    |
| 16      | 27-28-04-2019        | 70.9                                  | 39.1                                   | 9.7                                  | 15.0                                 | BDL                                  | N.D                      | N.D                                                | 0.527                    | BDL                     | BDL                     | BDL                     | 69.5                                  | 38.0                                   | 16.9                                 | 19.5                                 | 0.584                    | 57.7                                  | 31.6                                   | 9.6                                  | 13.6                                 | 0.353                    |
| 17      | 1-02-05-2019         | 67.0                                  | 36.4                                   | 12.1                                 | 14.3                                 | BDL                                  | N.D                      | N.D                                                | 0.527                    | BDL                     | BDL                     | BDL                     | 70.0                                  | 40.5                                   | 13.2                                 | 15.6                                 | 0.601                    | 48.3                                  | 27.8                                   | 9.0                                  | 12.3                                 | 0.324                    |
| 18      | 5-06-05-2019         | 70.4                                  | 37.6                                   | 9.6                                  | 15.6                                 | BDL                                  | N.D                      | N.D                                                | 0.527                    | BDL                     | BDL                     | BDL                     | 70.1                                  | 40.3                                   | 13.3                                 | 16.3                                 | 0.727                    | 42.6                                  | 23.8                                   | 8.4                                  | 11.0                                 | 0.382                    |
| 19      | 9-10-05-2019         | 66.4                                  | 38.0                                   | 9.9                                  | 15.9                                 | BDL                                  | N.D                      | N.D                                                | 0.544                    | BDL                     | BDL                     | BDL                     | 70.6                                  | 42.3                                   | 13.2                                 | 17.7                                 | 0.556                    | 42.0                                  | 24.2                                   | 7.4                                  | 9.5                                  | 0.377                    |
| 20      | 12-13-05-2019        | 68.9                                  | 40.6                                   | 13.2                                 | 15.0                                 | BDL                                  | N.D                      | N.D                                                | 0.527                    | BDL                     | BDL                     | BDL                     | 70.1                                  | 38.8                                   | 15.6                                 | 19.5                                 | 0.693                    | 52.2                                  | 31.0                                   | 9.9                                  | 10.0                                 | 0.260                    |
| 21      | 16-17-05-2019        | 66.5                                  | 39.6                                   | 10.7                                 | 17.7                                 | BDL                                  | N.D                      | N.D                                                | 0.584                    | BDL                     | BDL                     | BDL                     | 66.4                                  | 37.5                                   | 13.2                                 | 16.8                                 | 0.561                    | 55.3                                  | 32.0                                   | 7.4                                  | 13.2                                 | 0.289                    |
| 22      | 20-21-05-2019        | 67.6                                  | 39.6                                   | 9.9                                  | 15.9                                 | BDL                                  | N.D                      | N.D                                                | 0.39                     | BDL                     | BDL                     | BDL                     | 70.4                                  | 38.1                                   | 13.2                                 | 21.4                                 | 0.659                    | 55.6                                  | 30.0                                   | 7.4                                  | 13.2                                 | 0.382                    |
| 23      | 24-25-05-2019        | 65.4                                  | 36.6                                   | 13.2                                 | 15.4                                 | BDL                                  | N.D                      | N.D                                                | 0.378                    | BDL                     | BDL                     | BDL                     | 70.0                                  | 41.2                                   | 14.0                                 | 18.2                                 | 0.538                    | 43.6                                  | 25.4                                   | 9.9                                  | 11.8                                 | 0.313                    |
| 24      | 28-29-05-2019        | 67.3                                  | 37.2                                   | 10.7                                 | 15.5                                 | BDL                                  | N.D                      | N.D                                                | 0.493                    | BDL                     | BDL                     | BDL                     | 70.8                                  | 40.0                                   | 13.2                                 | 18.2                                 | 0.607                    | 52.8                                  | 30.0                                   | 9.1                                  | 10.9                                 | 0.243                    |
|         | <b>Minimum</b>       | <b>65.0</b>                           | <b>34.7</b>                            | <b>9.6</b>                           | <b>13.2</b>                          | <b>BDL</b>                           | -                        | -                                                  | <b>0.344</b>             | -                       | -                       | -                       | <b>66.4</b>                           | <b>35.7</b>                            | <b>12.6</b>                          | <b>15.0</b>                          | <b>0.527</b>             | <b>40.7</b>                           | <b>22.6</b>                            | <b>7.2</b>                           | <b>9.5</b>                           | <b>0.243</b>             |
|         | <b>Maximum</b>       | <b>70.9</b>                           | <b>41.7</b>                            | <b>13.2</b>                          | <b>17.7</b>                          | <b>BDL</b>                           | -                        | -                                                  | <b>0.596</b>             | -                       | -                       | -                       | <b>70.8</b>                           | <b>42.3</b>                            | <b>16.9</b>                          | <b>21.4</b>                          | <b>0.790</b>             | <b>57.7</b>                           | <b>32.9</b>                            | <b>10.0</b>                          | <b>13.8</b>                          | <b>0.400</b>             |
|         | <b>Average</b>       | <b>67.8</b>                           | <b>38.4</b>                            | <b>11.0</b>                          | <b>15.6</b>                          | <b>BDL</b>                           | -                        | -                                                  | <b>0.497</b>             | -                       | -                       | -                       | <b>69.2</b>                           | <b>39.3</b>                            | <b>14.5</b>                          | <b>18.5</b>                          | <b>0.630</b>             | <b>49.6</b>                           | <b>28.0</b>                            | <b>8.5</b>                           | <b>12.1</b>                          | <b>0.333</b>             |
|         | <b>98 percentile</b> | <b>70.7</b>                           | <b>41.2</b>                            | <b>13.2</b>                          | <b>17.6</b>                          | <b>BDL</b>                           | -                        | -                                                  | <b>0.590</b>             | -                       | -                       | -                       | <b>70.8</b>                           | <b>42.1</b>                            | <b>16.9</b>                          | <b>21.4</b>                          | <b>0.774</b>             | <b>57.5</b>                           | <b>32.8</b>                            | <b>9.9</b>                           | <b>13.8</b>                          | <b>0.400</b>             |

| Sl. No. | Date of sampling     | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NO <sub>2</sub><br>µg/m <sup>3</sup> | CO*<br>mg/m <sup>3</sup> | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NO <sub>2</sub><br>µg/m <sup>3</sup> | CO*<br>mg/m <sup>3</sup> | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NO <sub>2</sub><br>µg/m <sup>3</sup> | CO*<br>mg/m <sup>3</sup> |
|---------|----------------------|---------------------------------------|----------------------------------------|--------------------------------------|--------------------------------------|--------------------------|---------------------------------------|----------------------------------------|--------------------------------------|--------------------------------------|--------------------------|---------------------------------------|----------------------------------------|--------------------------------------|--------------------------------------|--------------------------|
|         | <b>LOCATION:</b>     | <b>Kadala Village</b>                 |                                        |                                      |                                      |                          | <b>Nimabahal Village</b>              |                                        |                                      |                                      |                          | <b>Thokar Village</b>                 |                                        |                                      |                                      |                          |
| 1       | 2-03-03-2019         | 61.1                                  | 36.7                                   | 9.3                                  | 17.5                                 | 0.557                    | 68.5                                  | 38.8                                   | 11.3                                 | 16.9                                 | 0.427                    | 51.8                                  | 29.6                                   | 9.3                                  | 11.9                                 | BDL                      |
| 2       | 6-07-03-2019         | 41.5                                  | 23.8                                   | 11.3                                 | 13.8                                 | 0.282                    | 61.3                                  | 35.4                                   | 10.0                                 | 20.1                                 | 0.432                    | 49.7                                  | 29.2                                   | 8.6                                  | 11.3                                 | 0.334                    |
| 3       | 10-11-03-2019        | 60.6                                  | 34.3                                   | 7.3                                  | 17.5                                 | 0.318                    | 62.8                                  | 35.9                                   | 12.0                                 | 18.2                                 | 0.369                    | 47.3                                  | 27.2                                   | 8.0                                  | 10.0                                 | 0.132                    |
| 4       | 13-14-03-2019        | 56.1                                  | 32.1                                   | 6.6                                  | 18.8                                 | 0.229                    | 57.6                                  | 34.1                                   | 14.6                                 | 18.8                                 | 0.571                    | 51.5                                  | 30.0                                   | BDL                                  | 9.4                                  | 0.115                    |
| 5       | 17-18-03-2019        | 60.1                                  | 34.5                                   | 13.3                                 | 17.5                                 | 0.366                    | 68.9                                  | 37.1                                   | 11.3                                 | 17.5                                 | 0.357                    | 45.4                                  | 25.4                                   | 8.0                                  | 9.4                                  | 0.236                    |
| 6       | 21-22-03-2019        | 60.6                                  | 35.0                                   | 13.3                                 | 18.2                                 | 0.563                    | 60.2                                  | 33.4                                   | 9.3                                  | 13.8                                 | 0.392                    | 51.6                                  | 29.3                                   | 8.0                                  | 8.8                                  | 0.161                    |
| 7       | 25-26-03-2019        | 48.5                                  | 27.2                                   | 7.2                                  | 13.7                                 | 0.187                    | 68.0                                  | 38.5                                   | 11.5                                 | 18.9                                 | 0.646                    | 47.0                                  | 27.5                                   | 6.0                                  | 10.4                                 | 0.300                    |
| 8       | 29-30-03-2019        | 41.9                                  | 22.0                                   | 12.0                                 | 14.3                                 | 0.497                    | 58.6                                  | 33.0                                   | 11.4                                 | 19.5                                 | 0.409                    | 49.7                                  | 27.9                                   | 6.0                                  | 8.5                                  | 0.155                    |
| 9       | 2-03-04-2019         | 49.4                                  | 27.9                                   | 10.8                                 | 13.0                                 | 0.312                    | 64.9                                  | 37.6                                   | 13.3                                 | 15.6                                 | 0.548                    | 45.4                                  | 26.7                                   | BDL                                  | 8.5                                  | 0.357                    |
| 10      | 6-07-04-2019         | 59.9                                  | 33.5                                   | 12.7                                 | 17.6                                 | 0.515                    | 67.9                                  | 36.3                                   | 9.6                                  | 20.2                                 | 0.404                    | 44.4                                  | 25.0                                   | 6.0                                  | 11.0                                 | 0.126                    |
| 11      | 10-11-04-2019        | 41.1                                  | 23.4                                   | 12.1                                 | 13.0                                 | 0.527                    | 58.6                                  | 33.3                                   | 14.5                                 | 20.8                                 | 0.461                    | 45.3                                  | 26.7                                   | 6.0                                  | 11.7                                 | 0.334                    |
| 12      | 13-14-04-2019        | 52.1                                  | 28.7                                   | 12.7                                 | 18.2                                 | 0.533                    | 57.7                                  | 32.2                                   | 9.6                                  | 20.2                                 | 0.409                    | 46.7                                  | 26.3                                   | 9.1                                  | 9.1                                  | 0.300                    |
| 13      | 17-18-04-2019        | 60.0                                  | 33.5                                   | 10.3                                 | 11.7                                 | 0.557                    | 61.4                                  | 34.5                                   | 12.0                                 | 20.1                                 | 0.560                    | 47.6                                  | 27.2                                   | BDL                                  | 10.4                                 | 0.219                    |
| 14      | 21-22-04-2019        | 48.9                                  | 27.9                                   | 11.5                                 | 13.0                                 | 0.420                    | 58.3                                  | 31.4                                   | 11.5                                 | 20.2                                 | 0.583                    | 43.2                                  | 24.7                                   | 9.0                                  | 13.0                                 | 0.253                    |
| 15      | 25-26-04-2019        | 60.6                                  | 34.5                                   | 8.4                                  | 13.0                                 | 0.557                    | 60.5                                  | 36.4                                   | 10.9                                 | 21.5                                 | 0.611                    | 42.1                                  | 24.3                                   | 7.2                                  | 11.7                                 | 0.172                    |
| 16      | 28-29-04-2019        | 46.1                                  | 27.9                                   | 13.3                                 | 14.3                                 | 0.342                    | 66.9                                  | 39.9                                   | 13.3                                 | 20.2                                 | 0.513                    | 48.6                                  | 27.5                                   | 6.0                                  | 8.4                                  | 0.138                    |
| 17      | 2-03-05-2019         | 54.8                                  | 30.3                                   | 7.2                                  | 13.0                                 | 0.575                    | 65.8                                  | 38.4                                   | 11.4                                 | 13.0                                 | 0.438                    | 54.0                                  | 31.3                                   | 7.8                                  | 9.8                                  | 0.265                    |
| 18      | 6-07-05-2019         | 47.0                                  | 25.7                                   | 13.2                                 | 16.4                                 | 0.217                    | 58.6                                  | 33.3                                   | 12.3                                 | 21.3                                 | 0.404                    | 42.3                                  | 24.6                                   | BDL                                  | 11.4                                 | 0.178                    |
| 19      | 10-11-05-2019        | 52.4                                  | 30.0                                   | 7.4                                  | 18.2                                 | 0.485                    | 65.6                                  | 36.3                                   | 9.1                                  | 16.8                                 | 0.594                    | 43.6                                  | 25.9                                   | 8.2                                  | 9.6                                  | 0.317                    |
| 20      | 13-14-05-2019        | 43.6                                  | 25.9                                   | 6.6                                  | 14.6                                 | 0.324                    | 65.8                                  | 36.6                                   | 12.4                                 | 20.9                                 | 0.473                    | 54.4                                  | 31.2                                   | 7.4                                  | 11.8                                 | 0.167                    |
| 21      | 17-18-05-2019        | 42.4                                  | 24.2                                   | 13.2                                 | 14.1                                 | 0.527                    | 63.6                                  | 33.9                                   | 13.2                                 | 21.4                                 | 0.600                    | 54.1                                  | 31.8                                   | 7.4                                  | 9.1                                  | 0.155                    |
| 22      | 21-22-05-2019        | 50.5                                  | 28.3                                   | 12.4                                 | 13.6                                 | 0.223                    | 60.2                                  | 34.2                                   | 12.3                                 | 17.7                                 | 0.525                    | 48.3                                  | 27.5                                   | 7.4                                  | 9.1                                  | 0.352                    |
| 23      | 25-26-05-2019        | 44.2                                  | 25.9                                   | 9.1                                  | 17.7                                 | 0.396                    | 65.7                                  | 39.3                                   | 14.0                                 | 14.5                                 | 0.531                    | 54.9                                  | 31.2                                   | BDL                                  | 11.8                                 | 0.207                    |
| 24      | 29-30-05-2019        | 51.9                                  | 30.6                                   | 13.2                                 | 14.1                                 | 0.223                    | 67.0                                  | 38.3                                   | 12.3                                 | 16.8                                 | 0.375                    | 49.9                                  | 29.7                                   | 7.4                                  | 8.2                                  | 0.172                    |
|         | <b>Minimum</b>       | <b>41.1</b>                           | <b>22.0</b>                            | <b>6.6</b>                           | <b>11.7</b>                          | <b>0.187</b>             | <b>57.6</b>                           | <b>31.4</b>                            | <b>9.1</b>                           | <b>13.0</b>                          | <b>0.357</b>             | <b>42.1</b>                           | <b>24.3</b>                            | <b>BDL</b>                           | <b>8.2</b>                           | <b>BDL</b>               |
|         | <b>Maximum</b>       | <b>61.1</b>                           | <b>36.7</b>                            | <b>13.3</b>                          | <b>18.8</b>                          | <b>0.575</b>             | <b>68.9</b>                           | <b>39.9</b>                            | <b>14.6</b>                          | <b>21.5</b>                          | <b>0.646</b>             | <b>54.9</b>                           | <b>31.8</b>                            | <b>9.3</b>                           | <b>13.0</b>                          | <b>0.357</b>             |
|         | <b>Average</b>       | <b>51.5</b>                           | <b>29.3</b>                            | <b>10.6</b>                          | <b>15.3</b>                          | <b>0.406</b>             | <b>63.1</b>                           | <b>35.8</b>                            | <b>11.8</b>                          | <b>18.5</b>                          | <b>0.485</b>             | <b>48.3</b>                           | <b>27.8</b>                            | <b>7.1</b>                           | <b>10.2</b>                          | <b>0.219</b>             |
|         | <b>98 percentile</b> | <b>60.9</b>                           | <b>35.9</b>                            | <b>13.3</b>                          | <b>18.5</b>                          | <b>0.569</b>             | <b>68.7</b>                           | <b>39.6</b>                            | <b>14.6</b>                          | <b>21.4</b>                          | <b>0.630</b>             | <b>54.7</b>                           | <b>31.6</b>                            | <b>9.2</b>                           | <b>12.5</b>                          | <b>0.355</b>             |

| Sl. No.              | Date of sampling | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NO <sub>2</sub><br>µg/m <sup>3</sup> | CO*<br>mg/m <sup>3</sup> | PM <sub>10</sub><br>µg/m <sup>3</sup> | PM <sub>2.5</sub><br>µg/m <sup>3</sup> | SO <sub>2</sub><br>µg/m <sup>3</sup> | NO <sub>2</sub><br>µg/m <sup>3</sup> | CO*<br>mg/m <sup>3</sup> |
|----------------------|------------------|---------------------------------------|----------------------------------------|--------------------------------------|--------------------------------------|--------------------------|---------------------------------------|----------------------------------------|--------------------------------------|--------------------------------------|--------------------------|
|                      | <b>LOCATION:</b> | <b>Beruanpal Village</b>              |                                        |                                      |                                      |                          | <b>Nimidha Village</b>                |                                        |                                      |                                      |                          |
| 1                    | 3 - 04-03-2019   | 68.1                                  | 39.7                                   | 9.3                                  | 16.3                                 | 0.567                    | 64.2                                  | 37.1                                   | 11.3                                 | 11.9                                 | 0.293                    |
| 2                    | 7 - 08-03-2019   | 64.3                                  | 35.9                                   | 10.0                                 | 16.9                                 | 0.408                    | 64.1                                  | 36.6                                   | 8.6                                  | 14.4                                 | 0.380                    |
| 3                    | 11 - 12-03-2019  | 65.2                                  | 36.0                                   | 9.3                                  | 15.1                                 | 0.426                    | 63.4                                  | 33.6                                   | 8.0                                  | 16.9                                 | 0.438                    |
| 4                    | 14 - 15-03-2019  | 67.9                                  | 36.3                                   | 10.6                                 | 16.3                                 | 0.361                    | 60.1                                  | 34.6                                   | 10.6                                 | 15.0                                 | 0.340                    |
| 5                    | 18 - 19-03-2019  | 66.7                                  | 37.7                                   | 10.6                                 | 15.7                                 | 0.567                    | 60.4                                  | 37.3                                   | 11.3                                 | 15.7                                 | 0.311                    |
| 6                    | 22 - 23-03-2019  | 67.2                                  | 39.2                                   | 9.6                                  | 15.0                                 | 0.549                    | 64.6                                  | 35.4                                   | 11.4                                 | 14.3                                 | 0.288                    |
| 7                    | 26 - 27-03-2019  | 66.3                                  | 36.6                                   | 13.3                                 | 14.3                                 | 0.508                    | 60.0                                  | 34.2                                   | 8.5                                  | 13.0                                 | 0.484                    |
| 8                    | 30 - 31-03-2019  | 64.5                                  | 35.7                                   | 12.0                                 | 14.3                                 | 0.520                    | 60.1                                  | 34.2                                   | 8.4                                  | 16.3                                 | 0.328                    |
| 9                    | 3 - 04-04-2019   | 65.9                                  | 38.0                                   | 11.5                                 | 16.3                                 | 0.579                    | 60.4                                  | 35.0                                   | 9.6                                  | 13.0                                 | 0.380                    |
| 10                   | 7 - 08-04-2019   | 65.0                                  | 37.1                                   | 13.3                                 | 13.0                                 | 0.473                    | 64.0                                  | 37.7                                   | 9.7                                  | 13.0                                 | 0.438                    |
| 11                   | 11 - 12-04-2019  | 69.9                                  | 42.2                                   | 11.4                                 | 16.2                                 | 0.385                    | 64.6                                  | 36.8                                   | 10.9                                 | 13.0                                 | 0.322                    |
| 12                   | 14 - 15-04-2019  | 67.1                                  | 37.2                                   | 12.7                                 | 16.9                                 | 0.620                    | 60.1                                  | 33.3                                   | 9.7                                  | 11.7                                 | 0.415                    |
| 13                   | 18 - 19-04-2019  | 67.3                                  | 36.0                                   | 12.7                                 | 14.3                                 | 0.361                    | 56.8                                  | 31.4                                   | 9.7                                  | 13.7                                 | 0.450                    |
| 14                   | 22 - 23-04-2019  | 68.8                                  | 40.1                                   | 9.6                                  | 13.7                                 | 0.502                    | 60.9                                  | 33.6                                   | 8.4                                  | 14.9                                 | 0.398                    |
| 15                   | 26 - 27-04-2019  | 65.7                                  | 36.2                                   | 12.7                                 | 15.0                                 | 0.414                    | 57.0                                  | 34.2                                   | 9.0                                  | 15.0                                 | 0.386                    |
| 16                   | 29 - 30-04-2019  | 67.5                                  | 36.7                                   | 13.9                                 | 14.3                                 | 0.514                    | 64.2                                  | 35.7                                   | 8.4                                  | 13.6                                 | 0.380                    |
| 17                   | 3 - 04-05-2019   | 69.1                                  | 36.8                                   | 12.1                                 | 15.6                                 | 0.361                    | 55.5                                  | 31.4                                   | 8.4                                  | 11.7                                 | 0.351                    |
| 18                   | 7 - 08-05-2019   | 67.8                                  | 36.7                                   | 14.0                                 | 15.0                                 | 0.514                    | 64.9                                  | 37.3                                   | 10.7                                 | 15.5                                 | 0.496                    |
| 19                   | 11 - 12-05-2019  | 65.0                                  | 38.3                                   | 14.0                                 | 14.1                                 | 0.414                    | 57.5                                  | 33.3                                   | 9.9                                  | 11.8                                 | 0.363                    |
| 20                   | 14 - 15-05-2019  | 64.1                                  | 38.5                                   | 10.7                                 | 13.2                                 | 0.455                    | 62.6                                  | 34.3                                   | 9.1                                  | 16.4                                 | 0.305                    |
| 21                   | 18 - 19-05-2019  | 69.0                                  | 38.8                                   | 9.1                                  | 15.5                                 | 0.490                    | 56.8                                  | 30.5                                   | 9.1                                  | 13.2                                 | 0.363                    |
| 22                   | 22 - 23-05-2019  | 65.0                                  | 34.5                                   | 9.9                                  | 13.2                                 | 0.379                    | 55.1                                  | 33.0                                   | 11.5                                 | 13.2                                 | 0.328                    |
| 23                   | 26 - 27-05-2019  | 64.9                                  | 36.7                                   | 13.2                                 | 16.8                                 | 0.620                    | 65.8                                  | 37.8                                   | 10.7                                 | 11.4                                 | 0.369                    |
| 24                   | 30 - 31-05-2019  | 66.2                                  | 38.2                                   | 11.5                                 | 12.3                                 | 0.349                    | 62.0                                  | 35.0                                   | 10.7                                 | 15.0                                 | 0.345                    |
| <b>Minimum</b>       |                  | <b>64.1</b>                           | <b>34.5</b>                            | <b>9.1</b>                           | <b>12.3</b>                          | <b>0.349</b>             | <b>55.1</b>                           | <b>30.5</b>                            | <b>8.0</b>                           | <b>11.4</b>                          | <b>0.288</b>             |
| <b>Maximum</b>       |                  | <b>69.9</b>                           | <b>42.2</b>                            | <b>14.0</b>                          | <b>16.9</b>                          | <b>0.620</b>             | <b>65.8</b>                           | <b>37.8</b>                            | <b>11.5</b>                          | <b>16.9</b>                          | <b>0.496</b>             |
| <b>Average</b>       |                  | <b>66.6</b>                           | <b>37.5</b>                            | <b>11.5</b>                          | <b>15.0</b>                          | <b>0.472</b>             | <b>61.0</b>                           | <b>34.7</b>                            | <b>9.7</b>                           | <b>13.9</b>                          | <b>0.373</b>             |
| <b>98 percentile</b> |                  | <b>69.5</b>                           | <b>41.2</b>                            | <b>14.0</b>                          | <b>16.9</b>                          | <b>0.620</b>             | <b>65.4</b>                           | <b>37.8</b>                            | <b>11.5</b>                          | <b>16.7</b>                          | <b>0.490</b>             |

| Sl. No. | Date of Sampling | Location           | NH <sub>3</sub><br>(µg/m <sup>3</sup> ) | BaP<br>(ng/m <sup>3</sup> ) | C <sub>6</sub> H <sub>6</sub><br>(µg/m <sup>3</sup> ) | Pb<br>(µg/m <sup>3</sup> ) | As<br>(ng/m <sup>3</sup> ) | Ni<br>(ng/m <sup>3</sup> ) |
|---------|------------------|--------------------|-----------------------------------------|-----------------------------|-------------------------------------------------------|----------------------------|----------------------------|----------------------------|
| 1       | 16-17/03/2019    | Mosonia Village    | BDL                                     | N.D                         | N.D                                                   | BDL                        | BDL                        | BDL                        |
| 2       | 16-17/03/2019    | Tarkabeda Village  | BDL                                     | N.D                         | N.D                                                   | BDL                        | BDL                        | BDL                        |
| 3       | 17-18/03/2019    | Kadala Village     | BDL                                     | N.D                         | N.D                                                   | BDL                        | BDL                        | BDL                        |
| 4       | 17-18/03/2019    | Nimabahali Village | BDL                                     | N.D                         | N.D                                                   | BDL                        | BDL                        | BDL                        |
| 5       | 17-18/03/2019    | Thokar Village     | BDL                                     | N.D                         | N.D                                                   | BDL                        | BDL                        | BDL                        |
| 6       | 18-19/03/2019    | Beruanpal Village  | BDL                                     | N.D                         | N.D                                                   | BDL                        | BDL                        | BDL                        |
| 7       | 18-19/03/2019    | Nimidha Village    | BDL                                     | N.D                         | N.D                                                   | BDL                        | BDL                        | BDL                        |

**N.D:** Not detected, \* Parameter 1ppm CO is 1.146mg/m<sup>3</sup> at 25°C

**Note:** BDL (Below Detection Limit) of SO<sub>2</sub><6.0; NH<sub>3</sub><1.0; Pb<0.07µg/m<sup>3</sup>; As < 0.6ng/m<sup>3</sup>; Ni<0.6 ng/m<sup>3</sup>

**Source:** Test Report no. MMA/06-19/12 from Min Mec R&D Laboratory, New Delhi

## NATIONAL AMBIENT AIR QUALITY STANDARDS

## CENTRAL POLLUTION CONTROL BOARD

## NOTIFICATION

Delhi, the 18<sup>th</sup> November, 2009

No.B-29016/20/90/PCI-I.— In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No.14 of 1981), and in supersession of the Notification No(s). S.O. 384(E), dated 11<sup>th</sup> April, 1994 and S.O. 935(E), dated 14<sup>th</sup> October, 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect, namely:-

## NATIONAL AMBIENT AIR QUALITY STANDARDS

| S. No. | Pollutant                                                                          | Time Weighted Average | Concentration in Ambient Air                  |                                                              |                                                                                                         |
|--------|------------------------------------------------------------------------------------|-----------------------|-----------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
|        |                                                                                    |                       | Industrial, Residential, Rural and Other Area | Ecologically Sensitive Area (notified by Central Government) | Methods of Measurement                                                                                  |
| (1)    | (2)                                                                                | (3)                   | (4)                                           | (5)                                                          | (6)                                                                                                     |
| 1      | Sulphur Dioxide (SO <sub>2</sub> ), µg/m <sup>3</sup>                              | Annual*               | 50                                            | 20                                                           | - Improved West and Gaeke<br>- Ultraviolet fluorescence                                                 |
|        |                                                                                    | 24 hours**            | 80                                            | 80                                                           |                                                                                                         |
| 2      | Nitrogen Dioxide (NO <sub>2</sub> ), µg/m <sup>3</sup>                             | Annual*               | 40                                            | 30                                                           | - Modified Jacob & Hochheiser (Na-Arsenite)<br>- Chemiluminescence                                      |
|        |                                                                                    | 24 hours**            | 80                                            | 80                                                           |                                                                                                         |
| 3      | Particulate Matter (size less than 10µm) or PM <sub>10</sub> , µg/m <sup>3</sup>   | Annual*               | 60                                            | 60                                                           | - Gravimetric<br>- TOEM<br>- Beta attenuation                                                           |
|        |                                                                                    | 24 hours**            | 100                                           | 100                                                          |                                                                                                         |
| 4      | Particulate Matter (size less than 2.5µm) or PM <sub>2.5</sub> , µg/m <sup>3</sup> | Annual*               | 40                                            | 40                                                           | - Gravimetric<br>- TOEM<br>- Beta attenuation                                                           |
|        |                                                                                    | 24 hours**            | 60                                            | 60                                                           |                                                                                                         |
| 5      | Ozone (O <sub>3</sub> ), µg/m <sup>3</sup>                                         | 8 hours**             | 100                                           | 100                                                          | - UV photometric<br>- Chemiluminescence<br>- Chemical Method                                            |
|        |                                                                                    | 1 hour**              | 180                                           | 180                                                          |                                                                                                         |
| 6      | Lead (Pb), µg/m <sup>3</sup>                                                       | Annual*               | 0.50                                          | 0.50                                                         | - AAS /ICP method after sampling on EPM 2000 or equivalent filter paper<br>- ED-XRF using Teflon filter |
|        |                                                                                    | 24 hours**            | 1.0                                           | 1.0                                                          |                                                                                                         |
| 7      | Carbon Monoxide (CO), mg/m <sup>3</sup>                                            | 8 hours**             | 02                                            | 02                                                           | - Non Dispersive Infra Red (NDIR) spectroscopy                                                          |
|        |                                                                                    | 1 hour**              | 04                                            | 04                                                           |                                                                                                         |

| (1) | (2)                                                              | (3)                   | (4)        | (5)        | (6)                                                                                                   |
|-----|------------------------------------------------------------------|-----------------------|------------|------------|-------------------------------------------------------------------------------------------------------|
| 8   | Ammonia (NH <sub>3</sub> ), µg/m <sup>3</sup>                    | Annual*<br>24 hours** | 100<br>400 | 100<br>400 | - Chemiluminescence<br>- Indophenol blue method                                                       |
| 9   | Benzene (C <sub>6</sub> H <sub>6</sub> ), µg/m <sup>3</sup>      | Annual*               | 05         | 05         | - Gas chromatography based continuous analyzer<br>- Adsorption and Desorption followed by GC analysis |
| 10  | Benzo(a)Pyrene (BaP) - particulate phase only, ng/m <sup>3</sup> | Annual*               | 01         | 01         | - Solvent extraction followed by HPLC/GC analysis                                                     |
| 11  | Arsenic (As), ng/m <sup>3</sup>                                  | Annual*               | 06         | 06         | - AAS /ICP method after sampling on EPM 2000 or equivalent filter paper                               |
| 12  | Nickel (Ni), ng/m <sup>3</sup>                                   | Annual*               | 20         | 20         | - AAS /ICP method after sampling on EPM 2000 or equivalent filter paper                               |

\* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

\*\* 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note. — Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

SANT PRASAD GAUTAM, Chairman  
[Advt-III/4/184/09/Exty.]

Note: The notifications on National Ambient Air Quality Standards were published by the Central Pollution Control Board in the Gazette of India, Extraordinary vide notification No(s). S.O. 384(E), dated 11<sup>th</sup> April, 1994 and S.O. 935(E), dated 14<sup>th</sup> October, 1998.



## ANNEXURE : IX

### TEST REPORT

| Customer's Name & Address                                                                                                                                                                                    |                                                             | Sample Particulars                                              |                   |                       |                               |                               |                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------|-------------------|-----------------------|-------------------------------|-------------------------------|----------------------------|
| Rungta Mines Ltd.<br>Dhenkanal Steel Plant<br>Village - Jharbandh<br>PO.- Nimbahali, Via- Meramandali<br>Dist. Dhenkanal - 759121<br>Odisha<br><br>Contact Person : Mr. G. P. Sharma<br>Phone : 06582-255261 |                                                             | Type of Sample : Surface & Ground water                         |                   |                       |                               |                               |                            |
|                                                                                                                                                                                                              |                                                             | Work Order No. : 4800009067                                     |                   |                       |                               |                               |                            |
|                                                                                                                                                                                                              |                                                             | Sampling Location : In and around Dhenkanal Steel Plant, Odisha |                   |                       |                               |                               |                            |
|                                                                                                                                                                                                              |                                                             | Sampling Procedure : IS 3025 (Part 1)                           |                   |                       |                               |                               |                            |
|                                                                                                                                                                                                              |                                                             | Sample Volume/Quantity : 1 ltr.                                 |                   |                       |                               |                               |                            |
|                                                                                                                                                                                                              |                                                             | Sampling Team : MMRDL (Manoj)                                   |                   |                       |                               |                               |                            |
|                                                                                                                                                                                                              |                                                             | Sample Reg. No. : MMW/05-2019/1.1-1.5,2.1-2.3                   |                   |                       |                               |                               |                            |
|                                                                                                                                                                                                              |                                                             | Date of Sampling : 30-04-2019                                   |                   |                       |                               |                               |                            |
|                                                                                                                                                                                                              |                                                             | Date of Receipt : 01-05-2019                                    |                   |                       |                               |                               |                            |
|                                                                                                                                                                                                              |                                                             | Date of Testing : 01/05/2019 to 07/05/2019                      |                   |                       |                               |                               |                            |
|                                                                                                                                                                                                              |                                                             | Date of Report : 08-05-2019                                     |                   |                       |                               |                               |                            |
|                                                                                                                                                                                                              |                                                             | Test Report No. : MMW/05-2019/1                                 |                   |                       |                               |                               |                            |
|                                                                                                                                                                                                              |                                                             | ULR Number : TC633719000000059P                                 |                   |                       |                               |                               |                            |
| Parameters                                                                                                                                                                                                   | Drinking water limits (IS: 10500:2012 and Ammendment No. 1) |                                                                 | Protocol          | TEST RESULTS          |                               |                               |                            |
|                                                                                                                                                                                                              | Desirable                                                   | Permissible                                                     |                   | Core Zone (Hand Pump) | Jharbandh Village (Hand Pump) | Tarkabeda Village (Hand Pump) | Kadala Village (Hand Pump) |
| Turbidity, NTU                                                                                                                                                                                               | 1                                                           | 5                                                               | IS 3025 (Part 10) | BDL                   | BDL                           | BDL                           | BDL                        |
| pH value                                                                                                                                                                                                     | 6.5 - 8.5                                                   | No relaxation                                                   | IS 3025 (Part 11) | 7.5                   | 6.9                           | 7.1                           | 7.3                        |
| Specific conductance, µmhos                                                                                                                                                                                  | -                                                           | -                                                               | IS 3025 (Part 14) | 867                   | 960                           | 637                           | 1029                       |
| Total Dissolved Solids, mg/l                                                                                                                                                                                 | 500                                                         | 2000                                                            | IS 3025 (Part 16) | 490                   | 626                           | 366                           | 628                        |
| Total Suspended Solids, mg/l                                                                                                                                                                                 | -                                                           | -                                                               | IS 3025 (Part 17) | BDL                   | BDL                           | BDL                           | BDL                        |
| Total Hardness as CaCO <sub>3</sub> , mg/l                                                                                                                                                                   | 200                                                         | 600                                                             | IS 3025 (Part 21) | 320                   | 312                           | 288                           | 384                        |
| Alkalinity, mg/l                                                                                                                                                                                             | 200                                                         | 600                                                             | IS 3025 (Part 23) | 384                   | 222                           | 335                           | 212                        |
| Sulphate as SO <sub>4</sub> mg/l                                                                                                                                                                             | 200                                                         | 400                                                             | IS 3025 (Part 24) | 28                    | 55                            | 13                            | 65                         |
| Phosphorous as P, mg/l                                                                                                                                                                                       | -                                                           | -                                                               | IS 3025 (Part 31) | BDL                   | BDL                           | BDL                           | BDL                        |
| Chloride as Cl, mg/l                                                                                                                                                                                         | 250                                                         | 1000                                                            | IS 3025 (Part 32) | 39                    | 157                           | 21                            | 159                        |
| Calcium as Ca, mg/l                                                                                                                                                                                          | 75                                                          | 200                                                             | IS 3025 (Part 40) | 74                    | 72                            | 51                            | 99                         |
| Dissolved oxygen, mg/l                                                                                                                                                                                       | -                                                           | -                                                               | IS 3025 (Part 38) | -                     | -                             | -                             | -                          |
| Biochemical Oxygen Demand (BOD), mg/l                                                                                                                                                                        | -                                                           | -                                                               | IS 3025 (Part 44) | -                     | -                             | -                             | -                          |
| Chemical Oxygen Demand (COD), mg/l                                                                                                                                                                           | -                                                           | -                                                               | APHA 5220 D       | -                     | -                             | -                             | -                          |
| Sodium as Na, mg/l                                                                                                                                                                                           | -                                                           | -                                                               | IS 3025 (Part 45) | 62.4                  | 70                            | 23.2                          | 52.0                       |
| Potassium as K, mg/l                                                                                                                                                                                         | -                                                           | -                                                               | IS 3025 (Part 45) | 2.5                   | 2.4                           | 1.0                           | 2.2                        |
| Magnesium as Mg, mg/l                                                                                                                                                                                        | 30                                                          | 100                                                             | IS 3025 (Part 46) | 33                    | 32                            | 38                            | 33                         |
| Iron as Fe, mg/l                                                                                                                                                                                             | 1.0                                                         | No relaxation                                                   | IS 3025 (Part 53) | BDL                   | 0.2                           | BDL                           | BDL                        |
| Fluoride as F, mg/l                                                                                                                                                                                          | 1.0                                                         | 1.5                                                             | APHA 4500-F-D     | 0.71                  | BDL                           | 0.36                          | 0.15                       |
| Oil & Grease, mg/l                                                                                                                                                                                           | -                                                           | -                                                               | IS 3025 (Part 39) | -                     | -                             | -                             | -                          |

#### NOTES :

- \* Total Liability of the laboratory is limited to the invoice amount
- \* The certificate shall not be reproduced wholly or in part without prior written consent of the laboratory
- \* Unused balance of sample received shall be destroyed after one month from the date of issue of test report, unless otherwise specified
- \* The report shall not be used in any advertising media or as evidence in the court of law without prior written consent of the laboratory
- \* Complaint register is available with the laboratory, in case required

### ANNEXURE : IX Contd..

| Parameters                         | Drinking water limits (IS: 10500:2012 and Amendment No. 1) |               | Protocol          | TEST RESULTS          |                               |                               |                            |
|------------------------------------|------------------------------------------------------------|---------------|-------------------|-----------------------|-------------------------------|-------------------------------|----------------------------|
|                                    | Desirable                                                  | Permissible   |                   | Core Zone (Hand Pump) | Jharbandh Village (Hand Pump) | Tarkabeda Village (Hand Pump) | Kadala Village (Hand Pump) |
| Silver as Ag, mg/l                 | 0.1                                                        | No relaxation | IS 3025 (Part 2)  | BDL                   | BDL                           | BDL                           | BDL                        |
| Boron as B, mg/l                   | 0.5                                                        | 1             | IS 3025 (Part 2)  | BDL                   | BDL                           | BDL                           | BDL                        |
| Chromium as Cr,mg/l                | 0.05                                                       | No relaxation | IS 3025 (Part 2)  | BDL                   | BDL                           | BDL                           | BDL                        |
| Copper as Cu, mg/l                 | 0.05                                                       | 1.5           | IS 3025 (Part 2)  | BDL                   | BDL                           | BDL                           | BDL                        |
| Manganese as Mn, mg/l              | 0.1                                                        | 0.3           | IS 3025 (Part 2)  | BDL                   | 0.020                         | 0.022                         | 0.022                      |
| Nickel as Ni, mg/l                 | 0.02                                                       | No relaxation | IS 3025 (Part 2)  | BDL                   | BDL                           | BDL                           | BDL                        |
| Selenium as Se, mg/l               | 0.01                                                       | No relaxation | IS 3025 (Part 2)  | BDL                   | BDL                           | BDL                           | BDL                        |
| Arsenic as As, mg/l                | 0.01                                                       | No relaxation | IS 3025 (Part 2)  | BDL                   | BDL                           | BDL                           | BDL                        |
| Zinc as Zn, mg/l                   | 5                                                          | 15            | IS 3025 (Part 2)  | BDL                   | 0.020                         | 0.236                         | 0.332                      |
| Acidity as CaCO <sub>3</sub> ,mg/l | -                                                          | -             | IS 3025 (Part 22) | 4 at pH 8.3           | 4 at pH 8.3                   | 12 at pH 8.3                  | 8 at pH 8.3                |
| Nitrate as NO <sub>3</sub> , mg/l  | 45                                                         | No relaxation | APHA (4500-NO3-B) | 8.62                  | 8.06                          | 3.20                          | 30.84                      |
| Hexavalent Chromium, mg/l          | -                                                          | -             | APHA 3500-Cr B    | BDL                   | BDL                           | BDL                           | BDL                        |
| Residual Free Chlorine, mg/l *     | 0.2                                                        | 1             | IS 3025 (Part 26) | NIL                   | NIL                           | NIL                           | NIL                        |
| Total Coliform (MPN/100ml) *       | -                                                          | -             | APHA 9221 B       | -                     | -                             | -                             | -                          |
| E. Coli *                          | -                                                          | -             | APHA 9221 F       | -                     | -                             | -                             | -                          |

NOTE : BDL(Below Detection Limit) of Turbidity (NTU) <1, TSS <10, P <0.1, Fe <0.1, F <0.1, O&G <5, Ag <0.01, B <0.01, Cr <0.01, Cu <0.01, Mn <0.01, Ni <0.01, Se <0.01, As <0.01, Zn <0.01, Cr6+ <0.1 mg/l

\* Parameter not in NABL scope.

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- \* The report shall not be used in any advertising media or as evidence in the court of law without prior written consent of the laboratory
- \* Complaint register is available with the laboratory, in case required

## ANNEXURE : IX Contd..

| TEST REPORT                                                                                                                                                                                                  |                                                            |               |                                                  |                                  |                                            |                        |                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------|--------------------------------------------------|----------------------------------|--------------------------------------------|------------------------|-----------------------------------------|
| Customer's Name & Address                                                                                                                                                                                    | Sample Particulars                                         |               |                                                  |                                  |                                            |                        |                                         |
| Rungta Mines Ltd.<br>Dhenkanal Steel Plant<br>Village - Jharbandh<br>PO.- Nimbahali, Via- Meramandali<br>Dist. Dhenkanal - 759121<br>Odisha<br><br>Contact Person : Mr. G. P. Sharma<br>Phone : 06582-255261 | Type of Sample                                             |               | : Surface & Ground water                         |                                  |                                            |                        |                                         |
|                                                                                                                                                                                                              | Work Order No.                                             |               | : 4800009067                                     |                                  |                                            |                        |                                         |
|                                                                                                                                                                                                              | Sampling Location                                          |               | : In and around Dhenkanal<br>Steel Plant, Odisha |                                  |                                            |                        |                                         |
|                                                                                                                                                                                                              | Sampling Procedure                                         |               | : IS 3025 (Part 1)                               |                                  |                                            |                        |                                         |
|                                                                                                                                                                                                              | Sample Volume/Quantity                                     |               | : 1 ltr.                                         |                                  |                                            |                        |                                         |
|                                                                                                                                                                                                              | Sampling Team                                              |               | : MMRDL (Manoj)                                  |                                  |                                            |                        |                                         |
|                                                                                                                                                                                                              | Sample Reg. No.                                            |               | : MMW/05-2019/1.1-1.5,2.1-2.3                    |                                  |                                            |                        |                                         |
|                                                                                                                                                                                                              | Date of Sampling                                           |               | : 30-04-2019                                     |                                  |                                            |                        |                                         |
|                                                                                                                                                                                                              | Date of Receipt                                            |               | : 01-05-2019                                     |                                  |                                            |                        |                                         |
|                                                                                                                                                                                                              | Date of Testing                                            |               | : 01/05/2019 to 07/05/2019                       |                                  |                                            |                        |                                         |
|                                                                                                                                                                                                              | Date of Report                                             |               | : 08-05-2019                                     |                                  |                                            |                        |                                         |
|                                                                                                                                                                                                              | Test Report No.                                            |               | : MMW/05-2019/1                                  |                                  |                                            |                        |                                         |
|                                                                                                                                                                                                              | ULR Number                                                 |               | : TC633719000000059P                             |                                  |                                            |                        |                                         |
| Parameters                                                                                                                                                                                                   | Drinking water limits (IS: 10500:2012 and Amendment No. 1) |               | Protocol                                         | TEST RESULTS                     |                                            |                        |                                         |
|                                                                                                                                                                                                              | Desirable                                                  | Permissible   |                                                  | Gandhij hara Village (Hand Pump) | Brahamani river near Khadag Prasad Village | Lingra Nala near Plant | Gandhijhara nala near Tarkabeda Village |
| Turbidity, NTU                                                                                                                                                                                               | 1                                                          | 5             | IS 3025 (Part 10)                                | BDL                              | BDL                                        | BDL                    | BDL                                     |
| pH value                                                                                                                                                                                                     | 6.5 - 8.5                                                  | No relaxation | IS 3025 (Part 11)                                | 7.8                              | 7.9                                        | 7.9                    | 7.2                                     |
| Specific conductance, µmhos                                                                                                                                                                                  | -                                                          | -             | IS 3025 (Part 14)                                | 959                              | 175                                        | 775                    | 726                                     |
| Total Dissolved Solids, mg/l                                                                                                                                                                                 | 500                                                        | 2000          | IS 3025 (Part 16)                                | 610                              | 116                                        | 460                    | 432                                     |
| Total Suspended Solids, mg/l                                                                                                                                                                                 | -                                                          | -             | IS 3025 (Part 17)                                | BDL                              | BDL                                        | BDL                    | BDL                                     |
| Total Hardness as CaCO <sub>3</sub> , mg/l                                                                                                                                                                   | 200                                                        | 600           | IS 3025 (Part 21)                                | 328                              | 64                                         | 184                    | 280                                     |
| Alkalinity, mg/l                                                                                                                                                                                             | 200                                                        | 600           | IS 3025 (Part 23)                                | 433                              | 74                                         | 143                    | 330                                     |
| Sulphate as SO <sub>4</sub> mg/l                                                                                                                                                                             | 200                                                        | 400           | IS 3025 (Part 24)                                | 19                               | 9                                          | 62                     | 21                                      |
| Phosphorous as P, mg/l                                                                                                                                                                                       | -                                                          | -             | IS 3025 (Part 31)                                | BDL                              | BDL                                        | BDL                    | BDL                                     |
| Chloride as Cl, mg/l                                                                                                                                                                                         | 250                                                        | 1000          | IS 3025 (Part 32)                                | 69                               | 15                                         | 118                    | 56                                      |
| Calcium as Ca, mg/l                                                                                                                                                                                          | 75                                                         | 200           | IS 3025 (Part 40)                                | 63                               | 13                                         | 45                     | 37                                      |
| Dissolved oxygen, mg/l                                                                                                                                                                                       | -                                                          | -             | IS 3025 (Part 38)                                | -                                | 6.9                                        | 7.1                    | 6.8                                     |
| Biochemical Oxygen Demand (BOD), mg/l                                                                                                                                                                        | -                                                          | -             | IS 3025 (Part 44)                                | -                                | 5                                          | 15                     | 10                                      |
| Chemical Oxygen Demand (COD), mg/l                                                                                                                                                                           | -                                                          | -             | APHA 5220 D                                      | -                                | 11                                         | 25                     | 18                                      |
| Sodium as Na, mg/l                                                                                                                                                                                           | -                                                          | -             | IS 3025 (Part 45)                                | 74.3                             | 6.5                                        | 75.4                   | 43.1                                    |
| Potassium as K, mg/l                                                                                                                                                                                         | -                                                          | -             | IS 3025 (Part 45)                                | 1.7                              | 1.8                                        | 11.9                   | 14.5                                    |
| Magnesium as Mg, mg/l                                                                                                                                                                                        | 30                                                         | 100           | IS 3025 (Part 46)                                | 41                               | 8                                          | 17                     | 34                                      |
| Iron as Fe, mg/l                                                                                                                                                                                             | 1.0                                                        | No relaxation | IS 3025 (Part 53)                                | 0.1                              | BDL                                        | BDL                    | BDL                                     |
| Fluoride as F, mg/l                                                                                                                                                                                          | 1.0                                                        | 1.5           | APHA 4500-F-D                                    | 0.27                             | 0.14                                       | 0.78                   | 0.17                                    |
| Oil & Grease, mg/l                                                                                                                                                                                           | -                                                          | -             | IS 3025 (Part 39)                                | -                                | BDL                                        | BDL                    | BDL                                     |

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## ANNEXURE : IX Contd..

| Parameters                         | Drinking water limits (IS: 10500:2012 and Amendment No. 1) |               | Protocol          | TEST RESULTS                     |                                           |                        |                                          |
|------------------------------------|------------------------------------------------------------|---------------|-------------------|----------------------------------|-------------------------------------------|------------------------|------------------------------------------|
|                                    | Desirable                                                  | Permissible   |                   | Gandhij hara Village (Hand Pump) | Brahmani river near Khadag Prasad Village | Lingra Nala near Plant | Gandhijhar a nala nera Tarkabeda Village |
| Silver as Ag, mg/l                 | 0.1                                                        | No relaxation | IS 3025 (Part 2)  | BDL                              | BDL                                       | BDL                    | BDL                                      |
| Boron as B, mg/l                   | 0.5                                                        | 1             | IS 3025 (Part 2)  | 0.028                            | 0.015                                     | 0.164                  | 0.057                                    |
| Chromium as Cr,mg/l                | 0.05                                                       | No relaxation | IS 3025 (Part 2)  | BDL                              | BDL                                       | BDL                    | BDL                                      |
| Copper as Cu, mg/l                 | 0.05                                                       | 1.5           | IS 3025 (Part 2)  | BDL                              | BDL                                       | BDL                    | BDL                                      |
| Manganese as Mn, mg/l              | 0.1                                                        | 0.3           | IS 3025 (Part 2)  | 0.067                            | BDL                                       | BDL                    | BDL                                      |
| Nickel as Ni, mg/l                 | 0.02                                                       | No relaxation | IS 3025 (Part 2)  | BDL                              | BDL                                       | BDL                    | BDL                                      |
| Selenium as Se, mg/l               | 0.01                                                       | No relaxation | IS 3025 (Part 2)  | BDL                              | BDL                                       | BDL                    | BDL                                      |
| Arsenic as As, mg/l                | 0.01                                                       | No relaxation | IS 3025 (Part 2)  | BDL                              | BDL                                       | BDL                    | BDL                                      |
| Zinc as Zn, mg/l                   | 5                                                          | 15            | IS 3025 (Part 2)  | 0.131                            | BDL                                       | 0.033                  | 0.038                                    |
| Acidity as CaCO <sub>3</sub> ,mg/l | -                                                          | -             | IS 3025 (Part 22) | 4 at pH 8.3                      | 4 at pH 8.3                               | 4 at pH 8.3            | 12 at pH 8.3                             |
| Nitrate as NO <sub>3</sub> , mg/l  | 45                                                         | No relaxation | APHA (4500-NO3-B) | 0.62                             | 0.74                                      | 14.62                  | 2.76                                     |
| Hexavalent Chromium, mg/l          | -                                                          | -             | APHA 3500-Cr B    | BDL                              | BDL                                       | BDL                    | BDL                                      |
| Residual Free Chlorine, mg/l *     | 0.2                                                        | 1             | IS 3025 (Part 26) | NIL                              | NIL                                       | NIL                    | NIL                                      |
| Total Coliform (MPN/100ml) *       | -                                                          | -             | APHA 9221 B       | -                                | 6                                         | 17                     | 12                                       |
| E. Coli *                          | -                                                          | -             | APHA 9221 F       | -                                | Absent                                    | Present                | Absent                                   |

NOTE : BDL(Below Detection Limit) of Turbidity (NTU) <1, TSS <10, P <0.1, Fe <0.1, F <0.1, O&G <5, Ag <0.01, B <0.01, Cr <0.01, Cu <0.01, Mn <0.01, Ni <0.01, Se <0.01, As <0.01, Zn <0.01, Cr6+ <0.1 mg/l

\* Parameter not in NABL scope.

Prepared By  
*Rashmi*  
Rashmi Gupta  
Administrative Manager

Checked By  
*Marisha*  
Dr. Marisha Sharma  
Authorised Signatory

:: End of Report ::

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## ANNEXURE : IX Contd..

### TEST REPORT

| Customer's Name & Address                                                                                                                                                                                                                          |                                                            | Sample Particulars     |                                             |                             |                                |                                  |                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------|---------------------------------------------|-----------------------------|--------------------------------|----------------------------------|-----------------------------|
| <b>Rungta Mines Ltd.,</b><br><b>Dhenkanal Steel Plant</b><br><b>Village - Jharbandh</b><br><b>PO Nimbahali, Via Meramandali</b><br><b>Dist. - Dhenkanal- 759121</b><br><br><b>Contact Person : Mr. G. P. Sharma</b><br><b>Phone : 06502 255261</b> |                                                            | Type of Sample         | Surface & Ground water                      |                             |                                |                                  |                             |
|                                                                                                                                                                                                                                                    |                                                            | Work Order No.         | RML/DSP/EMP/10-20/502(A)                    |                             |                                |                                  |                             |
|                                                                                                                                                                                                                                                    |                                                            | Sampling Location      | In and around Dhenkanal Steel Plant, Odisha |                             |                                |                                  |                             |
|                                                                                                                                                                                                                                                    |                                                            | Sampling Procedure     | IS 3025 (Part 1)                            |                             |                                |                                  |                             |
|                                                                                                                                                                                                                                                    |                                                            | Sample Volume/Quantity | 2 lit.                                      |                             |                                |                                  |                             |
|                                                                                                                                                                                                                                                    |                                                            | Sampling Team          | MMRDL (Mahesh Dutt)                         |                             |                                |                                  |                             |
|                                                                                                                                                                                                                                                    |                                                            | Sample Reg. No.        | MMW/06-2019/15 1-15 B 16 1-16 B             |                             |                                |                                  |                             |
|                                                                                                                                                                                                                                                    |                                                            | Date of Sampling       | 29.05.2019                                  |                             |                                |                                  |                             |
|                                                                                                                                                                                                                                                    |                                                            | Date of Receipt        | 30-05-2019                                  |                             |                                |                                  |                             |
|                                                                                                                                                                                                                                                    |                                                            | Date of Testing        | 30/05/2019 to 10/06/2019                    |                             |                                |                                  |                             |
|                                                                                                                                                                                                                                                    |                                                            | Date of Report         | 12.06.2019                                  |                             |                                |                                  |                             |
|                                                                                                                                                                                                                                                    |                                                            | Test Report No.        | MMW/06-2019/9                               |                             |                                |                                  |                             |
|                                                                                                                                                                                                                                                    |                                                            | UIR Number             | 10633/1900000089P                           |                             |                                |                                  |                             |
| Parameters                                                                                                                                                                                                                                         | Drinking water limits (IS: 10500:2012 and Amendment No. 1) |                        | Protocol                                    | TEST RESULTS                |                                |                                  |                             |
|                                                                                                                                                                                                                                                    | Desirable                                                  | Permissible            |                                             | Nimidha Village (Hand Pump) | Beruan pal Villagr (Hand Pump) | Dhulia munda Village (Hand Pump) | Taltali Village (Hand Pump) |
| Turbidity, NTU                                                                                                                                                                                                                                     | 1                                                          | 5                      | IS 3025 (Part 10)                           | BDL                         | BDL                            | BDL                              | BDL                         |
| pH value                                                                                                                                                                                                                                           | 6.5 - 8.5                                                  | No relaxation          | IS 3025 (Part 11)                           | 7.0                         | 6.8                            | 7.1                              | 6.9                         |
| Specific conductance, $\mu\text{mhos}$                                                                                                                                                                                                             |                                                            |                        | IS 3025 (Part 14)                           | 671                         | 701                            | 665                              | 490                         |
| Total Dissolved Solids, $\text{mg/l}$                                                                                                                                                                                                              | 500                                                        | 2000                   | IS 3025 (Part 16)                           | 432                         | 410                            | 484                              | 322                         |
| Total Suspended Solids, $\text{mg/l}$                                                                                                                                                                                                              | -                                                          | -                      | IS 3025 (Part 17)                           | BDL                         | 12                             | BDL                              | BDL                         |
| Total Hardness as $\text{CaCO}_3$ , $\text{mg/l}$                                                                                                                                                                                                  | 200                                                        | 600                    | IS 3025 (Part 21)                           | 324                         | 230                            | 372                              | 248                         |
| Alkalinity, $\text{mg/l}$                                                                                                                                                                                                                          | 200                                                        | 600                    | IS 3025 (Part 23)                           | 360                         | 143                            | 286                              | 177                         |
| Sulphate as $\text{SO}_4$ , $\text{mg/l}$                                                                                                                                                                                                          | 200                                                        | 400                    | IS 3025 (Part 24)                           | 9                           | 05                             | 20                               | 26                          |
| Phosphorus as P, $\text{mg/l}$                                                                                                                                                                                                                     |                                                            |                        | IS 3025 (Part 31)                           | 1101                        | 1101                           | 1101                             | 1101                        |
| Chloride as Cl, $\text{mg/l}$                                                                                                                                                                                                                      | 250                                                        | 1000                   | IS 3025 (Part 32)                           | 28                          | 84                             | 75                               | 47                          |
| Calcium as Ca, $\text{mg/l}$                                                                                                                                                                                                                       | 75                                                         | 200                    | IS 3025 (Part 40)                           | 67                          | 53                             | 72                               | 53                          |
| Dissolved oxygen, $\text{mg/l}$                                                                                                                                                                                                                    |                                                            |                        | IS 3025 (Part 38)                           |                             |                                |                                  |                             |
| Biochemical Oxygen Demand (BOD), $\text{mg/l}$                                                                                                                                                                                                     |                                                            |                        | IS 3025 (Part 44)                           |                             |                                |                                  |                             |
| Chemical Oxygen Demand (COD), $\text{mg/l}$                                                                                                                                                                                                        | -                                                          | -                      | APHA 5220 D                                 | -                           | -                              | -                                | -                           |
| Sodium as Na, $\text{mg/l}$                                                                                                                                                                                                                        |                                                            |                        | IS 3025 (Part 45)                           | 17.6                        | 41.2                           | 16                               | 8.3                         |
| Potassium as K, $\text{mg/l}$                                                                                                                                                                                                                      | -                                                          | -                      | IS 3025 (Part 45)                           | 1.8                         | 5.0                            | 1.3                              | 1.0                         |
| Magnesium as Mg, $\text{mg/l}$                                                                                                                                                                                                                     | 30                                                         | 100                    | IS 3025 (Part 46)                           | 37                          | 25                             | 46                               | 28                          |
| Iron as Fe, $\text{mg/l}$                                                                                                                                                                                                                          | 1.0                                                        | No relaxation          | IS 3025 (Part 53)                           | 0.37                        | 1101                           | 1101                             | 1101                        |
| Fluoride as F, $\text{mg/l}$                                                                                                                                                                                                                       | 1.0                                                        | 1.5                    | APHA 4500-F-D                               | 0.49                        | 0.14                           | 0.52                             | 0.25                        |

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## ANNEXURE : IX Contd..

| Parameters                          | Drinking water limits (IS: 10500:2012 and Amendment No. 1) |               | Protocol          | TEST RESULTS                |                                |                                  |                             |
|-------------------------------------|------------------------------------------------------------|---------------|-------------------|-----------------------------|--------------------------------|----------------------------------|-----------------------------|
|                                     | Desirable                                                  | Permissible   |                   | Nimidha Village (Hand Pump) | Beruan pal Village (Hand Pump) | Dhulia munda Village (Hand Pump) | Taltali Village (Hand Pump) |
| Oil & Grease, mg/l                  | -                                                          | -             | IS 3025 (Part 39) | -                           | -                              | -                                | -                           |
| Silver as Ag, mg/l                  | 0.1                                                        | No relaxation | IS 3025 (Part 2)  | BDL                         | BDL                            | BDL                              | BDL                         |
| Boron as B, mg/l                    | 0.5                                                        | 1             | IS 3025 (Part 2)  | BDL                         | 0.021                          | BDL                              | BDL                         |
| Chromium as Cr, mg/l                | 0.05                                                       | No relaxation | IS 3025 (Part 2)  | BDL                         | BDL                            | BDL                              | BDL                         |
| Copper as Cu, mg/l                  | 0.05                                                       | 1.5           | IS 3025 (Part 2)  | BDL                         | 0.025                          | BDL                              | BDL                         |
| Manganese as Mn, mg/l               | 0.1                                                        | 0.3           | IS 3025 (Part 2)  | BDL                         | BDL                            | 0.022                            | 0.032                       |
| Nickel as Ni, mg/l                  | 0.02                                                       | No relaxation | IS 3025 (Part 2)  | BDL                         | BDL                            | BDL                              | BDL                         |
| Selenium as Se, mg/l                | 0.01                                                       | No relaxation | IS 3025 (Part 2)  | BDL                         | BDL                            | BDL                              | BDL                         |
| Arsenic as As, mg/l                 | 0.01                                                       | No relaxation | IS 3025 (Part 2)  | BDL                         | BDL                            | BDL                              | BDL                         |
| Zinc as Zn, mg/l                    | 5                                                          | 15            | IS 3025 (Part 2)  | 0.214                       | BDL                            | 0.124                            | 0.041                       |
| Acidity as CaCO <sub>3</sub> , mg/l | -                                                          | -             | IS 3025 (Part 22) | 6 ul pH 8.3                 | 10 ul pH 8.3                   | 8 ul pH 8.3                      | 10 ul pH 8.3                |
| Nitrate as NO <sub>3</sub> , mg/l   | 45                                                         | No relaxation | APHA (4500-NO3-B) | 0.08                        | 25.50                          | 15.93                            | 0.85                        |
| Hexavalent Chromium, mg/l           | -                                                          | -             | APHA 3500-Cr B    | BDL                         | BDL                            | BDL                              | BDL                         |
| Residual Free Chlorine, mg/l *      | 0.2                                                        | 1             | IS 3025 (Part 26) | NII                         | NII                            | NII                              | NII                         |
| Total Coliform (MPN/100ml) *        | -                                                          | -             | APHA 9221 B       | -                           | -                              | -                                | -                           |
| E. Coli *                           | -                                                          | -             | APHA 9221 F       | -                           | -                              | -                                | -                           |

NOTE : BDL/Below Detection Limit of Turbidity (NTU) <1, TSS <10, P <0.1, K <1, Fe <0.1, O&G <5, Ag <0.01, B <0.01, Cr <0.01, Cu <0.01, Mn <0.01, Ni <0.01, Se <0.01, As <0.01, Zn <0.01, NO<sub>3</sub> <0.5, Cr<sup>6+</sup> <0.1 mg/l

\* Parameter not in NABL scope.

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## ANNEXURE : IX Contd..

### TEST REPORT

| Customer's Name & Address                                                                                                                                                                                                                          | Sample Particulars                                         |               |                                               |                                |                             |                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------|-----------------------------------------------|--------------------------------|-----------------------------|---------------------------------------------------------|
| <b>Rungla Mines Ltd.,</b><br><b>Dhenkanal Steel Plant</b><br><b>Village - Jharbandh</b><br><b>PO Nimbahali, Via Meramandali</b><br><b>Dist. _ Dhenkanal- 759121</b><br><br><b>Contact Person : Mr. G. P. Sharma</b><br><b>Phone : 98502 255201</b> | Type of Sample                                             |               | : Surface & Ground water                      |                                |                             |                                                         |
|                                                                                                                                                                                                                                                    | Work Order No.                                             |               | : RML/DSP/EMP/19-20/502(A)                    |                                |                             |                                                         |
|                                                                                                                                                                                                                                                    | Sampling Location                                          |               | : In and around Dhenkanal Steel Plant, Odisha |                                |                             |                                                         |
|                                                                                                                                                                                                                                                    | Sampling Procedure                                         |               | : IS 3025 (Part 1)                            |                                |                             |                                                         |
|                                                                                                                                                                                                                                                    | Sample Volume/Quantity                                     |               | : 2 lt.                                       |                                |                             |                                                         |
|                                                                                                                                                                                                                                                    | Sampling Team                                              |               | : MMRLD (Mahesh Dutt)                         |                                |                             |                                                         |
|                                                                                                                                                                                                                                                    | Sample Reg. No.                                            |               | : MMW06-2019/9 1-15 B 16 1-18 B               |                                |                             |                                                         |
|                                                                                                                                                                                                                                                    | Date of Sampling                                           |               | : 29.05.2019                                  |                                |                             |                                                         |
|                                                                                                                                                                                                                                                    | Date of Receipt                                            |               | : 30-05-2019                                  |                                |                             |                                                         |
|                                                                                                                                                                                                                                                    | Date of Testing                                            |               | : 30/05/2019 to 10/06/2019                    |                                |                             |                                                         |
|                                                                                                                                                                                                                                                    | Date of Report                                             |               | : 12.06.2019                                  |                                |                             |                                                         |
|                                                                                                                                                                                                                                                    | Test Report No.                                            |               | : MMW06-2019/9                                |                                |                             |                                                         |
|                                                                                                                                                                                                                                                    | ULIS Number                                                |               | : 10533/1900000089P                           |                                |                             |                                                         |
| Parameters                                                                                                                                                                                                                                         | Drinking water limits (IS: 10500:2012 and Amendment No. 1) |               | Protocol                                      | TEST RESULTS                   |                             |                                                         |
|                                                                                                                                                                                                                                                    | Desirable                                                  | Permissible   |                                               | Benipathar Village (Hand Pump) | Kankalu Village (Hand Pump) | Bramhani River near Pani Gengutla Village (Down Stream) |
| Turbidity, NTU                                                                                                                                                                                                                                     | 1                                                          | 5             | IS 3025 (Part 10)                             | BDL                            | BDL                         | BDL                                                     |
| pH value                                                                                                                                                                                                                                           | 6.5 - 8.5                                                  | No relaxation | IS 3025 (Part 11)                             | 7.4                            | 7.3                         | 7.7                                                     |
| Specific conductance, $\mu\text{mhos}$                                                                                                                                                                                                             |                                                            |               | IS 3025 (Part 14)                             | 1986                           | 1181                        | 191                                                     |
| Total Dissolved Solids, mg/l                                                                                                                                                                                                                       | 500                                                        | 2000          | IS 3025 (Part 16)                             | 1214                           | 710                         | 128                                                     |
| Total Suspended Solids, mg/l                                                                                                                                                                                                                       | -                                                          | -             | IS 3025 (Part 17)                             | BDL                            | BDL                         | BDL                                                     |
| Total Hardness as $\text{CaCO}_3$ , mg/l                                                                                                                                                                                                           | 200                                                        | 600           | IS 3025 (Part 21)                             | 448                            | 496                         | 84                                                      |
| Alkalinity, mg/l                                                                                                                                                                                                                                   | 200                                                        | 600           | IS 3025 (Part 23)                             | 714                            | 502                         | 59                                                      |
| Sulphate as $\text{SO}_4$ , mg/l                                                                                                                                                                                                                   | 200                                                        | 400           | IS 3025 (Part 24)                             | 130                            | 82                          | 11                                                      |
| Phosphorus as P, mg/l                                                                                                                                                                                                                              |                                                            |               | IS 3025 (Part 31)                             | 1101                           | 1101                        | 1101                                                    |
| Chloride as Cl, mg/l                                                                                                                                                                                                                               | 250                                                        | 1000          | IS 3025 (Part 32)                             | 191                            | 67                          | 24                                                      |
| Calcium as Ca, mg/l                                                                                                                                                                                                                                | 75                                                         | 200           | IS 3025 (Part 40)                             | 88                             | 93                          | 19                                                      |
| Dissolved oxygen, mg/l                                                                                                                                                                                                                             |                                                            |               | IS 3025 (Part 38)                             |                                |                             | 7.1                                                     |
| Biochemical Oxygen Demand (BOD), mg/l                                                                                                                                                                                                              |                                                            |               | IS 3025 (Part 44)                             |                                |                             | 7.1                                                     |
| Chemical Oxygen Demand (COD), mg/l                                                                                                                                                                                                                 | -                                                          | -             | APHA 5220 D                                   | -                              | -                           | 18                                                      |
| Sodium as Na, mg/l                                                                                                                                                                                                                                 |                                                            |               | IS 3025 (Part 45)                             | 266                            | 418                         | 73                                                      |
| Potassium as K, mg/l                                                                                                                                                                                                                               | -                                                          | -             | IS 3025 (Part 45)                             | 5.3                            | 2.3                         | 1.0                                                     |
| Magnesium as Mg, mg/l                                                                                                                                                                                                                              | 30                                                         | 100           | IS 3025 (Part 46)                             | 55                             | 63                          | 0                                                       |
| Iron as Fe, mg/l                                                                                                                                                                                                                                   | 1.0                                                        | No relaxation | IS 3025 (Part 53)                             | 1101                           | 1101                        | 1101                                                    |
| Fluoride as F, mg/l                                                                                                                                                                                                                                | 1.0                                                        | 1.5           | APHA 1500-F-D                                 | 0.43                           | 0.41                        | 0.18                                                    |

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## ANNEXURE : IX Contd..

| Parameters                          | Drinking water limits (IS: 10500:2012 and Amendment No. 1) |               | Protocol                       | TEST RESULTS                   |                             |                                                         |
|-------------------------------------|------------------------------------------------------------|---------------|--------------------------------|--------------------------------|-----------------------------|---------------------------------------------------------|
|                                     | Desirable                                                  | Permissible   |                                | Benipathar Village (Hand Pump) | Kankalu Village (Hand Pump) | Bramhani River near Pani Gengutla Village (Down Stream) |
| Oil & Grease, mg/l                  | -                                                          | -             | IS 3025 (Part 39)              | -                              | -                           | BDL                                                     |
| Silver as Ag, mg/l                  | 0.1                                                        | No relaxation | IS 3025 (Part 2)               | BDL                            | BDL                         | BDL                                                     |
| Boron as B, mg/l                    | 0.5                                                        | 1             | IS 3025 (Part 2)               | BDL                            | BDL                         | 0.012                                                   |
| Chromium as Cr, mg/l                | 0.05                                                       | No relaxation | IS 3025 (Part 2)               | BDL                            | BDL                         | BDL                                                     |
| Copper as Cu, mg/l                  | 0.05                                                       | 1.5           | IS 3025 (Part 2)               | BDL                            | BDL                         | BDL                                                     |
| Manganese as Mn, mg/l               | 0.1                                                        | 0.3           | IS 3025 (Part 2)               | 0.011                          | BDL                         | BDL                                                     |
| Nickel as Ni, mg/l                  | 0.02                                                       | No relaxation | IS 3025 (Part 2)               | BDL                            | BDL                         | BDL                                                     |
| Selenium as Se, mg/l                | 0.01                                                       | No relaxation | IS 3025 (Part 2)               | BDL                            | BDL                         | BDL                                                     |
| Arsenic as As, mg/l                 | 0.01                                                       | No relaxation | IS 3025 (Part 2)               | BDL                            | BDL                         | BDL                                                     |
| Zinc as Zn, mg/l                    | 5                                                          | 15            | IS 3025 (Part 2)               | 0.157                          | 0.052                       | BDL                                                     |
| Acidity as CaCO <sub>3</sub> , mg/l | -                                                          | -             | IS 3025 (Part 22)              | 6 at pH 8.3                    | 0 at pH 8.3                 | 4 at pH 8.3                                             |
| Nitrate as NO <sub>3</sub> , mg/l   | 45                                                         | No relaxation | APHA (4500-NO <sub>3</sub> -B) | 26.20                          | 0.87                        | 0.62                                                    |
| Hexavalent Chromium, mg/l           | -                                                          | -             | APHA 3500-Cr B                 | BDL                            | BDL                         | BDL                                                     |
| Residual Free Chlorine, mg/l *      | 0.2                                                        | 1             | IS 3025 (Part 26)              | NII                            | NII                         | NII                                                     |
| Total Coliform (MPN/100ml) *        | -                                                          | -             | APHA 9221 B                    | -                              | -                           | 3.0                                                     |
| E. Coli *                           | -                                                          | -             | APHA 9221 F                    | -                              | -                           | Absent                                                  |

NOTE : BDL(Below Detection Limit of Turbidity (NTU) <1, TSS <10, P <0.1, K <1, Fe <0.1, O&G <5, Ag <0.01, B <0.01, Cr <0.01, Cu <0.01, Mn <0.01, Ni <0.01, Se <0.01, As <0.01, Zn <0.01, NO<sub>3</sub> <0.5, Cd <0.1 mg/l

\* Parameter not in NABL scope.

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## ANNEXURE : IX Contd..

### TEST REPORT

| Customer's Name & Address                                                                                                                                                                         |                                                             | Sample Particulars                                              |                   |                                                |                             |                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------|-------------------|------------------------------------------------|-----------------------------|-----------------------------|
| Rungla Mines Ltd.,<br>Dhenkanal Steel Plant<br>Village - Jharbandh<br>PO Nimbahali, Via Meramandali<br>Dist. _ Dhenkanal- 759121<br><br>Contact Person : Mr. C. P. Sharma<br>Phone : 06502 255204 |                                                             | Type of Sample : Surface & Ground water                         |                   |                                                |                             |                             |
|                                                                                                                                                                                                   |                                                             | Work Order No. : RML/DSP/EMP/19-20/502(A)                       |                   |                                                |                             |                             |
|                                                                                                                                                                                                   |                                                             | Sampling Location : In and around Dhenkanal Steel Plant, Odisha |                   |                                                |                             |                             |
|                                                                                                                                                                                                   |                                                             | Sampling Procedure : IS 3025 (Part 1)                           |                   |                                                |                             |                             |
|                                                                                                                                                                                                   |                                                             | Sample Volume/Quantity : 2 lt.                                  |                   |                                                |                             |                             |
|                                                                                                                                                                                                   |                                                             | Sampling Team : MMRL (Mahesh Dutt)                              |                   |                                                |                             |                             |
|                                                                                                                                                                                                   |                                                             | Sample Reg. No. : MMW/06-2019/15 1-15 6 15 1-16 9               |                   |                                                |                             |                             |
|                                                                                                                                                                                                   |                                                             | Date of Sampling : 29.05.2019                                   |                   |                                                |                             |                             |
|                                                                                                                                                                                                   |                                                             | Date of Receipt : 30-05-2019                                    |                   |                                                |                             |                             |
|                                                                                                                                                                                                   |                                                             | Date of Testing : 30/05/2019 to 10/06/2019                      |                   |                                                |                             |                             |
|                                                                                                                                                                                                   |                                                             | Date of Report : 12-06-2019                                     |                   |                                                |                             |                             |
|                                                                                                                                                                                                   |                                                             | Test Report No. : MMW/06-2019/9                                 |                   |                                                |                             |                             |
|                                                                                                                                                                                                   |                                                             | UIR Number : 10533/19000000089P                                 |                   |                                                |                             |                             |
| Parameters                                                                                                                                                                                        | Drinking water limits (IS: 10500:2012 and Ammendment No. 1) |                                                                 | Protocol          | TEST RESULTS                                   |                             |                             |
|                                                                                                                                                                                                   | Desirable                                                   | Permissible                                                     |                   | Lingra nala near Kankalu Village (Down Stream) | Nala Near Beruanpal village | Nala near Nimbahali village |
| Turbidity, NTU                                                                                                                                                                                    | 1                                                           | 5                                                               | IS 3025 (Part 10) | BDL                                            | BDL                         | 2.11                        |
| pH value                                                                                                                                                                                          | 6.5 - 8.5                                                   | No relaxation                                                   | IS 3025 (Part 11) | 7.5                                            | 7.6                         | 7.3                         |
| Specific conductance, $\mu\text{mhos}$                                                                                                                                                            |                                                             |                                                                 | IS 3025 (Part 14) | 699                                            | 409                         | 321                         |
| Total Dissolved Solids, mg/l                                                                                                                                                                      | 500                                                         | 2000                                                            | IS 3025 (Part 16) | 440                                            | 260                         | 104                         |
| Total Suspended Solids, mg/l                                                                                                                                                                      | -                                                           | -                                                               | IS 3025 (Part 17) | BDL                                            | BDL                         | 14                          |
| Total Hardness as $\text{CaCO}_3$ , mg/l                                                                                                                                                          | 200                                                         | 600                                                             | IS 3025 (Part 21) | 192                                            | 180                         | 124                         |
| Alkalinity, mg/l                                                                                                                                                                                  | 200                                                         | 600                                                             | IS 3025 (Part 23) | 123                                            | 207                         | 113                         |
| Sulphate as $\text{SO}_4$ , mg/l                                                                                                                                                                  | 200                                                         | 400                                                             | IS 3025 (Part 24) | 76                                             | 8                           | 24                          |
| Phosphorous as P, mg/l                                                                                                                                                                            |                                                             |                                                                 | IS 3025 (Part 31) | 0.11                                           | 0.13                        | 0.01                        |
| Chloride as Cl, mg/l                                                                                                                                                                              | 250                                                         | 1000                                                            | IS 3025 (Part 32) | 94                                             | 19                          | 37                          |
| Calcium as Ca, mg/l                                                                                                                                                                               | 75                                                          | 200                                                             | IS 3025 (Part 40) | 46                                             | 50                          | 28                          |
| Dissolved oxygen, mg/l                                                                                                                                                                            |                                                             |                                                                 | IS 3025 (Part 38) | 6.9                                            | 7.1                         | 7.2                         |
| Biochemical Oxygen Demand (BOD), mg/l                                                                                                                                                             |                                                             |                                                                 | IS 3025 (Part 44) | 17.5                                           | 10                          | 13                          |
| Chemical Oxygen Demand (COD), mg/l                                                                                                                                                                | -                                                           | -                                                               | APHA 5220 D       | 32                                             | 18                          | 21                          |
| Sodium as Na, mg/l                                                                                                                                                                                |                                                             |                                                                 | IS 3025 (Part 41) | 60.5                                           | 10.5                        | 11.3                        |
| Potassium as K, mg/l                                                                                                                                                                              | -                                                           | -                                                               | IS 3025 (Part 45) | 7                                              | 2.3                         | 1.2                         |
| Magnesium as Mg, mg/l                                                                                                                                                                             | 30                                                          | 100                                                             | IS 3025 (Part 46) | 18                                             | 13                          | 14                          |
| Iron as Fe, mg/l                                                                                                                                                                                  | 1.0                                                         | No relaxation                                                   | IS 3025 (Part 13) | 1801                                           | 0.34                        | 0.48                        |
| Fluoride as F, mg/l                                                                                                                                                                               | 1.0                                                         | 1.5                                                             | APHA 1500-F-D     | 0.62                                           | 0.70                        | 0.51                        |

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## ANNEXURE : IX Contd..

| Parameters                          | Drinking water limits (IS: 10500:2012 and Amendment No. 1) |               | Protocol                       | TEST RESULTS                                   |                             |                             |
|-------------------------------------|------------------------------------------------------------|---------------|--------------------------------|------------------------------------------------|-----------------------------|-----------------------------|
|                                     | Desirable                                                  | Permissible   |                                | Lingra nala near Kankalu Village (Down Stream) | Nala Near Beruanpal village | Nala near Nimbahall village |
| Oil & Grease, mg/l                  | -                                                          | -             | IS 3025 (Part 30)              | BDL                                            | BDL                         | BDL                         |
| Silver as Ag, mg/l                  | 0.1                                                        | No relaxation | IS 3025 (Part 2)               | BDL                                            | BDL                         | BDL                         |
| Boron as B, mg/l                    | 0.5                                                        | 1             | IS 3025 (Part 2)               | 0.064                                          | BDL                         | BDL                         |
| Chromium as Cr, mg/l                | 0.05                                                       | No relaxation | IS 3025 (Part 2)               | BDL                                            | 0.011                       | BDL                         |
| Copper as Cu, mg/l                  | 0.05                                                       | 1.5           | IS 3025 (Part 2)               | BDL                                            | BDL                         | BDL                         |
| Manganese as Mn, mg/l               | 0.1                                                        | 0.3           | IS 3025 (Part 2)               | BDL                                            | BDL                         | BDL                         |
| Nickel as Ni, mg/l                  | 0.02                                                       | No relaxation | IS 3025 (Part 2)               | BDL                                            | BDL                         | BDL                         |
| Selenium as Se, mg/l                | 0.01                                                       | No relaxation | IS 3025 (Part 2)               | BDL                                            | BDL                         | BDL                         |
| Arsenic as As, mg/l                 | 0.01                                                       | No relaxation | IS 3025 (Part 2)               | BDL                                            | BDL                         | BDL                         |
| Zinc as Zn, mg/l                    | 5                                                          | 15            | IS 3025 (Part 2)               | 0.051                                          | BDL                         | BDL                         |
| Acidity as CaCO <sub>3</sub> , mg/l | -                                                          | -             | IS 3025 (Part 22)              | 4 at pH 8.3                                    | 6 at pH 8.3                 | 5 at pH 8.3                 |
| Nitrate as NO <sub>3</sub> , mg/l   | 45                                                         | No relaxation | APHA (4500-NO <sub>3</sub> -B) | 10.85                                          | 1.00                        | BDL                         |
| Hexavalent Chromium, mg/l           | -                                                          | -             | APHA 3500-Cr B                 | BDL                                            | BDL                         | BDL                         |
| Residual Free Chlorine, mg/l *      | 0.2                                                        | 1             | IS 3025 (Part 26)              | NII                                            | NII                         | NII                         |
| Total Coliform (MPN/100ml) *        | -                                                          | -             | APHA 9221 B                    | 11                                             | 6.1                         | 8.3                         |
| E. Coli *                           | -                                                          | -             | APHA 9221 F                    | Present                                        | Present                     | Absent                      |

NOTE : BDL(Below Detection Limit) of Turbidity (NTU) <1, TSS <10, P <0.1, K <1, Fe <0.1, O&B <5, Ag <0.01, B <0.01, Cr <0.01, Cu <0.01, Mn <0.01, Ni <0.01, Se <0.01, As <0.01, Zn <0.01, NO<sub>3</sub> <0.5, Cr6+ <0.1 mg/l

\* Parameter not in NABL scope.

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## ANNEXURE : IX Contd..

### TEST REPORT

| Customer's Name & Address                                                                                                                                                                                                                          | Sample Particulars                                         |               |                                               |                                                  |                                |                                 |                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------|-----------------------------------------------|--------------------------------------------------|--------------------------------|---------------------------------|----------------------------------------|
| <b>Rungla Mines Ltd.,</b><br><b>Dhenkanal Steel Plant</b><br><b>Village - Jharbandh</b><br><b>PO Nimbahali, Via Meramandali</b><br><b>Dist. _ Dhenkanal- 759121</b><br><br><b>Contact Person ; Mr. G. P. Sharma</b><br><b>Phone : 90502 255261</b> | Type of Sample                                             |               | : Surface & Ground water                      |                                                  |                                |                                 |                                        |
|                                                                                                                                                                                                                                                    | Work Order No.                                             |               | : RML/DSP/EMP/19-20/502(A)                    |                                                  |                                |                                 |                                        |
|                                                                                                                                                                                                                                                    | Sampling Location                                          |               | : In and around Dhenkanal Steel Plant, Odisha |                                                  |                                |                                 |                                        |
|                                                                                                                                                                                                                                                    | Sampling Procedure                                         |               | : IS 3025 (Part 1)                            |                                                  |                                |                                 |                                        |
|                                                                                                                                                                                                                                                    | Sample Volume/Quantity                                     |               | : 2 lt.                                       |                                                  |                                |                                 |                                        |
|                                                                                                                                                                                                                                                    | Sampling Team                                              |               | : MMH/DI (Mahesh Dutt)                        |                                                  |                                |                                 |                                        |
|                                                                                                                                                                                                                                                    | Sample Reg. No.                                            |               | : MMW/06-2019/15 1-15 B, 16 1-16 B            |                                                  |                                |                                 |                                        |
|                                                                                                                                                                                                                                                    | Date of Sampling                                           |               | : 29.05.2019                                  |                                                  |                                |                                 |                                        |
|                                                                                                                                                                                                                                                    | Date of Receipt                                            |               | : 30-05-2019                                  |                                                  |                                |                                 |                                        |
|                                                                                                                                                                                                                                                    | Date of Testing                                            |               | : 30/05/2019 to 10/06/2019                    |                                                  |                                |                                 |                                        |
|                                                                                                                                                                                                                                                    | Date of Report                                             |               | : 12.06.2019                                  |                                                  |                                |                                 |                                        |
|                                                                                                                                                                                                                                                    | Test Report No.                                            |               | : MMW/06-2019/9                               |                                                  |                                |                                 |                                        |
|                                                                                                                                                                                                                                                    | UIR Number                                                 |               | : 10633/19000000089P                          |                                                  |                                |                                 |                                        |
| Parameters                                                                                                                                                                                                                                         | Drinking water limits (IS: 10500:2012 and Amendment No. 1) |               | Protocol                                      | TEST RESULTS                                     |                                |                                 |                                        |
|                                                                                                                                                                                                                                                    | Desirable                                                  | Permissible   |                                               | Kusumad or Jhor Nala near Bishwana thpur Village | Reservoir for miner irrigation | Kaneti nala near Gulehl village | Kisinda Jhor near Narendar pur Village |
| Turbidity, NTU                                                                                                                                                                                                                                     | 1                                                          | 5             | IS 3025 (Part 10)                             | BDL                                              | BDL                            | 1.12                            | 2.55                                   |
| pH value                                                                                                                                                                                                                                           | 6.5 - 8.5                                                  | No relaxation | IS 3025 (Part 11)                             | 7.7                                              | 7.1                            | 7.7                             | 7.4                                    |
| Specific conductance, $\mu$ mhos                                                                                                                                                                                                                   |                                                            |               | IS 3025 (Part 14)                             | 361                                              | 137                            | 386                             | 368                                    |
| Total Dissolved Solids, mg/l                                                                                                                                                                                                                       | 500                                                        | 2000          | IS 3025 (Part 16)                             | 238                                              | 80                             | 248                             | 248                                    |
| Total Suspended Solids, mg/l                                                                                                                                                                                                                       | -                                                          | -             | IS 3025 (Part 17)                             | BDL                                              | 12                             | 10                              | 26                                     |
| Total Hardness as $\text{CaCO}_3$ , mg/l                                                                                                                                                                                                           | 200                                                        | 600           | IS 3025 (Part 21)                             | 152                                              | 48                             | 140                             | 118                                    |
| Alkalinity, mg/l                                                                                                                                                                                                                                   | 200                                                        | 600           | IS 3025 (Part 23)                             | 148                                              | 44                             | 192                             | 103                                    |
| Sulphate as $\text{SO}_4$ , mg/l                                                                                                                                                                                                                   | 200                                                        | 400           | IS 3025 (Part 24)                             | 13                                               | 12                             | 11                              | 35                                     |
| Phosphorous as P, mg/l                                                                                                                                                                                                                             |                                                            |               | IS 3025 (Part 31)                             | 0.11                                             | 0.01                           | 0.01                            | 0.01                                   |
| Chloride as Cl, mg/l                                                                                                                                                                                                                               | 250                                                        | 1000          | IS 3025 (Part 32)                             | 35                                               | 12                             | 21                              | 43                                     |
| Calcium as Ca, mg/l                                                                                                                                                                                                                                | 75                                                         | 200           | IS 3025 (Part 40)                             | 35                                               | 10                             | 34                              | 24                                     |
| Dissolved oxygen, mg/l                                                                                                                                                                                                                             |                                                            |               | IS 3025 (Part 38)                             | 8.8                                              | 7.6                            | 6.9                             | 6.7                                    |
| Biochemical Oxygen Demand (BOD), mg/l                                                                                                                                                                                                              |                                                            |               | IS 3025 (Part 44)                             | 20                                               | 11                             | 15                              | 8                                      |
| Chemical Oxygen Demand (COD), mg/l                                                                                                                                                                                                                 | -                                                          | -             | APHA 5220 D                                   | 42                                               | 11                             | 35                              | 17.5                                   |
| Sodium as Na, mg/l                                                                                                                                                                                                                                 |                                                            |               | IS 3025 (Part 45)                             | 9                                                | 8.3                            | 20.3                            | 26.3                                   |
| Potassium as K, mg/l                                                                                                                                                                                                                               | -                                                          | -             | IS 3025 (Part 45)                             | BDL                                              | BDL                            | 2.1                             | 3.2                                    |
| Magnesium as Mg, mg/l                                                                                                                                                                                                                              | 30                                                         | 100           | IS 3025 (Part 46)                             | 15                                               | 8                              | 13                              | 13                                     |
| Iron as Fe, mg/l                                                                                                                                                                                                                                   | 1.0                                                        | No relaxation | IS 3025 (Part 53)                             | 0.01                                             | 0.01                           | 0.23                            | 0.01                                   |
| Fluoride as F, mg/l                                                                                                                                                                                                                                | 1.0                                                        | 1.5           | APHA 4500-F-D                                 | 0.51                                             | 0.24                           | 0.52                            | 0.44                                   |

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**ANNEXURE : IX Contd..**

| Parameters                          | Drinking water limits (IS: 10500:2012 and Amendment No. 1) |               | Protocol                       | TEST RESULTS                                     |                                |                                 |                                        |
|-------------------------------------|------------------------------------------------------------|---------------|--------------------------------|--------------------------------------------------|--------------------------------|---------------------------------|----------------------------------------|
|                                     | Desirable                                                  | Permissible   |                                | Kusumad or Jhor Nala near Bishwana thpur Village | Reservoir for mlier irrigation | Kaneti nala near Gulehl village | Kisinda Jhor near Narendar pur Village |
| Oil & Grease, mg/l                  | -                                                          | -             | IS 3025 (Part 39)              | BDL                                              | BDL                            | BDL                             | BDL                                    |
| Silver as Ag, mg/l                  | 0.1                                                        | No relaxation | IS 3025 (Part 2)               | BDL                                              | BDL                            | BDL                             | BDL                                    |
| Boron as B, mg/l                    | 0.5                                                        | 1             | IS 3025 (Part 2)               | BDL                                              | BDL                            | BDL                             | BDL                                    |
| Chromium as Cr, mg/l                | 0.05                                                       | No relaxation | IS 3025 (Part 2)               | BDL                                              | BDL                            | BDL                             | BDL                                    |
| Copper as Cu, mg/l                  | 0.05                                                       | 1.5           | IS 3025 (Part 2)               | BDL                                              | BDL                            | BDL                             | BDL                                    |
| Manganese as Mn, mg/l               | 0.1                                                        | 0.3           | IS 3025 (Part 2)               | 0.021                                            | 0.022                          | 0.01                            | 0.012                                  |
| Nickel as Ni, mg/l                  | 0.02                                                       | No relaxation | IS 3025 (Part 2)               | BDL                                              | BDL                            | BDL                             | BDL                                    |
| Selenium as Se, mg/l                | 0.01                                                       | No relaxation | IS 3025 (Part 2)               | BDL                                              | BDL                            | BDL                             | BDL                                    |
| Arsenic as As, mg/l                 | 0.01                                                       | No relaxation | IS 3025 (Part 2)               | BDL                                              | BDL                            | BDL                             | BDL                                    |
| Zinc as Zn, mg/l                    | 5                                                          | 15            | IS 3025 (Part 2)               | BDL                                              | 0.061                          | 0.121                           | 0.521                                  |
| Acidity as CaCO <sub>3</sub> , mg/l | -                                                          | -             | IS 3025 (Part 22)              | 4 at pH 8.3                                      | 8 at pH 8.3                    | 6 at pH 8.3                     | 6 at pH 8.3                            |
| Nitrate as NO <sub>3</sub> , mg/l   | 45                                                         | No relaxation | APHA (4500-NO <sub>3</sub> -B) | 1.08                                             | 0.41                           | 1.22                            | 4.03                                   |
| Hexavalent Chromium, mg/l           | -                                                          | -             | APHA 3500-Cr B                 | BDL                                              | BDL                            | BDL                             | BDL                                    |
| Residual Free Chlorine, mg/l *      | 0.2                                                        | 1             | IS 3025 (Part 26)              | NII                                              | NII                            | NII                             | NII                                    |
| Total Coliform (MPN/100ml) *        | -                                                          | -             | APHA 9221 B                    | 17                                               | <1.8                           | 3.6                             | <1.8                                   |
| E. Coli *                           | -                                                          | -             | APHA 9221 F                    | Absent                                           | Absent                         | Absent                          | Absent                                 |

NOTE : BDL(Below Detection Limit) of Turbidity (NTU) <1, TSS <10, P <0.1, K <1, Fe <0.1, O&G <5, Ag <0.01, B <0.01, Cr <0.01, Cu <0.01, Mn <0.01, Ni <0.01, Se <0.01, As <0.01, Zn <0.01, NO<sub>3</sub> <0.5, Cr<sup>6+</sup> <0.1 mg/l

\* Parameter not in NABL scope.

Prepared By

*Rashmi*

Rashmi Gupta  
Administrative Manager

Checked By

*Marisha*

Dr. Marisha Sharma  
Authorised Signatory

:: End of Report ::

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# Indian Standard

## DRINKING WATER — SPECIFICATION

### ( Second Revision )

#### 1 SCOPE

This standard prescribes the requirements and the methods of sampling and test for drinking water.

#### 2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

#### 3 TERMINOLOGY

For the purpose of this standard the following definition shall apply.

**3.1 Drinking Water** — Drinking water is water intended for human consumption for drinking and cooking purposes from any source. It includes water (treated or untreated) supplied by any means for human consumption.

#### 4 REQUIREMENTS

Drinking water shall comply with the requirements given in Tables 1 to 4. The analysis of pesticide residues given in Table 3 shall be conducted by a recognized laboratory using internationally established test method meeting the residue limits as given in Table 3.

Drinking water shall also comply with bacteriological requirements (see 4.1), virological requirements (see 4.2) and biological requirements (see 4.3).

##### 4.1 Bacteriological Requirements

###### 4.1.1 Water in Distribution System

Ideally, all samples taken from the distribution system including consumers' premises, should be free from coliform organisms and the following bacteriological quality of drinking water collected in the distribution system, as given in Table 6 is, therefore specified when tested in accordance with IS 1622.

##### 4.2 Virological Requirements

4.2.1 Ideally, all samples taken from the distribution

**Table 1 Organoleptic and Physical Parameters**  
(Foreword and Clause 4)

| Sl No. | Characteristic                    | Requirement (Acceptable Limit) | Permissible Limit in the Absence of Alternate Source | Method of Test, Ref to Part of IS 3025 | Remarks                                                                                    |
|--------|-----------------------------------|--------------------------------|------------------------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------|
| (1)    | (2)                               | (3)                            | (4)                                                  | (5)                                    | (6)                                                                                        |
| i)     | Colour, Hazen units, 40°C         | 5                              | 15                                                   | Part 4                                 | Extended to 15 only, if toxic substances are not suspected in absence of alternate sources |
| ii)    | Odour                             | Agreeable                      | Agreeable                                            | Part 5                                 | a) Test cold and when heated<br>b) Test at several dilutions                               |
| iii)   | pH value                          | 6.5-8.5                        | No relaxation                                        | Part 11                                | —                                                                                          |
| iv)    | Taste                             | Agreeable                      | Agreeable                                            | Parts 7 and 8                          | Test to be conducted only after safety has been established                                |
| v)     | Turbidity, NTU, Max               | 1                              | 5                                                    | Part 10                                | —                                                                                          |
| vi)    | Total dissolved solids, mg/l, Max | 500                            | 2 000                                                | Part 16                                | —                                                                                          |

**NOTE** — It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.



IS 10500 : 2012

**Table 2 General Parameters Concerning Substances Undesirable in Excessive Amounts**  
(Foreword and Clause 4)

| Sl No. | Characteristic                                                             | Requirement (Acceptable Limit) | Permissible Limit in the Absence of Alternate Source | Method of Test, Ref to                                  | Remarks                                                                                                                                                     |
|--------|----------------------------------------------------------------------------|--------------------------------|------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1)    | (2)                                                                        | (3)                            | (4)                                                  | (5)                                                     | (6)                                                                                                                                                         |
| i)     | Aluminium (as Al), mg/l, <i>Max</i>                                        | 0.03                           | 0.2                                                  | IS 3025 (Part 53)                                       | —                                                                                                                                                           |
| ii)    | Ammonia (as total ammonia-N), mg/l, <i>Max</i>                             | 0.5                            | No relaxation                                        | IS 3025 (Part 34)                                       | —                                                                                                                                                           |
| iii)   | Anionic detergents (as MBAS), mg/l, <i>Max</i>                             | 0.2                            | 1.0                                                  | Annex K of IS 13428                                     | —                                                                                                                                                           |
| iv)    | Barium (as Ba), mg/l, <i>Max</i>                                           | 0.7                            | No relaxation                                        | Annex F of IS 13428* or IS 15302                        | —                                                                                                                                                           |
| v)     | Boron (as B), mg/l, <i>Max</i>                                             | 0.5                            | 1.0                                                  | IS 3025 (Part 57)                                       | —                                                                                                                                                           |
| vi)    | Cadmium (as Cd), mg/l, <i>Max</i>                                          | 75                             | 200                                                  | IS 3025 (Part 40)                                       | —                                                                                                                                                           |
| vii)   | Chloramines (as Cl <sub>2</sub> ), mg/l, <i>Max</i>                        | 4.0                            | No relaxation                                        | IS 3025 (Part 26)* or APHA 4500-Cl O                    | —                                                                                                                                                           |
| viii)  | Chloride (as Cl), mg/l, <i>Max</i>                                         | 250                            | 1 000                                                | IS 3025 (Part 32)                                       | —                                                                                                                                                           |
| ix)    | Copper (as Cu), mg/l, <i>Max</i>                                           | 0.05                           | 1.5                                                  | IS 3025 (Part 42)                                       | —                                                                                                                                                           |
| x)     | Fluoride (as F), mg/l, <i>Max</i>                                          | 1.0                            | 1.5                                                  | IS 3025 (Part 60)                                       | —                                                                                                                                                           |
| xi)    | Free residual chlorine, mg/l, <i>Min</i>                                   | 0.2                            | 1                                                    | IS 3025 (Part 26)                                       | To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be minimum 0.5 mg/l |
| xii)   | Iron (as Fe), mg/l, <i>Max</i>                                             | 0.3                            | No relaxation                                        | IS 3025 (Part 53)                                       | Total concentration of manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l                                                                         |
| xiii)  | Magnesium (as Mg), mg/l, <i>Max</i>                                        | 30                             | 100                                                  | IS 3025 (Part 46)                                       | —                                                                                                                                                           |
| xiv)   | Manganese (as Mn), mg/l, <i>Max</i>                                        | 0.1                            | 0.3                                                  | IS 3025 (Part 59)                                       | Total concentration of manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l                                                                         |
| xv)    | Mineral oil, mg/l, <i>Max</i>                                              | 0.5                            | No relaxation                                        | Clause 6 of IS 3025 (Part 29) Infrared partition method | —                                                                                                                                                           |
| xvi)   | Nitrate (as NO <sub>3</sub> ), mg/l, <i>Max</i>                            | 45                             | No relaxation                                        | IS 3025 (Part 34)                                       | —                                                                                                                                                           |
| xvii)  | Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), mg/l, <i>Max</i> | 0.001                          | 0.002                                                | IS 3025 (Part 43)                                       | —                                                                                                                                                           |
| xviii) | Selenium (as Se), mg/l, <i>Max</i>                                         | 0.01                           | No relaxation                                        | IS 3025 (Part 56) or IS 15303*                          | —                                                                                                                                                           |
| xix)   | Silver (as Ag), mg/l, <i>Max</i>                                           | 0.1                            | No relaxation                                        | Annex J of IS 13428                                     | —                                                                                                                                                           |
| xx)    | Sulphate (as SO <sub>4</sub> ), mg/l, <i>Max</i>                           | 200                            | 400                                                  | IS 3025 (Part 24)                                       | May be extended to 400 provided that Magnesium does not exceed 30                                                                                           |
| xxi)   | Sulphide (as H <sub>2</sub> S), mg/l, <i>Max</i>                           | 0.05                           | No relaxation                                        | IS 3025 (Part 29)                                       | —                                                                                                                                                           |
| xxii)  | Total alkalinity as calcium carbonate, mg/l, <i>Max</i>                    | 200                            | 600                                                  | IS 3025 (Part 23)                                       | —                                                                                                                                                           |
| xxiii) | Total hardness (as CaCO <sub>3</sub> ), mg/l, <i>Max</i>                   | 200                            | 600                                                  | IS 3025 (Part 21)                                       | —                                                                                                                                                           |
| xxiv)  | Zinc (as Zn), mg/l, <i>Max</i>                                             | 5                              | 15                                                   | IS 3025 (Part 49)                                       | —                                                                                                                                                           |

**NOTES**

1 In case of dispute, the method indicated by '\*' shall be the reference method

2 It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above, which the sources will have to be rejected.

**Table 3 Parameters Concerning Toxic Substances**  
(Foreword and Clause 4)

| Sl No. | Characteristic                                        | Requirement<br>(Acceptable<br>Limit) | Permissible<br>Limit in the<br>Absence of<br>Alternate<br>Source | Method of Test,<br>Ref to             | Remarks           |
|--------|-------------------------------------------------------|--------------------------------------|------------------------------------------------------------------|---------------------------------------|-------------------|
| (1)    | (2)                                                   | (3)                                  | (4)                                                              | (5)                                   | (6)               |
| i)     | Cadmium (as Cd), mg/l, Max                            | 0.003                                | No relaxation                                                    | IS 3025 (Part 41)                     | —                 |
| ii)    | Cyanide (as CN), mg/l, Max                            | 0.05                                 | No relaxation                                                    | IS 3025 (Part 27)                     | —                 |
| iii)   | Lead (as Pb), mg/l, Max                               | 0.01                                 | No relaxation                                                    | IS 3025 (Part 47)                     | —                 |
| iv)    | Mercury (as Hg), mg/l, Max                            | 0.001                                | No relaxation                                                    | IS 3025 (Part 48)<br>Mercury analyser | —                 |
| v)     | Molybdenum (as Mo), mg/l, Max                         | 0.07                                 | No relaxation                                                    | IS 3025 (Part 2)                      | —                 |
| vi)    | Nickel (as Ni), mg/l, Max                             | 0.02                                 | No relaxation                                                    | IS 3025 (Part 54)                     | —                 |
| vii)   | Pesticides, µg/l, Max                                 | See Table 3                          | No relaxation                                                    | See Table 5                           | —                 |
| viii)  | Polychlorinated biphenyls, mg/l, Max                  | 0.000 5                              | No relaxation                                                    | ASTM 5175*                            | —<br>or APHA 6630 |
| ix)    | Polynuclear aromatic hydrocarbons (as PAH), mg/l, Max | 0.000 1                              | No relaxation                                                    | APHA 6440                             | —                 |
| x)     | Total arsenic (as As), mg/l, Max                      | 0.01                                 | 0.05                                                             | IS 3025 (Part 37)                     | —                 |
| xi)    | Total chromium (as Cr), mg/l, Max                     | 0.05                                 | No relaxation                                                    | IS 3025 (Part 52)                     | —                 |
| xii)   | Trihalomethanes:                                      |                                      |                                                                  |                                       |                   |
| a)     | Bromoform, mg/l, Max                                  | 0.1                                  | No relaxation                                                    | ASTM D 3973-85*<br>or APHA 6232       | —                 |
| b)     | Dibromochloromethane, mg/l, Max                       | 0.1                                  | No relaxation                                                    | ASTM D 3973-85*<br>or APHA 6232       | —                 |
| c)     | Bromodichloromethane, mg/l, Max                       | 0.06                                 | No relaxation                                                    | ASTM D 3973-85*<br>or APHA 6232       | —                 |
| d)     | Chloroform, mg/l, Max                                 | 0.2                                  | No relaxation                                                    | ASTM D 3973-85*<br>or APHA 6232       | —                 |

**NOTES**

1 In case of dispute, the method indicated by \* shall be the reference method.

2 It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

**Table 4 Parameters Concerning Radioactive Substances**  
(Foreword and Clause 4)

| Sl No. | Characteristic           | Requirement<br>(Acceptable<br>Limit) | Permissible<br>Limit in the<br>Absence of<br>Alternate<br>Source | Method of Test,<br>Ref to Part of<br>IS 14194 | Remarks |
|--------|--------------------------|--------------------------------------|------------------------------------------------------------------|-----------------------------------------------|---------|
| (1)    | (2)                      | (3)                                  | (4)                                                              | (5)                                           | (6)     |
| i)     | Radioactive materials:   |                                      |                                                                  |                                               |         |
| a)     | Alpha emitters Bq/l, Max | 0.1                                  | No relaxation                                                    | Part 2                                        | —       |
| b)     | Beta emitters Bq/l, Max  | 1.0                                  | No relaxation                                                    | Part 1                                        | —       |

NOTE — It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

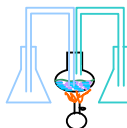
**AMENDMENT NO. 1 JUNE 2015**  
**TO**  
**IS 10500 : 2012 DRINKING WATER — SPECIFICATION**  
(Second Revision)

[Page 2, Table 2, Sl No. xii), col 3] — Substitute '1.0' for '0.3'.

[Page 3, Table 3, Sl No. x), col 4] — Substitute 'No relaxation' for '0.05'.



# Min Mec R&D Laboratory



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## ANNEXURE : XI

### TEST REPORT

| NAME AND ADDRESS OF CUSTOMER                                                                                                                                                                                | SAMPLE PARTICULARS                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Rungta Mines Ltd.<br>Dhenkanal Steel Plant<br>Village- Jharbandh,<br>PO.- Nimabahal, Via - Meramandali<br>Dist.- Dhenkanal-759121<br>Odisha<br><br>Contact Person : Mr. G. P. Sharma<br>Phone: 06582-255261 | Type of Sample : Noise                                                                   |
|                                                                                                                                                                                                             | Work Order No. : 4800009067                                                              |
|                                                                                                                                                                                                             | Sampling Location : As per table given below in and around Dhenkanal Steel Plant, Odisha |
|                                                                                                                                                                                                             | Sampling Procedure : Protocol for Ambient Level Noise Monitoring, CPCB                   |
|                                                                                                                                                                                                             | Sample Duration : 24 hours                                                               |
|                                                                                                                                                                                                             | Sampling Team : MMRDL (Ravikant)                                                         |
|                                                                                                                                                                                                             | Sample Reg. No. : MMN/05-19/2.1- 2.4                                                     |
|                                                                                                                                                                                                             | Date of Monitoring : 28/04/2019 to 30/04/2019                                            |
|                                                                                                                                                                                                             | Date of Receipt : 21/05/2019                                                             |
|                                                                                                                                                                                                             | Date of Report : 28/05/2019                                                              |
|                                                                                                                                                                                                             | Test Report No. : MMN/05-19/03                                                           |
|                                                                                                                                                                                                             | ULR No. : TC633719000000061F                                                             |
|                                                                                                                                                                                                             | Page : 1 of 1                                                                            |

| Hours↓              | Plant area    | Nimbahali Village | Tarkabeda Village | Kadala Village |
|---------------------|---------------|-------------------|-------------------|----------------|
| Date of monitoring→ | 28-29/04/2019 | 28-29/04/2019     | 29-30/04/2019     | 29-30/04/2019  |
| 10-11               | 52.27         | 46.72             | 52.44             | 51.22          |
| 11-12               | 54.08         | 47.69             | 48.37             | 45.11          |
| 12-13               | 46.85         | 47.06             | 47.91             | 45.12          |
| 13-14               | 47.41         | 50.61             | 49.18             | 45.65          |
| 14-15               | 51.5          | 50                | 48.68             | 48.99          |
| 15-16               | 51.17         | 49.68             | 48.43             | 47.78          |
| 16-17               | 50.79         | 48.14             | 48.37             | 52.46          |
| 17-18               | 48.04         | 47.95             | 47.72             | 52.46          |
| 18-19               | 47.92         | 48.2              | 47.23             | 51.19          |
| 19-20               | 47.65         | 48.02             | 47.47             | 41.63          |
| 20-21               | 42.83         | 40.61             | 43.26             | 41.98          |
| 21-22               | 42.96         | 41.03             | 42.93             | 42.15          |
| 22-23               | 42.66         | 40.97             | 42.96             | 42.74          |
| 23-00               | 40.83         | 40.71             | 40.91             | 38.96          |
| 00-01               | 41.24         | 41.44             | 41.15             | 38.9           |
| 01-02               | 41.02         | 41.48             | 41.15             | 39.61          |
| 02-03               | 40.43         | 41.07             | 40.95             | 39.46          |
| 03-04               | 40.94         | 41.02             | 40.87             | 38.73          |
| 04-05               | 40.32         | 41.15             | 40.98             | 39.08          |
| 05-06               | 40.89         | 41.15             | 41.15             | 39.59          |
| 06-07               | 52.96         | 50.07             | 51.06             | 50.93          |
| 07-08               | 53.39         | 50                | 51.42             | 51.01          |
| 08-09               | 52.8          | 49.31             | 51.53             | 52.56          |
| 09-10               | 53.81         | 47.87             | 51.61             | 50.5           |
| Day time Leq.       | 51.18         | 48.58             | 49.52             | 49.79          |
| Night time Leq.     | 41.35         | 41.12             | 41.53             | 40.17          |
| 24 hour Avg. Leq.   | 49.41         | 46.98             | 47.88             | 48.03          |

| Category of area | Ambient Air Quality Standards in Respect of Noise in db (A) Leq as per Noise Pollution (Regulation and Control) Rules 2000 |            |
|------------------|----------------------------------------------------------------------------------------------------------------------------|------------|
|                  | Day time                                                                                                                   | Night time |
| Industrial area  | 75                                                                                                                         | 70         |
| Commercial area  | 65                                                                                                                         | 55         |
| Residential area | 55                                                                                                                         | 45         |
| Silence zone     | 50                                                                                                                         | 40         |

Source: Pollution Control Acts, Rules and Notifications Issued Thereunder, Pollution Control Law Series: PCLS/02/1992 (Fourth edition) of Central Pollution Control Board, Sept -2001, Page 711

Prepared by

*Rashmi*

Rashmi Gupta  
Administrative Manager

Checked by

*Marisha*

Dr. Marisha Sharma  
Authorised Signatory  
-end of report-

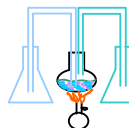
#### NOTES :

- ◆ The results indicated only refer to the tested samples and listed parameters and do not endorse any product
- ◆ Total liability of the laboratory is limited to the invoice amount
- ◆ This certificate shall not be reproduced wholly or in part without prior written consent of the laboratory
- ◆ Unused balance of samples received shall be destroyed after one month from the date of issue of test report, unless other wise specified
- ◆ This report shall not be used in any advertising media or as evidence in the court of law without prior written consent of the laboratory
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## ANNEXURE : XI Contd..

### TEST REPORT

| NAME AND ADDRESS OF CUSTOMER                                                                                                                                                                                | SAMPLE PARTICULARS                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Rungta Mines Ltd.<br>Dhenkanal Steel Plant<br>Village- Jharbandh,<br>PO.- Nimabahal, Via - Meramandali<br>Dist.- Dhenkanal-759121<br>Odisha<br><br>Contact Person : Mr. G. P. Sharma<br>Phone: 06582-255261 | Type of Sample : Noise                                                                   |
|                                                                                                                                                                                                             | Work Order No. : RML/DSP/EMP/19-20/502(A)                                                |
|                                                                                                                                                                                                             | Sampling Location : As per table given below in and around Dhenkanal Steel Plant, Odisha |
|                                                                                                                                                                                                             | Sampling Procedure : Protocol for Ambient Level Noise Monitoring, CPCB                   |
|                                                                                                                                                                                                             | Sample Duration : 24 hours                                                               |
|                                                                                                                                                                                                             | Sampling Team : MMRDL (Mahesh Dutt)                                                      |
|                                                                                                                                                                                                             | Sample Reg. No. : MMN/05-19/8.1-8.6                                                      |
|                                                                                                                                                                                                             | Date of Monitoring : 01/05/2019 to 07/05/2019                                            |
|                                                                                                                                                                                                             | Date of Receipt : 03/06/2019                                                             |
|                                                                                                                                                                                                             | Date of Report : 12/06/2019                                                              |
|                                                                                                                                                                                                             | Test Report No. : MMN/06-19/11                                                           |
|                                                                                                                                                                                                             | ULR No. : TC633719000000091F                                                             |
|                                                                                                                                                                                                             | Page : 1 of 1                                                                            |

| Hours↓<br>Date of Monitoring→ | Nimidha Village<br>01-02/05/2019 | Mosonia Village<br>02-03/05/2019 | Thokar Village<br>03-04/05/2019 | Beruanpal Village<br>04-05/05/2019 | Jharbandh Village<br>05-06/05/2019 | Taltali Village<br>06-07/05/2019 |
|-------------------------------|----------------------------------|----------------------------------|---------------------------------|------------------------------------|------------------------------------|----------------------------------|
| 10-11                         | 46.53                            | 48.85                            | 50.20                           | 46.03                              | 50.38                              | 48.69                            |
| 11-12                         | 47.23                            | 48.76                            | 49.65                           | 49.94                              | 49.68                              | 48.29                            |
| 12-13                         | 47.08                            | 50.25                            | 50.43                           | 49.44                              | 50.07                              | 49.77                            |
| 13-14                         | 50.29                            | 50.30                            | 49.95                           | 49.94                              | 49.48                              | 50.41                            |
| 14-15                         | 49.80                            | 49.64                            | 50.18                           | 49.73                              | 49.65                              | 49.59                            |
| 15-16                         | 50.35                            | 50.23                            | 49.87                           | 49.36                              | 49.32                              | 48.92                            |
| 16-17                         | 52.78                            | 52.93                            | 50.07                           | 49.98                              | 52.78                              | 53.25                            |
| 17-18                         | 52.00                            | 52.08                            | 50.08                           | 49.75                              | 53.53                              | 53.53                            |
| 18-19                         | 53.20                            | 52.48                            | 54.70                           | 52.43                              | 54.31                              | 53.55                            |
| 19-20                         | 52.12                            | 40.88                            | 54.59                           | 52.68                              | 52.89                              | 41.61                            |
| 20-21                         | 41.50                            | 41.58                            | 43.27                           | 41.62                              | 43.02                              | 41.51                            |
| 21-22                         | 41.69                            | 41.96                            | 43.31                           | 41.31                              | 42.87                              | 41.77                            |
| 22-23                         | 41.77                            | 42.32                            | 43.10                           | 41.60                              | 42.76                              | 41.47                            |
| 23-00                         | 39.17                            | 40.34                            | 41.07                           | 39.31                              | 42.12                              | 41.16                            |
| 00-01                         | 38.89                            | 40.41                            | 41.96                           | 39.34                              | 41.59                              | 41.25                            |
| 01-02                         | 38.56                            | 40.63                            | 41.92                           | 39.17                              | 41.77                              | 41.23                            |
| 02-03                         | 38.85                            | 40.80                            | 41.80                           | 39.80                              | 41.89                              | 41.54                            |
| 03-04                         | 38.80                            | 40.44                            | 41.73                           | 39.03                              | 41.48                              | 40.81                            |
| 04-05                         | 39.08                            | 40.64                            | 41.39                           | 39.73                              | 41.94                              | 40.48                            |
| 05-06                         | 39.12                            | 40.79                            | 41.55                           | 39.70                              | 41.89                              | 41.23                            |
| 06-07                         | 49.39                            | 52.51                            | 52.87                           | 51.18                              | 53.20                              | 52.47                            |
| 07-08                         | 49.47                            | 53.02                            | 53.32                           | 50.89                              | 52.74                              | 52.47                            |
| 08-09                         | 49.10                            | 52.87                            | 52.84                           | 51.51                              | 52.80                              | 51.97                            |
| 09-10                         | 46.59                            | 48.56                            | 53.83                           | 50.59                              | 49.69                              | 49.10                            |
| Day time Leq.                 | 49.73                            | 50.46                            | 51.52                           | 49.98                              | 51.32                              | 50.54                            |
| Night time Leq.               | 39.8                             | 41                               | 42.1                            | 40.02                              | 42.08                              | 41.23                            |
| 24 hour Avg. Leq.             | 48.19                            | 48.94                            | 50                              | 48.44                              | 49.81                              | 49.03                            |

| Category of area | Ambient Air Quality Standards in Respect of Noise in db (A) Leq as per Noise Pollution (Regulation and Control) Rules 2000 |            |
|------------------|----------------------------------------------------------------------------------------------------------------------------|------------|
|                  | Day time                                                                                                                   | Night time |
| Industrial area  | 75                                                                                                                         | 70         |
| Commercial area  | 65                                                                                                                         | 55         |
| Residential area | 55                                                                                                                         | 45         |
| Silence zone     | 50                                                                                                                         | 40         |

Source: Pollution Control Acts, Rules and Notifications Issued Thereunder, Pollution Control Law Series: PCLS/02/1992 (Fourth edition) of Central Pollution Control Board, Sept -2001, Page 711

Prepared by

*Rashmi*

Rashmi Gupta  
Administrative Manager

Checked by

*Marisha*

Dr. Marisha Sharma  
Authorised Signatory

-end of report-

#### NOTES :

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## THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000

## SCHEDULE

[ See Rule 3(1) and 4(1) ]

**Ambient Air Quality Standards in respect of Noise**

| Area Code | Category of Area/Zone | Limits in dB(A) Leq* |            |
|-----------|-----------------------|----------------------|------------|
|           |                       | Day Time             | Night Time |
| (A)       | Industrial area       | 75                   | 70         |
| (B)       | Commercial area       | 65                   | 55         |
| (C)       | Residential area      | 55                   | 45         |
| (D)       | Silence Zone          | 50                   | 40         |

**Note :**

1. Day time shall mean from 6.00 a.m. to 10.00 p.m.
2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
- <sup>a</sup>[3. Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority].
4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.
- \* dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale 'A' which is relatable to human hearing.

A "decibel" is a unit in which noise is measured.

"A", in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

Leq : It is an energy mean of the noise level over a specified period.

**SOURCE :** *Pollution Control Acts, Rules and Notifications Issued Thereunder, Pollution Control Law Series : PCLS/02/1992 (Fourth Edition) of Central Pollution Control Board, September 2001, pp 711*

<sup>a</sup> Substituted by Rule 4 of the Noise Pollution (Regulation and Control) (Amendment) Rules, 2000 notified vide S.O. 1046(E), dated 22.11.2000.

**DAMAGE RISK CRITERIA FOR HEARING LOSS  
OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION (OSHA)**

| <b>MAXIMUM ALLOWABLE<br/>DURATION PER DAY, hour</b> | <b>NOISE LEVEL dB(A)<br/>(SLOW RESPONSE)</b> |
|-----------------------------------------------------|----------------------------------------------|
| 8                                                   | 90                                           |
| 6                                                   | 92                                           |
| 4                                                   | 95                                           |
| 3                                                   | 97                                           |
| 2                                                   | 100                                          |
| 1.5                                                 | 102                                          |
| 1.0                                                 | 105                                          |
| 0.5                                                 | 110                                          |
| 0.25 or Less                                        | 115                                          |

**MAXIMUM PERMISSIBLE EXPOSURE TO SOUND UNDER  
OCCUPATIONAL HEALTH AND SAFETY IN INDIA**

| <b>SOUND LEVEL, dB(A)</b> | <b>MAXIMUM EXPOSURE HOURS</b> |
|---------------------------|-------------------------------|
| 90                        | 8                             |
| 93                        | 4                             |
| 96                        | 2                             |
| 99                        | 1                             |
| 102                       | $\frac{1}{2}$                 |
| 105                       | $\frac{1}{4}$                 |
| 108                       | 1/8 or 7.5 min                |

**TRAFFIC VOLUME MONITORING RESULTS**  
**PROJECT : DHENKANAL INTEGRATED STELL PLANT, ORISSA**

**LOCATION : NH55 NEAR NIMABAHALI CHOWK**

**DATE OF MONITORING : 16-17/04/2019**

| Time (hrs)     | Cycles / Carts | 2/3 wheelers | LMV         | HMV         | Total        |
|----------------|----------------|--------------|-------------|-------------|--------------|
| 0.00 to 1.00   | 0              | 0            | 22          | 263         | <b>285</b>   |
| 1.00 to 2.00   | 0              | 0            | 11          | 429         | <b>440</b>   |
| 2.00 to 3.00   | 0              | 0            | 18          | 334         | <b>352</b>   |
| 3.00 to 4.00   | 0              | 6            | 21          | 382         | <b>409</b>   |
| 4.00 to 5.00   | 3              | 13           | 30          | 368         | <b>414</b>   |
| 5.00 to 6.00   | 10             | 19           | 93          | 481         | <b>603</b>   |
| 6.00 to 7.00   | 20             | 23           | 137         | 508         | <b>688</b>   |
| 7.00 to 8.00   | 53             | 47           | 87          | 382         | <b>569</b>   |
| 8.00 to 9.00   | 58             | 53           | 105         | 401         | <b>617</b>   |
| 9.00 to 10.00  | 58             | 156          | 109         | 191         | <b>514</b>   |
| 10.00 to 11.00 | 46             | 184          | 218         | 215         | <b>663</b>   |
| 11.00 to 12.00 | 29             | 163          | 263         | 143         | <b>598</b>   |
| 12.00 to 13.00 | 27             | 145          | 153         | 191         | <b>516</b>   |
| 13.00 to 14.00 | 15             | 225          | 109         | 212         | <b>561</b>   |
| 14.00 to 15.00 | 24             | 123          | 109         | 96          | <b>352</b>   |
| 15.00 to 16.00 | 27             | 109          | 131         | 143         | <b>410</b>   |
| 16.00 to 17.00 | 54             | 98           | 131         | 167         | <b>450</b>   |
| 17.00 to 18.00 | 67             | 143          | 218         | 238         | <b>666</b>   |
| 18.00 to 19.00 | 74             | 157          | 240         | 287         | <b>758</b>   |
| 19.00 to 20.00 | 33             | 196          | 263         | 334         | <b>826</b>   |
| 20.00 to 21.00 | 10             | 65           | 174         | 334         | <b>583</b>   |
| 21.00 to 22.00 | 2              | 13           | 153         | 382         | <b>550</b>   |
| 22.00 to 23.00 | 0              | 13           | 188         | 429         | <b>630</b>   |
| 23.00 to 24.00 | 0              | 11           | 155         | 429         | <b>595</b>   |
| <b>TOTAL</b>   | <b>610</b>     | <b>1962</b>  | <b>3138</b> | <b>7339</b> | <b>13049</b> |

**LOCATION : NIMABAHALI TO JHARBANDH ROAD**

**DATE OF MONITORING : 17-18/04/2019**

| Time (hrs)     | Cycles / Carts | 2/3 wheelers | LMV       | HMV       | Total      |
|----------------|----------------|--------------|-----------|-----------|------------|
| 0.00 to 1.00   | 0              | 0            | 1         | 2         | <b>3</b>   |
| 1.00 to 2.00   | 0              | 0            | 1         | 3         | <b>4</b>   |
| 2.00 to 3.00   | 0              | 0            | 1         | 3         | <b>4</b>   |
| 3.00 to 4.00   | 0              | 1            | 1         | 2         | <b>4</b>   |
| 4.00 to 5.00   | 1              | 1            | 1         | 2         | <b>5</b>   |
| 5.00 to 6.00   | 3              | 1            | 1         | 3         | <b>8</b>   |
| 6.00 to 7.00   | 5              | 2            | 2         | 3         | <b>12</b>  |
| 7.00 to 8.00   | 15             | 3            | 1         | 2         | <b>21</b>  |
| 8.00 to 9.00   | 16             | 4            | 2         | 2         | <b>24</b>  |
| 9.00 to 10.00  | 20             | 12           | 2         | 2         | <b>36</b>  |
| 10.00 to 11.00 | 16             | 14           | 3         | 2         | <b>35</b>  |
| 11.00 to 12.00 | 10             | 13           | 4         | 1         | <b>28</b>  |
| 12.00 to 13.00 | 9              | 11           | 2         | 2         | <b>24</b>  |
| 13.00 to 14.00 | 6              | 17           | 2         | 2         | <b>27</b>  |
| 14.00 to 15.00 | 8              | 10           | 2         | 1         | <b>21</b>  |
| 15.00 to 16.00 | 9              | 9            | 2         | 1         | <b>21</b>  |
| 16.00 to 17.00 | 18             | 8            | 2         | 2         | <b>30</b>  |
| 17.00 to 18.00 | 23             | 11           | 3         | 2         | <b>39</b>  |
| 18.00 to 19.00 | 25             | 12           | 4         | 2         | <b>43</b>  |
| 19.00 to 20.00 | 11             | 15           | 4         | 3         | <b>33</b>  |
| 20.00 to 21.00 | 4              | 5            | 3         | 3         | <b>15</b>  |
| 21.00 to 22.00 | 1              | 2            | 2         | 3         | <b>8</b>   |
| 22.00 to 23.00 | 0              | 2            | 3         | 3         | <b>8</b>   |
| 23.00 to 24.00 | 0              | 1            | 2         | 3         | <b>6</b>   |
| <b>TOTAL</b>   | <b>200</b>     | <b>154</b>   | <b>51</b> | <b>54</b> | <b>459</b> |

**POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code                          | Town/village name | Populat<br>ion | Total<br>area  | Forest<br>land | Area under<br>Non-<br>Agricultural<br>Uses | Barren &<br>Un-<br>cultivable<br>Land | Permanent<br>Pastures<br>and Other<br>Grazing<br>Land | Land<br>Under<br>Misc. Tree<br>Crops etc. | Culturable<br>Waste<br>Land | Fallows Land<br>other than<br>Current<br>Fallows | Current<br>Fallows | Net Area<br>Sown | Total<br>Unirrigated<br>Land | Area<br>Irrigated<br>by Source | Canals        | Wells/<br>Tube<br>Wells | Tanks/<br>Lakes | Waterf<br>all | Other<br>Source |
|---------------------------------------------------|-------------------|----------------|----------------|----------------|--------------------------------------------|---------------------------------------|-------------------------------------------------------|-------------------------------------------|-----------------------------|--------------------------------------------------|--------------------|------------------|------------------------------|--------------------------------|---------------|-------------------------|-----------------|---------------|-----------------|
| <b>District Dhenkanal<br/>Sub Distt. Parajang</b> |                   |                |                |                |                                            |                                       |                                                       |                                           |                             |                                                  |                    |                  |                              |                                |               |                         |                 |               |                 |
| 402286                                            | Palasahi          | 1283           | 410.00         | 12.02          | 88.07                                      | 0.00                                  | 8.36                                                  | 1.77                                      | 2.68                        | 21.69                                            | 5.58               | 269.83           | 269.83                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402287                                            | Dihakamar         | 286            | 96.00          | 0.87           | 19.54                                      | 0.00                                  | 2.36                                                  | 0.00                                      | 0.00                        | 0.00                                             | 1.50               | 71.73            | 67.60                        | 4.13                           | 4.13          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402288                                            | Patarapada        | 3069           | 694.00         | 19.87          | 64.35                                      | 0.00                                  | 21.28                                                 | 7.30                                      | 8.16                        | 52.74                                            | 13.84              | 506.46           | 388.15                       | 118.31                         | 118.31        | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402289                                            | Sankamar          | 657            | 31.00          | 0.00           | 2.97                                       | 5.56                                  | 0.06                                                  | 0.00                                      | 0.00                        | 0.13                                             | 0.01               | 22.27            | 22.27                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402290                                            | Gailo             | 854            | 212.00         | 5.54           | 17.08                                      | 43.35                                 | 3.57                                                  | 6.72                                      | 1.24                        | 3.01                                             | 0.00               | 131.49           | 99.75                        | 31.74                          | 31.74         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402291                                            | Kundandeipur      | 598            | 154.00         | 0.00           | 24.31                                      | 16.75                                 | 0.00                                                  | 1.82                                      | 1.40                        | 2.47                                             | 0.00               | 107.25           | 73.59                        | 33.66                          | 33.66         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402292                                            | Panibhandar       | 1129           | 248.00         | 14.07          | 2.62                                       | 36.96                                 | 8.19                                                  | 0.98                                      | 0.00                        | 2.89                                             | 0.02               | 182.27           | 182.27                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402293                                            | Badakamar         | 521            | 88.00          | 0.00           | 20.56                                      | 0.00                                  | 0.73                                                  | 0.60                                      | 1.59                        | 0.00                                             | 0.76               | 63.76            | 36.46                        | 27.30                          | 27.30         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402294                                            | Katabahal         | 2372           | 233.00         | 6.34           | 32.39                                      | 1.49                                  | 12.29                                                 | 2.88                                      | 5.00                        | 1.65                                             | 5.51               | 165.45           | 162.82                       | 2.63                           | 2.63          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402298                                            | Ria               | 431            | 130.00         | 0.10           | 3.20                                       | 10.71                                 | 0.98                                                  | 0.15                                      | 0.00                        | 0.00                                             | 0.00               | 114.86           | 0.00                         | 114.86                         | 0.00          | 0.00                    | 0.00            | 0.00          | 114.86          |
| 402304                                            | Panigengutia      | 1269           | 531.00         | 47.21          | 36.77                                      | 119.50                                | 11.92                                                 | 1.63                                      | 0.00                        | 5.10                                             | 0.03               | 308.84           | 308.84                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402305                                            | Roda              | 2190           | 503.00         | 10.47          | 113.28                                     | 52.84                                 | 8.24                                                  | 0.49                                      | 0.00                        | 7.07                                             | 0.00               | 310.61           | 288.04                       | 22.57                          | 22.57         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402306                                            | Renthapat         | 259            | 103.00         | 0.00           | 20.80                                      | 7.75                                  | 1.20                                                  | 0.45                                      | 0.00                        | 0.60                                             | 0.01               | 72.19            | 72.19                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402307                                            | Tarahata          | 162            | 60.00          | 0.00           | 16.15                                      | 1.01                                  | 21.57                                                 | 0.00                                      | 0.00                        | 0.00                                             | 0.00               | 21.27            | 0.00                         | 21.27                          | 0.00          | 0.00                    | 0.00            | 0.00          | 21.27           |
| 402308                                            | Siarimalia        | 588            | 151.00         | 1.33           | 24.40                                      | 11.58                                 | 2.85                                                  | 2.17                                      | 0.00                        | 1.49                                             | 0.00               | 107.18           | 107.18                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| <b>Sub total</b>                                  |                   | <b>15668</b>   | <b>3644.00</b> | <b>117.82</b>  | <b>486.49</b>                              | <b>307.50</b>                         | <b>103.60</b>                                         | <b>26.96</b>                              | <b>20.07</b>                | <b>98.84</b>                                     | <b>27.26</b>       | <b>2455.46</b>   | <b>2078.99</b>               | <b>376.47</b>                  | <b>240.34</b> | <b>0.00</b>             | <b>0.00</b>     | <b>0.00</b>   | <b>136.13</b>   |
| <b>Sub Distt. Motunga</b>                         |                   |                |                |                |                                            |                                       |                                                       |                                           |                             |                                                  |                    |                  |                              |                                |               |                         |                 |               |                 |
| 402897                                            | Kusupanga         | 1911           | 107.00         | 0.00           | 46.47                                      | 48.41                                 | 1.99                                                  | 0.01                                      | 0.28                        | 5.63                                             | 4.21               | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402898                                            | Kurunti           | 2910           | 649.00         | 12.57          | 275.63                                     | 226.62                                | 21.53                                                 | 0.02                                      | 2.24                        | 88.16                                            | 22.23              | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402899                                            | Kochilamada       | 1114           | 127.00         | 0.00           | 31.56                                      | 81.50                                 | 1.16                                                  | 0.00                                      | 0.96                        | 4.84                                             | 6.98               | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402901                                            | Charadagadia      | 835            | 104.00         | 6.58           | 21.11                                      | 58.88                                 | 3.34                                                  | 0.00                                      | 1.63                        | 11.59                                            | 0.87               | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402905                                            | Motunga           | 1883           | 157.00         | 0.00           | 84.01                                      | 65.40                                 | 1.02                                                  | 0.01                                      | 0.00                        | 2.84                                             | 3.72               | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402906                                            | Kharagprasad      | 4507           | 1313.00        | 73.51          | 192.05                                     | 419.69                                | 61.21                                                 | 113.95                                    | 26.83                       | 278.12                                           | 147.64             | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402907                                            | Kharagprasadpatna | 1696           | 16.00          | 0.00           | 3.35                                       | 0.00                                  | 0.21                                                  | 0.01                                      | 11.78                       | 0.61                                             | 0.04               | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402908                                            | Suravi            | 765            | 179.00         | 0.00           | 48.15                                      | 124.64                                | 2.75                                                  | 0.01                                      | 0.00                        | 3.04                                             | 0.41               | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402909                                            | Bido              | 1407           | 272.00         | 0.00           | 42.60                                      | 88.11                                 | 1.26                                                  | 1.29                                      | 0.03                        | 2.71                                             | 0.00               | 136.00           | 136.00                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402910                                            | Taladanga         | 438            | 45.00          | 0.00           | 4.16                                       | 15.95                                 | 0.80                                                  | 0.01                                      | 0.00                        | 1.09                                             | 0.49               | 22.50            | 22.50                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402911                                            | Ranjasinga        | 1256           | 112.00         | 0.00           | 28.69                                      | 42.55                                 | 0.73                                                  | 0.03                                      | 0.11                        | 23.67                                            | 16.22              | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402913                                            | Nagari            | 940            | 103.00         | 0.00           | 29.33                                      | 42.50                                 | 2.86                                                  | 0.00                                      | 0.10                        | 15.56                                            | 12.65              | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402914                                            | Gaudapasi         | 124            | 131.00         | 0.00           | 5.75                                       | 53.07                                 | 0.39                                                  | 0.05                                      | 0.00                        | 4.05                                             | 2.19               | 65.50            | 65.50                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402915                                            | Chintapokhari     | 775            | 93.00          | 0.00           | 13.57                                      | 70.04                                 | 1.27                                                  | 0.00                                      | 0.15                        | 5.73                                             | 2.24               | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402916                                            | Malibido          | 674            | 123.00         | 0.36           | 16.83                                      | 40.10                                 | 0.16                                                  | 0.01                                      | 0.03                        | 1.77                                             | 2.24               | 61.50            | 61.50                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402917                                            | Binakarkateni     | 587            | 76.00          | 0.00           | 9.61                                       | 62.46                                 | 0.48                                                  | 0.03                                      | 0.02                        | 2.96                                             | 0.44               | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402918                                            | Budhapanka        | 669            | 97.00          | 0.87           | 21.44                                      | 18.58                                 | 1.53                                                  | 0.00                                      | 0.08                        | 3.69                                             | 2.31               | 48.50            | 48.50                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402919                                            | Brajabiharipur    | 230            | 125.00         | 0.00           | 34.73                                      | 77.88                                 | 0.02                                                  | 0.00                                      | 0.02                        | 4.16                                             | 3.51               | 4.68             | 4.68                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402920                                            | Salapada          | 63             | 51.00          | 0.00           | 3.35                                       | 16.09                                 | 0.03                                                  | 0.00                                      | 0.00                        | 4.44                                             | 1.59               | 25.50            | 25.50                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402922                                            | Kunjabiharipur    | 531            | 240.00         | 0.33           | 39.24                                      | 58.17                                 | 0.19                                                  | 0.00                                      | 0.26                        | 13.96                                            | 7.85               | 120.00           | 120.00                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402924                                            | Nadhara           | 1370           | 6.00           | 0.00           | 3.00                                       | 0.00                                  | 0.00                                                  | 0.00                                      | 0.00                        | 0.00                                             | 0.00               | 3.00             | 3.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402925                                            | Ekagharia         | 893            | 165.00         | 0.42           | 8.64                                       | 0.02                                  | 3.36                                                  | 1.06                                      | 0.35                        | 62.09                                            | 6.35               | 82.71            | 82.71                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402926                                            | Bangurasinga      | 2838           | 293.00         | 1.63           | 17.76                                      | 6.94                                  | 1.29                                                  | 2.03                                      | 47.65                       | 5.89                                             | 33.48              | 176.33           | 176.33                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402927                                            | Jarada            | 484            | 90.00          | 0.00           | 9.03                                       | 0.11                                  | 0.00                                                  | 0.25                                      | 0.34                        | 3.75                                             | 9.86               | 66.66            | 66.66                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402928                                            | Nuara             | 103            | 9.00           | 0.00           | 0.04                                       | 0.00                                  | 0.00                                                  | 0.12                                      | 0.00                        | 0.44                                             | 0.02               | 8.38             | 8.38                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |

**POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code               | Town/village name     | Populat<br>ion | Total<br>area  | Forest<br>land | Area under<br>Non-<br>Agricultural<br>Uses | Barren &<br>Un-<br>cultivable<br>Land | Permanent<br>Pastures<br>and Other<br>Grazing<br>Land | Land<br>Under<br>Misc. Tree<br>Crops etc. | Culturable<br>Waste<br>Land | Fallow Land<br>other than<br>Current<br>Fallows | Current<br>Fallows | Net Area<br>Sown | Total<br>Unirrigated<br>Land | Area<br>Irrigated<br>by Source | Canals        | Wells/<br>Tube<br>Wells | Tanks/<br>Lakes | Waterf<br>all | Other<br>Source |
|----------------------------------------|-----------------------|----------------|----------------|----------------|--------------------------------------------|---------------------------------------|-------------------------------------------------------|-------------------------------------------|-----------------------------|-------------------------------------------------|--------------------|------------------|------------------------------|--------------------------------|---------------|-------------------------|-----------------|---------------|-----------------|
| 402929                                 | Talabaghalunda        | 905            | 97.00          | 0.00           | 8.39                                       | 22.61                                 | 0.00                                                  | 0.00                                      | 0.05                        | 12.26                                           | 9.41               | 44.28            | 44.28                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402930                                 | Upabaghalunda         | 955            | 157.00         | 0.00           | 11.47                                      | 43.05                                 | 3.21                                                  | 0.00                                      | 0.15                        | 8.22                                            | 12.29              | 78.61            | 51.52                        | 27.09                          | 27.09         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402931                                 | Nayabaghirathipur(Eas | 1254           | 135.00         | 0.00           | 5.75                                       | 21.93                                 | 1.55                                                  | 0.00                                      | 0.36                        | 19.80                                           | 18.26              | 67.35            | 67.35                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402932                                 | Nayabaghirathipur(We  | 1027           | 99.00          | 0.00           | 9.00                                       | 22.37                                 | 0.00                                                  | 0.00                                      | 0.00                        | 0.00                                            | 14.12              | 53.51            | 53.51                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402933                                 | Kalusahukateni        | 753            | 176.00         | 1.88           | 14.07                                      | 64.71                                 | 3.89                                                  | 1.00                                      | 0.48                        | 1.60                                            | 0.37               | 88.00            | 88.00                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402934                                 | Haladibahali          | 1662           | 384.00         | 2.38           | 38.59                                      | 133.48                                | 6.00                                                  | 0.00                                      | 0.21                        | 6.68                                            | 4.62               | 192.04           | 192.04                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402935                                 | Budhipahad            | 492            | 211.00         | 61.34          | 11.45                                      | 0.88                                  | 0.00                                                  | 0.03                                      | 32.39                       | 103.07                                          | 0.00               | 1.84             | 1.84                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402936                                 | Uperpal               | 420            | 104.00         | 0.00           | 9.70                                       | 40.01                                 | 0.94                                                  | 0.54                                      | 0.15                        | 0.66                                            | 0.01               | 51.99            | 0.00                         | 51.99                          | 51.99         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402937                                 | Meramandali           | 1377           | 276.00         | 10.18          | 75.89                                      | 161.55                                | 10.06                                                 | 0.00                                      | 2.31                        | 10.94                                           | 5.07               | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402938                                 | Nimidha               | 3118           | 1102.00        | 99.08          | 44.38                                      | 11.00                                 | 43.58                                                 | 3.53                                      | 26.16                       | 63.07                                           | 19.74              | 791.46           | 738.60                       | 52.86                          | 52.86         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402939                                 | Ranibania             | 672            | 172.00         | 2.97           | 6.67                                       | 0.06                                  | 6.91                                                  | 0.49                                      | 11.49                       | 15.30                                           | 3.12               | 124.99           | 22.28                        | 102.71                         | 102.71        | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402940                                 | Badalo                | 1355           | 243.00         | 0.00           | 14.13                                      | 0.00                                  | 8.91                                                  | 2.34                                      | 10.91                       | 27.39                                           | 1.51               | 177.81           | 90.50                        | 87.31                          | 87.31         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402942                                 | Artasantrakateni      | 1263           | 157.00         | 0.00           | 15.19                                      | 0.34                                  | 5.04                                                  | 0.17                                      | 1.30                        | 3.86                                            | 10.35              | 120.75           | 120.75                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402943                                 | Murdangapali          | 962            | 14.00          | 0.00           | 0.00                                       | 0.00                                  | 0.00                                                  | 0.00                                      | 0.00                        | 0.00                                            | 14.00              | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402944                                 | Balaramprasad         | 3237           | 836.00         | 54.61          | 84.47                                      | 3.64                                  | 5.45                                                  | 8.35                                      | 120.59                      | 18.30                                           | 44.41              | 496.18           | 496.18                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402946                                 | Handifuta             | 670            | 120.00         | 4.21           | 3.41                                       | 0.19                                  | 4.79                                                  | 0.23                                      | 5.15                        | 9.25                                            | 7.97               | 84.80            | 34.08                        | 50.72                          | 50.72         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402947                                 | Ghodadian             | 1348           | 269.00         | 13.49          | 12.83                                      | 0.10                                  | 9.01                                                  | 1.04                                      | 11.13                       | 39.58                                           | 1.23               | 180.59           | 35.41                        | 145.18                         | 145.18        | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402948                                 | Naraharipur           | 237            | 84.00          | 1.51           | 4.58                                       | 0.72                                  | 2.71                                                  | 1.11                                      | 5.31                        | 0.36                                            | 55.11              | 12.59            | 0.00                         | 12.59                          | 12.59         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402949                                 | Sridihi               | 686            | 266.00         | 0.00           | 8.48                                       | 0.00                                  | 7.25                                                  | 0.51                                      | 7.71                        | 39.88                                           | 2.41               | 199.76           | 124.29                       | 75.47                          | 75.47         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402950                                 | Bachhuribanka         | 520            | 128.00         | 4.55           | 3.27                                       | 0.19                                  | 4.98                                                  | 0.86                                      | 5.78                        | 12.26                                           | 5.74               | 90.37            | 90.37                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402951                                 | Chheliabedha          | 273            | 96.00          | 8.07           | 10.42                                      | 0.01                                  | 0.12                                                  | 1.20                                      | 0.89                        | 5.76                                            | 0.12               | 69.41            | 69.41                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402952                                 | Paneilo               | 766            | 62.00          | 1.38           | 1.51                                       | 1.33                                  | 1.68                                                  | 0.40                                      | 7.46                        | 1.67                                            | 15.60              | 30.97            | 30.97                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| <b>Sub total</b>                       |                       | <b>52955</b>   | <b>9871.00</b> | <b>361.92</b>  | <b>1383.75</b>                             | <b>2145.88</b>                        | <b>233.66</b>                                         | <b>140.69</b>                             | <b>342.84</b>               | <b>950.70</b>                                   | <b>533.00</b>      | <b>3778.56</b>   | <b>3172.64</b>               | <b>605.92</b>                  | <b>605.92</b> | <b>0.00</b>             | <b>0.00</b>     | <b>0.00</b>   | <b>0.00</b>     |
| <b>Sub Distt. Bhusan Steel Limited</b> |                       |                |                |                |                                            |                                       |                                                       |                                           |                             |                                                 |                    |                  |                              |                                |               |                         |                 |               |                 |
| 402967                                 | Mangalpur             | 5448           | 1084.00        | 16.72          | 554.86                                     | 336.60                                | 36.16                                                 | 1.99                                      | 6.11                        | 115.73                                          | 15.83              | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402968                                 | Itapa                 | 335            | 65.00          | 8.43           | 18.35                                      | 30.90                                 | 3.81                                                  | 0.00                                      | 0.97                        | 1.46                                            | 1.08               | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402969                                 | Narendrapur           | 1940           | 279.00         | 27.94          | 129.99                                     | 46.05                                 | 0.00                                                  | 8.03                                      | 2.17                        | 12.52                                           | 52.30              | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402970                                 | Asanabania            | 221            | 71.00          | 2.50           | 23.41                                      | 32.34                                 | 0.00                                                  | 0.00                                      | 1.20                        | 2.74                                            | 8.81               | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402971                                 | Sibapur               | 1813           | 419.00         | 21.74          | 234.17                                     | 113.28                                | 17.53                                                 | 9.69                                      | 0.98                        | 9.52                                            | 12.09              | 0.00             | 0.00                         | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402972                                 | Rakala                | 636            | 218.00         | 6.15           | 0.23                                       | 7.85                                  | 10.74                                                 | 0.00                                      | 0.00                        | 0.00                                            | 0.22               | 192.81           | 192.81                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402973                                 | Panaghudughuda        | 344            | 152.00         | 1.83           | 1.59                                       | 14.28                                 | 9.72                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.32               | 124.26           | 124.26                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402974                                 | Amana                 | 1421           | 304.00         | 0.00           | 0.89                                       | 24.31                                 | 17.22                                                 | 0.00                                      | 0.00                        | 0.00                                            | 0.38               | 261.20           | 261.20                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402975                                 | Sanjapada             | 1927           | 374.00         | 0.00           | 40.85                                      | 1.80                                  | 23.92                                                 | 0.00                                      | 0.00                        | 0.00                                            | 0.00               | 307.43           | 269.85                       | 37.58                          | 37.58         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402976                                 | Badibahal             | 518            | 140.00         | 11.65          | 0.23                                       | 11.33                                 | 7.26                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.02               | 109.51           | 79.47                        | 30.04                          | 0.00          | 0.00                    | 30.04           | 0.00          | 0.00            |
| 402977                                 | Khaliberana           | 823            | 200.00         | 2.52           | 0.15                                       | 18.96                                 | 13.68                                                 | 0.00                                      | 0.00                        | 0.00                                            | 0.00               | 164.69           | 164.69                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402978                                 | Nadeilo               | 529            | 101.00         | 0.00           | 0.71                                       | 12.13                                 | 1.64                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.38               | 86.14            | 86.14                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402979                                 | Bramhanapurunakot     | 627            | 257.00         | 0.00           | 0.24                                       | 40.29                                 | 14.11                                                 | 0.00                                      | 0.00                        | 0.00                                            | 0.00               | 202.36           | 202.36                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402980                                 | Naraharipur           | 198            | 33.00          | 0.00           | 0.09                                       | 3.29                                  | 0.00                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.00               | 29.62            | 29.62                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402981                                 | Chandrasekharpur      | 91             | 34.00          | 0.00           | 3.27                                       | 0.00                                  | 0.08                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.42               | 30.23            | 30.23                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402982                                 | Kankalu               | 1210           | 205.00         | 0.00           | 0.48                                       | 32.81                                 | 9.80                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.00               | 161.91           | 161.91                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402983                                 | Mitikapasi            | 125            | 74.00          | 4.20           | 0.61                                       | 5.50                                  | 5.34                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.00               | 58.35            | 58.35                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402984                                 | Sarapa                | 486            | 176.00         | 23.71          | 0.74                                       | 14.45                                 | 12.00                                                 | 0.00                                      | 0.00                        | 0.00                                            | 0.00               | 125.10           | 125.10                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402985                                 | Raghunathapur         | 823            | 232.00         | 9.68           | 1.46                                       | 45.47                                 | 9.74                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.40               | 165.25           | 165.25                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402986                                 | Nuagan                | 975            | 195.00         | 0.00           | 0.26                                       | 23.51                                 | 9.13                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.00               | 162.10           | 162.10                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402987                                 | Mahatala              | 71             | 56.00          | 0.00           | 0.38                                       | 2.79                                  | 3.47                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.00               | 49.36            | 49.36                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |

**POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code | Town/village name | Populat<br>ion | Total<br>area  | Forest<br>land | Area under<br>Non-<br>Agricultural<br>Uses | Barren &<br>Un-<br>cultivable<br>Land | Permanent<br>Pastures<br>and Other<br>Grazing<br>Land | Land<br>Under<br>Misc. Tree<br>Crops etc. | Culturable<br>Waste<br>Land | Fallows Land<br>other than<br>Current<br>Fallows | Current<br>Fallows | Net Area<br>Sown | Total<br>Unirrigated<br>Land | Area<br>Irrigated<br>by Source | Canals       | Wells/<br>Tube<br>Wells | Tanks/<br>Lakes | Waterf<br>all | Other<br>Source |
|--------------------------|-------------------|----------------|----------------|----------------|--------------------------------------------|---------------------------------------|-------------------------------------------------------|-------------------------------------------|-----------------------------|--------------------------------------------------|--------------------|------------------|------------------------------|--------------------------------|--------------|-------------------------|-----------------|---------------|-----------------|
| 402989                   | Paikpuranakot     | 1345           | 434.00         | 123.19         | 1.07                                       | 65.87                                 | 21.76                                                 | 0.00                                      | 0.00                        | 0.00                                             | 0.20               | 221.91           | 221.91                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402991                   | Jhaduberani       | 387            | 189.00         | 17.53          | 0.33                                       | 42.98                                 | 5.35                                                  | 0.00                                      | 0.00                        | 0.00                                             | 0.44               | 122.37           | 122.37                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| <b>Sub total</b>         |                   | <b>22293</b>   | <b>5292.00</b> | <b>277.79</b>  | <b>1014.36</b>                             | <b>926.79</b>                         | <b>232.46</b>                                         | <b>19.71</b>                              | <b>11.43</b>                | <b>141.97</b>                                    | <b>92.89</b>       | <b>2574.60</b>   | <b>2506.98</b>               | <b>67.62</b>                   | <b>37.58</b> | <b>0.00</b>             | <b>30.04</b>    | <b>0.00</b>   | <b>0.00</b>     |
| <b>Sub Distt. Balimi</b> |                   |                |                |                |                                            |                                       |                                                       |                                           |                             |                                                  |                    |                  |                              |                                |              |                         |                 |               |                 |
| 402993                   | Beruanpal         | 1217           | 296.00         | 0.00           | 10.40                                      | 0.00                                  | 19.14                                                 | 0.00                                      | 0.00                        | 0.00                                             | 23.91              | 242.55           | 122.66                       | 119.89                         | 119.89       | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402994                   | Gandijhara        | 218            | 79.00          | 0.00           | 0.97                                       | 0.00                                  | 0.99                                                  | 0.00                                      | 0.00                        | 0.00                                             | 16.30              | 60.74            | 60.74                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402995                   | Galapada          | 1222           | 338.00         | 11.00          | 7.03                                       | 0.00                                  | 22.91                                                 | 0.00                                      | 0.00                        | 0.00                                             | 37.10              | 259.96           | 237.52                       | 22.44                          | 22.44        | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402996                   | Bhanupada         | 293            | 69.00          | 0.00           | 2.46                                       | 0.00                                  | 3.50                                                  | 0.00                                      | 0.00                        | 0.00                                             | 13.22              | 49.82            | 49.82                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402997                   | Chitipada         | 256            | 66.00          | 0.00           | 3.23                                       | 0.00                                  | 4.36                                                  | 0.00                                      | 0.00                        | 0.00                                             | 10.73              | 47.68            | 47.68                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402998                   | Nimabahal         | 967            | 206.00         | 13.89          | 3.04                                       | 0.00                                  | 8.82                                                  | 0.00                                      | 0.00                        | 0.00                                             | 26.45              | 153.80           | 153.80                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 402999                   | Kothalu           | 379            | 48.00          | 0.00           | 3.90                                       | 0.00                                  | 2.13                                                  | 0.00                                      | 0.00                        | 0.00                                             | 4.19               | 37.78            | 37.78                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403000                   | Jhadabandha       | 1635           | 560.00         | 104.79         | 11.64                                      | 0.00                                  | 30.15                                                 | 0.00                                      | 0.00                        | 0.00                                             | 81.46              | 331.96           | 331.96                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403001                   | Madhupur          | 126            | 190.00         | 37.31          | 12.12                                      | 11.09                                 | 11.35                                                 | 13.09                                     | 3.57                        | 3.61                                             | 0.00               | 97.86            | 97.86                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403002                   | Nua               | 2250           | 576.00         | 48.68          | 20.30                                      | 10.59                                 | 19.05                                                 | 18.21                                     | 1.17                        | 15.27                                            | 0.85               | 441.88           | 429.66                       | 12.22                          | 12.22        | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403003                   | Thokar            | 1721           | 358.00         | 22.59          | 18.24                                      | 13.20                                 | 12.91                                                 | 8.37                                      | 0.65                        | 6.30                                             | 2.83               | 272.91           | 272.91                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403004                   | Barasingha        | 2455           | 647.00         | 43.23          | 36.43                                      | 20.24                                 | 14.89                                                 | 40.40                                     | 5.75                        | 24.29                                            | 8.50               | 453.27           | 453.27                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403005                   | Tarkabeda         | 1073           | 766.00         | 54.31          | 43.46                                      | 31.05                                 | 41.09                                                 | 53.58                                     | 3.00                        | 20.36                                            | 29.29              | 489.86           | 489.86                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403006                   | Kadala            | 2129           | 261.00         | 7.19           | 12.14                                      | 8.00                                  | 5.17                                                  | 9.00                                      | 18.81                       | 2.02                                             | 0.00               | 198.67           | 198.15                       | 0.52                           | 0.52         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403007                   | Benipathara       | 142            | 67.00          | 0.00           | 2.82                                       | 0.00                                  | 25.40                                                 | 0.00                                      | 0.00                        | 0.00                                             | 0.00               | 38.78            | 38.78                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403008                   | Badamunda         | 649            | 205.00         | 4.97           | 0.29                                       | 0.00                                  | 10.23                                                 | 0.00                                      | 0.00                        | 0.00                                             | 0.00               | 189.51           | 189.51                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403009                   | Kantimili         | 1469           | 280.00         | 12.97          | 10.20                                      | 15.01                                 | 8.29                                                  | 0.00                                      | 0.00                        | 0.02                                             | 0.00               | 233.51           | 233.51                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403010                   | Sanamunda         | 831            | 259.00         | 19.14          | 12.00                                      | 13.01                                 | 12.00                                                 | 0.00                                      | 0.00                        | 0.00                                             | 0.00               | 202.85           | 202.85                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403011                   | Solanali          | 428            | 92.00          | 0.00           | 3.75                                       | 4.04                                  | 6.13                                                  | 0.00                                      | 0.00                        | 0.34                                             | 0.00               | 77.74            | 77.74                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403012                   | Jharabeda         | 899            | 199.00         | 7.05           | 13.23                                      | 18.09                                 | 19.06                                                 | 0.00                                      | 0.00                        | 0.39                                             | 0.00               | 141.18           | 141.18                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403013                   | Nuapada           | 685            | 221.00         | 15.37          | 18.70                                      | 22.05                                 | 7.53                                                  | 0.00                                      | 0.00                        | 0.78                                             | 1.72               | 154.85           | 154.85                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403014                   | Patala            | 2003           | 332.00         | 17.34          | 18.03                                      | 11.00                                 | 1.99                                                  | 0.00                                      | 0.00                        | 0.05                                             | 0.00               | 283.59           | 283.59                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403015                   | Bankidi           | 1114           | 214.00         | 8.86           | 13.00                                      | 11.62                                 | 5.40                                                  | 0.00                                      | 0.00                        | 1.12                                             | 0.32               | 173.68           | 173.68                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403016                   | Panuberani        | 316            | 158.00         | 6.50           | 0.46                                       | 25.02                                 | 6.09                                                  | 0.00                                      | 0.00                        | 0.00                                             | 0.43               | 119.50           | 119.50                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403017                   | Dahanimara        | 73             | 35.00          | 0.00           | 1.44                                       | 0.00                                  | 1.56                                                  | 0.00                                      | 0.00                        | 0.00                                             | 0.00               | 32.00            | 32.00                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403018                   | Khalapal          | 332            | 32.00          | 0.00           | 0.19                                       | 0.27                                  | 1.67                                                  | 0.00                                      | 0.00                        | 0.08                                             | 0.00               | 29.79            | 29.79                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403019                   | Nagiaberani       | 179            | 33.00          | 0.00           | 1.45                                       | 3.14                                  | 0.89                                                  | 0.00                                      | 0.00                        | 0.00                                             | 0.00               | 27.52            | 27.52                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403020                   | Iswarapur         | 241            | 39.00          | 7.75           | 0.86                                       | 1.41                                  | 0.00                                                  | 0.00                                      | 0.18                        | 2.51                                             | 0.00               | 26.29            | 0.00                         | 26.29                          | 26.29        | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403021                   | Gotiaberani       | 119            | 60.00          | 0.00           | 3.00                                       | 2.01                                  | 1.86                                                  | 0.00                                      | 0.00                        | 0.08                                             | 0.09               | 52.96            | 52.96                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403022                   | Kantamila         | 449            | 115.00         | 13.90          | 7.09                                       | 3.80                                  | 7.38                                                  | 0.00                                      | 0.00                        | 0.86                                             | 0.00               | 81.97            | 81.97                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403024                   | Mahalunda         | 1494           | 161.00         | 0.00           | 3.62                                       | 12.57                                 | 1.54                                                  | 0.00                                      | 0.00                        | 0.07                                             | 0.00               | 143.20           | 143.20                       | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403025                   | Bedanali          | 150            | 38.00          | 0.00           | 0.01                                       | 0.12                                  | 0.11                                                  | 0.00                                      | 0.00                        | 0.13                                             | 0.00               | 37.63            | 37.63                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403026                   | Maguberani        | 396            | 55.00          | 3.86           | 4.74                                       | 1.83                                  | 1.58                                                  | 0.00                                      | 0.00                        | 1.40                                             | 0.25               | 41.34            | 41.34                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403027                   | Krushnachandrapur | 559            | 90.00          | 0.00           | 3.28                                       | 4.02                                  | 0.22                                                  | 0.00                                      | 0.00                        | 0.00                                             | 0.00               | 82.48            | 82.48                        | 0.00                           | 0.00         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403028                   | Gulehi            | 1814           | 337.00         | 16.33          | 24.26                                      | 8.30                                  | 13.27                                                 | 11.33                                     | 1.78                        | 10.12                                            | 2.02               | 249.59           | 107.33                       | 142.26                         | 0.00         | 0.00                    | 142.26          | 0.00          | 0.00            |

**POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code | Town/village name | Populat<br>ion | Total<br>area   | Forest<br>land | Area under<br>Non-<br>Agricultural<br>Uses | Barren &<br>Un-<br>cultivable<br>Land | Permanent<br>Pastures<br>and Other<br>Grazing<br>Land | Land<br>Under<br>Misc. Tree<br>Crops etc. | Culturable<br>Waste<br>Land | Fallows Land<br>other than<br>Current<br>Fallows | Current<br>Fallows | Net Area<br>Sown | Total<br>Unirrigated<br>Land | Area<br>Irrigated<br>by Source | Canals        | Wells/<br>Tube<br>Wells | Tanks/<br>Lakes | Waterf<br>all | Other<br>Source |
|--------------------------|-------------------|----------------|-----------------|----------------|--------------------------------------------|---------------------------------------|-------------------------------------------------------|-------------------------------------------|-----------------------------|--------------------------------------------------|--------------------|------------------|------------------------------|--------------------------------|---------------|-------------------------|-----------------|---------------|-----------------|
| 403029                   | Dudurokot         | 5189           | 1451.00         | 120.79         | 100.07                                     | 32.90                                 | 43.96                                                 | 85.35                                     | 20.89                       | 40.37                                            | 28.36              | 978.31           | 900.33                       | 77.98                          | 0.00          | 0.00                    | 77.98           | 0.00          | 0.00            |
| 403030                   | Bramhanamara      | 939            | 238.00          | 20.31          | 22.26                                      | 13.76                                 | 10.15                                                 | 6.07                                      | 1.87                        | 3.20                                             | 0.00               | 160.38           | 160.38                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403031                   | Kumurusinga       | 1276           | 412.00          | 40.46          | 11.19                                      | 6.12                                  | 20.10                                                 | 19.51                                     | 0.00                        | 4.07                                             | 2.07               | 308.48           | 294.36                       | 14.12                          | 0.00          | 0.00                    | 14.12           | 0.00          | 0.00            |
| 403032                   | Ranjagola         | 2817           | 709.00          | 55.48          | 32.38                                      | 6.07                                  | 27.51                                                 | 2.83                                      | 2.26                        | 40.02                                            | 4.45               | 538.00           | 488.69                       | 49.31                          | 49.31         | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403033                   | Asarada           | 1061           | 268.00          | 41.46          | 15.12                                      | 8.90                                  | 19.90                                                 | 9.31                                      | 0.23                        | 4.58                                             | 0.00               | 168.50           | 168.50                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403034                   | Balimi            | 889            | 206.00          | 11.42          | 20.31                                      | 1.33                                  | 3.13                                                  | 10.76                                     | 0.00                        | 2.02                                             | 0.00               | 157.03           | 157.03                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403035                   | Kukuta            | 2961           | 520.00          | 9.78           | 14.02                                      | 12.95                                 | 13.74                                                 | 21.27                                     | 0.16                        | 10.93                                            | 1.66               | 435.49           | 435.49                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403036                   | Sanahindol        | 749            | 139.00          | 16.61          | 12.81                                      | 4.64                                  | 4.07                                                  | 5.07                                      | 0.00                        | 3.21                                             | 0.00               | 92.59            | 92.59                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403037                   | Nandapur          | 802            | 185.00          | 8.02           | 6.26                                       | 4.04                                  | 2.08                                                  | 8.50                                      | 0.00                        | 1.09                                             | 0.50               | 154.51           | 154.51                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403038                   | Gurilo            | 626            | 279.00          | 42.46          | 15.78                                      | 6.31                                  | 13.25                                                 | 14.00                                     | 0.84                        | 16.24                                            | 5.26               | 164.86           | 164.86                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| <b>Sub total</b>         |                   | <b>47592</b>   | <b>11889.00</b> | <b>843.82</b>  | <b>577.98</b>                              | <b>348.50</b>                         | <b>486.55</b>                                         | <b>336.65</b>                             | <b>61.16</b>                | <b>215.53</b>                                    | <b>301.96</b>      | <b>8716.85</b>   | <b>8251.82</b>               | <b>465.03</b>                  | <b>230.67</b> | <b>0.00</b>             | <b>234.36</b>   | <b>0.00</b>   | <b>0.00</b>     |
| <b>Sub Distt. Hindol</b> |                   |                |                 |                |                                            |                                       |                                                       |                                           |                             |                                                  |                    |                  |                              |                                |               |                         |                 |               |                 |
| 403040                   | Chhelachheli      | 45             | 80.00           | 0.00           | 23.88                                      | 26.60                                 | 1.57                                                  | 0.00                                      | 0.00                        | 0.00                                             | 0.00               | 27.95            | 27.95                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403041                   | Kalihundi         | 234            | 54.00           | 0.00           | 1.60                                       | 4.34                                  | 0.70                                                  | 0.00                                      | 0.00                        | 0.00                                             | 0.00               | 47.36            | 47.36                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403042                   | Tutupada          | 213            | 57.00           | 0.00           | 2.60                                       | 1.78                                  | 3.53                                                  | 0.00                                      | 0.00                        | 0.00                                             | 0.16               | 48.93            | 48.93                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403043                   | Tangisal          | 346            | 108.00          | 11.14          | 3.80                                       | 6.74                                  | 6.94                                                  | 0.00                                      | 0.00                        | 1.84                                             | 0.00               | 77.54            | 77.54                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403044                   | Balasar           | 1198           | 226.00          | 7.77           | 9.96                                       | 9.04                                  | 26.72                                                 | 4.48                                      | 0.00                        | 0.00                                             | 0.00               | 168.03           | 168.03                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403045                   | Hatura            | 997            | 168.00          | 0.01           | 5.87                                       | 0.00                                  | 3.79                                                  | 4.16                                      | 12.83                       | 0.00                                             | 0.01               | 141.33           | 141.33                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403046                   | Jayapanga         | 297            | 124.00          | 9.94           | 5.00                                       | 5.71                                  | 8.38                                                  | 0.00                                      | 0.00                        | 0.95                                             | 0.00               | 94.02            | 94.02                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403047                   | Hariharapur       | 539            | 140.00          | 14.08          | 10.69                                      | 4.77                                  | 9.57                                                  | 0.00                                      | 0.00                        | 0.00                                             | 0.00               | 100.89           | 100.89                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403048                   | Bangu             | 460            | 152.00          | 17.56          | 3.74                                       | 6.73                                  | 10.68                                                 | 0.00                                      | 0.00                        | 0.69                                             | 0.26               | 112.34           | 112.34                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403049                   | Pada              | 2018           | 768.00          | 35.00          | 59.32                                      | 150.62                                | 8.45                                                  | 0.03                                      | 0.00                        | 15.38                                            | 73.02              | 426.18           | 426.18                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403070                   | Kalanda           | 1044           | 460.00          | 28.89          | 5.16                                       | 72.64                                 | 18.59                                                 | 0.00                                      | 0.00                        | 26.63                                            | 3.52               | 304.57           | 304.57                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403072                   | Keutaganthi       | 2              | 59.00           | 5.53           | 0.06                                       | 0.00                                  | 4.25                                                  | 0.00                                      | 0.00                        | 0.00                                             | 0.00               | 49.16            | 49.16                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403074                   | Baghadharia       | 987            | 371.00          | 40.76          | 4.85                                       | 12.15                                 | 52.05                                                 | 41.04                                     | 9.27                        | 12.15                                            | 5.67               | 193.06           | 193.06                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| <b>Sub total</b>         |                   | <b>8380</b>    | <b>2767.00</b>  | <b>170.68</b>  | <b>136.53</b>                              | <b>301.12</b>                         | <b>155.22</b>                                         | <b>49.71</b>                              | <b>22.10</b>                | <b>57.64</b>                                     | <b>82.64</b>       | <b>1791.36</b>   | <b>1791.36</b>               | <b>0.00</b>                    | <b>0.00</b>   | <b>0.00</b>             | <b>0.00</b>     | <b>0.00</b>   | <b>0.00</b>     |
| <b>Sub Distt. Rasol</b>  |                   |                |                 |                |                                            |                                       |                                                       |                                           |                             |                                                  |                    |                  |                              |                                |               |                         |                 |               |                 |
| 403094                   | Panchupada        | 2383           | 641.00          | 66.37          | 33.20                                      | 1.26                                  | 46.54                                                 | 13.65                                     | 0.88                        | 0.35                                             | 0.41               | 478.34           | 470.42                       | 7.92                           | 7.92          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403095                   | Jarada            | 1499           | 231.00          | 2.60           | 14.68                                      | 0.23                                  | 10.32                                                 | 4.52                                      | 0.37                        | 0.35                                             | 0.00               | 197.93           | 91.38                        | 106.55                         | 0.00          | 0.00                    | 106.55          | 0.00          | 0.00            |
| 403096                   | Haripur           | 278            | 111.00          | 1.03           | 2.93                                       | 0.22                                  | 3.10                                                  | 0.51                                      | 0.00                        | 0.16                                             | 0.00               | 103.05           | 103.05                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403097                   | Badabahal         | 672            | 97.00           | 0.00           | 6.97                                       | 8.02                                  | 0.50                                                  | 0.00                                      | 0.00                        | 0.00                                             | 0.00               | 81.51            | 81.51                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403098                   | Giridharprasad    | 2421           | 675.00          | 48.98          | 8.40                                       | 4.32                                  | 100.42                                                | 23.08                                     | 32.94                       | 0.00                                             | 0.00               | 456.86           | 456.86                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403099                   | Karanda           | 6778           | 1952.00         | 18.42          | 24.46                                      | 435.40                                | 71.90                                                 | 22.40                                     | 37.44                       | 0.00                                             | 0.00               | 1341.98          | 1341.98                      | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403100                   | Khanditiri        | 1673           | 361.00          | 24.23          | 9.96                                       | 29.58                                 | 23.45                                                 | 43.50                                     | 3.55                        | 0.00                                             | 0.00               | 226.73           | 226.73                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403101                   | Brahmapur         | 1653           | 685.00          | 82.44          | 6.03                                       | 148.12                                | 45.07                                                 | 8.09                                      | 65.97                       | 0.00                                             | 0.00               | 329.28           | 329.28                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403102                   | Bedapada          | 3541           | 893.00          | 145.81         | 9.89                                       | 98.49                                 | 10.28                                                 | 8.61                                      | 95.37                       | 0.00                                             | 0.14               | 524.41           | 318.28                       | 206.13                         | 206.13        | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403117                   | Bhingira          | 455            | 278.00          | 79.67          | 4.37                                       | 31.73                                 | 23.29                                                 | 0.00                                      | 0.44                        | 0.00                                             | 0.00               | 138.50           | 138.50                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403119                   | Basanta pokhari   | 122            | 68.00           | 5.82           | 0.88                                       | 5.55                                  | 0.36                                                  | 0.67                                      | 0.08                        | 0.00                                             | 0.42               | 54.22            | 54.22                        | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403120                   | Thenga            | 1340           | 290.00          | 41.77          | 3.30                                       | 9.95                                  | 19.34                                                 | 2.89                                      | 5.59                        | 0.00                                             | 0.00               | 207.16           | 207.16                       | 0.00                           | 0.00          | 0.00                    | 0.00            | 0.00          | 0.00            |
| 403122                   | Gulugundi         | 339            | 48.00           | 0.80           | 1.87                                       | 0.00                                  | 0.62                                                  | 0.64                                      | 0.00                        | 0.08                                             | 0.00               | 43.99            | 20.37                        | 23.62                          | 23.62         | 0.00                    | 0.00            | 0.00          | 0.00            |
| <b>Sub total</b>         |                   | <b>23154</b>   | <b>6330.00</b>  | <b>517.94</b>  | <b>126.94</b>                              | <b>772.87</b>                         | <b>355.19</b>                                         | <b>128.56</b>                             | <b>242.63</b>               | <b>0.94</b>                                      | <b>0.97</b>        | <b>4183.96</b>   | <b>3839.74</b>               | <b>344.22</b>                  | <b>237.67</b> | <b>0.00</b>             | <b>106.55</b>   | <b>0.00</b>   | <b>0.00</b>     |



**POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code | Town/village name | Populat<br>ion | Total<br>area  | Forest<br>land | Area under<br>Non-<br>Agricultural<br>Uses | Barren &<br>Un-<br>cultivable<br>Land | Permanent<br>Pastures<br>and Other<br>Grazing<br>Land | Land<br>Under<br>Misc. Tree<br>Crops etc. | Culturable<br>Waste<br>Land | Fallow Land<br>other than<br>Current<br>Fallows | Current<br>Fallows | Net Area<br>Sown | Total<br>Unirrigated<br>Land | Area<br>Irrigated<br>by Source | Canals         | Wells/<br>Tube<br>Wells | Tanks/<br>Lakes | Waterf<br>all | Other<br>Source |
|--------------------------|-------------------|----------------|----------------|----------------|--------------------------------------------|---------------------------------------|-------------------------------------------------------|-------------------------------------------|-----------------------------|-------------------------------------------------|--------------------|------------------|------------------------------|--------------------------------|----------------|-------------------------|-----------------|---------------|-----------------|
| <b>District</b>          | <b>Anugul</b>     |                |                |                |                                            |                                       |                                                       |                                           |                             |                                                 |                    |                  |                              |                                |                |                         |                 |               |                 |
| <b>Sub Distt.</b>        | <b>Banarpal</b>   |                |                |                |                                            |                                       |                                                       |                                           |                             |                                                 |                    |                  |                              |                                |                |                         |                 |               |                 |
| 404141                   | Tentulihata       | 768            | 85.00          | 0.00           | 19.80                                      | 2.40                                  | 9.80                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.40               | 52.60            | 28.40                        | 24.20                          | 12.00          | 5.00                    | 2.20            | 0.00          | 5.00            |
| 404142                   | Apartipur         | 552            | 55.00          | 2.40           | 26.00                                      | 0.00                                  | 2.00                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.40               | 24.20            | 12.20                        | 12.00                          | 3.00           | 8.00                    | 1.00            | 0.00          | 0.00            |
| 404145                   | Banarpal          | 1522           | 60.00          | 0.00           | 30.97                                      | 0.00                                  | 13.35                                                 | 0.00                                      | 0.00                        | 0.00                                            | 0.00               | 15.68            | 7.94                         | 7.74                           | 2.90           | 2.90                    | 1.94            | 0.00          | 0.00            |
| 404146                   | Joragadia         | 389            | 79.00          | 0.80           | 20.20                                      | 0.00                                  | 8.60                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.80               | 48.60            | 24.40                        | 24.20                          | 15.00          | 8.00                    | 1.20            | 0.00          | 0.00            |
| 404147                   | Birabahanpur      | 384            | 95.00          | 0.00           | 26.99                                      | 2.13                                  | 16.15                                                 | 0.00                                      | 0.00                        | 0.00                                            | 5.53               | 44.20            | 18.49                        | 25.71                          | 15.94          | 8.50                    | 1.27            | 0.00          | 0.00            |
| 404148                   | Badakhali         | 362            | 128.00         | 1.82           | 46.13                                      | 0.00                                  | 4.74                                                  | 0.73                                      | 0.00                        | 0.00                                            | 0.73               | 73.85            | 29.18                        | 44.67                          | 9.11           | 27.35                   | 8.21            | 0.00          | 0.00            |
| 404149                   | Bhagabatpur       | 725            | 162.00         | 5.20           | 32.40                                      | 0.00                                  | 20.40                                                 | 0.80                                      | 0.00                        | 0.80                                            | 1.20               | 101.20           | 32.40                        | 68.80                          | 20.00          | 25.00                   | 18.80           | 0.00          | 5.00            |
| 404150                   | Narendrapur       | 405            | 181.00         | 0.00           | 126.00                                     | 3.60                                  | 6.80                                                  | 0.00                                      | 0.00                        | 0.00                                            | 22.40              | 22.20            | 10.20                        | 12.00                          | 5.00           | 5.00                    | 2.00            | 0.00          | 0.00            |
| 404151                   | Chauridiha        | 892            | 123.00         | 0.00           | 40.40                                      | 3.60                                  | 13.80                                                 | 0.40                                      | 0.00                        | 0.00                                            | 0.00               | 64.80            | 28.40                        | 36.40                          | 25.00          | 10.00                   | 1.40            | 0.00          | 0.00            |
| 404152                   | Jhajiribahal      | 994            | 177.00         | 0.00           | 77.67                                      | 5.96                                  | 28.21                                                 | 3.18                                      | 0.00                        | 0.00                                            | 2.38               | 59.60            | 27.81                        | 31.79                          | 17.88          | 8.94                    | 4.97            | 0.00          | 0.00            |
| 404153                   | Gadasantri        | 3877           | 796.00         | 0.00           | 141.33                                     | 20.05                                 | 32.16                                                 | 3.18                                      | 0.00                        | 1.98                                            | 6.76               | 590.54           | 269.17                       | 321.37                         | 248.13         | 49.62                   | 23.62           | 0.00          | 0.00            |
| 404155                   | Gangijodi         | 149            | 41.00          | 0.01           | 11.14                                      | 1.26                                  | 1.26                                                  | 0.84                                      | 0.00                        | 0.00                                            | 0.84               | 25.65            | 13.04                        | 12.61                          | 0.00           | 10.51                   | 2.10            | 0.00          | 0.00            |
| 404156                   | Tulasipal         | 3060           | 603.00         | 4.00           | 170.42                                     | 22.99                                 | 25.01                                                 | 18.76                                     | 0.00                        | 3.23                                            | 4.64               | 353.95           | 109.92                       | 244.03                         | 176.47         | 25.21                   | 42.35           | 0.00          | 0.00            |
| 404159                   | Languliabeda      | 1201           | 234.00         | 2.37           | 51.93                                      | 8.89                                  | 0.00                                                  | 6.12                                      | 0.00                        | 0.00                                            | 0.80               | 163.89           | 44.03                        | 119.86                         | 78.98          | 29.62                   | 11.26           | 0.00          | 0.00            |
| 404160                   | Rajibpur          | 374            | 41.00          | 0.00           | 13.00                                      | 4.80                                  | 2.00                                                  | 0.80                                      | 0.00                        | 0.00                                            | 0.20               | 20.20            | 20.20                        | 0.00                           | 0.00           | 0.00                    | 0.00            | 0.00          | 0.00            |
| 404163                   | Purkia            | 1284           | 225.00         | 0.40           | 58.20                                      | 0.00                                  | 11.40                                                 | 1.20                                      | 0.00                        | 0.00                                            | 0.00               | 153.80           | 69.80                        | 84.00                          | 50.00          | 30.00                   | 4.00            | 0.00          | 0.00            |
| 404164                   | Arahat            | 1513           | 287.00         | 0.00           | 17.34                                      | 9.77                                  | 36.67                                                 | 0.80                                      | 0.00                        | 1.59                                            | 1.60               | 219.23           | 57.00                        | 162.23                         | 101.51         | 48.34                   | 12.38           | 0.00          | 0.00            |
| 404165                   | Talatali          | 1619           | 420.00         | 31.27          | 101.76                                     | 37.37                                 | 42.74                                                 | 5.18                                      | 0.00                        | 0.00                                            | 2.23               | 199.45           | 94.54                        | 104.91                         | 74.01          | 27.75                   | 3.15            | 0.00          | 0.00            |
| 404166                   | Kusuna            | 420            | 182.00         | 2.00           | 53.80                                      | 14.60                                 | 6.80                                                  | 0.80                                      | 0.00                        | 0.00                                            | 21.00              | 83.00            | 39.00                        | 44.00                          | 30.00          | 10.00                   | 4.00            | 0.00          | 0.00            |
| 404167                   | Kalandapal        | 303            | 82.00          | 0.00           | 14.60                                      | 2.60                                  | 1.60                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.20               | 63.00            | 22.00                        | 41.00                          | 20.00          | 10.00                   | 11.00           | 0.00          | 0.00            |
| 404168                   | Ramimunda         | 429            | 147.00         | 0.00           | 23.33                                      | 14.25                                 | 10.32                                                 | 0.83                                      | 0.00                        | 0.00                                            | 3.30               | 94.97            | 41.29                        | 53.68                          | 14.12          | 32.97                   | 6.59            | 0.00          | 0.00            |
| 404170                   | Fulapada          | 2103           | 672.00         | 0.00           | 178.60                                     | 76.80                                 | 34.00                                                 | 21.60                                     | 0.00                        | 1.60                                            | 3.40               | 356.00           | 194.00                       | 162.00                         | 98.00          | 42.00                   | 22.00           | 0.00          | 0.00            |
| 404172                   | Rankasinga        | 554            | 128.00         | 0.00           | 17.00                                      | 12.00                                 | 1.60                                                  | 3.60                                      | 0.00                        | 0.00                                            | 12.80              | 81.00            | 32.00                        | 49.00                          | 25.00          | 15.00                   | 9.00            | 0.00          | 0.00            |
| 404173                   | Juharpur          | 379            | 63.00          | 0.00           | 19.80                                      | 8.40                                  | 0.80                                                  | 0.90                                      | 0.00                        | 0.00                                            | 0.40               | 32.70            | 13.00                        | 19.70                          | 5.00           | 10.00                   | 4.40            | 0.00          | 0.30            |
| 404174                   | Similichhuin      | 440            | 137.00         | 0.00           | 14.20                                      | 22.60                                 | 11.00                                                 | 0.20                                      | 0.00                        | 0.00                                            | 0.80               | 88.20            | 28.20                        | 60.00                          | 30.00          | 20.00                   | 10.00           | 0.00          | 0.00            |
| 404175                   | Chakuriapal       | 73             | 43.00          | 0.00           | 15.60                                      | 4.00                                  | 0.00                                                  | 0.80                                      | 0.00                        | 0.00                                            | 0.00               | 22.60            | 10.60                        | 12.00                          | 8.00           | 3.00                    | 1.00            | 0.00          | 0.00            |
| 404178                   | Kainchhabahala    | 298            | 66.00          | 0.00           | 9.62                                       | 3.96                                  | 10.75                                                 | 0.75                                      | 0.00                        | 0.00                                            | 3.02               | 37.90            | 29.04                        | 8.86                           | 1.88           | 5.66                    | 1.32            | 0.00          | 0.00            |
| 404179                   | Girdhabasa        | 318            | 109.00         | 0.00           | 20.79                                      | 2.02                                  | 11.91                                                 | 0.40                                      | 0.00                        | 0.00                                            | 0.00               | 73.88            | 33.10                        | 40.78                          | 20.19          | 15.14                   | 5.45            | 0.00          | 0.00            |
| 404180                   | Tilapanga         | 356            | 62.00          | 0.00           | 16.70                                      | 2.80                                  | 0.00                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.10               | 42.40            | 42.40                        | 0.00                           | 0.00           | 0.00                    | 0.00            | 0.00          | 0.00            |
| 404181                   | Talamulasasan     | 4749           | 1098.00        | 44.70          | 33.84                                      | 62.58                                 | 83.65                                                 | 7.66                                      | 0.00                        | 0.00                                            | 25.86              | 839.71           | 322.80                       | 516.91                         | 399.10         | 79.82                   | 37.99           | 0.00          | 0.00            |
| 404182                   | Gadatalamul       | 1813           | 279.00         | 0.00           | 47.00                                      | 25.20                                 | 6.00                                                  | 3.90                                      | 0.00                        | 0.00                                            | 2.40               | 194.50           | 68.80                        | 125.70                         | 100.00         | 20.00                   | 5.40            | 0.00          | 0.30            |
| 404183                   | Harichandabasti   | 124            | 1.00           | 0.00           | 0.60                                       | 0.00                                  | 0.00                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.00               | 0.40             | 0.40                         | 0.00                           | 0.00           | 0.00                    | 0.00            | 0.00          | 0.00            |
| 404184                   | Talmulpatna Basti | 1673           | 9.00           | 0.00           | 3.20                                       | 0.00                                  | 1.20                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.60               | 4.00             | 0.80                         | 3.20                           | 0.00           | 2.00                    | 1.20            | 0.00          | 0.00            |
| 404187                   | Harichandajami    | 13             | 101.00         | 1.40           | 27.20                                      | 7.60                                  | 4.00                                                  | 0.00                                      | 0.00                        | 0.00                                            | 0.00               | 60.80            | 28.80                        | 32.00                          | 10.00          | 15.00                   | 7.00            | 0.00          | 0.00            |
| 404189                   | Khandanali        | 79             | 24.00          | 0.00           | 4.65                                       | 2.01                                  | 0.50                                                  | 0.50                                      | 0.00                        | 0.00                                            | 7.54               | 8.80             | 4.40                         | 4.40                           | 3.14           | 1.26                    | 0.00            | 0.00          | 0.00            |
| 404190                   | Serenabeda        | 1340           | 321.00         | 2.83           | 63.88                                      | 15.56                                 | 38.41                                                 | 4.04                                      | 0.00                        | 0.00                                            | 20.42              | 175.86           | 65.69                        | 110.17                         | 83.89          | 20.22                   | 6.06            | 0.00          | 0.00            |
| 404192                   | Budhapanka (CT)   | 6129           | 1219.00        | -              | 1219.00                                    | -                                     | -                                                     | -                                         | -                           | -                                               | -                  | -                | -                            | -                              | -              | -                       | -               | -             | -               |
| 404194                   | Nuahata (CT)      | 5920           | 848.00         | -              | 848.00                                     | -                                     | -                                                     | -                                         | -                           | -                                               | -                  | -                | -                            | -                              | -              | -                       | -               | -             | -               |
| <b>Sub total</b>         |                   | <b>47583</b>   | <b>9383.00</b> | <b>99.20</b>   | <b>3643.09</b>                             | <b>399.80</b>                         | <b>497.63</b>                                         | <b>87.97</b>                              | <b>0.00</b>                 | <b>9.20</b>                                     | <b>152.75</b>      | <b>4493.36</b>   | <b>1873.44</b>               | <b>2619.92</b>                 | <b>1703.25</b> | <b>631.81</b>           | <b>274.26</b>   | <b>0.00</b>   | <b>10.60</b>    |

POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)  
EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.

| Town/<br>village<br>code               | Town/village name | Populat<br>ion | Total<br>area   | Forest<br>land | Area under<br>Non-<br>Agricultural<br>Uses | Barren &<br>Un-<br>cultivable<br>Land | Permanent<br>Pastures<br>and Other<br>Grazing<br>Land | Land<br>Under<br>Misc. Tree<br>Crops etc. | Culturable<br>Waste<br>Land | Fallows Land<br>other than<br>Current<br>Fallows | Current<br>Fallows | Net Area<br>Sown | Total<br>Unirrigated<br>Land | Area<br>Irrigated<br>by Source | Canals         | Wells/<br>Tube<br>Wells | Tanks/<br>Lakes | Waterf<br>all | Other<br>Source |
|----------------------------------------|-------------------|----------------|-----------------|----------------|--------------------------------------------|---------------------------------------|-------------------------------------------------------|-------------------------------------------|-----------------------------|--------------------------------------------------|--------------------|------------------|------------------------------|--------------------------------|----------------|-------------------------|-----------------|---------------|-----------------|
| <b>Sub Distt. Bhusan Steel Limited</b> |                   |                |                 |                |                                            |                                       |                                                       |                                           |                             |                                                  |                    |                  |                              |                                |                |                         |                 |               |                 |
| 404195                                 | Talabahal         | 673            | 74.00           | 0.00           | 25.20                                      | 2.40                                  | 7.20                                                  | 0.00                                      | 0.00                        | 0.00                                             | 0.80               | 38.40            | 22.40                        | 16.00                          | 10.00          | 5.00                    | 1.00            | 0.00          | 0.00            |
| 404196                                 | Ganthigadia       | 425            | 175.00          | 0.79           | 94.62                                      | 0.00                                  | 29.30                                                 | 1.98                                      | 0.00                        | 0.00                                             | 4.76               | 43.55            | 27.71                        | 15.84                          | 9.90           | 4.95                    | 0.99            | 0.00          | 0.00            |
| <b>Sub total</b>                       |                   | <b>1098</b>    | <b>249.00</b>   | <b>0.79</b>    | <b>119.82</b>                              | <b>2.40</b>                           | <b>36.50</b>                                          | <b>1.98</b>                               | <b>0.00</b>                 | <b>0.00</b>                                      | <b>5.56</b>        | <b>81.95</b>     | <b>50.11</b>                 | <b>31.84</b>                   | <b>19.90</b>   | <b>9.95</b>             | <b>1.99</b>     | <b>0.00</b>   | <b>0.00</b>     |
| <b>Sub Distt. Anugul</b>               |                   |                |                 |                |                                            |                                       |                                                       |                                           |                             |                                                  |                    |                  |                              |                                |                |                         |                 |               |                 |
| 404232                                 | Kankinali         | 839            | 130.00          | 0.00           | 11.80                                      | 11.60                                 | 2.00                                                  | 0.80                                      | 0.00                        | 0.00                                             | 0.80               | 103.00           | 39.00                        | 64.00                          | 15.00          | 40.00                   | 9.00            | 0.00          | 0.00            |
| <b>Sub total</b>                       |                   | <b>839</b>     | <b>130.00</b>   | <b>0.00</b>    | <b>11.80</b>                               | <b>11.60</b>                          | <b>2.00</b>                                           | <b>0.80</b>                               | <b>0.00</b>                 | <b>0.00</b>                                      | <b>0.80</b>        | <b>103.00</b>    | <b>39.00</b>                 | <b>64.00</b>                   | <b>15.00</b>   | <b>40.00</b>            | <b>9.00</b>     | <b>0.00</b>   | <b>0.00</b>     |
| <b>RESERVED/PROTECTED FORESTS</b>      |                   |                |                 |                |                                            |                                       |                                                       |                                           |                             |                                                  |                    |                  |                              |                                |                |                         |                 |               |                 |
|                                        | Jharbandh RF      |                | 308.00          | 308.00         | -                                          | -                                     | -                                                     | -                                         | -                           | -                                                | -                  | -                | -                            | -                              | -              | -                       | -               | -             | -               |
|                                        | Nimidha RF        |                | 140.00          | 140.00         | -                                          | -                                     | -                                                     | -                                         | -                           | -                                                | -                  | -                | -                            | -                              | -              | -                       | -               | -             | -               |
|                                        | Gandhigariya PF   |                | 124.00          | 124.00         | -                                          | -                                     | -                                                     | -                                         | -                           | -                                                | -                  | -                | -                            | -                              | -              | -                       | -               | -             | -               |
| <b>Sub total</b>                       |                   |                | <b>572.00</b>   | <b>572.00</b>  | <b>0.00</b>                                | <b>0.00</b>                           | <b>0.00</b>                                           | <b>0.00</b>                               | <b>0.00</b>                 | <b>0.00</b>                                      | <b>0.00</b>        | <b>0.00</b>      | <b>0.00</b>                  | <b>0.00</b>                    | <b>0.00</b>    | <b>0.00</b>             | <b>0.00</b>     | <b>0.00</b>   | <b>0.00</b>     |
| <b>GRAND TOTAL</b>                     |                   | <b>219562</b>  | <b>50127.00</b> | <b>2961.96</b> | <b>7500.76</b>                             | <b>5216.46</b>                        | <b>2102.81</b>                                        | <b>793.03</b>                             | <b>700.23</b>               | <b>1474.82</b>                                   | <b>1197.83</b>     | <b>28179.10</b>  | <b>23604.08</b>              | <b>4575.02</b>                 | <b>3090.33</b> | <b>681.76</b>           | <b>656.20</b>   | <b>0.00</b>   | <b>146.73</b>   |
| <b>%</b>                               |                   |                | <b>100.00</b>   | <b>5.91</b>    | <b>14.96</b>                               | <b>10.41</b>                          | <b>4.19</b>                                           | <b>1.58</b>                               | <b>1.40</b>                 | <b>2.94</b>                                      | <b>2.39</b>        | <b>56.22</b>     | <b>47.09</b>                 | <b>9.13</b>                    | <b>67.55</b>   | <b>14.90</b>            | <b>14.34</b>    | <b>0.00</b>   | <b>3.21</b>     |

Kind Attn. to The Director

DIVISIONAL FOREST OFFICE: DHENKANAL

No. 4030 dt. 08-07-10

To

The Senior Manager,  
Rungta Mines Ltd.  
At: Korlan By-pass, Dhenkanal

Sub:

Authentication of the list of Flora & Fauna within 10 km radius of proposed integrated Steel plant of M/s Rungta Mines Ltd., Dhenkanal District of Orissa regarding environmental clearance.

Ref:

Your Letter No. RML / DKL / 10 - 11 / 0005 dt. 06.04.10.

Sir,

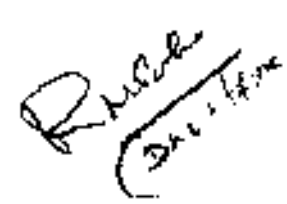
On the above mentioned subject under reference I am to say that the above list of Flora & Fauna enquired by the Range Officer, Hindol Range is sent herewith duly countersigned for necessary action at your level as requested vide your letter under reference.

Encl: As above

Yours faithfully,

  
Divisional Forest Officer,  
Dhenkanal Division.

**Divisional Forest Officer  
Dhenkanal Division**

  
1/5

**PROPOSED INTEGRATED STEEL PLANT (1.9 MTPA) at Village - Jharbandh,  
District - Dhenkanal, Orissa of M/s Rungta Mines Limited**

**LIST OF FLORA IN THE STUDY AREA**

| Sl. No.      | Botanical Name                  | Common Name     | Family Name    |
|--------------|---------------------------------|-----------------|----------------|
| <b>TREES</b> |                                 |                 |                |
| 1.           | <i>Acacia auriculiformis</i>    | Akasia          | Mimosaceae     |
| 2.           | <i>Acacia ferruginea</i>        | Garkhar         | Mimosaceae     |
| 3.           | <i>Acacia nilotica</i>          | Babul           | Mimosaceae     |
| 4.           | <i>Aegle marmelos</i>           | Bel             | Rutaceae       |
| 5.           | <i>Albanthus excelsa</i>        | Mahallimb       | Simarubaceae   |
| 6.           | <i>Albizia lebbek</i>           | Sirs            | Mimosaceae     |
| 7.           | <i>Albizia procera</i>          | Maranga/ Tantra | Mimosaceae     |
| 8.           | <i>Alstonia scholaris</i>       | Chhalian        | Apoynaceae     |
| 9.           | <i>Anacardium occidentale</i>   | Kaju            | Anacardiaceae  |
| 10.          | <i>Annona reticulata</i>        | Rampal          | Annonaceae     |
| 11.          | <i>Annona squamosa</i>          | Sharfa          | Annonaceae     |
| 12.          | <i>Anthocephalus chinensis</i>  | Kadamba         | Rubiaceae      |
| 13.          | <i>Artocarpus heterophyllus</i> | Panasa          | Moraceae       |
| 14.          | <i>Azadirachta indica</i>       | Neem            | Meliaceae      |
| 15.          | <i>Bombax ceiba</i>             | Simili          | Bombacaceae    |
| 16.          | <i>Borassus flabellifer</i>     | Tal             | Palmae         |
| 17.          | <i>Buchanania lanzan</i>        | Char            | Anacardiaceae  |
| 18.          | <i>Bumel monoparmita</i>        | Palas           | Papilionaceae  |
| 19.          | <i>Caesalpinia pulcherrima</i>  | Peacock flower  | Caesalpinaceae |
| 20.          | <i>Cassia fistula</i>           | Sunari          | Caesalpinaceae |
| 21.          | <i>Cocos nucifera</i>           | Narkul          | Palmae         |
| 22.          | <i>Dalbergia sissoo</i>         | Sissoo          | Papilionaceae  |
| 23.          | <i>Deionix regia</i>            | Gulmohar        | Caesalpinaceae |
| 24.          | <i>Diospyros melanoxylon</i>    | Kendu           | Ebenaceae      |
| 25.          | <i>Eucalyptus hybrid</i>        | Palas           | Myrtaceae      |
| 26.          | <i>Ficus benghalensis</i>       | Bars            | Moraceae       |
| 27.          | <i>Ficus glomerata</i>          | Chumar          | Moraceae       |
| 28.          | <i>Ficus religiosa</i>          | Aswath          | Moraceae       |
| 29.          | <i>Limonia acidissima</i>       | Kaliho          | Rutaceae       |
| 30.          | <i>Madhua indica</i>            | Mahul           | Sapotaceae     |
| 31.          | <i>Mangifera indica</i>         | Amba            | Anacardiaceae  |
| 32.          | <i>Melia composita</i>          | Ratra           | Meliaceae      |
| 33.          | <i>Mimusops elengi</i>          | Bohl            | Sapotaceae     |
| 34.          | <i>Moringa oleifera</i>         | Sajna           | Moringaceae    |
| 35.          | <i>Phoenix sylvestris</i>       | Khajur          | Palmae         |
| 36.          | <i>Polyalthia cerasiodes</i>    | Palmostu        | Annonaceae     |
| 37.          | <i>Pongamia pinnata</i>         | Karanj          | Papilionaceae  |
| 38.          | <i>Psidium guajava</i>          | Amrud           | Myrtaceae      |
| 39.          | <i>Spondia pinnata</i>          | Ambada          | Anacardiaceae  |
| 40.          | <i>Syzygium cumini</i>          | Jambu           | Myrtaceae      |
| 41.          | <i>Tamarindus indica</i>        | Tetuli          | Caesalpinaceae |
| 42.          | <i>Tectona grandis</i>          | Teak            | Verbenaceae    |
| 43.          | <i>Zizyphus mauritiana</i>      | Borkuli         | Rhamnaceae     |

Integrated Steel Plant of RML at Jharbandh

For RUNGTA MINES LTD.

R.N. SAHU  
Sr. Manager

1/3  
Range Officer  
Hindustan Range, Mine.

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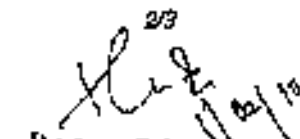
**PROPOSED INTEGRATED STEEL PLANT (1.9 MTPA) at Village - Jharbandh,  
District - Dhenkanal, Orissa of M/s Rungta Mines Limited**

| Sl. No.         | Botanical Name                    | Common Name       | Family Name     |
|-----------------|-----------------------------------|-------------------|-----------------|
| <b>BAMBOOS</b>  |                                   |                   |                 |
| 1.              | <i>Bambusa arundinacea</i>        | Kanta bans        | Bambusaceae     |
| 2.              | <i>Dendrocalamus strictus</i>     | Salla             | Gramineae       |
| <b>SHRUBS</b>   |                                   |                   |                 |
| 1.              | <i>Adhatoda vasica</i>            | Isarak            | Acanthaceae     |
| 2.              | <i>Calotropis gigantea</i>        | Arakha            | Asclepiadaceae  |
| 3.              | <i>Cassia alata</i>               | Candle-stick tree | Caesalpiniaceae |
| 4.              | <i>Clorodendron viscosum</i>      | Kumtil            | Verbenaceae     |
| 5.              | <i>Datura metel</i>               | Dhatura           | Solanaceae      |
| 6.              | <i>Euphorbia nerifolia</i>        | Kantasidhu        | Euphorbiaceae   |
| 7.              | <i>Hibiscus rosa-sinensis</i>     | Gurhal            | Malvaceae       |
| 8.              | <i>Holarrhena antioxyenterica</i> | Korel             | Apocynaceae     |
| 9.              | <i>Ipomoea purpurea</i>           | Morning glory     | Convolvulaceae  |
| 10.             | <i>Jatropha podagrica</i>         | Jatropha          | Euphorbiaceae   |
| 11.             | <i>Lantana camara</i>             | Bholupodi         | Verbenaceae     |
| 12.             | <i>Nerium oleander</i>            | Kaner             | Apocynaceae     |
| 13.             | <i>Phoenix aculeata</i>           | Bankhajuri        | Palmae          |
| 14.             | <i>Ricinus communis</i>           | Arand             | Euphorbiaceae   |
| 15.             | <i>Vitex negundo</i>              | Begunia           | Verbenaceae     |
| 16.             | <i>Woodfordia fruticosa</i>       | Dhalki            | Lythraceae      |
| <b>HERBS</b>    |                                   |                   |                 |
| 1.              | <i>Achyranthus aspera</i>         | Chirchira         | Amaranthaceae   |
| 2.              | <i>Amaranthus spinosus</i>        | cheull            | Amaranthaceae   |
| 3.              | <i>Euphorbia hirta</i>            | Dudhi bel         | Euphorbiaceae   |
| 4.              | <i>Leucas montana</i>             | Gepha             | Labiatae        |
| 5.              | <i>Mimosa pudica</i>              | Lajwanti          | Mimosaceae      |
| 6.              | <i>Odium gratissimum</i>          | Banatal           | Labiatae        |
| 7.              | <i>Odium sanctum</i>              | Tulsi             | Labiatae        |
| 8.              | <i>Solanum nigrum</i>             | Bhatkadrana       | Solanaceae      |
| <b>CLIMBERS</b> |                                   |                   |                 |
| 1.              | <i>Butea superba</i>              | Palas lata        | Papilionaceae   |
| 2.              | <i>Ziziphus oenoplia</i>          | Makai             | Rhamnaceae      |
| <b>GRASSES</b>  |                                   |                   |                 |
| 1.              | <i>Cynodon dactylon</i>           | Duba              | Poaceae         |
| 2.              | <i>Dichanthum annulatum</i>       | Marvel grass      | Poaceae         |
| 3.              | <i>Heteropogon contortus</i>      | Sinkula           | Poaceae         |
| 4.              | <i>Themeda triandra</i>           | Roi grass         | Poaceae         |

Integrated Steel Plant of RML at Jharbandh

For RUNGTA MINES LTD.

  
R.N. SAHU  
Sr. Manager

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Rungta Mines Ltd.  
Bunder Barga, Barga

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PROPOSED INTEGRATED STEEL PLANT (1.9 MTPA) at Village - Jharbandh, <sup>12</sup>  
District - Dhenkanal, Orissa of M/s Rungta Mines Limited

## LIST OF FLORA IN THE CORE ZONE

| Sl. No.        | Botanical Name                 | Common Name   | Family Name    |
|----------------|--------------------------------|---------------|----------------|
| <b>TREES</b>   |                                |               |                |
| 1.             | <i>Acacia ferruginea</i>       | Garkhar       | Mimosaceae     |
| 2.             | <i>Acacia nilotica</i>         | Babul         | Mimosaceae     |
| 3.             | <i>Anacardium occidentale</i>  | Kaju          | Anacardiaceae  |
| 4.             | <i>Annona reticulata</i>       | Ramphal       | Annonaceae     |
| 5.             | <i>Annona squamosa</i>         | Bharla        | Annonaceae     |
| 6.             | <i>Azadirachta indica</i>      | Neem          | Melaceae       |
| 7.             | <i>Borassus flabellifer</i>    | Tal           | Palmae         |
| 8.             | <i>Butea monosperma</i>        | Palas         | Papilionaceae  |
| 9.             | <i>Coccoloba nucifera</i>      | Narkul        | Palmae         |
| 10.            | <i>Mangifera indica</i>        | Amra          | Anacardiaceae  |
| 11.            | <i>Moringa oleifera</i>        | Sajna         | Moringaceae    |
| 12.            | <i>Phoenix sylvestris</i>      | Khajur        | Palmae         |
| 13.            | <i>Peltium guajava</i>         | Amrud         | Myrtaceae      |
| 14.            | <i>Spondia pinnata</i>         | Ambada        | Anacardiaceae  |
| 15.            | <i>Syzygium cumini</i>         | Jambu         | Myrtaceae      |
| 16.            | <i>Zizyphus mauritiana</i>     | Borkul        | Rhamnaceae     |
| <b>SHRUBS</b>  |                                |               |                |
| 1.             | <i>Calotropis gigantea</i>     | Arakha        | Asclepiadaceae |
| 2.             | <i>Ipomoea purpurea</i>        | Morning glory | Convolvulaceae |
| 3.             | <i>Jatropha podagrica</i>      | Jatropha      | Euphorbiaceae  |
| 4.             | <i>Lantana camara</i>          | Bholupodi     | Verbenaceae    |
| 5.             | <i>Phoenix aculeata</i>        | Bankhatul     | Palmae         |
| 6.             | <i>Ricinus communis</i>        | Arand         | Euphorbiaceae  |
| 7.             | <i>Vitex negundo</i>           | Begunia       | Verbenaceae    |
| <b>HERBS</b>   |                                |               |                |
| 1.             | <i>Achyranthus aspera</i>      | Chirchira     | Amaranthaceae  |
| 2.             | <i>Amaranthus spinosus</i>     | Chauli        | Amaranthaceae  |
| 3.             | <i>Euphorbia hirta</i>         | Dudhi bel     | Euphorbiaceae  |
| 4.             | <i>Mimosa pudica</i>           | Lajwanti      | Mimosaceae     |
| 5.             | <i>Ocimum sanctum</i>          | Tulsi         | Labiatae       |
| 6.             | <i>Solanum nigrum</i>          | Bhaskadana    | Solanaceae     |
| <b>GRASSES</b> |                                |               |                |
| 1.             | <i>Cynodon dactylon</i>        | Duba          | Poaceae        |
| 2.             | <i>Dipentanthium annulatum</i> | Marvel grass  | Poaceae        |
| 3.             | <i>Heteropogon contortus</i>   | Shikula       | Poaceae        |
| 4.             | <i>Themeda triandra</i>        | Red grass     | Poaceae        |

Corrected Signed.

Divisional Forest Officer,  
Dhenkanal Division.

Range Officer,  
Hindol Range, N.E.

Integrated Steel Plant of RML at Jharbandh  
For RUNGTA MINES LTD.

R.N. SAHU  
Sr. Manager

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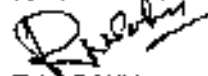
**PROPOSED INTEGRATED STEEL PLANT (1.9 MTPA) at Village - Jharbandh,  
District - Dhenkanal, Orissa of M/s Rungta Mines Limited**

**LIST OF FAUNA IN THE STUDY AREA**

| Sl. No.  | Scientific Name                  | Common Name                | Family          | Reference to Schedule as per Wildlife (Protection) Act 1972, as Amended upto 2006. |      |           |
|----------|----------------------------------|----------------------------|-----------------|------------------------------------------------------------------------------------|------|-----------|
|          |                                  |                            |                 | Schedule                                                                           | Part | Serial    |
| MAMMALS  |                                  |                            |                 |                                                                                    |      |           |
| 1.       | <i>Canis aureus</i>              | Jackal                     | Canidae         | II                                                                                 | II   | 2B        |
| 2.       | <i>Cynopterus sphinx</i>         | Short-nosed fruit bat      | Pteropodidae    | V                                                                                  | -    | 3         |
| 3.       | <i>Funambulus pennanti</i>       | Five striped palm squirrel | Sciuridae       | IV                                                                                 | -    | 3A        |
| 4.       | <i>Presbytis entellus</i>        | Langur                     | Cercopithecidae | II                                                                                 | I    | 4-A       |
| 5.       | <i>Herpestes edwardsi</i>        | Common mongoose            | Herpestidae     | II                                                                                 | II   | 1B        |
| 6.       | <i>Lepus nigricollis</i>         | Indian hare                | Leporidae       | IV                                                                                 | -    | 4         |
| 7.       | <i>Macaca mulatta</i>            | Rhesus macaque             | Cercopithecidae | II                                                                                 | I    | 17A       |
| 8.       | <i>Rattus rattus</i>             | Common house rat           | Muridae         | V                                                                                  | -    | 6         |
| 9.       | <i>Sus scrofa</i>                | Indian wild boar           | Suidae          | III                                                                                | -    | 19        |
| REPTILES |                                  |                            |                 |                                                                                    |      |           |
| 1.       | <i>Bungarus caeruleus</i>        | Common Indian krait        | Elapidae        | IV                                                                                 | -    | 12 (vi)   |
| 2.       | <i>Calotes versicolor</i>        | Common garden lizard       | Agamidae        | -                                                                                  | -    | -         |
| 3.       | <i>Chamaeleon zeylanicus</i>     | Indian chameleon           | Chamaeleonidae  | II                                                                                 | I    | 24        |
| 4.       | <i>Echis carinatus</i>           | Saw scaled viper           | Viperidae       | IV                                                                                 | -    | 12 (xiii) |
| 5.       | <i>Hemidactylus flaviviridis</i> | Northern house gecko       | Geckonidae      | -                                                                                  | -    | -         |
| 6.       | <i>Ptyas mucosus</i>             | Common rat snake           | Colubridae      | II                                                                                 | II   | 9         |
| AVES     |                                  |                            |                 |                                                                                    |      |           |
| 1.       | <i>Acridotheres tristis</i>      | Indian myna                | Sturnidae       | IV                                                                                 | -    | 11(45)    |
| 2.       | <i>Anser indicus</i>             | Barheaded goose            | Anatidae        | IV                                                                                 | -    | 11(29)    |
| 3.       | <i>Bubo bubo</i>                 | Owl                        | Strigidae       | IV                                                                                 | -    | 11(48)    |
| 4.       | <i>Columba livia</i>             | Blue rock Pigeon           | Columbidae      | -                                                                                  | -    | -         |
| 5.       | <i>Corvus splendens</i>          | House crow                 | Corvidae        | V                                                                                  | -    | I         |
| 6.       | <i>Gallus gallus</i>             | Jungle fowl                | Phasianidae     | IV                                                                                 | -    | 36-A      |
| 7.       | <i>Francolinus pondicerianus</i> | Grey partridge             | Phasianidae     | IV                                                                                 | -    | 11(51)    |
| 8.       | <i>Dicurus adimilis</i>          | King crow                  | Corvidae        | -                                                                                  | -    | -         |
| 9.       | <i>Passer domesticus</i>         | House sparrow              | Passeridae      | -                                                                                  | -    | -         |
| 10.      | <i>Psittacula eupatria</i>       | Large Indian Parakeet      | Psittacidae     | IV                                                                                 | -    | 11(50)    |

Integrated Steel Plant of RML at Jharbandh

For RUNGTA MINES LTD.

  
R.N. BAHU  
Sr. Manager

  
Rungta Mines Ltd.  
Dhenkanal, Orissa  
11.7.10

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**PROPOSED INTEGRATED STEEL PLANT (1.9 MTPA) at Village – Jharbandh,  
District – Dhenkanal, Orissa of M/s Rungta Mines Limited**

**LIST OF FAUNA IN THE CORE ZONE**

| Sl. No.                | Scientific Name                  | Common Name                | Family           | Reference to Schedule as per Wildlife (Protection) Act 1972, as Amended upto 2006. |    |         |
|------------------------|----------------------------------|----------------------------|------------------|------------------------------------------------------------------------------------|----|---------|
| Schedule : Part Serial |                                  |                            |                  |                                                                                    |    |         |
| MAMMALS                |                                  |                            |                  |                                                                                    |    |         |
| 1.                     | <i>Funambulus pennanti</i>       | Five striped palm squirrel | Sciuridae        | IV                                                                                 | -  | 3A      |
| 2.                     | <i>Herpestes edwardsi</i>        | Common mongoose            | Herpestidae      | II                                                                                 | II | 16      |
| 3.                     | <i>Lepus nigricollis</i>         | Indian hare                | Leporidae        | IV                                                                                 | -  | 4       |
| 4.                     | <i>Macaca mulatta</i>            | Rhesus macaque             | Cercopithecoidea | II                                                                                 | I  | 17A     |
| 5.                     | <i>Rattus rattus</i>             | Common house rat           | Muridae          | V                                                                                  | -  | 6       |
| REPTILES               |                                  |                            |                  |                                                                                    |    |         |
| 1.                     | <i>Bungarus caeruleus</i>        | Common Indian krait        | Elapidae         | IV                                                                                 | -  | 12 (vi) |
| 2.                     | <i>Crotalus variator</i>         | Common garden lizard       | Agamidae         | -                                                                                  | -  | -       |
| 3.                     | <i>Chamaeleon zeylanicus</i>     | Indian chameleon           | Chamaeleonidae   | II                                                                                 | I  | 24      |
| 4.                     | <i>Hemidactylus navivindis</i>   | Northern house gecko       | Gekkonidae       | -                                                                                  | -  | -       |
| 5.                     | <i>Ptyas mucosus</i>             | Common rat snake           | Colubridae       | II                                                                                 | II | 9       |
| AVES                   |                                  |                            |                  |                                                                                    |    |         |
| 1.                     | <i>Acridothera tristis</i>       | Indian myna                | Sturnidae        | IV                                                                                 | -  | 11(45)  |
| 2.                     | <i>Bubo bubo</i>                 | Owl                        | Strigidae        | IV                                                                                 | -  | 11(48)  |
| 3.                     | <i>Columba livia</i>             | Blue rock Pigeon           | Columbidae       | -                                                                                  | -  | -       |
| 4.                     | <i>Corvus splendens</i>          | House crow                 | Corvidae         | V                                                                                  | -  | I       |
| 5.                     | <i>Gallus gallus</i>             | Jungle fowl                | Phasianidae      | IV                                                                                 | -  | 36-A    |
| 6.                     | <i>Francolinus pondicerianus</i> | Grey partridge             | Phasianidae      | IV                                                                                 | -  | 11(51)  |
| 7.                     | <i>Oriolus chinensis</i>         | King crow                  | Corvidae         | -                                                                                  | -  | -       |
| 8.                     | <i>Psittacula krameri</i>        | Large Indian Parakeet      | Psittacidae      | IV                                                                                 | -  | 11(50)  |

*Copy Signed*

**Divisional Forest Officer  
Dhenkanal Division**

Integrated Steel Plant of RML at Jharbandh

**For RUNGTA MINES LTD.**

*R. N. Samu*  
**R.N. SAMU**  
Sr. Manager

*X*  
Rungta Mines Ltd.  
Dhenkanal Division

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**VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code | Town/village<br>name | No. of<br>house-<br>holds | Population break-up |             |             | Population (0-6 years) |            |            | Schedule<br>Caste | Schedule<br>Tribe | Literacy level    |                  |                    |
|--------------------------|----------------------|---------------------------|---------------------|-------------|-------------|------------------------|------------|------------|-------------------|-------------------|-------------------|------------------|--------------------|
|                          |                      |                           | Total               | Male        | Female      | Total                  | Male       | Female     |                   |                   | Total<br>literate | Male<br>literate | Female<br>literate |
| <b>District</b>          | <b>Dhenkanal</b>     |                           |                     |             |             |                        |            |            |                   |                   |                   |                  |                    |
| <b>Sub Distt.</b>        | <b>Parajang</b>      |                           |                     |             |             |                        |            |            |                   |                   |                   |                  |                    |
| 402286                   | Palasahi             | 333                       | 1283                | 594         | 689         | 154                    | 80         | 74         | 88                | 0                 | 830               | 444              | 386                |
| 402287                   | Dihakamar            | 78                        | 286                 | 160         | 126         | 18                     | 9          | 9          | 61                | 0                 | 220               | 136              | 84                 |
| 402288                   | Patarapada           | 770                       | 3069                | 1520        | 1549        | 243                    | 132        | 111        | 223               | 0                 | 2300              | 1225             | 1075               |
| 402289                   | Sankamar             | 177                       | 657                 | 343         | 314         | 77                     | 50         | 27         | 130               | 0                 | 494               | 258              | 236                |
| 402290                   | Gailo                | 231                       | 854                 | 443         | 411         | 103                    | 56         | 47         | 318               | 0                 | 601               | 339              | 262                |
| 402291                   | Kundandeipur         | 154                       | 598                 | 311         | 287         | 57                     | 35         | 22         | 110               | 0                 | 432               | 238              | 194                |
| 402292                   | Panibhandar          | 257                       | 1129                | 603         | 526         | 123                    | 58         | 65         | 204               | 0                 | 943               | 533              | 410                |
| 402293                   | Badakamar            | 139                       | 521                 | 273         | 248         | 57                     | 32         | 25         | 100               | 0                 | 394               | 227              | 167                |
| 402294                   | Katabahal            | 633                       | 2372                | 1209        | 1163        | 268                    | 140        | 128        | 291               | 0                 | 1613              | 905              | 708                |
| 402298                   | Ria                  | 98                        | 431                 | 211         | 220         | 43                     | 26         | 17         | 21                | 0                 | 331               | 175              | 156                |
| 402304                   | Panigengutia         | 322                       | 1269                | 602         | 667         | 148                    | 81         | 67         | 364               | 212               | 840               | 451              | 389                |
| 402305                   | Roda                 | 564                       | 2190                | 1171        | 1019        | 208                    | 119        | 89         | 507               | 16                | 1510              | 878              | 632                |
| 402306                   | Renthapat            | 68                        | 259                 | 125         | 134         | 37                     | 19         | 18         | 143               | 4                 | 157               | 81               | 76                 |
| 402307                   | Tarahata             | 52                        | 162                 | 73          | 89          | 27                     | 14         | 13         | 122               | 0                 | 77                | 41               | 36                 |
| 402308                   | Siarimalia           | 158                       | 588                 | 276         | 312         | 56                     | 33         | 23         | 58                | 2                 | 362               | 183              | 179                |
| <b>Sub total</b>         |                      | <b>4034</b>               | <b>15668</b>        | <b>7914</b> | <b>7754</b> | <b>1619</b>            | <b>884</b> | <b>735</b> | <b>2740</b>       | <b>234</b>        | <b>11104</b>      | <b>6114</b>      | <b>4990</b>        |
| <b>Sub Distt.</b>        | <b>Motunga</b>       |                           |                     |             |             |                        |            |            |                   |                   |                   |                  |                    |
| 402897                   | Kusupanga            | 450                       | 1911                | 1013        | 898         | 220                    | 134        | 86         | 434               | 0                 | 1323              | 755              | 568                |
| 402898                   | Kurunti              | 673                       | 2910                | 1737        | 1173        | 312                    | 173        | 139        | 309               | 140               | 2012              | 1290             | 722                |
| 402899                   | Kochilamada          | 314                       | 1114                | 617         | 497         | 130                    | 73         | 57         | 189               | 10                | 867               | 512              | 355                |
| 402901                   | Charadagadia         | 195                       | 835                 | 430         | 405         | 107                    | 55         | 52         | 272               | 39                | 559               | 326              | 233                |
| 402905                   | Motunga              | 446                       | 1883                | 998         | 885         | 201                    | 117        | 84         | 356               | 21                | 1283              | 733              | 550                |
| 402906                   | Kharagprasad         | 966                       | 4507                | 2375        | 2132        | 581                    | 324        | 257        | 2020              | 108               | 3412              | 1919             | 1493               |
| 402907                   | Kharagprasadpatna    | 355                       | 1696                | 882         | 814         | 222                    | 105        | 117        | 154               | 22                | 1257              | 744              | 513                |
| 402908                   | Suravi               | 170                       | 765                 | 416         | 349         | 83                     | 43         | 40         | 259               | 12                | 551               | 334              | 217                |
| 402909                   | Bido                 | 319                       | 1407                | 661         | 746         | 157                    | 74         | 83         | 411               | 0                 | 930               | 482              | 448                |
| 402910                   | Taladanga            | 112                       | 438                 | 201         | 237         | 57                     | 30         | 27         | 92                | 0                 | 282               | 144              | 138                |
| 402911                   | Ranjasinga           | 298                       | 1256                | 669         | 587         | 126                    | 76         | 50         | 102               | 5                 | 962               | 553              | 409                |
| 402913                   | Nagari               | 246                       | 940                 | 459         | 481         | 111                    | 56         | 55         | 403               | 0                 | 634               | 349              | 285                |
| 402914                   | Gaudapasi            | 34                        | 124                 | 62          | 62          | 18                     | 9          | 9          | 111               | 0                 | 74                | 45               | 29                 |
| 402915                   | Chintapokhari        | 170                       | 775                 | 391         | 384         | 96                     | 47         | 49         | 68                | 0                 | 578               | 317              | 261                |
| 402916                   | Malibido             | 170                       | 674                 | 338         | 336         | 84                     | 45         | 39         | 183               | 0                 | 467               | 251              | 216                |
| 402917                   | Binakarkateni        | 124                       | 587                 | 292         | 295         | 68                     | 34         | 34         | 6                 | 0                 | 408               | 220              | 188                |
| 402918                   | Budhapanka           | 175                       | 669                 | 358         | 311         | 80                     | 40         | 40         | 184               | 0                 | 558               | 310              | 248                |
| 402919                   | Brajabiharipur       | 65                        | 230                 | 124         | 106         | 25                     | 17         | 8          | 67                | 0                 | 170               | 96               | 74                 |
| 402920                   | Salapada             | 15                        | 63                  | 33          | 30          | 7                      | 4          | 3          | 8                 | 0                 | 53                | 28               | 25                 |
| 402922                   | Kunjabiharipur       | 117                       | 531                 | 269         | 262         | 78                     | 34         | 44         | 154               | 371               | 356               | 207              | 149                |

**VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code | Town/village<br>name        | No. of<br>house-<br>holds | Population break-up |              |              | Population (0-6 years) |             |             | Schedule<br>Caste | Schedule<br>Tribe | Literacy level    |                  |                    |
|--------------------------|-----------------------------|---------------------------|---------------------|--------------|--------------|------------------------|-------------|-------------|-------------------|-------------------|-------------------|------------------|--------------------|
|                          |                             |                           | Total               | Male         | Female       | Total                  | Male        | Female      |                   |                   | Total<br>literate | Male<br>literate | Female<br>literate |
| 402924                   | Nadhara                     | 356                       | 1370                | 719          | 651          | 118                    | 71          | 47          | 96                | 0                 | 1103              | 606              | 497                |
| 402925                   | Ekagharia                   | 228                       | 893                 | 469          | 424          | 91                     | 45          | 46          | 99                | 8                 | 713               | 406              | 307                |
| 402926                   | Bangurasinga                | 696                       | 2838                | 1506         | 1332         | 267                    | 153         | 114         | 704               | 239               | 2031              | 1171             | 860                |
| 402927                   | Jarada                      | 108                       | 484                 | 256          | 228          | 55                     | 33          | 22          | 66                | 92                | 372               | 212              | 160                |
| 402928                   | Nuara                       | 18                        | 103                 | 54           | 49           | 20                     | 11          | 9           | 0                 | 0                 | 78                | 43               | 35                 |
| 402929                   | Talabaghalunda              | 198                       | 905                 | 472          | 433          | 95                     | 59          | 36          | 98                | 0                 | 716               | 390              | 326                |
| 402930                   | Uparbaghalunda              | 258                       | 955                 | 485          | 470          | 117                    | 66          | 51          | 381               | 11                | 625               | 353              | 272                |
| 402931                   | Nayabhagirathipur(East)     | 311                       | 1254                | 636          | 618          | 103                    | 55          | 48          | 208               | 79                | 1014              | 537              | 477                |
| 402932                   | Nayabhagirathipur(West)     | 282                       | 1027                | 535          | 492          | 141                    | 71          | 70          | 380               | 93                | 704               | 420              | 284                |
| 402933                   | Kalusahukateni              | 167                       | 753                 | 390          | 363          | 77                     | 47          | 30          | 210               | 0                 | 659               | 338              | 321                |
| 402934                   | Haladibahali                | 407                       | 1662                | 867          | 795          | 186                    | 99          | 87          | 448               | 0                 | 1319              | 735              | 584                |
| 402935                   | Budhipahad                  | 117                       | 492                 | 257          | 235          | 79                     | 43          | 36          | 140               | 209               | 267               | 163              | 104                |
| 402936                   | Uperpal                     | 104                       | 420                 | 208          | 212          | 50                     | 26          | 24          | 23                | 91                | 292               | 163              | 129                |
| 402937                   | Meramandali                 | 351                       | 1377                | 701          | 676          | 136                    | 71          | 65          | 487               | 0                 | 955               | 553              | 402                |
| 402938                   | Nimidha                     | 706                       | 3118                | 1603         | 1515         | 414                    | 215         | 199         | 684               | 823               | 1935              | 1120             | 815                |
| 402939                   | Ranibania                   | 161                       | 672                 | 328          | 344          | 81                     | 37          | 44          | 167               | 17                | 455               | 242              | 213                |
| 402940                   | Badalo                      | 330                       | 1355                | 698          | 657          | 145                    | 77          | 68          | 403               | 124               | 925               | 540              | 385                |
| 402942                   | Artasantrakateni            | 269                       | 1263                | 646          | 617          | 127                    | 64          | 63          | 530               | 49                | 895               | 498              | 397                |
| 402943                   | Murdangapali                | 217                       | 962                 | 472          | 490          | 127                    | 71          | 56          | 322               | 0                 | 608               | 346              | 262                |
| 402944                   | Balaramprasad               | 720                       | 3237                | 1682         | 1555         | 387                    | 208         | 179         | 502               | 69                | 2449              | 1377             | 1072               |
| 402946                   | Handifuta                   | 163                       | 670                 | 364          | 306          | 90                     | 55          | 35          | 216               | 2                 | 435               | 255              | 180                |
| 402947                   | Ghodadian                   | 321                       | 1348                | 700          | 648          | 181                    | 94          | 87          | 401               | 5                 | 859               | 510              | 349                |
| 402948                   | Naraharipur                 | 63                        | 237                 | 119          | 118          | 28                     | 14          | 14          | 76                | 19                | 164               | 89               | 75                 |
| 402949                   | Sridihi                     | 171                       | 686                 | 340          | 346          | 79                     | 36          | 43          | 252               | 219               | 506               | 285              | 221                |
| 402950                   | Bachhuribanka               | 135                       | 520                 | 271          | 249          | 61                     | 40          | 21          | 177               | 16                | 372               | 210              | 162                |
| 402951                   | Chheliabedha                | 57                        | 273                 | 127          | 146          | 39                     | 17          | 22          | 0                 | 0                 | 196               | 102              | 94                 |
| 402952                   | Paneilo                     | 195                       | 766                 | 394          | 372          | 118                    | 65          | 53          | 512               | 91                | 490               | 276              | 214                |
| <b>Sub total</b>         |                             | <b>12523</b>              | <b>52955</b>        | <b>27624</b> | <b>25331</b> | <b>6175</b>            | <b>3333</b> | <b>2842</b> | <b>13364</b>      | <b>2984</b>       | <b>37873</b>      | <b>21555</b>     | <b>16318</b>       |
| <b>Sub Distt.</b>        | <b>Bhusan Steel Limited</b> |                           |                     |              |              |                        |             |             |                   |                   |                   |                  |                    |
| 402967                   | Mangalpur                   | 1209                      | 5448                | 3188         | 2260         | 585                    | 302         | 283         | 1210              | 241               | 4045              | 2571             | 1474               |
| 402968                   | Itapa                       | 75                        | 335                 | 179          | 156          | 41                     | 25          | 16          | 0                 | 2                 | 239               | 132              | 107                |
| 402969                   | Narendrapur                 | 509                       | 1940                | 1078         | 862          | 246                    | 114         | 132         | 297               | 810               | 1242              | 802              | 440                |
| 402970                   | Asanabania                  | 47                        | 221                 | 118          | 103          | 35                     | 22          | 13          | 46                | 0                 | 148               | 80               | 68                 |
| 402971                   | Sibapur                     | 383                       | 1813                | 1015         | 798          | 250                    | 135         | 115         | 561               | 707               | 1452              | 839              | 613                |
| 402972                   | Rakala                      | 138                       | 636                 | 326          | 310          | 81                     | 45          | 36          | 128               | 0                 | 467               | 272              | 195                |
| 402973                   | Panaghudughuda              | 84                        | 344                 | 155          | 189          | 38                     | 21          | 17          | 171               | 0                 | 206               | 102              | 104                |
| 402974                   | Amana                       | 329                       | 1421                | 716          | 705          | 179                    | 89          | 90          | 100               | 102               | 921               | 520              | 401                |
| 402975                   | Sanjapada                   | 421                       | 1927                | 992          | 935          | 217                    | 111         | 106         | 474               | 19                | 1262              | 743              | 519                |
| 402976                   | Badibahal                   | 128                       | 518                 | 255          | 263          | 73                     | 36          | 37          | 10                | 128               | 359               | 207              | 152                |
| 402977                   | Khaliberana                 | 216                       | 823                 | 428          | 395          | 86                     | 45          | 41          | 43                | 42                | 629               | 353              | 276                |

**VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code | Town/village<br>name | No. of<br>house-<br>holds | Population break-up |              |              | Population (0-6 years) |             |             | Schedule<br>Caste | Schedule<br>Tribe | Literacy level    |                  |                    |
|--------------------------|----------------------|---------------------------|---------------------|--------------|--------------|------------------------|-------------|-------------|-------------------|-------------------|-------------------|------------------|--------------------|
|                          |                      |                           | Total               | Male         | Female       | Total                  | Male        | Female      |                   |                   | Total<br>literate | Male<br>literate | Female<br>literate |
| 402978                   | Nadeilo              | 131                       | 529                 | 276          | 253          | 55                     | 32          | 23          | 78                | 173               | 398               | 221              | 177                |
| 402979                   | Bramhanapurunakot    | 142                       | 627                 | 317          | 310          | 89                     | 41          | 48          | 182               | 76                | 429               | 246              | 183                |
| 402980                   | Naraharipur          | 48                        | 198                 | 100          | 98           | 15                     | 5           | 10          | 24                | 22                | 156               | 82               | 74                 |
| 402981                   | Chandrasekharpur     | 24                        | 91                  | 47           | 44           | 9                      | 4           | 5           | 0                 | 0                 | 70                | 41               | 29                 |
| 402982                   | Kankalu              | 277                       | 1210                | 622          | 588          | 146                    | 82          | 64          | 452               | 0                 | 925               | 508              | 417                |
| 402983                   | Mitikapasi           | 32                        | 125                 | 80           | 45           | 11                     | 7           | 4           | 0                 | 0                 | 92                | 65               | 27                 |
| 402984                   | Sarapa               | 118                       | 486                 | 255          | 231          | 67                     | 37          | 30          | 218               | 34                | 354               | 207              | 147                |
| 402985                   | Raghunathapur        | 231                       | 823                 | 443          | 380          | 108                    | 55          | 53          | 271               | 74                | 564               | 345              | 219                |
| 402986                   | Nuagan               | 221                       | 975                 | 505          | 470          | 121                    | 62          | 59          | 167               | 128               | 679               | 396              | 283                |
| 402987                   | Mahatala             | 18                        | 71                  | 40           | 31           | 8                      | 5           | 3           | 18                | 0                 | 51                | 30               | 21                 |
| 402989                   | Paikpurunakot        | 307                       | 1345                | 689          | 656          | 152                    | 84          | 68          | 339               | 21                | 916               | 527              | 389                |
| 402991                   | Jhaduberani          | 97                        | 387                 | 201          | 186          | 44                     | 22          | 22          | 70                | 0                 | 250               | 158              | 92                 |
| <b>Sub total</b>         |                      | <b>5185</b>               | <b>22293</b>        | <b>12025</b> | <b>10268</b> | <b>2656</b>            | <b>1381</b> | <b>1275</b> | <b>4859</b>       | <b>2579</b>       | <b>15854</b>      | <b>9447</b>      | <b>6407</b>        |
| <b>Sub Distt.</b>        | <b>Balimi</b>        |                           |                     |              |              |                        |             |             |                   |                   |                   |                  |                    |
| 402993                   | Beruanpal            | 325                       | 1217                | 616          | 601          | 158                    | 80          | 78          | 513               | 76                | 799               | 457              | 342                |
| 402994                   | Gandijhara           | 55                        | 218                 | 114          | 104          | 28                     | 19          | 9           | 218               | 0                 | 156               | 88               | 68                 |
| 402995                   | Galapada             | 320                       | 1222                | 622          | 600          | 138                    | 61          | 77          | 621               | 0                 | 735               | 437              | 298                |
| 402996                   | Bhanupada            | 76                        | 293                 | 154          | 139          | 23                     | 10          | 13          | 0                 | 0                 | 238               | 136              | 102                |
| 402997                   | Chitipada            | 72                        | 256                 | 153          | 103          | 30                     | 19          | 11          | 0                 | 0                 | 185               | 119              | 66                 |
| 402998                   | Nimabahal            | 239                       | 967                 | 496          | 471          | 79                     | 41          | 38          | 167               | 40                | 743               | 424              | 319                |
| 402999                   | Kothalu              | 110                       | 379                 | 196          | 183          | 46                     | 23          | 23          | 100               | 0                 | 291               | 169              | 122                |
| 403000                   | Jhadabandha          | 410                       | 1635                | 811          | 824          | 187                    | 106         | 81          | 324               | 0                 | 1208              | 654              | 554                |
| 403001                   | Madhupur             | 34                        | 126                 | 61           | 65           | 15                     | 10          | 5           | 0                 | 11                | 85                | 43               | 42                 |
| 403002                   | Nua                  | 539                       | 2250                | 1142         | 1108         | 259                    | 162         | 97          | 246               | 36                | 1508              | 832              | 676                |
| 403003                   | Thokar               | 431                       | 1721                | 865          | 856          | 184                    | 112         | 72          | 110               | 13                | 1168              | 636              | 532                |
| 403004                   | Barasingha           | 642                       | 2455                | 1254         | 1201         | 270                    | 131         | 139         | 988               | 0                 | 1532              | 912              | 620                |
| 403005                   | Tarkabeda            | 328                       | 1073                | 578          | 495          | 116                    | 76          | 40          | 197               | 37                | 778               | 470              | 308                |
| 403006                   | Kadala               | 480                       | 2129                | 1094         | 1035         | 223                    | 116         | 107         | 535               | 0                 | 1368              | 804              | 564                |
| 403007                   | Benipathara          | 38                        | 142                 | 80           | 62           | 14                     | 7           | 7           | 67                | 0                 | 106               | 64               | 42                 |
| 403008                   | Badamunda            | 132                       | 649                 | 325          | 324          | 87                     | 38          | 49          | 227               | 0                 | 446               | 261              | 185                |
| 403009                   | Kantimili            | 333                       | 1469                | 744          | 725          | 164                    | 76          | 88          | 208               | 0                 | 915               | 537              | 378                |
| 403010                   | Sanamunda            | 203                       | 831                 | 421          | 410          | 95                     | 47          | 48          | 327               | 0                 | 511               | 305              | 206                |
| 403011                   | Solanali             | 111                       | 428                 | 206          | 222          | 64                     | 31          | 33          | 25                | 0                 | 232               | 125              | 107                |
| 403012                   | Jharabeda            | 201                       | 899                 | 467          | 432          | 111                    | 61          | 50          | 270               | 57                | 579               | 333              | 246                |
| 403013                   | Nuapada              | 186                       | 685                 | 358          | 327          | 89                     | 44          | 45          | 285               | 0                 | 460               | 259              | 201                |
| 403014                   | Patala               | 525                       | 2003                | 1020         | 983          | 204                    | 103         | 101         | 631               | 0                 | 1334              | 769              | 565                |
| 403015                   | Bankidi              | 307                       | 1114                | 586          | 528          | 101                    | 54          | 47          | 340               | 0                 | 730               | 432              | 298                |
| 403016                   | Panuberani           | 111                       | 316                 | 148          | 168          | 32                     | 16          | 16          | 13                | 14                | 224               | 113              | 111                |
| 403017                   | Dahanimara           | 21                        | 73                  | 33           | 40           | 10                     | 4           | 6           | 55                | 0                 | 40                | 23               | 17                 |
| 403018                   | Khalapal             | 93                        | 332                 | 176          | 156          | 32                     | 25          | 7           | 0                 | 0                 | 197               | 123              | 74                 |

**VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code | Town/village<br>name | No. of<br>house-<br>holds | Population break-up |              |              | Population (0-6 years) |             |             | Schedule<br>Caste | Schedule<br>Tribe | Literacy level    |                  |                    |
|--------------------------|----------------------|---------------------------|---------------------|--------------|--------------|------------------------|-------------|-------------|-------------------|-------------------|-------------------|------------------|--------------------|
|                          |                      |                           | Total               | Male         | Female       | Total                  | Male        | Female      |                   |                   | Total<br>literate | Male<br>literate | Female<br>literate |
| 403019                   | Nagiaberani          | 49                        | 179                 | 88           | 91           | 26                     | 13          | 13          | 86                | 11                | 78                | 45               | 33                 |
| 403020                   | Iswarapur            | 61                        | 241                 | 132          | 109          | 25                     | 15          | 10          | 0                 | 0                 | 189               | 108              | 81                 |
| 403021                   | Gotiaberani          | 27                        | 119                 | 64           | 55           | 16                     | 10          | 6           | 101               | 0                 | 67                | 39               | 28                 |
| 403022                   | Kantamila            | 133                       | 449                 | 238          | 211          | 51                     | 31          | 20          | 0                 | 0                 | 285               | 170              | 115                |
| 403024                   | Mahalunda            | 349                       | 1494                | 785          | 709          | 177                    | 105         | 72          | 247               | 48                | 1011              | 588              | 423                |
| 403025                   | Bedanali             | 34                        | 150                 | 78           | 72           | 25                     | 16          | 9           | 0                 | 0                 | 85                | 50               | 35                 |
| 403026                   | Maguberani           | 112                       | 396                 | 207          | 189          | 51                     | 34          | 17          | 0                 | 0                 | 270               | 144              | 126                |
| 403027                   | Krushnachandrapur    | 165                       | 559                 | 285          | 274          | 55                     | 25          | 30          | 224               | 97                | 324               | 185              | 139                |
| 403028                   | Gulehi               | 407                       | 1814                | 932          | 882          | 216                    | 110         | 106         | 397               | 55                | 1193              | 668              | 525                |
| 403029                   | Dudurokot            | 1350                      | 5189                | 2687         | 2502         | 630                    | 349         | 281         | 1167              | 224               | 3335              | 1915             | 1420               |
| 403030                   | Bramhanamara         | 231                       | 939                 | 482          | 457          | 101                    | 56          | 45          | 129               | 81                | 611               | 352              | 259                |
| 403031                   | Kumurusinga          | 286                       | 1276                | 636          | 640          | 129                    | 65          | 64          | 339               | 31                | 916               | 489              | 427                |
| 403032                   | Ranjagola            | 714                       | 2817                | 1440         | 1377         | 256                    | 145         | 111         | 482               | 0                 | 2009              | 1121             | 888                |
| 403033                   | Asarada              | 276                       | 1061                | 543          | 518          | 124                    | 67          | 57          | 273               | 0                 | 800               | 456              | 344                |
| 403034                   | Balimi               | 227                       | 889                 | 466          | 423          | 78                     | 39          | 39          | 54                | 4                 | 685               | 396              | 289                |
| 403035                   | Kukuta               | 727                       | 2961                | 1478         | 1483         | 267                    | 137         | 130         | 511               | 26                | 2138              | 1175             | 963                |
| 403036                   | Sanahindol           | 201                       | 749                 | 377          | 372          | 99                     | 45          | 54          | 171               | 0                 | 527               | 292              | 235                |
| 403037                   | Nandapur             | 238                       | 802                 | 402          | 400          | 97                     | 54          | 43          | 239               | 99                | 571               | 302              | 269                |
| 403038                   | Gurilo               | 148                       | 626                 | 336          | 290          | 72                     | 46          | 26          | 19                | 9                 | 382               | 220              | 162                |
| <b>Sub total</b>         |                      | <b>12057</b>              | <b>47592</b>        | <b>24376</b> | <b>23216</b> | <b>5254</b>            | <b>2834</b> | <b>2420</b> | <b>10906</b>      | <b>969</b>        | <b>32044</b>      | <b>18240</b>     | <b>13804</b>       |
| <b>Sub Distt. Hindol</b> |                      |                           |                     |              |              |                        |             |             |                   |                   |                   |                  |                    |
| 403040                   | Chhelachheli         | 13                        | 45                  | 22           | 23           | 4                      | 1           | 3           | 41                | 4                 | 32                | 19               | 13                 |
| 403041                   | Kalihundi            | 60                        | 234                 | 117          | 117          | 29                     | 14          | 15          | 219               | 0                 | 162               | 96               | 66                 |
| 403042                   | Tutupada             | 66                        | 213                 | 105          | 108          | 26                     | 13          | 13          | 61                | 0                 | 160               | 88               | 72                 |
| 403043                   | Tangisal             | 90                        | 346                 | 192          | 154          | 44                     | 28          | 16          | 77                | 0                 | 278               | 157              | 121                |
| 403044                   | Balasar              | 283                       | 1198                | 608          | 590          | 142                    | 78          | 64          | 272               | 263               | 839               | 456              | 383                |
| 403045                   | Hatura               | 272                       | 997                 | 486          | 511          | 108                    | 51          | 57          | 96                | 3                 | 700               | 368              | 332                |
| 403046                   | Jayapanga            | 77                        | 297                 | 142          | 155          | 21                     | 8           | 13          | 85                | 33                | 184               | 97               | 87                 |
| 403047                   | Hariharapur          | 141                       | 539                 | 278          | 261          | 56                     | 38          | 18          | 40                | 0                 | 370               | 205              | 165                |
| 403048                   | Bangu                | 107                       | 460                 | 229          | 231          | 33                     | 19          | 14          | 128               | 0                 | 365               | 197              | 168                |
| 403049                   | Pada                 | 526                       | 2018                | 906          | 1112         | 239                    | 126         | 113         | 552               | 80                | 1376              | 669              | 707                |
| 403070                   | Kalanda              | 257                       | 1044                | 516          | 528          | 120                    | 59          | 61          | 233               | 59                | 627               | 341              | 286                |
| 403072                   | Keutaganthi          | 1                         | 2                   | 1            | 1            | 0                      | 0           | 0           | 0                 | 0                 | 0                 | 0                | 0                  |
| 403074                   | Baghadharia          | 271                       | 987                 | 502          | 485          | 94                     | 47          | 47          | 209               | 9                 | 647               | 359              | 288                |
| <b>Sub total</b>         |                      | <b>2164</b>               | <b>8380</b>         | <b>4104</b>  | <b>4276</b>  | <b>916</b>             | <b>482</b>  | <b>434</b>  | <b>2013</b>       | <b>451</b>        | <b>5740</b>       | <b>3052</b>      | <b>2688</b>        |
| <b>Sub Distt. Rasol</b>  |                      |                           |                     |              |              |                        |             |             |                   |                   |                   |                  |                    |
| 403094                   | Panchupada           | 586                       | 2383                | 1197         | 1186         | 249                    | 138         | 111         | 722               | 187               | 1597              | 860              | 737                |

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| Town/<br>village<br>code       | Town/village<br>name       | No. of<br>house-<br>holds | Population break-up |              |              | Population (0-6 years) |             |             | Schedule<br>Caste | Schedule<br>Tribe | Literacy level    |                  |                    |
|--------------------------------|----------------------------|---------------------------|---------------------|--------------|--------------|------------------------|-------------|-------------|-------------------|-------------------|-------------------|------------------|--------------------|
|                                |                            |                           | Total               | Male         | Female       | Total                  | Male        | Female      |                   |                   | Total<br>literate | Male<br>literate | Female<br>literate |
| 403095                         | Jarada                     | 362                       | 1499                | 795          | 704          | 156                    | 92          | 64          | 530               | 28                | 1003              | 568              | 435                |
| 403096                         | Haripur                    | 81                        | 278                 | 134          | 144          | 33                     | 16          | 17          | 47                | 0                 | 212               | 111              | 101                |
| 403097                         | Badabahal                  | 174                       | 672                 | 342          | 330          | 57                     | 26          | 31          | 242               | 0                 | 450               | 258              | 192                |
| 403098                         | Giridharprasad             | 599                       | 2421                | 1243         | 1178         | 238                    | 119         | 119         | 389               | 43                | 1669              | 941              | 728                |
| 403099                         | Karanda                    | 1568                      | 6778                | 3504         | 3274         | 716                    | 386         | 330         | 1268              | 326               | 4730              | 2698             | 2032               |
| 403100                         | Khanditiri                 | 438                       | 1673                | 832          | 841          | 162                    | 87          | 75          | 327               | 12                | 1187              | 630              | 557                |
| 403101                         | Brahmapur                  | 421                       | 1653                | 845          | 808          | 217                    | 119         | 98          | 335               | 262               | 1146              | 632              | 514                |
| 403102                         | Bedapada                   | 840                       | 3541                | 1853         | 1688         | 394                    | 238         | 156         | 510               | 104               | 2473              | 1414             | 1059               |
| 403117                         | Bhingira                   | 121                       | 455                 | 238          | 217          | 59                     | 25          | 34          | 165               | 30                | 287               | 176              | 111                |
| 403119                         | Basanta pokhari            | 36                        | 122                 | 64           | 58           | 17                     | 9           | 8           | 91                | 0                 | 69                | 41               | 28                 |
| 403120                         | Thenga                     | 312                       | 1340                | 699          | 641          | 145                    | 77          | 68          | 238               | 11                | 1003              | 572              | 431                |
| 403122                         | Gulugundi                  | 83                        | 339                 | 174          | 165          | 34                     | 14          | 20          | 158               | 16                | 221               | 131              | 90                 |
| <b>Sub total</b>               |                            | <b>5621</b>               | <b>23154</b>        | <b>11920</b> | <b>11234</b> | <b>2477</b>            | <b>1346</b> | <b>1131</b> | <b>5022</b>       | <b>1019</b>       | <b>16047</b>      | <b>9032</b>      | <b>7015</b>        |
| <b>District<br/>Sub Distt.</b> | <b>Anugul<br/>Banarpal</b> |                           |                     |              |              |                        |             |             |                   |                   |                   |                  |                    |
| 404141                         | Tentulihata                | 180                       | 768                 | 402          | 366          | 129                    | 74          | 55          | 755               | 0                 | 567               | 307              | 260                |
| 404142                         | Apartipur                  | 126                       | 552                 | 284          | 268          | 66                     | 30          | 36          | 28                | 153               | 393               | 222              | 171                |
| 404145                         | Banarpal                   | 335                       | 1522                | 769          | 753          | 176                    | 87          | 89          | 632               | 25                | 1205              | 641              | 564                |
| 404146                         | Joragadia                  | 87                        | 389                 | 204          | 185          | 44                     | 27          | 17          | 0                 | 0                 | 270               | 152              | 118                |
| 404147                         | Birabahanpur               | 91                        | 384                 | 193          | 191          | 56                     | 27          | 29          | 381               | 0                 | 242               | 138              | 104                |
| 404148                         | Badakhali                  | 88                        | 362                 | 192          | 170          | 41                     | 21          | 20          | 53                | 90                | 248               | 147              | 101                |
| 404149                         | Bhagabatpur                | 169                       | 725                 | 394          | 331          | 84                     | 46          | 38          | 90                | 137               | 507               | 307              | 200                |
| 404150                         | Narendrapur                | 92                        | 405                 | 209          | 196          | 47                     | 26          | 21          | 90                | 235               | 313               | 169              | 144                |
| 404151                         | Chauridiha                 | 189                       | 892                 | 445          | 447          | 74                     | 41          | 33          | 78                | 0                 | 632               | 341              | 291                |
| 404152                         | Jhajiribahal               | 212                       | 994                 | 508          | 486          | 111                    | 63          | 48          | 212               | 23                | 715               | 411              | 304                |
| 404153                         | Gadasantri                 | 883                       | 3877                | 2062         | 1815         | 426                    | 241         | 185         | 554               | 222               | 2689              | 1561             | 1128               |
| 404155                         | Gangijodi                  | 42                        | 149                 | 82           | 67           | 18                     | 10          | 8           | 29                | 5                 | 106               | 59               | 47                 |
| 404156                         | Tulasipal                  | 683                       | 3060                | 1561         | 1499         | 349                    | 181         | 168         | 429               | 126               | 2179              | 1210             | 969                |
| 404159                         | Languliabeda               | 281                       | 1201                | 609          | 592          | 129                    | 66          | 63          | 133               | 21                | 974               | 517              | 457                |
| 404160                         | Rajibpur                   | 88                        | 374                 | 198          | 176          | 47                     | 25          | 22          | 26                | 0                 | 276               | 160              | 116                |
| 404163                         | Purkia                     | 323                       | 1284                | 674          | 610          | 127                    | 73          | 54          | 82                | 9                 | 947               | 533              | 414                |
| 404164                         | Arahat                     | 403                       | 1513                | 770          | 743          | 157                    | 92          | 65          | 40                | 100               | 1078              | 604              | 474                |
| 404165                         | Talatali                   | 384                       | 1619                | 815          | 804          | 146                    | 82          | 64          | 264               | 34                | 1104              | 615              | 489                |
| 404166                         | Kusuna                     | 93                        | 420                 | 215          | 205          | 67                     | 39          | 28          | 375               | 0                 | 202               | 121              | 81                 |
| 404167                         | Kalandapal                 | 71                        | 303                 | 175          | 128          | 35                     | 23          | 12          | 43                | 0                 | 218               | 139              | 79                 |
| 404168                         | Ramimunda                  | 93                        | 429                 | 218          | 211          | 48                     | 30          | 18          | 23                | 13                | 291               | 162              | 129                |
| 404170                         | Fulapada                   | 434                       | 2103                | 1071         | 1032         | 235                    | 129         | 106         | 464               | 546               | 1511              | 841              | 670                |
| 404172                         | Rankasinga                 | 120                       | 554                 | 276          | 278          | 60                     | 35          | 25          | 143               | 39                | 419               | 221              | 198                |
| 404173                         | Juharpur                   | 83                        | 379                 | 197          | 182          | 61                     | 37          | 24          | 341               | 0                 | 262               | 145              | 117                |
| 404174                         | Similichhuin               | 105                       | 440                 | 215          | 225          | 39                     | 13          | 26          | 316               | 0                 | 353               | 186              | 167                |

**VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code               | Town/village<br>name | No. of<br>house-<br>holds | Population break-up |               |               | Population (0-6 years) |              |              | Schedule<br>Caste | Schedule<br>Tribe | Literacy level    |                  |                    |
|----------------------------------------|----------------------|---------------------------|---------------------|---------------|---------------|------------------------|--------------|--------------|-------------------|-------------------|-------------------|------------------|--------------------|
|                                        |                      |                           | Total               | Male          | Female        | Total                  | Male         | Female       |                   |                   | Total<br>literate | Male<br>literate | Female<br>literate |
| 404175                                 | Chakuriapal          | 20                        | 73                  | 33            | 40            | 8                      | 3            | 5            | 8                 | 0                 | 63                | 30               | 33                 |
| 404178                                 | Kainchhabahala       | 70                        | 298                 | 158           | 140           | 41                     | 21           | 20           | 120               | 64                | 220               | 127              | 93                 |
| 404179                                 | Girdhabasa           | 63                        | 318                 | 155           | 163           | 49                     | 24           | 25           | 0                 | 303               | 243               | 120              | 123                |
| 404180                                 | Tilapanga            | 71                        | 356                 | 179           | 177           | 41                     | 24           | 17           | 0                 | 20                | 256               | 138              | 118                |
| 404181                                 | Talamulasasan        | 1119                      | 4749                | 2500          | 2249          | 632                    | 356          | 276          | 1214              | 49                | 3295              | 1899             | 1396               |
| 404182                                 | Gadatalamul          | 427                       | 1813                | 939           | 874           | 197                    | 104          | 93           | 629               | 242               | 1306              | 742              | 564                |
| 404183                                 | Harichandabasti      | 28                        | 124                 | 58            | 66            | 13                     | 7            | 6            | 0                 | 0                 | 101               | 49               | 52                 |
| 404184                                 | Talmulpatna Basti    | 365                       | 1673                | 891           | 782           | 199                    | 114          | 85           | 103               | 95                | 1240              | 716              | 524                |
| 404187                                 | Harichandajami       | 4                         | 13                  | 5             | 8             | 3                      | 1            | 2            | 6                 | 0                 | 7                 | 3                | 4                  |
| 404189                                 | Khandanali           | 19                        | 79                  | 42            | 37            | 11                     | 9            | 2            | 2                 | 0                 | 58                | 27               | 31                 |
| 404190                                 | Serenabeda           | 330                       | 1340                | 667           | 673           | 169                    | 96           | 73           | 556               | 0                 | 944               | 504              | 440                |
| 404192                                 | Budhapanka (CT)      | 1265                      | 6129                | 3162          | 2967          | 661                    | 381          | 280          | 1225              | 615               | 4339              | 2471             | 1868               |
| 404194                                 | Nuahata (CT)         | 1301                      | 5920                | 3146          | 2774          | 690                    | 385          | 305          | 1516              | 76                | 4309              | 2485             | 1824               |
| <b>Sub total</b>                       |                      | <b>10737</b>              | <b>47583</b>        | <b>24673</b>  | <b>22910</b>  | <b>5486</b>            | <b>3043</b>  | <b>2443</b>  | <b>10960</b>      | <b>3242</b>       | <b>34082</b>      | <b>19220</b>     | <b>14862</b>       |
| <b>Sub Distt. Bhusan Steel Limited</b> |                      |                           |                     |               |               |                        |              |              |                   |                   |                   |                  |                    |
| 404195                                 | Talabahal            | 179                       | 673                 | 351           | 322           | 110                    | 64           | 46           | 620               | 28                | 503               | 270              | 233                |
| 404196                                 | Ganthigadia          | 93                        | 425                 | 207           | 218           | 53                     | 28           | 25           | 0                 | 0                 | 323               | 169              | 154                |
| <b>Sub total</b>                       |                      | <b>272</b>                | <b>1098</b>         | <b>558</b>    | <b>540</b>    | <b>163</b>             | <b>92</b>    | <b>71</b>    | <b>620</b>        | <b>28</b>         | <b>826</b>        | <b>439</b>       | <b>387</b>         |
| <b>Sub Distt. Anugul</b>               |                      |                           |                     |               |               |                        |              |              |                   |                   |                   |                  |                    |
| 404232                                 | Kankinali            | 212                       | 839                 | 450           | 389           | 81                     | 51           | 30           | 228               | 38                | 519               | 295              | 224                |
| <b>Sub total</b>                       |                      | <b>212</b>                | <b>839</b>          | <b>450</b>    | <b>389</b>    | <b>81</b>              | <b>51</b>    | <b>30</b>    | <b>228</b>        | <b>38</b>         | <b>519</b>        | <b>295</b>       | <b>224</b>         |
| <b>GRAND TOTAL</b>                     |                      | <b>52805</b>              | <b>219562</b>       | <b>113644</b> | <b>105918</b> | <b>24827</b>           | <b>13446</b> | <b>11381</b> | <b>50712</b>      | <b>11544</b>      | <b>154089</b>     | <b>87394</b>     | <b>66695</b>       |
| <b>Percentage</b>                      |                      |                           | <b>100.00</b>       | <b>51.76</b>  | <b>48.24</b>  | <b>11.31</b>           | <b>6.12</b>  | <b>5.18</b>  | <b>23.10</b>      | <b>5.26</b>       | <b>70.18</b>      | <b>39.80</b>     | <b>30.38</b>       |

**VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code | Town/village<br>name | Employment pattern |              |             |               |            |             |                  |             |              |           |            |                |
|--------------------------|----------------------|--------------------|--------------|-------------|---------------|------------|-------------|------------------|-------------|--------------|-----------|------------|----------------|
|                          |                      | Total<br>workers   | Main workers |             |               |            |             | Marginal workers |             |              |           |            | Non<br>workers |
|                          |                      |                    | Total        | Cultivators | Agri. Labours | HH ind.    | Others      | Total            | Cultivators | Agr. Labours | HH ind.   | Others     |                |
| <b>District</b>          | <b>Dhenkanal</b>     |                    |              |             |               |            |             |                  |             |              |           |            |                |
| <b>Sub Distt.</b>        | <b>Parajang</b>      |                    |              |             |               |            |             |                  |             |              |           |            |                |
| 402286                   | Palasahi             | 366                | 330          | 154         | 13            | 2          | 161         | 36               | 0           | 10           | 1         | 25         | 917            |
| 402287                   | Dihakamar            | 88                 | 19           | 1           | 0             | 0          | 18          | 69               | 15          | 47           | 1         | 6          | 198            |
| 402288                   | Patarapada           | 965                | 291          | 37          | 200           | 10         | 44          | 674              | 101         | 432          | 12        | 129        | 2104           |
| 402289                   | Sankamar             | 216                | 39           | 11          | 1             | 0          | 27          | 177              | 4           | 166          | 1         | 6          | 441            |
| 402290                   | Gailo                | 268                | 35           | 24          | 2             | 2          | 7           | 233              | 6           | 224          | 1         | 2          | 586            |
| 402291                   | Kundandeipur         | 171                | 71           | 14          | 2             | 2          | 53          | 100              | 22          | 30           | 3         | 45         | 427            |
| 402292                   | Panibhandar          | 353                | 331          | 160         | 101           | 2          | 68          | 22               | 3           | 17           | 0         | 2          | 776            |
| 402293                   | Badakamar            | 174                | 69           | 24          | 9             | 0          | 36          | 105              | 7           | 49           | 1         | 48         | 347            |
| 402294                   | Katabahal            | 1138               | 546          | 238         | 107           | 19         | 182         | 592              | 18          | 327          | 27        | 220        | 1234           |
| 402298                   | Ria                  | 113                | 79           | 24          | 40            | 7          | 8           | 34               | 0           | 23           | 9         | 2          | 318            |
| 402304                   | Panigengutia         | 423                | 332          | 84          | 97            | 38         | 113         | 91               | 1           | 80           | 3         | 7          | 846            |
| 402305                   | Roda                 | 667                | 538          | 92          | 86            | 113        | 247         | 129              | 2           | 71           | 7         | 49         | 1523           |
| 402306                   | Renthapat            | 82                 | 40           | 5           | 8             | 0          | 27          | 42               | 2           | 26           | 0         | 14         | 177            |
| 402307                   | Tarahata             | 73                 | 21           | 0           | 0             | 1          | 20          | 52               | 0           | 42           | 0         | 10         | 89             |
| 402308                   | Siarimalia           | 295                | 51           | 17          | 4             | 1          | 29          | 244              | 26          | 185          | 2         | 31         | 293            |
| <b>Sub total</b>         |                      | <b>5392</b>        | <b>2792</b>  | <b>885</b>  | <b>670</b>    | <b>197</b> | <b>1040</b> | <b>2600</b>      | <b>207</b>  | <b>1729</b>  | <b>68</b> | <b>596</b> | <b>10276</b>   |
| <b>Sub Distt.</b>        | <b>Motunga</b>       |                    |              |             |               |            |             |                  |             |              |           |            |                |
| 402897                   | Kusupanga            | 553                | 409          | 31          | 8             | 0          | 370         | 144              | 13          | 9            | 1         | 121        | 1358           |
| 402898                   | Kurunti              | 1423               | 1317         | 160         | 34            | 21         | 1102        | 106              | 14          | 17           | 12        | 63         | 1487           |
| 402899                   | Kochilamada          | 342                | 191          | 12          | 89            | 12         | 78          | 151              | 19          | 78           | 18        | 36         | 772            |
| 402901                   | Charadagadia         | 300                | 243          | 19          | 7             | 1          | 216         | 57               | 6           | 13           | 0         | 38         | 535            |
| 402905                   | Motunga              | 880                | 527          | 163         | 94            | 7          | 263         | 353              | 15          | 261          | 0         | 77         | 1003           |
| 402906                   | Kharagprasad         | 1444               | 977          | 53          | 37            | 60         | 827         | 467              | 12          | 85           | 41        | 329        | 3063           |
| 402907                   | Kharagprasadpatna    | 484                | 464          | 9           | 3             | 50         | 402         | 20               | 5           | 1            | 2         | 12         | 1212           |
| 402908                   | Suravi               | 244                | 209          | 42          | 8             | 2          | 157         | 35               | 3           | 16           | 0         | 16         | 521            |
| 402909                   | Bido                 | 376                | 327          | 111         | 7             | 31         | 178         | 49               | 3           | 18           | 16        | 12         | 1031           |
| 402910                   | Taladanga            | 125                | 120          | 21          | 3             | 0          | 96          | 5                | 1           | 2            | 0         | 2          | 313            |
| 402911                   | Ranjasinga           | 600                | 415          | 75          | 49            | 16         | 275         | 185              | 13          | 1            | 0         | 171        | 656            |
| 402913                   | Nagari               | 289                | 137          | 40          | 11            | 58         | 28          | 152              | 14          | 60           | 41        | 37         | 651            |
| 402914                   | Gaudapasi            | 42                 | 32           | 3           | 2             | 24         | 3           | 10               | 3           | 0            | 3         | 4          | 82             |
| 402915                   | Chintapokhari        | 219                | 200          | 42          | 9             | 0          | 149         | 19               | 0           | 13           | 0         | 6          | 556            |
| 402916                   | Malibido             | 205                | 146          | 15          | 12            | 8          | 111         | 59               | 3           | 20           | 3         | 33         | 469            |
| 402917                   | Binakarkateni        | 168                | 135          | 17          | 16            | 1          | 101         | 33               | 2           | 4            | 2         | 25         | 419            |
| 402918                   | Budhapanka           | 263                | 237          | 26          | 82            | 83         | 46          | 26               | 1           | 1            | 12        | 12         | 406            |
| 402919                   | Brajabiharipur       | 74                 | 65           | 1           | 22            | 1          | 41          | 9                | 0           | 3            | 0         | 6          | 156            |
| 402920                   | Salapada             | 17                 | 17           | 3           | 1             | 0          | 13          | 0                | 0           | 0            | 0         | 0          | 46             |
| 402922                   | Kunjabiharipur       | 300                | 10           | 0           | 0             | 0          | 10          | 290              | 0           | 246          | 0         | 44         | 231            |

**VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code               | Town/village<br>name    | Employment pattern |              |             |               |            |              |                  |             |              |            |             |                |
|----------------------------------------|-------------------------|--------------------|--------------|-------------|---------------|------------|--------------|------------------|-------------|--------------|------------|-------------|----------------|
|                                        |                         | Total<br>workers   | Main workers |             |               |            |              | Marginal workers |             |              |            |             | Non<br>workers |
|                                        |                         |                    | Total        | Cultivators | Agri. Labours | HH ind.    | Others       | Total            | Cultivators | Agr. Labours | HH ind.    | Others      |                |
| 402924                                 | Nadhara                 | 342                | 322          | 78          | 53            | 2          | 189          | 20               | 0           | 16           | 0          | 4           | 1028           |
| 402925                                 | Ekagharia               | 312                | 272          | 80          | 8             | 13         | 171          | 40               | 3           | 1            | 0          | 36          | 581            |
| 402926                                 | Bangurasinga            | 1084               | 702          | 49          | 177           | 28         | 448          | 382              | 10          | 258          | 5          | 109         | 1754           |
| 402927                                 | Jarada                  | 177                | 101          | 9           | 11            | 0          | 81           | 76               | 0           | 0            | 0          | 76          | 307            |
| 402928                                 | Nuara                   | 28                 | 28           | 3           | 5             | 0          | 20           | 0                | 0           | 0            | 0          | 0           | 75             |
| 402929                                 | Talabaghalunda          | 255                | 142          | 22          | 9             | 8          | 103          | 113              | 9           | 52           | 3          | 49          | 650            |
| 402930                                 | Uparbaghalunda          | 288                | 229          | 39          | 58            | 7          | 125          | 59               | 4           | 3            | 0          | 52          | 667            |
| 402931                                 | Nayabhagirathipur(East) | 397                | 381          | 39          | 39            | 13         | 290          | 16               | 0           | 3            | 4          | 9           | 857            |
| 402932                                 | Nayabhagirathipur(West) | 518                | 422          | 104         | 19            | 3          | 296          | 96               | 26          | 64           | 0          | 6           | 509            |
| 402933                                 | Kalusahukateni          | 184                | 184          | 123         | 42            | 0          | 19           | 0                | 0           | 0            | 0          | 0           | 569            |
| 402934                                 | Haladibahali            | 540                | 470          | 131         | 78            | 6          | 255          | 70               | 10          | 40           | 4          | 16          | 1122           |
| 402935                                 | Budhipahad              | 187                | 105          | 0           | 1             | 0          | 104          | 82               | 0           | 11           | 1          | 70          | 305            |
| 402936                                 | Uperpal                 | 151                | 115          | 21          | 7             | 1          | 86           | 36               | 1           | 15           | 1          | 19          | 269            |
| 402937                                 | Meramandali             | 482                | 459          | 95          | 13            | 2          | 349          | 23               | 2           | 8            | 1          | 12          | 895            |
| 402938                                 | Nimidha                 | 937                | 848          | 73          | 12            | 3          | 760          | 89               | 43          | 12           | 1          | 33          | 2181           |
| 402939                                 | Ranibania               | 224                | 220          | 10          | 92            | 0          | 118          | 4                | 0           | 0            | 0          | 4           | 448            |
| 402940                                 | Badalo                  | 396                | 389          | 79          | 0             | 13         | 297          | 7                | 2           | 0            | 0          | 5           | 959            |
| 402942                                 | Artasantrakateni        | 514                | 486          | 10          | 292           | 4          | 180          | 28               | 2           | 12           | 0          | 14          | 749            |
| 402943                                 | Murdangapali            | 333                | 319          | 26          | 5             | 0          | 288          | 14               | 0           | 0            | 0          | 14          | 629            |
| 402944                                 | Balarampasad            | 1049               | 992          | 45          | 15            | 23         | 909          | 57               | 8           | 9            | 1          | 39          | 2188           |
| 402946                                 | Handifuta               | 268                | 195          | 34          | 48            | 0          | 113          | 73               | 5           | 52           | 0          | 16          | 402            |
| 402947                                 | Ghodadian               | 588                | 587          | 87          | 7             | 5          | 488          | 1                | 1           | 0            | 0          | 0           | 760            |
| 402948                                 | Naraharipur             | 81                 | 80           | 22          | 0             | 4          | 54           | 1                | 0           | 0            | 0          | 1           | 156            |
| 402949                                 | Sridihi                 | 188                | 51           | 24          | 0             | 0          | 27           | 137              | 7           | 123          | 1          | 6           | 498            |
| 402950                                 | Bachhuribanka           | 167                | 155          | 42          | 5             | 7          | 101          | 12               | 4           | 2            | 0          | 6           | 353            |
| 402951                                 | Chheliabedha            | 80                 | 28           | 2           | 1             | 2          | 23           | 52               | 3           | 3            | 2          | 44          | 193            |
| 402952                                 | Paneilo                 | 280                | 200          | 4           | 68            | 16         | 112          | 80               | 0           | 20           | 3          | 57          | 486            |
| <b>Sub total</b>                       |                         | <b>18398</b>       | <b>14660</b> | <b>2094</b> | <b>1559</b>   | <b>535</b> | <b>10472</b> | <b>3738</b>      | <b>267</b>  | <b>1552</b>  | <b>178</b> | <b>1741</b> | <b>34557</b>   |
| <b>Sub Distt. Bhusan Steel Limited</b> |                         |                    |              |             |               |            |              |                  |             |              |            |             |                |
| 402967                                 | Mangalpur               | 2072               | 1934         | 163         | 26            | 16         | 1729         | 138              | 29          | 39           | 3          | 67          | 3376           |
| 402968                                 | Itapa                   | 99                 | 99           | 7           | 0             | 1          | 91           | 0                | 0           | 0            | 0          | 0           | 236            |
| 402969                                 | Narendrapur             | 1017               | 920          | 18          | 5             | 2          | 895          | 97               | 3           | 0            | 16         | 78          | 923            |
| 402970                                 | Asanabania              | 58                 | 58           | 0           | 0             | 0          | 58           | 0                | 0           | 0            | 0          | 0           | 163            |
| 402971                                 | Sibapur                 | 675                | 413          | 41          | 29            | 1          | 342          | 262              | 21          | 93           | 3          | 145         | 1138           |
| 402972                                 | Rakala                  | 191                | 122          | 82          | 8             | 2          | 30           | 69               | 7           | 6            | 1          | 55          | 445            |
| 402973                                 | Panaghudughuda          | 111                | 60           | 1           | 1             | 2          | 56           | 51               | 5           | 24           | 0          | 22          | 233            |
| 402974                                 | Amana                   | 497                | 353          | 56          | 15            | 10         | 272          | 144              | 17          | 32           | 4          | 91          | 924            |
| 402975                                 | Sanjapada               | 598                | 446          | 71          | 139           | 13         | 223          | 152              | 4           | 10           | 0          | 138         | 1329           |
| 402976                                 | Badibahal               | 163                | 131          | 1           | 16            | 1          | 113          | 32               | 2           | 15           | 0          | 15          | 355            |
| 402977                                 | Khaliberana             | 209                | 195          | 2           | 0             | 1          | 192          | 14               | 4           | 2            | 0          | 8           | 614            |



**VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code | Town/village<br>name | Employment pattern |              |             |               |            |             |                  |             |              |           |            |                |
|--------------------------|----------------------|--------------------|--------------|-------------|---------------|------------|-------------|------------------|-------------|--------------|-----------|------------|----------------|
|                          |                      | Total<br>workers   | Main workers |             |               |            |             | Marginal workers |             |              |           |            | Non<br>workers |
|                          |                      |                    | Total        | Cultivators | Agri. Labours | HH ind.    | Others      | Total            | Cultivators | Agr. Labours | HH ind.   | Others     |                |
| 402978                   | Nadeilo              | 166                | 115          | 8           | 1             | 0          | 106         | 51               | 1           | 0            | 18        | 32         | 363            |
| 402979                   | Bramhanapurunakot    | 206                | 117          | 6           | 0             | 0          | 111         | 89               | 7           | 22           | 1         | 59         | 421            |
| 402980                   | Naraharipur          | 50                 | 39           | 13          | 1             | 1          | 24          | 11               | 3           | 3            | 4         | 1          | 148            |
| 402981                   | Chandrasekharpur     | 33                 | 26           | 11          | 4             | 0          | 11          | 7                | 7           | 0            | 0         | 0          | 58             |
| 402982                   | Kankalu              | 381                | 155          | 14          | 5             | 78         | 58          | 226              | 25          | 182          | 10        | 9          | 829            |
| 402983                   | Mitikapasi           | 62                 | 59           | 1           | 1             | 0          | 57          | 3                | 1           | 1            | 0         | 1          | 63             |
| 402984                   | Sarapa               | 151                | 109          | 2           | 0             | 0          | 107         | 42               | 6           | 4            | 2         | 30         | 335            |
| 402985                   | Raghunathapur        | 269                | 231          | 1           | 1             | 7          | 222         | 38               | 2           | 18           | 2         | 16         | 554            |
| 402986                   | Nuagan               | 345                | 309          | 60          | 113           | 5          | 131         | 36               | 1           | 1            | 1         | 33         | 630            |
| 402987                   | Mahatala             | 37                 | 23           | 4           | 5             | 3          | 11          | 14               | 0           | 1            | 12        | 1          | 34             |
| 402989                   | Paikpurunakot        | 432                | 339          | 25          | 13            | 7          | 294         | 93               | 4           | 19           | 0         | 70         | 913            |
| 402991                   | Jhaduberani          | 128                | 64           | 4           | 0             | 2          | 58          | 64               | 27          | 37           | 0         | 0          | 259            |
| <b>Sub total</b>         |                      | <b>7950</b>        | <b>6317</b>  | <b>591</b>  | <b>383</b>    | <b>152</b> | <b>5191</b> | <b>1633</b>      | <b>176</b>  | <b>509</b>   | <b>77</b> | <b>871</b> | <b>14343</b>   |
| <b>Sub Distt.</b>        | <b>Balimi</b>        |                    |              |             |               |            |             |                  |             |              |           |            |                |
| 402993                   | Beruanpal            | 414                | 372          | 72          | 8             | 5          | 287         | 42               | 18          | 22           | 0         | 2          | 803            |
| 402994                   | Gandijhara           | 62                 | 10           | 2           | 0             | 0          | 8           | 52               | 4           | 39           | 0         | 9          | 156            |
| 402995                   | Galapada             | 575                | 179          | 25          | 6             | 64         | 84          | 396              | 16          | 214          | 49        | 117        | 647            |
| 402996                   | Bhanupada            | 94                 | 67           | 2           | 3             | 14         | 48          | 27               | 0           | 3            | 2         | 22         | 199            |
| 402997                   | Chitipada            | 92                 | 77           | 18          | 0             | 1          | 58          | 15               | 1           | 2            | 2         | 10         | 164            |
| 402998                   | Nimabahal            | 320                | 92           | 9           | 12            | 8          | 63          | 228              | 3           | 182          | 19        | 24         | 647            |
| 402999                   | Kothalu              | 196                | 95           | 14          | 2             | 10         | 69          | 101              | 2           | 5            | 29        | 65         | 183            |
| 403000                   | Jhadabandha          | 595                | 356          | 185         | 8             | 40         | 123         | 239              | 69          | 76           | 15        | 79         | 1040           |
| 403001                   | Madhupur             | 33                 | 33           | 10          | 22            | 0          | 1           | 0                | 0           | 0            | 0         | 0          | 93             |
| 403002                   | Nua                  | 641                | 382          | 135         | 73            | 0          | 174         | 259              | 3           | 176          | 0         | 80         | 1609           |
| 403003                   | Thokar               | 510                | 238          | 78          | 9             | 4          | 147         | 272              | 32          | 105          | 2         | 133        | 1211           |
| 403004                   | Barasingha           | 847                | 425          | 50          | 160           | 22         | 193         | 422              | 45          | 243          | 12        | 122        | 1608           |
| 403005                   | Tarkabeda            | 363                | 46           | 8           | 3             | 0          | 35          | 317              | 15          | 65           | 2         | 235        | 710            |
| 403006                   | Kadala               | 692                | 484          | 60          | 34            | 108        | 282         | 208              | 8           | 86           | 22        | 92         | 1437           |
| 403007                   | Benipathara          | 49                 | 17           | 11          | 1             | 0          | 5           | 32               | 2           | 9            | 0         | 21         | 93             |
| 403008                   | Badamunda            | 279                | 197          | 47          | 22            | 0          | 128         | 82               | 33          | 30           | 0         | 19         | 370            |
| 403009                   | Kantimili            | 480                | 397          | 126         | 44            | 34         | 193         | 83               | 7           | 25           | 13        | 38         | 989            |
| 403010                   | Sanamunda            | 284                | 245          | 37          | 108           | 3          | 97          | 39               | 11          | 25           | 0         | 3          | 547            |
| 403011                   | Solanali             | 172                | 112          | 35          | 0             | 3          | 74          | 60               | 55          | 4            | 0         | 1          | 256            |
| 403012                   | Jharabeda            | 307                | 271          | 66          | 32            | 9          | 164         | 36               | 19          | 11           | 5         | 1          | 592            |
| 403013                   | Nuapada              | 247                | 230          | 63          | 125           | 1          | 41          | 17               | 4           | 11           | 0         | 2          | 438            |
| 403014                   | Patala               | 704                | 435          | 89          | 216           | 9          | 121         | 269              | 15          | 127          | 65        | 62         | 1299           |
| 403015                   | Bankidi              | 389                | 233          | 63          | 141           | 3          | 26          | 156              | 9           | 147          | 0         | 0          | 725            |
| 403016                   | Panuberani           | 69                 | 67           | 16          | 13            | 10         | 28          | 2                | 0           | 1            | 0         | 1          | 247            |
| 403017                   | Dahanimara           | 18                 | 16           | 0           | 8             | 0          | 8           | 2                | 1           | 0            | 0         | 1          | 55             |
| 403018                   | Khalapal             | 116                | 26           | 12          | 0             | 1          | 13          | 90               | 0           | 37           | 4         | 49         | 216            |

**VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code | Town/village<br>name | Employment pattern |              |             |               |            |             |                  |             |              |            |             |                |
|--------------------------|----------------------|--------------------|--------------|-------------|---------------|------------|-------------|------------------|-------------|--------------|------------|-------------|----------------|
|                          |                      | Total<br>workers   | Main workers |             |               |            |             | Marginal workers |             |              |            |             | Non<br>workers |
|                          |                      |                    | Total        | Cultivators | Agri. Labours | HH ind.    | Others      | Total            | Cultivators | Agr. Labours | HH ind.    | Others      |                |
| 403019                   | Nagiaberani          | 60                 | 4            | 1           | 1             | 0          | 2           | 56               | 0           | 27           | 4          | 25          | 119            |
| 403020                   | Iswarapur            | 76                 | 34           | 7           | 0             | 0          | 27          | 42               | 2           | 38           | 0          | 2           | 165            |
| 403021                   | Gotiaberani          | 35                 | 17           | 3           | 4             | 1          | 9           | 18               | 0           | 11           | 0          | 7           | 84             |
| 403022                   | Kantamila            | 158                | 113          | 0           | 112           | 0          | 1           | 45               | 0           | 43           | 1          | 1           | 291            |
| 403024                   | Mahalunda            | 806                | 448          | 95          | 77            | 13         | 263         | 358              | 24          | 32           | 69         | 233         | 688            |
| 403025                   | Bedanali             | 52                 | 48           | 20          | 0             | 2          | 26          | 4                | 4           | 0            | 0          | 0           | 98             |
| 403026                   | Maguberani           | 139                | 133          | 28          | 27            | 8          | 70          | 6                | 1           | 2            | 0          | 3           | 257            |
| 403027                   | Krushnachandrapur    | 182                | 82           | 1           | 3             | 2          | 76          | 100              | 0           | 37           | 8          | 55          | 377            |
| 403028                   | Gulehi               | 731                | 319          | 11          | 215           | 41         | 52          | 412              | 5           | 392          | 11         | 4           | 1083           |
| 403029                   | Dudurokot            | 1833               | 759          | 119         | 260           | 16         | 364         | 1074             | 21          | 826          | 3          | 224         | 3356           |
| 403030                   | Bramhanamara         | 334                | 226          | 99          | 42            | 2          | 83          | 108              | 5           | 100          | 1          | 2           | 605            |
| 403031                   | Kumurusinga          | 691                | 159          | 49          | 14            | 0          | 96          | 532              | 13          | 502          | 0          | 17          | 585            |
| 403032                   | Ranjagola            | 1005               | 226          | 31          | 7             | 8          | 180         | 779              | 67          | 424          | 70         | 218         | 1812           |
| 403033                   | Asarada              | 411                | 143          | 57          | 9             | 12         | 65          | 268              | 44          | 60           | 34         | 130         | 650            |
| 403034                   | Balimi               | 279                | 225          | 65          | 6             | 0          | 154         | 54               | 5           | 27           | 3          | 19          | 610            |
| 403035                   | Kukuta               | 948                | 789          | 218         | 202           | 16         | 353         | 159              | 70          | 48           | 2          | 39          | 2013           |
| 403036                   | Sanahindol           | 271                | 102          | 26          | 16            | 3          | 57          | 169              | 14          | 141          | 5          | 9           | 478            |
| 403037                   | Nandapur             | 258                | 153          | 9           | 24            | 11         | 109         | 105              | 2           | 83           | 4          | 16          | 544            |
| 403038                   | Gurilo               | 174                | 173          | 48          | 5             | 3          | 117         | 1                | 0           | 0            | 0          | 1           | 452            |
| <b>Sub total</b>         |                      | <b>16991</b>       | <b>9255</b>  | <b>2120</b> | <b>2074</b>   | <b>487</b> | <b>4574</b> | <b>7736</b>      | <b>649</b>  | <b>4438</b>  | <b>456</b> | <b>2193</b> | <b>30601</b>   |
| <b>Sub Distt. Hindol</b> |                      |                    |              |             |               |            |             |                  |             |              |            |             |                |
| 403040                   | Chhelachheli         | 14                 | 14           | 1           | 12            | 1          | 0           | 0                | 0           | 0            | 0          | 0           | 31             |
| 403041                   | Kalihundi            | 64                 | 62           | 0           | 58            | 0          | 4           | 2                | 0           | 2            | 0          | 0           | 170            |
| 403042                   | Tutupada             | 62                 | 53           | 18          | 0             | 0          | 35          | 9                | 0           | 6            | 0          | 3           | 151            |
| 403043                   | Tangisal             | 102                | 97           | 16          | 0             | 0          | 81          | 5                | 0           | 3            | 0          | 2           | 244            |
| 403044                   | Balasar              | 502                | 313          | 55          | 71            | 9          | 178         | 189              | 3           | 140          | 7          | 39          | 696            |
| 403045                   | Hatura               | 358                | 264          | 61          | 23            | 3          | 177         | 94               | 2           | 45           | 0          | 47          | 639            |
| 403046                   | Jayapanga            | 90                 | 89           | 33          | 48            | 1          | 7           | 1                | 0           | 0            | 0          | 1           | 207            |
| 403047                   | Hariharapur          | 271                | 147          | 30          | 42            | 3          | 72          | 124              | 1           | 80           | 1          | 42          | 268            |
| 403048                   | Bangu                | 218                | 217          | 22          | 163           | 0          | 32          | 1                | 0           | 0            | 0          | 1           | 242            |
| 403049                   | Pada                 | 536                | 447          | 141         | 98            | 8          | 200         | 89               | 19          | 43           | 3          | 24          | 1482           |
| 403070                   | Kalanda              | 369                | 328          | 72          | 198           | 3          | 55          | 41               | 2           | 5            | 0          | 34          | 675            |
| 403072                   | Keutaganthi          | 0                  | 0            | 0           | 0             | 0          | 0           | 0                | 0           | 0            | 0          | 0           | 2              |
| 403074                   | Baghadharia          | 335                | 262          | 87          | 55            | 11         | 109         | 73               | 21          | 21           | 0          | 31          | 652            |
| <b>Sub total</b>         |                      | <b>2921</b>        | <b>2293</b>  | <b>536</b>  | <b>768</b>    | <b>39</b>  | <b>950</b>  | <b>628</b>       | <b>48</b>   | <b>345</b>   | <b>11</b>  | <b>224</b>  | <b>5459</b>    |
| <b>Sub Distt. Rasol</b>  |                      |                    |              |             |               |            |             |                  |             |              |            |             |                |
| 403094                   | Panchupada           | 700                | 661          | 218         | 216           | 41         | 186         | 39               | 10          | 14           | 12         | 3           | 1683           |

**VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code       | Town/village<br>name       | Employment pattern |              |             |               |            |             |                  |             |              |            |            |                |
|--------------------------------|----------------------------|--------------------|--------------|-------------|---------------|------------|-------------|------------------|-------------|--------------|------------|------------|----------------|
|                                |                            | Total<br>workers   | Main workers |             |               |            |             | Marginal workers |             |              |            |            | Non<br>workers |
|                                |                            |                    | Total        | Cultivators | Agri. Labours | HH ind.    | Others      | Total            | Cultivators | Agr. Labours | HH ind.    | Others     |                |
| 403095                         | Jarada                     | 449                | 442          | 124         | 234           | 4          | 80          | 7                | 4           | 0            | 0          | 3          | 1050           |
| 403096                         | Haripur                    | 98                 | 90           | 14          | 11            | 2          | 63          | 8                | 0           | 4            | 0          | 4          | 180            |
| 403097                         | Badabahal                  | 261                | 117          | 43          | 7             | 17         | 50          | 144              | 22          | 10           | 10         | 102        | 411            |
| 403098                         | Giridharprasad             | 867                | 499          | 163         | 111           | 6          | 219         | 368              | 19          | 296          | 3          | 50         | 1554           |
| 403099                         | Karanda                    | 2384               | 1882         | 361         | 56            | 71         | 1394        | 502              | 29          | 168          | 16         | 289        | 4394           |
| 403100                         | Khanditiri                 | 574                | 306          | 169         | 2             | 12         | 123         | 268              | 52          | 65           | 12         | 139        | 1099           |
| 403101                         | Brahmapur                  | 547                | 485          | 135         | 19            | 5          | 326         | 62               | 1           | 10           | 1          | 50         | 1106           |
| 403102                         | Bedapada                   | 1110               | 745          | 40          | 200           | 53         | 452         | 365              | 44          | 142          | 12         | 167        | 2431           |
| 403117                         | Bhingira                   | 131                | 131          | 46          | 0             | 0          | 85          | 0                | 0           | 0            | 0          | 0          | 324            |
| 403119                         | Basanta pokhari            | 39                 | 38           | 20          | 0             | 0          | 18          | 1                | 0           | 0            | 0          | 1          | 83             |
| 403120                         | Thenga                     | 509                | 264          | 74          | 70            | 26         | 94          | 245              | 41          | 151          | 23         | 30         | 831            |
| 403122                         | Gulugundi                  | 139                | 36           | 4           | 1             | 9          | 22          | 103              | 0           | 7            | 13         | 83         | 200            |
| <b>Sub total</b>               |                            | <b>7808</b>        | <b>5696</b>  | <b>1411</b> | <b>927</b>    | <b>246</b> | <b>3112</b> | <b>2112</b>      | <b>222</b>  | <b>867</b>   | <b>102</b> | <b>921</b> | <b>15346</b>   |
| <b>District<br/>Sub Distt.</b> | <b>Anugul<br/>Banarpal</b> |                    |              |             |               |            |             |                  |             |              |            |            |                |
| 404141                         | Tentulihata                | 198                | 165          | 52          | 12            | 96         | 5           | 33               | 12          | 2            | 7          | 12         | 570            |
| 404142                         | Apartipur                  | 190                | 144          | 29          | 2             | 1          | 112         | 46               | 5           | 6            | 6          | 29         | 362            |
| 404145                         | Banarpal                   | 484                | 458          | 54          | 107           | 20         | 277         | 26               | 4           | 3            | 6          | 13         | 1038           |
| 404146                         | Joragadia                  | 136                | 93           | 13          | 10            | 51         | 19          | 43               | 3           | 28           | 11         | 1          | 253            |
| 404147                         | Birabahanpur               | 127                | 66           | 2           | 20            | 36         | 8           | 61               | 2           | 48           | 10         | 1          | 257            |
| 404148                         | Badakhali                  | 128                | 110          | 2           | 40            | 16         | 52          | 18               | 4           | 4            | 3          | 7          | 234            |
| 404149                         | Bhagabatpur                | 409                | 280          | 56          | 11            | 0          | 213         | 129              | 62          | 22           | 0          | 45         | 316            |
| 404150                         | Narendrapur                | 123                | 110          | 14          | 0             | 0          | 96          | 13               | 1           | 0            | 1          | 11         | 282            |
| 404151                         | Chauridiha                 | 303                | 157          | 18          | 3             | 9          | 127         | 146              | 19          | 12           | 9          | 106        | 589            |
| 404152                         | Jhajiribahal               | 292                | 283          | 37          | 12            | 2          | 232         | 9                | 1           | 0            | 0          | 8          | 702            |
| 404153                         | Gadasantri                 | 1218               | 679          | 53          | 150           | 128        | 348         | 539              | 62          | 204          | 65         | 208        | 2659           |
| 404155                         | Gangijodi                  | 57                 | 45           | 12          | 1             | 0          | 32          | 12               | 2           | 6            | 0          | 4          | 92             |
| 404156                         | Tulasipal                  | 1012               | 900          | 213         | 279           | 7          | 401         | 112              | 10          | 65           | 2          | 35         | 2048           |
| 404159                         | Languliabeda               | 325                | 180          | 82          | 2             | 0          | 96          | 145              | 23          | 100          | 0          | 22         | 876            |
| 404160                         | Rajibpur                   | 121                | 90           | 22          | 0             | 0          | 68          | 31               | 10          | 18           | 0          | 3          | 253            |
| 404163                         | Purkia                     | 367                | 284          | 40          | 5             | 2          | 237         | 83               | 19          | 60           | 0          | 4          | 917            |
| 404164                         | Arahat                     | 388                | 373          | 25          | 101           | 16         | 231         | 15               | 1           | 10           | 0          | 4          | 1125           |
| 404165                         | Talatali                   | 444                | 413          | 37          | 31            | 5          | 340         | 31               | 2           | 19           | 5          | 5          | 1175           |
| 404166                         | Kusuna                     | 120                | 83           | 1           | 47            | 0          | 35          | 37               | 0           | 4            | 1          | 32         | 300            |
| 404167                         | Kalandapal                 | 98                 | 89           | 4           | 35            | 1          | 49          | 9                | 5           | 0            | 0          | 4          | 205            |
| 404168                         | Ramimunda                  | 314                | 83           | 37          | 45            | 0          | 1           | 231              | 50          | 176          | 4          | 1          | 115            |
| 404170                         | Fulapada                   | 758                | 665          | 58          | 275           | 23         | 309         | 93               | 29          | 49           | 0          | 15         | 1345           |
| 404172                         | Rankasinga                 | 258                | 258          | 73          | 142           | 0          | 43          | 0                | 0           | 0            | 0          | 0          | 296            |
| 404173                         | Juharpur                   | 88                 | 88           | 65          | 0             | 0          | 23          | 0                | 0           | 0            | 0          | 0          | 291            |
| 404174                         | Similichhuin               | 170                | 167          | 59          | 99            | 2          | 7           | 3                | 0           | 3            | 0          | 0          | 270            |

**VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br>code               | Town/village<br>name | Employment pattern |              |              |               |             |              |                  |             |              |             |              |                |
|----------------------------------------|----------------------|--------------------|--------------|--------------|---------------|-------------|--------------|------------------|-------------|--------------|-------------|--------------|----------------|
|                                        |                      | Total<br>workers   | Main workers |              |               |             |              | Marginal workers |             |              |             |              | Non<br>workers |
|                                        |                      |                    | Total        | Cultivators  | Agri. Labours | HH ind.     | Others       | Total            | Cultivators | Agr. Labours | HH ind.     | Others       |                |
| 404175                                 | Chakuriapal          | 21                 | 18           | 9            | 3             | 3           | 3            | 3                | 1           | 1            | 0           | 1            | 52             |
| 404178                                 | Kainchhabahala       | 171                | 171          | 46           | 124           | 0           | 1            | 0                | 0           | 0            | 0           | 0            | 127            |
| 404179                                 | Girdhabasa           | 92                 | 90           | 6            | 42            | 0           | 42           | 2                | 0           | 1            | 0           | 1            | 226            |
| 404180                                 | Tilapanga            | 126                | 125          | 12           | 46            | 0           | 67           | 1                | 0           | 0            | 0           | 1            | 230            |
| 404181                                 | Talamulasasan        | 1430               | 685          | 140          | 118           | 76          | 351          | 745              | 42          | 446          | 43          | 214          | 3319           |
| 404182                                 | Gadatalamul          | 467                | 313          | 16           | 15            | 25          | 257          | 154              | 26          | 33           | 11          | 84           | 1346           |
| 404183                                 | Harichandabasti      | 20                 | 15           | 0            | 0             | 0           | 15           | 5                | 1           | 0            | 0           | 4            | 104            |
| 404184                                 | Talmulpatna Basti    | 485                | 171          | 8            | 11            | 0           | 152          | 314              | 6           | 40           | 11          | 257          | 1188           |
| 404187                                 | Harichandajami       | 6                  | 1            | 0            | 0             | 0           | 1            | 5                | 0           | 0            | 0           | 5            | 7              |
| 404189                                 | Khandanali           | 23                 | 3            | 0            | 0             | 0           | 3            | 20               | 0           | 0            | 1           | 19           | 56             |
| 404190                                 | Serenabeda           | 694                | 297          | 31           | 138           | 3           | 125          | 397              | 3           | 40           | 5           | 349          | 646            |
| 404192                                 | Budhapanka (CT)      | 1888               | 1652         | 98           | 29            | 64          | 1461         | 236              | 38          | 74           | 18          | 106          | 4241           |
| 404194                                 | Nuahata (CT)         | 1904               | 1477         | 122          | 67            | 141         | 1147         | 427              | 13          | 92           | 19          | 303          | 4016           |
| <b>Sub total</b>                       |                      | <b>15455</b>       | <b>11281</b> | <b>1546</b>  | <b>2022</b>   | <b>727</b>  | <b>6986</b>  | <b>4174</b>      | <b>456</b>  | <b>1566</b>  | <b>238</b>  | <b>1914</b>  | <b>32128</b>   |
| <b>Sub Distt. Bhusan Steel Limited</b> |                      |                    |              |              |               |             |              |                  |             |              |             |              |                |
| 404195                                 | Talabahal            | 219                | 168          | 6            | 12            | 4           | 146          | 51               | 6           | 11           | 2           | 32           | 454            |
| 404196                                 | Ganthigadia          | 146                | 5            | 0            | 0             | 0           | 5            | 141              | 12          | 0            | 0           | 129          | 279            |
| <b>Sub total</b>                       |                      | <b>365</b>         | <b>173</b>   | <b>6</b>     | <b>12</b>     | <b>4</b>    | <b>151</b>   | <b>192</b>       | <b>18</b>   | <b>11</b>    | <b>2</b>    | <b>161</b>   | <b>733</b>     |
| <b>Sub Distt. Anugul</b>               |                      |                    |              |              |               |             |              |                  |             |              |             |              |                |
| 404232                                 | Kankinali            | 283                | 279          | 72           | 24            | 5           | 178          | 4                | 1           | 1            | 0           | 2            | 556            |
| <b>Sub total</b>                       |                      | <b>283</b>         | <b>279</b>   | <b>72</b>    | <b>24</b>     | <b>5</b>    | <b>178</b>   | <b>4</b>         | <b>1</b>    | <b>1</b>     | <b>0</b>    | <b>2</b>     | <b>556</b>     |
| <b>GRAND TOTAL</b>                     |                      | <b>75563</b>       | <b>52746</b> | <b>9261</b>  | <b>8439</b>   | <b>2392</b> | <b>32654</b> | <b>22817</b>     | <b>2044</b> | <b>11018</b> | <b>1132</b> | <b>8623</b>  | <b>143999</b>  |
| <b>Percentage</b>                      |                      | <b>34.42</b>       | <b>24.02</b> | <b>17.56</b> | <b>16.00</b>  | <b>4.53</b> | <b>61.91</b> | <b>10.39</b>     | <b>8.96</b> | <b>48.29</b> | <b>4.96</b> | <b>37.79</b> | <b>65.58</b>   |

**AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village | Town/village<br>name        | EDUCATION FACILITIES |      |           |      |           |      |           |      |           |      |           |      |           |      |          |      |          |      |          |      |           |      |           |      |           |      |          |      |      |   |
|------------------|-----------------------------|----------------------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|------|----------|------|----------|------|----------|------|-----------|------|-----------|------|-----------|------|----------|------|------|---|
|                  |                             | PPS                  |      | PS        |      | MS        |      | SS        |      | SSS       |      | DCAS      |      | EC        |      | MC       |      | MI       |      | P        |      | VTS/ITI   |      | NFTC      |      | SFD       |      | EO       |      |      |   |
|                  |                             | Govt.                | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.    | Pvt. | Govt.    | Pvt. | Govt.    | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.    | Pvt. |      |   |
|                  | <b>District : Dhenkanal</b> |                      |      |           |      |           |      |           |      |           |      |           |      |           |      |          |      |          |      |          |      |           |      |           |      |           |      |          |      |      |   |
|                  | <b>Sub distt.: Parajang</b> |                      |      |           |      |           |      |           |      |           |      |           |      |           |      |          |      |          |      |          |      |           |      |           |      |           |      |          |      |      |   |
| 402286           | Palasahi                    | (5-10 km)            | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402287           | Dihakamar                   | (10+ km)             | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (5-10 km) | -    | N.A.      | -    | (10+ km)  | -    | N.A.     | -    |      |   |
| 402288           | Patarapada                  | (10+ km)             | -    | 3         | -    | 1         | -    | 1         | -    | -         | 2    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402289           | Sankamar                    | (10+ km)             | -    | 1         | 1    | 1         | 1    | 1         | 1    | 1         | 1    | 1         | 1    | 1         | 1    | 1        | 1    | 1        | 1    | 1        | 1    | 1         | 1    | N.A.      | -    | N.A.      | -    | N.A.     | -    |      |   |
| 402290           | Gailo                       | (10+ km)             | -    | 1         | -    | 1         | 1    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.     | -    | 1         | 1    | (10+ km)  | -    | N.A.      | -    | N.A.     | -    |      |   |
| 402291           | Kundandeipur                | (10+ km)             | -    | 1         | -    | 1         | -    | 1         | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402292           | Panibhandar                 | (10+ km)             | -    | 2         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | N.A.      | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402293           | Badakamar                   | N.A.                 | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402294           | Katabahal                   | (10+ km)             | -    | 3         | -    | 2         | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402298           | Ria                         | (10+ km)             | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | N.A.      | -    | (10+ km)  | -    | N.A.     | -    |      |   |
| 402304           | Panigengutia                | (10+ km)             | -    | 1         | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | N.A.      | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402305           | Roda                        | (5-10 km)            | -    | 2         | -    | 1         | -    | 1         | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | N.A.      | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402306           | Renthapat                   | (10+ km)             | -    | 1         | -    | (5-10 km) | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | N.A.      | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402307           | Tarahata                    | (10+ km)             | -    | 1         | -    | (5-10 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.      | -    | (10+ km) | -    | N.A. | - |
| 402308           | Siarimalia                  | (10+ km)             | -    | 1         | -    | (5-10 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.      | -    | (10+ km) | -    | N.A. | - |
|                  | <b>Sub distt.: Motunga</b>  |                      |      |           |      |           |      |           |      |           |      |           |      |           |      |          |      |          |      |          |      |           |      |           |      |           |      |          |      |      |   |
| 402897           | Kusupanga                   | (<5 km)              | -    | 2         | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (5-10 km) | -    | N.A.      | -    | (10+ km) | -    | N.A. | - |
| 402898           | Kurunti                     | (5-10 km)            | -    | 1         | 1    | 1         | 1    | -         | 1    | 1         | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402899           | Kochilamada                 | (5-10 km)            | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (5-10 km) | -    | N.A.      | -    | (10+ km)  | -    | N.A.     | -    |      |   |
| 402901           | Charadagadia                | (5-10 km)            | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (5-10 km) | -    | N.A.      | -    | (10+ km) | -    | N.A. | - |
| 402905           | Motunga                     | (<5 km)              | -    | 2         | -    | 1         | -    | 1         | -    | 1         | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402906           | Kharagprasad                | -                    | 1    | 4         | -    | 2         | -    | 1         | -    | 1         | -    | 1         | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (<5 km)   | -    | N.A.      | -    | (10+ km)  | -    | N.A.     | -    | N.A. | - |
| 402907           | Kharagprasadpatna           | (<5 km)              | -    | 2         | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (5-10 km) | -    | N.A.      | -    | (10+ km) | -    | N.A. | - |
| 402908           | Suravi                      | (<5 km)              | -    | 1         | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.     | -    | N.A. | - |
| 402909           | Bido                        | (10+ km)             | -    | 1         | 1    | 1         | 1    | -         | 1    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | N.A. | - |
| 402910           | Taladanga                   | (5-10 km)            | -    | 1         | -    | (5-10 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | N.A.      | -    | (10+ km)  | -    | (<5 km)   | -    | N.A.     | -    | N.A. | - |
| 402911           | Ranjasinga                  | (5-10 km)            | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (<5 km)   | -    | N.A.      | -    | (<5 km)  | -    | N.A. | - |
| 402913           | Nagari                      | (<5 km)              | -    | 1         | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.     | -    | N.A. | - |
| 402914           | Gaudapasi                   | (10+ km)             | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | -         | 1    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (5-10 km) | -    | (5-10 km) | -    | N.A.      | -    | (10+ km) | -    | N.A. | - |
| 402915           | Chintapokhari               | -                    | 1    | 1         | -    | 1         | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (<5 km)   | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402916           | Malibido                    | (5-10 km)            | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A. | - |
| 402917           | Binarkateni                 | N.A.                 | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | N.A.     | -    | N.A.      | -    | N.A.      | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402918           | Budhapanka                  | N.A.                 | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A. | - |
| 402919           | Brajabiharipur              | N.A.                 | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | -         | 1    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | N.A.     | -    | -         | 1    | N.A.      | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402920           | Salapada                    | N.A.                 | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | -         | 1    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | -         | 1    | (10+ km)  | -    | (10+ km) | -    | N.A. | - |
| 402922           | Kunjabiharipur              | N.A.                 | -    | 1         | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | N.A.     | -    | N.A. | - |
| 402924           | Nadhara                     | (10+ km)             | -    | 2         | 1    | 1         | 1    | 1         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (5-10 km) | -    | N.A.      | -    | (10+ km) | -    | N.A. | - |
| 402925           | Ekagharia                   | (5-10 km)            | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | N.A. | - |
| 402926           | Bangurasinga                | (<5 km)              | -    | 3         | 1    | 1         | 1    | -         | 1    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | -         | 1    | N.A.      | -    | (10+ km) | -    | N.A. | - |
| 402927           | Jarada                      | (<5 km)              | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (<5 km)   | -    | N.A.      | -    | (10+ km) | -    | N.A. | - |
| 402928           | Nuara                       | N.A.                 | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | N.A.     | -    | N.A.      | -    | N.A.      | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402929           | Talabaghalunda              | N.A.                 | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | N.A.     | -    | N.A.      | -    | N.A.      | -    | N.A.      | -    | N.A.     | -    | N.A. | - |
| 402930           | Uparbaghalunda              | N.A.                 | -    | 1         | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (5-10 km) | -    | N.A.      | -    | (10+ km) | -    | N.A. | - |

**AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br><br>code           | Town/village<br>name    | EDUCATION FACILITIES |      |         |      |           |      |           |      |           |      |           |      |           |      |          |      |          |      |           |      |           |      |           |      |          |      |          |      |
|----------------------------------------|-------------------------|----------------------|------|---------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|------|----------|------|----------|------|-----------|------|-----------|------|-----------|------|----------|------|----------|------|
|                                        |                         | PPS                  |      | PS      |      | MS        |      | SS        |      | SSS       |      | DCAS      |      | EC        |      | MC       |      | MI       |      | P         |      | VTS/ITI   |      | NFTC      |      | SFD      |      | EO       |      |
|                                        |                         | Govt.                | Pvt. | Govt.   | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.    | Pvt. | Govt.    | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.    | Pvt. | Govt.    | Pvt. |
| 402931                                 | Nayabhagirathipur(East) | N.A.                 | -    | 1       | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | N.A.      | -    | N.A.      | -    | (10+ km) | -    | N.A.     | -    |
| 402932                                 | Nayabhagirathipur(West) | N.A.                 | -    | 1       | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (5-10 km) | -    | N.A.      | -    | (10+ km) | -    | N.A.     | -    |
| 402933                                 | Kalusahukateni          | N.A.                 | -    | 1       | -    | 1         | -    | 1         | -    | -         | 1    | -         | 1    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | N.A.      | -    | (5-10 km) | -    | N.A.      | -    | N.A.     | -    | N.A.     | -    |
| 402934                                 | Haladibahali            | N.A.                 | -    | 2       | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | N.A.      | -    | (5-10 km) | -    | N.A.      | -    | (10+ km) | -    | N.A.     | -    |
| 402935                                 | Budhipahad              | N.A.                 | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km) | -    | 1         | -    | 1         | -    | N.A.      | -    | N.A.     | -    | N.A.     | -    |
| 402936                                 | Uperpal                 | (5-10 km)            | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402937                                 | Meramandali             | (5-10 km)            | -    | 1       | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (5-10 km) | -    | N.A.      | -    | (10+ km) | -    | N.A.     | -    |
| 402938                                 | Nimidha                 | (<5 km)              | -    | 1       | 1    | 1         | 1    | -         | 1    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402939                                 | Ranibania               | (10+ km)             | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (5-10 km) | -    | N.A.      | -    | (10+ km) | -    | N.A.     | -    |
| 402940                                 | Badalo                  | (<5 km)              | -    | 1       | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402942                                 | Artasantrakateni        | (10+ km)             | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402943                                 | Murdangapali            | (10+ km)             | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402944                                 | Balarampasad            | N.A.                 | -    | 3       | -    | 1         | -    | 1         | -    | (10+ km)  | -    | -         | 1    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | N.A.      | -    | -         | 1    | N.A.      | -    | N.A.     | -    | N.A.     | -    |
| 402946                                 | Handifuta               | N.A.                 | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (5-10 km) | -    | (5-10 km) | -    | N.A.      | -    | (10+ km) | -    | N.A.     | -    |
| 402947                                 | Ghodadian               | N.A.                 | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km) | -    | N.A.     | -    |
| 402948                                 | Naraharipur             | N.A.                 | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | N.A.      | -    | N.A.      | -    | N.A.      | -    | N.A.     | -    | N.A.     | -    |
| 402949                                 | Sridihi                 | (5-10 km)            | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | N.A.     | -    | (10+ km) | -    | (10+ km)  | -    | (5-10 km) | -    | N.A.      | -    | (10+ km) | -    | N.A.     | -    |
| 402950                                 | Bachhuribanka           | (5-10 km)            | -    | 1       | -    | 1         | -    | (<5 km)   | -    | 1         | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.     | -    | N.A.     | -    |
| 402951                                 | Chheliabedha            | N.A.                 | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km) | -    | N.A.      | -    | (<5 km)   | -    | (10+ km)  | -    | N.A.     | -    | N.A.     | -    |
| 402952                                 | Paneilo                 | (5-10 km)            | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| <b>Sub dist.: Bhusan Steel Limited</b> |                         |                      |      |         |      |           |      |           |      |           |      |           |      |           |      |          |      |          |      |           |      |           |      |           |      |          |      |          |      |
| 402967                                 | Mangalpur               | N.A.                 | -    | 4       | -    | 1         | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.     | -    | N.A.     | -    |
| 402968                                 | Itapa                   | N.A.                 | -    | 1       | 1    | -         | 1    | -         | 1    | -         | 1    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.      | -    | N.A.      | -    | (5-10 km) | -    | N.A.     | -    | N.A.     | -    |
| 402969                                 | Narendrapur             | (<5 km)              | -    | 2       | -    | 1         | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.      | -    | (10+ km)  | -    | N.A.      | -    | (10+ km) | -    | N.A.     | -    |
| 402970                                 | Asanabania              | (5-10 km)            | -    | 1       | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | N.A.      | -    | N.A.      | -    | N.A.     | -    | N.A.     | -    |
| 402971                                 | Sibapur                 | (5-10 km)            | -    | 2       | -    | 1         | -    | 1         | -    | -         | 1    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402972                                 | Rakala                  | (5-10 km)            | -    | 1       | -    | 1         | -    | 1         | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    |
| 402973                                 | Panaghudughuda          | (5-10 km)            | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402974                                 | Amana                   | (5-10 km)            | -    | 1       | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402975                                 | Sanjapada               | (10+ km)             | -    | 2       | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402976                                 | Badibahal               | (10+ km)             | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402977                                 | Khaliberana             | (10+ km)             | -    | 1       | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402978                                 | Nadeilo                 | (5-10 km)            | -    | 1       | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402979                                 | Bramhanapurunakot       | (<5 km)              | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402980                                 | Naraharipur             | (<5 km)              | -    | (<5 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402981                                 | Chandrasekharapur       | (<5 km)              | -    | (<5 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    |
| 402982                                 | Kankalu                 | (<5 km)              | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402983                                 | Mitikapasi              | (<5 km)              | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402984                                 | Sarapa                  | N.A.                 | -    | 1       | -    | -         | 1    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402985                                 | Raghunathapur           | (<5 km)              | -    | 1       | -    | -         | 1    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402986                                 | Nuagan                  | (<5 km)              | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402987                                 | Mahatala                | (<5 km)              | -    | (<5 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |
| 402989                                 | Paikpurunakot           | -                    | 1    | 1       | -    | 1         | -    | 1         | -    | -         | 1    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | N.A.     | -    |

**AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village | Town/village<br>name | EDUCATION FACILITIES |      |         |      |           |      |           |      |           |      |           |      |           |      |          |      |          |      |          |      |          |      |           |      |          |      |          |      |      |   |
|------------------|----------------------|----------------------|------|---------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|------|----------|------|----------|------|----------|------|----------|------|-----------|------|----------|------|----------|------|------|---|
|                  |                      | PPS                  |      | PS      |      | MS        |      | SS        |      | SSS       |      | DCAS      |      | EC        |      | MC       |      | MI       |      | P        |      | VTS/ITI  |      | NFTC      |      | SFD      |      | EO       |      |      |   |
|                  |                      | Govt.                | Pvt. | Govt.   | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.    | Pvt. | Govt.    | Pvt. | Govt.    | Pvt. | Govt.    | Pvt. | Govt.     | Pvt. | Govt.    | Pvt. | Govt.    | Pvt. |      |   |
| 402991           | Jhaduberani          | (<5 km)              | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    |      |   |
|                  | Sub distt.: Balimi   |                      |      |         |      |           |      |           |      |           |      |           |      |           |      |          |      |          |      |          |      |          |      |           |      |          |      |          |      |      |   |
| 402993           | Beruanpal            | (10+ km)             | -    | 2       | -    | 1         | -    | 1         | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 402994           | Gandijhara           | (10+ km)             | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 402995           | Galapada             | N.A.                 | -    | 1       | -    | 1         | -    | 1         | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 402996           | Bhanupada            | (10+ km)             | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 402997           | Chitipada            | (10+ km)             | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 402998           | Nimabahali           | (10+ km)             | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 402999           | Kothalu              | (10+ km)             | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403000           | Jhadabandha          | (10+ km)             | -    | 2       | -    | 1         | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403001           | Madhupur             | (10+ km)             | -    | 1       | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403002           | Nua                  | (10+ km)             | -    | 2       | -    | 2         | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403003           | Thokar               | (10+ km)             | -    | 2       | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403004           | Barasingha           | (5-10 km)            | -    | 2       | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403005           | Tarkabeda            | (5-10 km)            | -    | 1       | -    | 1         | -    | 1         | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403006           | Kadala               | (10+ km)             | -    | 2       | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403007           | Benipathara          | (10+ km)             | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403008           | Badamunda            | (10+ km)             | -    | 1       | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403009           | Kantimili            | (<5 km)              | -    | 1       | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403010           | Sanamunda            | (5-10 km)            | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403011           | Solanali             | (<5 km)              | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403012           | Jharabeda            | (5-10 km)            | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403013           | Nuapada              | (5-10 km)            | -    | (<5 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403014           | Patala               | (<5 km)              | -    | 3       | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403015           | Bankidi              | (5-10 km)            | -    | 1       | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403016           | Panuberani           | (<5 km)              | -    | 1       | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403017           | Dahanimara           | (5-10 km)            | -    | (<5 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403018           | Khalapal             | (5-10 km)            | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403019           | Nagiaberani          | (5-10 km)            | -    | (<5 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403020           | Iswarapur            | (5-10 km)            | -    | (<5 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403021           | Gotiaberani          | (5-10 km)            | -    | (<5 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403022           | Kantamila            | (5-10 km)            | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403024           | Mahalunda            | (5-10 km)            | -    | 1       | -    | 1         | -    | 1         | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403025           | Bedanali             | (5-10 km)            | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403026           | Maguberani           | (5-10 km)            | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403027           | Krushnachandrapur    | (5-10 km)            | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403028           | Gulehi               | N.A.                 | -    | 2       | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403029           | Dudurokot            | (5-10 km)            | -    | 4       | -    | 2         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403030           | Bramhanamara         | (5-10 km)            | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403031           | Kumurusinga          | (5-10 km)            | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403032           | Ranjagola            | (<5 km)              | -    | 3       | -    | 2         | -    | 1         | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403033           | Asarada              | (5-10 km)            | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |
| 403034           | Balimi               | (<5 km)              | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A. | - |

**AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br><br>code | Town/village<br>name | EDUCATION FACILITIES |      |         |      |           |      |           |      |           |      |           |      |           |      |          |      |           |      |           |      |           |      |          |      |          |      |       |      |
|------------------------------|----------------------|----------------------|------|---------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|------|----------|------|-----------|------|-----------|------|-----------|------|----------|------|----------|------|-------|------|
|                              |                      | PPS                  |      | PS      |      | MS        |      | SS        |      | SSS       |      | DCAS      |      | EC        |      | MC       |      | MI        |      | P         |      | VTS/ITI   |      | NFTC     |      | SFD      |      | EO    |      |
|                              |                      | Govt.                | Pvt. | Govt.   | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.    | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.    | Pvt. | Govt.    | Pvt. | Govt. | Pvt. |
| 403035                       | Kukuta               | -                    | 1    | 3       | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403036                       | Sanahindol           | (<5 km)              | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403037                       | Nandapur             | (5-10 km)            | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403038                       | Gurilo               | (<5 km)              | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| <b>Sub distt.: Hindol</b>    |                      |                      |      |         |      |           |      |           |      |           |      |           |      |           |      |          |      |           |      |           |      |           |      |          |      |          |      |       |      |
| 403040                       | Chhelachheli         | (<5 km)              | -    | (<5 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403041                       | Kalihundi            | (<5 km)              | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403042                       | Tutupada             | (<5 km)              | -    | (<5 km) | -    | (5-10 km) | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403043                       | Tangisal             | (5-10 km)            | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403044                       | Balasar              | (10+ km)             | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403045                       | Hatura               | -                    | 1    | 1       | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403046                       | Jayapanga            | (<5 km)              | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403047                       | Hariharapur          | (10+ km)             | -    | (<5 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403048                       | Bangu                | (10+ km)             | -    | 1       | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403049                       | Pada                 | (<5 km)              | -    | 2       | -    | 1         | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403070                       | Kalanda              | (10+ km)             | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403072                       | Keutaganthi          | (10+ km)             | -    | (<5 km) | -    | (5-10 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403074                       | Baghadharia          | (10+ km)             | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | -         | 1    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| <b>Sub distt.: Rasol</b>     |                      |                      |      |         |      |           |      |           |      |           |      |           |      |           |      |          |      |           |      |           |      |           |      |          |      |          |      |       |      |
| 403094                       | Panchupada           | (10+ km)             | -    | 3       | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403095                       | Jarada               | -                    | 1    | 1       | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403096                       | Haripur              | (<5 km)              | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403097                       | Badabahal            | (10+ km)             | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403098                       | Giridharprasad       | (10+ km)             | -    | 2       | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403099                       | Karanda              | (<5 km)              | -    | 6       | -    | 3         | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | -         | 1    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403100                       | Khanditiri           | (10+ km)             | -    | 2       | 1    | 1         | 1    | -         | 1    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403101                       | Brahmapur            | (10+ km)             | -    | 2       | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403102                       | Bedapada             | (<5 km)              | -    | 3       | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403117                       | Bhingira             | (10+ km)             | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403119                       | Basanta pokhari      | (10+ km)             | -    | (<5 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403120                       | Thenga               | (<5 km)              | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 403122                       | Gulugundi            | (5-10 km)            | -    | (<5 km) | -    | (5-10 km) | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| <b>District : Anugul</b>     |                      |                      |      |         |      |           |      |           |      |           |      |           |      |           |      |          |      |           |      |           |      |           |      |          |      |          |      |       |      |
| <b>Sub distt.: Banarpal</b>  |                      |                      |      |         |      |           |      |           |      |           |      |           |      |           |      |          |      |           |      |           |      |           |      |          |      |          |      |       |      |
| 404141                       | Tentulihata          | (5-10 km)            | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 404142                       | Apartipur            | (<5 km)              | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 404145                       | Banarpal             | -                    | 1    | 2       | -    | 1         | -    | 1         | -    | -         | 1    | -         | 1    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | -         | 2    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 404146                       | Joragadia            | (<5 km)              | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | N.A.     | -    | (10+ km)  | -    | (10+ km)  | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 404147                       | Birabahanpur         | (5-10 km)            | -    | 1       | -    | -         | 1    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 404148                       | Badakhali            | (5-10 km)            | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |
| 404149                       | Bhagabatpur          | (5-10 km)            | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km) | -    | N.A.  | -    |



**AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village | Town/village<br>name             | EDUCATION FACILITIES |      |         |      |           |      |           |      |           |      |           |      |           |      |          |      |           |      |           |      |           |      |           |      |           |      |       |      |
|------------------|----------------------------------|----------------------|------|---------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|------|----------|------|-----------|------|-----------|------|-----------|------|-----------|------|-----------|------|-------|------|
|                  |                                  | PPS                  |      | PS      |      | MS        |      | SS        |      | SSS       |      | DCAS      |      | EC        |      | MC       |      | MI        |      | P         |      | VTS/ITI   |      | NFTC      |      | SFD       |      | EO    |      |
|                  |                                  | Govt.                | Pvt. | Govt.   | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.    | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt.     | Pvt. | Govt. | Pvt. |
| 404150           | Narendrapur                      | (5-10 km)            | -    | 1       | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404151           | Chauridiha                       | (<5 km)              | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404152           | Jhajiribahal                     | (5-10 km)            | -    | 1       | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (<5 km)   | -    | N.A.  | -    |
| 404153           | Gadasantri                       | (5-10 km)            | -    | 3       | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404155           | Gangijodi                        | (5-10 km)            | -    | (<5 km) | -    | (5-10 km) | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404156           | Tulasipal                        | (<5 km)              | -    | 1       | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | N.A.     | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404159           | Languliabeda                     | (10+ km)             | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (5-10 km) | -    | N.A.     | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404160           | Rajibpur                         | (<5 km)              | -    | (<5 km) | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404163           | Purkia                           | (10+ km)             | -    | 1       | -    | 1         | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | N.A.     | -    | (10+ km)  | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404164           | Arahat                           | (5-10 km)            | -    | 2       | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | N.A.     | -    | -         | 1    | -         | 1    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | N.A.  | -    |
| 404165           | Talatali                         | (5-10 km)            | -    | 2       | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404166           | Kusuna                           | (<5 km)              | -    | 1       | -    | (5-10 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404167           | Kalandapal                       | (5-10 km)            | -    | 1       | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404168           | Ramimunda                        | (5-10 km)            | -    | 1       | 1    | -         | 1    | -         | 1    | (5-10 km) | -    | (10+ km)  | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404170           | Fulapada                         | -                    | 1    | 3       | -    | 1         | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404172           | Rankasinga                       | (<5 km)              | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404173           | Juharpur                         | (10+ km)             | -    | 1       | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (5-10 km) | -    | N.A.     | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404174           | Similichhuin                     | (5-10 km)            | -    | 1       | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404175           | Chakuriapal                      | (<5 km)              | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404178           | Kainchhabahala                   | N.A.                 | -    | 1       | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | N.A.     | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404179           | Girdhabasa                       | (<5 km)              | -    | 1       | 4    | -         | 1    | (<5 km)   | -    | -         | 1    | (5-10 km) | -    | (5-10 km) | -    | N.A.     | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404180           | Tilapanga                        | (<5 km)              | -    | 1       | 1    | -         | 1    | -         | 1    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404181           | Talamulasasan                    | (<5 km)              | -    | 4       | -    | 1         | -    | (<5 km)   | -    | -         | 1    | -         | 1    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404182           | Gadatalamul                      | (<5 km)              | -    | 2       | -    | 1         | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404183           | Harichandabasti                  | N.A.                 | -    | (<5 km) | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404184           | Talmulpatna Basti                | (<5 km)              | -    | 2       | -    | 1         | -    | (<5 km)   | -    | (<5 km)   | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404187           | Harichandajami                   | (<5 km)              | -    | (<5 km) | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km)  | -    | (<5 km)   | -    | (5-10 km) | -    | N.A.     | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404189           | Khandanali                       | (<5 km)              | -    | 1       | 1    | -         | 2    | -         | 1    | (10+ km)  | -    | (<5 km)   | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404190           | Serenabeda                       | (<5 km)              | -    | 1       | -    | 1         | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km)  | -    | N.A.     | -    | (10+ km)  | -    | (10+ km)  | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
|                  | Sub distt.: Bhusan Steel Limited |                      |      |         |      |           |      |           |      |           |      |           |      |           |      |          |      |           |      |           |      |           |      |           |      |           |      |       |      |
| 404195           | Talabahal                        | (5-10 km)            | -    | 1       | -    | 1         | -    | 1         | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
| 404196           | Ganthigadia                      | (5-10 km)            | -    | 1       | -    | (<5 km)   | -    | (5-10 km) | -    | (5-10 km) | -    | (5-10 km) | -    | (<5 km)   | -    | (10+ km) | -    | (10+ km)  | -    | (10+ km)  | -    | (5-10 km) | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |
|                  | Sub distt.: Anugul               |                      |      |         |      |           |      |           |      |           |      |           |      |           |      |          |      |           |      |           |      |           |      |           |      |           |      |       |      |
| 404232           | Kankinali                        | (10+ km)             | -    | 1       | -    | 1         | -    | 1         | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km) | -    | (<5 km)   | -    | (<5 km)   | -    | (10+ km)  | -    | (10+ km)  | -    | (10+ km)  | -    | N.A.  | -    |

**AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br><br>code | Town/village<br>name        | MEDICAL FACILITIES |           |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
|------------------------------|-----------------------------|--------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------------|--------------|------------|---------------|-------------|-------------|---------------|-------------|------------|
|                              |                             | CHC                | PHC       | PHSC      | MCWC      | TBC       | HA        | HAM       | D         | VH        | MHC       | FWC       | NGMF-<br>OP | NGMF-<br>IOP | NGMF-<br>C | NGMF-<br>MBBS | NGMF-<br>OD | NGMF-<br>ND | NGMF-<br>TPFH | NGMF-<br>MS | NGMF-<br>O |
|                              | <b>District : Dhenkanal</b> |                    |           |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
|                              | <b>Sub distt.: Parajang</b> |                    |           |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
| 402286                       | Palasahi                    | (10+ km)           | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402287                       | Dihakamar                   | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402288                       | Patarapada                  | (10+ km)           | (10+ km)  | 1         | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 402289                       | Sankamar                    | (10+ km)           | (10+ km)  | (10+ km)  | (10+ km)  | 1         | 1         | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402290                       | Gailo                       | (10+ km)           | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | 1         | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402291                       | Kundandeipur                | (10+ km)           | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402292                       | Panibhandar                 | (10+ km)           | (5-10 km) | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402293                       | Badakamar                   | (10+ km)           | (<5 km)   | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402294                       | Katabahal                   | (10+ km)           | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402298                       | Ria                         | (10+ km)           | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402304                       | Panigengutia                | (10+ km)           | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402305                       | Roda                        | (10+ km)           | (10+ km)  | 1         | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | 1           | -          |
| 402306                       | Renthapat                   | (10+ km)           | (10+ km)  | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402307                       | Tarahata                    | (10+ km)           | (10+ km)  | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | 1             | -           | -           | -             | 1           | 1          |
| 402308                       | Siarimalia                  | (10+ km)           | (10+ km)  | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
|                              | <b>Sub distt.: Motunga</b>  |                    |           |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
| 402897                       | Kusupanga                   | (10+ km)           | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402898                       | Kurunti                     | (10+ km)           | (10+ km)  | 1         | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 402899                       | Kochilamada                 | (10+ km)           | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402901                       | Charadagadia                | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402905                       | Motunga                     | (10+ km)           | (5-10 km) | (<5 km)   | 1         | (10+ km)  | 1         | (10+ km)  | 1         | 1         | (10+ km)  | 1         | -           | -            | -          | 1             | -           | -           | -             | -           | -          |
| 402906                       | Kharagprasad                | (10+ km)           | (<5 km)   | 1         | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 402907                       | Kharagprasadpatna           | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402908                       | Suravi                      | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402909                       | Bido                        | (10+ km)           | (10+ km)  | 1         | (5-10 km) | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | 1             | -           | -           | -             | 3           | -          |
| 402910                       | Taladanga                   | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | 1         | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402911                       | Ranjasinga                  | (10+ km)           | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402913                       | Nagari                      | (10+ km)           | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402914                       | Gaudapasi                   | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402915                       | Chintapokhari               | (10+ km)           | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402916                       | Malibido                    | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402917                       | Binakarkateni               | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402918                       | Budhapanka                  | (10+ km)           | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402919                       | Brajabiharipur              | (10+ km)           | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402920                       | Salapada                    | (10+ km)           | (<5 km)   | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402922                       | Kunjabiharipur              | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402924                       | Nadhara                     | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402925                       | Ekagharia                   | (10+ km)           | (10+ km)  | (5-10 km) | 1         | (10+ km)  | (5-10 km) | 1         | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402926                       | Bangurasinga                | (5-10 km)          | (10+ km)  | 1         | 1         | (10+ km)  | 1         | (10+ km)  | (<5 km)   | 1         | (10+ km)  | 1         | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 402927                       | Jarada                      | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402928                       | Nuara                       | (10+ km)           | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402929                       | Talabaghalunda              | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402930                       | Uparbaghalunda              | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |

**AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br><br>code   | Town/village<br>name    | MEDICAL FACILITIES |           |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
|--------------------------------|-------------------------|--------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------------|--------------|------------|---------------|-------------|-------------|---------------|-------------|------------|
|                                |                         | CHC                | PHC       | PHSC      | MCWC      | TBC       | HA        | HAM       | D         | VH        | MHC       | FWC       | NGMF-<br>OP | NGMF-<br>IOP | NGMF-<br>C | NGMF-<br>MBBS | NGMF-<br>OD | NGMF-<br>ND | NGMF-<br>TPFH | NGMF-<br>MS | NGMF-<br>O |
| 402931                         | Nayabhagirathipur(East) | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402932                         | Nayabhagirathipur(West) | (10+ km)           | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402933                         | Kalusahukateni          | (10+ km)           | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402934                         | Haladibahali            | (10+ km)           | (<5 km)   | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | 1         | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402935                         | Budhipahad              | (10+ km)           | (5-10 km) | (5-10 km) | (5-10 km) | (<5 km)   | (<5 km)   | (10+ km)  | (5-10 km) | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402936                         | Uperpal                 | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402937                         | Meramandali             | (10+ km)           | (5-10 km) | (5-10 km) | 1         | (10+ km)  | 1         | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | 1             | -           | -           | -             | -           | -          |
| 402938                         | Nimidha                 | (10+ km)           | (10+ km)  | 1         | 1         | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 402939                         | Ranibania               | (10+ km)           | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402940                         | Badalo                  | (10+ km)           | (10+ km)  | 1         | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 402942                         | Artasantrakateni        | (10+ km)           | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (<5 km)   | (<5 km)   | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402943                         | Murdangapali            | (10+ km)           | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (<5 km)   | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402944                         | Balaramprasad           | (10+ km)           | (5-10 km) | 1         | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | 1         | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 402946                         | Handifuta               | (10+ km)           | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402947                         | Ghodadian               | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402948                         | Naraharipur             | (10+ km)           | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402949                         | Sridihi                 | (10+ km)           | (10+ km)  | (5-10 km) | 1         | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402950                         | Bachhuribanka           | (10+ km)           | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402951                         | Chheliabedha            | (10+ km)           | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402952                         | Paneilo                 | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| <b>Sub distt.: Bhusan Ster</b> |                         |                    |           |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
| 402967                         | Mangalpur               | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402968                         | Itapa                   | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402969                         | Narendrapur             | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402970                         | Asanabania              | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402971                         | Sibapur                 | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402972                         | Rakala                  | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402973                         | Panaghudughuda          | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402974                         | Amana                   | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402975                         | Sanjapada               | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402976                         | Badibahal               | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402977                         | Khaliberana             | (10+ km)           | (5-10 km) | 1         | (10+ km)  | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 402978                         | Nadeilo                 | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402979                         | Bramhanapurunakot       | (10+ km)           | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402980                         | Naraharipur             | (10+ km)           | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402981                         | Chandrasekharapur       | (10+ km)           | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402982                         | Kankalu                 | (10+ km)           | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402983                         | Mitikapasi              | (10+ km)           | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402984                         | Sarapa                  | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402985                         | Raghunathapur           | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402986                         | Nuagan                  | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402987                         | Mahatala                | (10+ km)           | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402989                         | Paikpurunakot           | (10+ km)           | (10+ km)  | 1         | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | 1         | 1         | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | 3           | -          |

**AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br><br>code | Town/village<br>name | MEDICAL FACILITIES |          |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
|------------------------------|----------------------|--------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------------|--------------|------------|---------------|-------------|-------------|---------------|-------------|------------|
|                              |                      | CHC                | PHC      | PHSC      | MCWC      | TBC       | HA        | HAM       | D         | VH        | MHC       | FWC       | NGMF-<br>OP | NGMF-<br>IOP | NGMF-<br>C | NGMF-<br>MBBS | NGMF-<br>OD | NGMF-<br>ND | NGMF-<br>TPFH | NGMF-<br>MS | NGMF-<br>O |
| 402991                       | Jhaduberani          | (10+ km)           | (10+ km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
|                              | Sub distt.: Balimi   |                    |          |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
| 402993                       | Beruanpal            | (10+ km)           | (10+ km) | (<5 km)   | (10+ km)  | (10+ km)  | (5-10 km) | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402994                       | Gandijhara           | (10+ km)           | (10+ km) | (<5 km)   | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402995                       | Galapada             | (10+ km)           | (10+ km) | 1         | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | 1         | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 402996                       | Bhanupada            | (10+ km)           | (10+ km) | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402997                       | Chitipada            | (10+ km)           | (10+ km) | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402998                       | Nimabahali           | (10+ km)           | (10+ km) | (<5 km)   | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 402999                       | Kothalu              | (10+ km)           | (10+ km) | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403000                       | Jhadabandha          | (10+ km)           | (10+ km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403001                       | Madhupur             | (10+ km)           | (10+ km) | (<5 km)   | (10+ km)  | (10+ km)  | (<5 km)   | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403002                       | Nua                  | (10+ km)           | (10+ km) | 1         | (10+ km)  | (<5 km)   | (<5 km)   | (5-10 km) | (<5 km)   | (<5 km)   | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 403003                       | Thokar               | (10+ km)           | (10+ km) | (<5 km)   | (10+ km)  | (<5 km)   | (<5 km)   | (5-10 km) | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403004                       | Barasingha           | (10+ km)           | (10+ km) | (<5 km)   | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403005                       | Tarkabeda            | (10+ km)           | (10+ km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403006                       | Kadala               | (10+ km)           | (10+ km) | (<5 km)   | (5-10 km) | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403007                       | Benipathara          | (10+ km)           | (10+ km) | (<5 km)   | (10+ km)  | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403008                       | Badamunda            | (10+ km)           | (10+ km) | (<5 km)   | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403009                       | Kantimili            | (10+ km)           | (10+ km) | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403010                       | Sanamunda            | (10+ km)           | (10+ km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403011                       | Solanali             | (10+ km)           | (10+ km) | (<5 km)   | (10+ km)  | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403012                       | Jharabeda            | (10+ km)           | (10+ km) | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403013                       | Nuapada              | (10+ km)           | (10+ km) | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403014                       | Patala               | (10+ km)           | (10+ km) | 1         | (5-10 km) | (5-10 km) | (5-10 km) | (<5 km)   | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 403015                       | Bankidi              | (10+ km)           | (10+ km) | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403016                       | Panuberani           | (10+ km)           | (10+ km) | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403017                       | Dahanimara           | (10+ km)           | (10+ km) | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403018                       | Khalapal             | (10+ km)           | (10+ km) | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403019                       | Nagiaberani          | (10+ km)           | (10+ km) | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403020                       | Iswarapur            | (10+ km)           | (10+ km) | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (<5 km)   | (5-10 km) | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403021                       | Gotiaberani          | (5-10 km)          | (10+ km) | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403022                       | Kantamila            | (10+ km)           | (10+ km) | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403024                       | Mahalunda            | (5-10 km)          | (10+ km) | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403025                       | Bedanali             | (5-10 km)          | (10+ km) | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403026                       | Maguberani           | (10+ km)           | (10+ km) | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403027                       | Krushnachandrapur    | (10+ km)           | (10+ km) | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403028                       | Gulehi               | (10+ km)           | (10+ km) | 1         | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | 1         | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 403029                       | Dudurokot            | (10+ km)           | (10+ km) | 1         | 1         | (5-10 km) | (5-10 km) | (5-10 km) | 1         | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 403030                       | Bramhanamara         | (10+ km)           | (10+ km) | (<5 km)   | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403031                       | Kumurusinga          | (10+ km)           | (10+ km) | (<5 km)   | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403032                       | Ranjagola            | (10+ km)           | (10+ km) | (<5 km)   | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | (5-10 km) | 1         | (10+ km)  | 1         | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403033                       | Asarada              | (10+ km)           | (10+ km) | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403034                       | Balimi               | (10+ km)           | (10+ km) | (5-10 km) | (10+ km)  | (<5 km)   | (<5 km)   | (5-10 km) | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |

**AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br><br>code | Town/village<br>name | MEDICAL FACILITIES |           |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
|------------------------------|----------------------|--------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------------|--------------|------------|---------------|-------------|-------------|---------------|-------------|------------|
|                              |                      | CHC                | PHC       | PHSC      | MCWC      | TBC       | HA        | HAM       | D         | VH        | MHC       | FWC       | NGMF-<br>OP | NGMF-<br>IOP | NGMF-<br>C | NGMF-<br>MBBS | NGMF-<br>OD | NGMF-<br>ND | NGMF-<br>TPFH | NGMF-<br>MS | NGMF-<br>O |
| 403035                       | Kukuta               | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (<5 km)   | (<5 km)   | (5-10 km) | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403036                       | Sanahindol           | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (<5 km)   | (<5 km)   | (5-10 km) | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403037                       | Nandapur             | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403038                       | Gurilo               | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| <b>Sub distt.: Hindol</b>    |                      |                    |           |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
| 403040                       | Chhelachheli         | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403041                       | Kalihundi            | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403042                       | Tutupada             | (10+ km)           | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403043                       | Tangisal             | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403044                       | Balasar              | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403045                       | Hatura               | (10+ km)           | (10+ km)  | 1         | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 403046                       | Jayapanga            | (10+ km)           | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403047                       | Hariharapur          | (10+ km)           | (10+ km)  | (<5 km)   | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403048                       | Bangu                | (10+ km)           | (10+ km)  | (<5 km)   | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403049                       | Pada                 | (10+ km)           | (10+ km)  | (<5 km)   | (<5 km)   | (10+ km)  | (<5 km)   | (10+ km)  | 1         | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403070                       | Kalanda              | (10+ km)           | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403072                       | Keutaganthi          | (10+ km)           | (10+ km)  | (<5 km)   | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403074                       | Baghadharia          | (10+ km)           | (10+ km)  | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (<5 km)   | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| <b>Sub distt.: Rasol</b>     |                      |                    |           |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
| 403094                       | Panchupada           | (10+ km)           | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (<5 km)   | (10+ km)  | 1         | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403095                       | Jarada               | (10+ km)           | (10+ km)  | (<5 km)   | 1         | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | 1           | -             | -           | -          |
| 403096                       | Haripur              | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (<5 km)   | (5-10 km) | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403097                       | Badabahal            | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (<5 km)   | (5-10 km) | (<5 km)   | (5-10 km) | (5-10 km) | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403098                       | Giridharprasad       | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403099                       | Karanda              | (10+ km)           | (10+ km)  | 1         | (10+ km)  | (<5 km)   | (<5 km)   | (<5 km)   | (5-10 km) | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 403100                       | Khanditiri           | (10+ km)           | (5-10 km) | 1         | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | 1             | 3           | -          |
| 403101                       | Brahmapur            | (10+ km)           | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403102                       | Bedapada             | (10+ km)           | (10+ km)  | 1         | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | 1         | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 403117                       | Bhingira             | (10+ km)           | (<5 km)   | (5-10 km) | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403119                       | Basanta pokhari      | (10+ km)           | (5-10 km) | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403120                       | Thenga               | (10+ km)           | (10+ km)  | (<5 km)   | 1         | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 403122                       | Gulugundi            | (10+ km)           | (5-10 km) | (<5 km)   | (5-10 km) | (5-10 km) | (5-10 km) | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| <b>District : Anugul</b>     |                      |                    |           |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
| <b>Sub distt.: Banarpal</b>  |                      |                    |           |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
| 404141                       | Tentulihata          | (10+ km)           | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404142                       | Apartipur            | (10+ km)           | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (<5 km)   | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404145                       | Banarpal             | (10+ km)           | 1         | 1         | (10+ km)  | (10+ km)  | (10+ km)  | 1         | (<5 km)   | 1         | (10+ km)  | 1         | -           | -            | -          | 2             | -           | -           | -             | 3           | -          |
| 404146                       | Joragadia            | (10+ km)           | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (<5 km)   | (<5 km)   | (5-10 km) | (<5 km)   | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404147                       | Birabahanpur         | (10+ km)           | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (<5 km)   | (5-10 km) | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404148                       | Badakhali            | (10+ km)           | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (5-10 km) | (<5 km)   | (5-10 km) | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404149                       | Bhagabatpur          | (10+ km)           | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (5-10 km) | (<5 km)   | (5-10 km) | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |

**AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)**  
**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br><br>code | Town/village<br>name | MEDICAL FACILITIES |           |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
|------------------------------|----------------------|--------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------------|--------------|------------|---------------|-------------|-------------|---------------|-------------|------------|
|                              |                      | CHC                | PHC       | PHSC      | MCWC      | TBC       | HA        | HAM       | D         | VH        | MHC       | FWC       | NGMF-<br>OP | NGMF-<br>IOP | NGMF-<br>C | NGMF-<br>MBBS | NGMF-<br>OD | NGMF-<br>ND | NGMF-<br>TPFH | NGMF-<br>MS | NGMF-<br>O |
| 404150                       | Narendrapur          | (5-10 km)          | (5-10 km) | (<5 km)   | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404151                       | Chauridiha           | (10+ km)           | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404152                       | Jhajiribahal         | (10+ km)           | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404153                       | Gadasantri           | (10+ km)           | (10+ km)  | 1         | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 404155                       | Gangijodi            | (10+ km)           | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (<5 km)   | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404156                       | Tulasipal            | (10+ km)           | (5-10 km) | 1         | (10+ km)  | (10+ km)  | (<5 km)   | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 404159                       | Languliabeda         | (10+ km)           | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (<5 km)   | (10+ km)  | (<5 km)   | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404160                       | Rajibpur             | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (<5 km)   | (<5 km)   | (<5 km)   | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404163                       | Purkia               | (10+ km)           | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404164                       | Arahat               | (10+ km)           | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (5-10 km) | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404165                       | Talatali             | (10+ km)           | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (<5 km)   | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404166                       | Kusuna               | (10+ km)           | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404167                       | Kalandapal           | (10+ km)           | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404168                       | Ramimunda            | (10+ km)           | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404170                       | Fulapada             | (10+ km)           | (5-10 km) | 1         | 1         | (10+ km)  | (5-10 km) | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | 1           | -          |
| 404172                       | Rankasinga           | (10+ km)           | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404173                       | Juharpur             | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404174                       | Similichhuin         | (10+ km)           | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404175                       | Chakuriapal          | (10+ km)           | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (<5 km)   | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404178                       | Kainchhabahala       | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404179                       | Girdhabasa           | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404180                       | Tilapanga            | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404181                       | Talamulasasan        | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (5-10 km) | 2           | -            | -          | -             | -           | -           | -             | 2           | -          |
| 404182                       | Gadatalamul          | (10+ km)           | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (<5 km)   | (10+ km)  | (<5 km)   | -           | -            | -          | 1             | 1           | -           | -             | -           | -          |
| 404183                       | Harichandabasti      | (10+ km)           | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404184                       | Talmulpatna Basti    | (10+ km)           | (10+ km)  | 1         | (10+ km)  | (10+ km)  | (<5 km)   | (5-10 km) | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | 3           | -          |
| 404187                       | Harichandajami       | (10+ km)           | (10+ km)  | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404189                       | Khandanali           | (10+ km)           | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404190                       | Serenabeda           | (10+ km)           | (5-10 km) | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| Sub distt.: Bhusan Ster      |                      |                    |           |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
| 404195                       | Talabahal            | (10+ km)           | (<5 km)   | (<5 km)   | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (5-10 km) | (5-10 km) | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| 404196                       | Ganthigadia          | (10+ km)           | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (5-10 km) | (<5 km)   | (5-10 km) | (10+ km)  | (<5 km)   | -           | -            | -          | -             | -           | -           | -             | -           | -          |
| Sub distt.: Anugul           |                      |                    |           |           |           |           |           |           |           |           |           |           |             |              |            |               |             |             |               |             |            |
| 404232                       | Kankinali            | (10+ km)           | (<5 km)   | (10+ km)  | (5-10 km) | (10+ km)  | (10+ km)  | (5-10 km) | (10+ km)  | (<5 km)   | (10+ km)  | (5-10 km) | -           | -            | -          | -             | -           | -           | -             | -           | -          |

**AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)**

**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br><br>code | Town/village<br>name                         | DRINKING WATER FACILITY |      |    |    |    |           |   |     |     |    | COMMUNICATION SYSTEM |           |           |        |          |          |           |           |           |
|------------------------------|----------------------------------------------|-------------------------|------|----|----|----|-----------|---|-----|-----|----|----------------------|-----------|-----------|--------|----------|----------|-----------|-----------|-----------|
|                              |                                              | TWT                     | TWUT | CW | UW | HP | TW/<br>BW | S | R/C | T/P | WO | PO                   | SPO       | P&T       | PIN    | T        | PCO      | MPC       | IC/CSC    | PCF       |
|                              | District : Dhenkanal<br>Sub distt.: Parajang |                         |      |    |    |    |           |   |     |     |    |                      |           |           |        |          |          |           |           |           |
| 402286                       | Palasahi                                     | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | (<5 km)              | (10+ km)  | 1         | 759120 | 1        | N.A.     | 1         | 1         | (10+ km)  |
| 402287                       | Dihakamar                                    | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (<5 km)              | (5-10 km) | (5-10 km) | 759120 | 1        | N.A.     | 1         | (10+ km)  | (10+ km)  |
| 402288                       | Patarapada                                   | N                       | N    | N  | Y  | Y  | Y         | N | Y   | Y   | Y  | 1                    | (5-10 km) | (5-10 km) | 759120 | 1        | 1        | 1         | (5-10 km) | 1         |
| 402289                       | Sankamar                                     | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759120 | 1        | N.A.     | 1         | (10+ km)  | (10+ km)  |
| 402290                       | Gailo                                        | N                       | N    | N  | Y  | Y  | N         | N | Y   | N   | N  | (10+ km)             | (<5 km)   | (10+ km)  | 759120 | 1        | 1        | 1         | (10+ km)  | (10+ km)  |
| 402291                       | Kundandeipur                                 | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (<5 km)   | (10+ km)  | 759120 | 1        | N.A.     | 1         | (10+ km)  | (10+ km)  |
| 402292                       | Panibhandar                                  | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (5-10 km)            | (10+ km)  | (10+ km)  | 759120 | 1        | N.A.     | 1         | (5-10 km) | (5-10 km) |
| 402293                       | Badakamar                                    | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | 1                    | (10+ km)  | (10+ km)  | 759120 | (10+ km) | (10+ km) | 1         | (10+ km)  | (10+ km)  |
| 402294                       | Katabahal                                    | N                       | N    | N  | Y  | Y  | N         | Y | N   | Y   | Y  | (10+ km)             | (5-10 km) | (5-10 km) | 759120 | 1        | N.A.     | 1         | (10+ km)  | 1         |
| 402298                       | Ria                                          | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (5-10 km)            | (5-10 km) | (5-10 km) | 759019 | 1        | N.A.     | 1         | (10+ km)  | (10+ km)  |
| 402304                       | Panigengutia                                 | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (5-10 km)            | (10+ km)  | (10+ km)  | 759120 | 1        | 1        | 1         | (10+ km)  | (10+ km)  |
| 402305                       | Roda                                         | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | Y  | 1                    | (10+ km)  | 1         | 759120 | 1        | 1        | 1         | (10+ km)  | 1         |
| 402306                       | Renthapat                                    | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (5-10 km)            | (10+ km)  | 1         | 759120 | 1        | N.A.     | (10+ km)  | (10+ km)  | (10+ km)  |
| 402307                       | Tarahata                                     | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (<5 km)              | (5-10 km) | (5-10 km) | 759019 | (10+ km) | (10+ km) | 1         | (10+ km)  | (10+ km)  |
| 402308                       | Siarimalia                                   | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (<5 km)              | (5-10 km) | (5-10 km) | 759019 | (10+ km) | (10+ km) | 1         | (10+ km)  | (10+ km)  |
|                              | Sub distt.: Motunga                          |                         |      |    |    |    |           |   |     |     |    |                      |           |           |        |          |          |           |           |           |
| 402897                       | Kusupanga                                    | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | 1                    | (5-10 km) | (5-10 km) | 759121 | 1        | N.A.     | 1         | (10+ km)  | (10+ km)  |
| 402898                       | Kurunti                                      | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (5-10 km)            | (<5 km)   | (5-10 km) | 759121 | 1        | N.A.     | 1         | (10+ km)  | 1         |
| 402899                       | Kochilamada                                  | N                       | N    | N  | Y  | Y  | N         | Y | N   | Y   | N  | (<5 km)              | (<5 km)   | (5-10 km) | 759121 | 1        | N.A.     | 1         | (10+ km)  | (10+ km)  |
| 402901                       | Charadagadia                                 | N                       | N    | N  | Y  | Y  | N         | Y | N   | Y   | N  | (5-10 km)            | (<5 km)   | (<5 km)   | 759121 | 1        | N.A.     | 1         | (5-10 km) | (5-10 km) |
| 402905                       | Motunga                                      | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | Y  | 1                    | (10+ km)  | 1         | 759121 | 1        | 1        | 1         | (10+ km)  | (10+ km)  |
| 402906                       | Kharagprasad                                 | N                       | Y    | N  | Y  | Y  | Y         | N | Y   | Y   | N  | 1                    | (<5 km)   | (<5 km)   | 759121 | 1        | 1        | 1         | (10+ km)  | 1         |
| 402907                       | Kharagprasadpatna                            | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (<5 km)              | (5-10 km) | (5-10 km) | 759121 | 1        | N.A.     | 1         | (10+ km)  | (10+ km)  |
| 402908                       | Suravi                                       | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | (10+ km)             | (<5 km)   | (10+ km)  | 759121 | (10+ km) | 1        | 1         | (10+ km)  | (10+ km)  |
| 402909                       | Bido                                         | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | 1                    | (10+ km)  | (5-10 km) | 759121 | (10+ km) | (10+ km) | 1         | (5-10 km) | (5-10 km) |
| 402910                       | Taladanga                                    | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (<5 km)   | (<5 km)   | 759121 | 1        | N.A.     | 1         | (10+ km)  | (10+ km)  |
| 402911                       | Ranjasinga                                   | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (5-10 km) | (<5 km)   | 759121 | 1        | N.A.     | 1         | (10+ km)  | (10+ km)  |
| 402913                       | Nagari                                       | N                       | Y    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (<5 km)              | (<5 km)   | (<5 km)   | 759121 | 1        | N.A.     | 1         | (10+ km)  | (10+ km)  |
| 402914                       | Gaudapasi                                    | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | 1         | (<5 km)   | 759013 | (10+ km) | (10+ km) | (5-10 km) | (5-10 km) | (5-10 km) |
| 402915                       | Chintapokhari                                | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | 1                    | (10+ km)  | 1         | 759121 | (10+ km) | 1        | 1         | (10+ km)  | (10+ km)  |
| 402916                       | Malibido                                     | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (<5 km)   | (5-10 km) | 759121 | (10+ km) | (10+ km) | 1         | (5-10 km) | (5-10 km) |
| 402917                       | Binarkateni                                  | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (<5 km)              | (<5 km)   | (<5 km)   | 759121 | 1        | N.A.     | 1         | (<5 km)   | (<5 km)   |
| 402918                       | Budhapanka                                   | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (<5 km)   | (5-10 km) | 759121 | 1        | N.A.     | 1         | (5-10 km) | (5-10 km) |
| 402919                       | Brajabiharipur                               | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (5-10 km)            | (5-10 km) | (5-10 km) | 759032 | 1        | N.A.     | (10+ km)  | (10+ km)  | (10+ km)  |
| 402920                       | Salapada                                     | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (5-10 km)            | (<5 km)   | (5-10 km) | 759121 | (10+ km) | (10+ km) | 1         | (5-10 km) | (5-10 km) |
| 402922                       | Kunjabiharipur                               | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (<5 km)   | (5-10 km) | 759019 | (10+ km) | (10+ km) | 1         | (5-10 km) | (5-10 km) |
| 402924                       | Nadhara                                      | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | 1                    | (5-10 km) | (5-10 km) | 759019 | 1        | N.A.     | 1         | (5-10 km) | (5-10 km) |
| 402925                       | Ekagharia                                    | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | (5-10 km)            | (<5 km)   | (5-10 km) | 759019 | 1        | N.A.     | 1         | (5-10 km) | (5-10 km) |
| 402926                       | Bangurasinga                                 | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | 1                    | (10+ km)  | (10+ km)  | 759019 | 1        | N.A.     | 1         | 1         | 1         |
| 402927                       | Jarada                                       | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | (<5 km)              | (<5 km)   | (10+ km)  | 759019 | 1        | N.A.     | 1         | (<5 km)   | (<5 km)   |
| 402928                       | Nuara                                        | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | 1                    | (10+ km)  | 1         | 759121 | (10+ km) | (10+ km) | 1         | (<5 km)   | (<5 km)   |
| 402929                       | Talabaghalunda                               | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (5-10 km) | (5-10 km) | 759019 | 1        | N.A.     | 1         | (5-10 km) | (5-10 km) |
| 402930                       | Uparbaghalunda                               | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (<5 km)              | (5-10 km) | (10+ km)  | 759019 | 1        | N.A.     | 1         | (<5 km)   | (<5 km)   |

**AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)**

**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br><br>code | Town/village<br>name    | DRINKING WATER FACILITY |      |    |    |    |           |   |     |     |    | COMMUNICATION SYSTEM |            |            |        |            |            |           |            |            |
|------------------------------|-------------------------|-------------------------|------|----|----|----|-----------|---|-----|-----|----|----------------------|------------|------------|--------|------------|------------|-----------|------------|------------|
|                              |                         | TWT                     | TWUT | CW | UW | HP | TW/<br>BW | S | R/C | T/P | WO | PO                   | SPO        | P&T        | PIN    | T          | PCO        | MPC       | IC/CSC     | PCF        |
| 402931                       | Nayabhagirathipur(East) | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | 1                    | (5-10 km)  | (5-10 km)  | 759019 | 1          | 1          | 1         | (5-10 km)  | (5-10 km)  |
| 402932                       | Nayabhagirathipur(West) | N                       | N    | N  | Y  | Y  | N         | N | Y   | N   | N  | (10+ km)             | (5-10 km)  | (5-10 km)  | 759019 | 1          | N.A.       | 1         | (10+ km)   | (10+ km)   |
| 402933                       | Kalusahukateni          | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | 1                    | (10+ km)   | (10+ km)   | 759121 | 1          | N.A.       | 1         | (10+ km)   | (10+ km)   |
| 402934                       | Haladibahali            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | 1                    | (10+ km)   | (5-10 km)  | 759121 | (10+ km)   | (10+ km)   | 1         | (5-10 km)  | (5-10 km)  |
| 402935                       | Budhipahad              | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | 1                    | (10+ km)   | 1          | 759019 | (10+ km)   | (10+ km)   | 1         | (10+ km)   | (10+ km)   |
| 402936                       | Uperpal                 | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | ( $<5$ km) | (10+ km)   | 759121 | (10+ km)   | (10+ km)   | 1         | (5-10 km)  | (5-10 km)  |
| 402937                       | Meramandali             | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | ( $<5$ km)           | ( $<5$ km) | 1          | 759121 | 1          | N.A.       | 1         | (10+ km)   | (10+ km)   |
| 402938                       | Nimidha                 | N                       | N    | N  | Y  | Y  | Y         | N | N   | N   | N  | (5-10 km)            | ( $<5$ km) | (5-10 km)  | 759020 | 1          | 1          | 1         | (5-10 km)  | 1          |
| 402939                       | Ranibania               | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (5-10 km)            | (5-10 km)  | 1          | 759020 | 1          | N.A.       | 1         | (5-10 km)  | (5-10 km)  |
| 402940                       | Badalo                  | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | 1                    | (5-10 km)  | (10+ km)   | 759020 | (5-10 km)  | 1          | 1         | (10+ km)   | (10+ km)   |
| 402942                       | Artasantrakateni        | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | 1                    | ( $<5$ km) | 1          | 759019 | 1          | 1          | 1         | ( $<5$ km) | ( $<5$ km) |
| 402943                       | Murdangapali            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | ( $<5$ km)           | ( $<5$ km) | ( $<5$ km) | 759019 | (10+ km)   | (10+ km)   | 1         | ( $<5$ km) | ( $<5$ km) |
| 402944                       | Balaramprasad           | N                       | N    | N  | Y  | Y  | Y         | Y | Y   | N   | N  | 1                    | ( $<5$ km) | ( $<5$ km) | 759019 | 1          | 1          | 1         | ( $<5$ km) | 1          |
| 402946                       | Handifuta               | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | ( $<5$ km)           | (10+ km)   | (5-10 km)  | 759020 | 1          | N.A.       | 1         | (10+ km)   | (10+ km)   |
| 402947                       | Ghodadian               | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | ( $<5$ km)           | (5-10 km)  | (5-10 km)  | 759020 | (10+ km)   | 1          | 1         | (10+ km)   | (10+ km)   |
| 402948                       | Naraharipur             | N                       | N    | N  | Y  | Y  | N         | N | Y   | N   | N  | (5-10 km)            | (5-10 km)  | (5-10 km)  | 759019 | (5-10 km)  | (5-10 km)  | 1         | (10+ km)   | (10+ km)   |
| 402949                       | Sridihi                 | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | ( $<5$ km)           | (5-10 km)  | (10+ km)   | 759019 | 1          | N.A.       | 1         | (5-10 km)  | (5-10 km)  |
| 402950                       | Bachhuribanka           | N                       | N    | N  | Y  | Y  | N         | Y | N   | N   | N  | (5-10 km)            | (5-10 km)  | (5-10 km)  | 759019 | (5-10 km)  | (5-10 km)  | 1         | (5-10 km)  | (5-10 km)  |
| 402951                       | Chheliabedha            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | ( $<5$ km)           | ( $<5$ km) | ( $<5$ km) | 759019 | (10+ km)   | (10+ km)   | 1         | ( $<5$ km) | ( $<5$ km) |
| 402952                       | Paneilo                 | N                       | N    | N  | Y  | Y  | N         | Y | Y   | N   | N  | ( $<5$ km)           | ( $<5$ km) | ( $<5$ km) | 759019 | ( $<5$ km) | ( $<5$ km) | 1         | ( $<5$ km) | ( $<5$ km) |
| Sub distt.: Bhusan Steer     |                         |                         |      |    |    |    |           |   |     |     |    |                      |            |            |        |            |            |           |            |            |
| 402967                       | Mangalpur               | N                       | N    | Y  | Y  | Y  | Y         | Y | Y   | Y   | Y  | ( $<5$ km)           | (5-10 km)  | (5-10 km)  | 759121 | 1          | 1          | 1         | (5-10 km)  | 1          |
| 402968                       | Itapa                   | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (5-10 km)            | (5-10 km)  | (5-10 km)  | 759121 | (10+ km)   | (10+ km)   | 1         | (5-10 km)  | (5-10 km)  |
| 402969                       | Narendrapur             | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (5-10 km)            | (5-10 km)  | (5-10 km)  | 759121 | 1          | 1          | 1         | ( $<5$ km) | ( $<5$ km) |
| 402970                       | Asanabania              | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (5-10 km)            | (5-10 km)  | (5-10 km)  | 759121 | ( $<5$ km) | ( $<5$ km) | 1         | (5-10 km)  | (5-10 km)  |
| 402971                       | Sibapur                 | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | 1                    | (10+ km)   | (10+ km)   | 759121 | 1          | N.A.       | 1         | (10+ km)   | (10+ km)   |
| 402972                       | Rakala                  | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (10+ km)   | (10+ km)   | 759128 | (10+ km)   | (10+ km)   | 1         | (10+ km)   | (10+ km)   |
| 402973                       | Panaghudughuda          | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (5-10 km)            | (10+ km)   | (10+ km)   | 759128 | 1          | N.A.       | (10+ km)  | (10+ km)   | (10+ km)   |
| 402974                       | Amana                   | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (10+ km)   | (10+ km)   | 759128 | 1          | N.A.       | 1         | (10+ km)   | (10+ km)   |
| 402975                       | Sanjapada               | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | 1                    | (10+ km)   | (10+ km)   | 759128 | 1          | N.A.       | 1         | (10+ km)   | (10+ km)   |
| 402976                       | Badibahal               | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km)  | (5-10 km)  | 759128 | (5-10 km)  | (5-10 km)  | 1         | (10+ km)   | (10+ km)   |
| 402977                       | Khaliberana             | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km)  | (5-10 km)  | 759128 | (5-10 km)  | (5-10 km)  | 1         | (10+ km)   | (10+ km)   |
| 402978                       | Nadeilo                 | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (5-10 km)            | (10+ km)   | ( $<5$ km) | 759128 | (10+ km)   | (10+ km)   | 1         | (10+ km)   | (10+ km)   |
| 402979                       | Bramhanapurinakot       | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (5-10 km)  | (10+ km)   | 759128 | 1          | N.A.       | 1         | (5-10 km)  | (5-10 km)  |
| 402980                       | Naraharipur             | N                       | N    | N  | Y  | Y  | N         | N | Y   | N   | N  | (10+ km)             | (10+ km)   | (10+ km)   | 759121 | (10+ km)   | (10+ km)   | (10+ km)  | (10+ km)   | (10+ km)   |
| 402981                       | Chandrasekharpur        | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)   | (10+ km)   | 759121 | ( $<5$ km) | ( $<5$ km) | 1         | (10+ km)   | (10+ km)   |
| 402982                       | Kankalu                 | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | 1                    | (10+ km)   | (10+ km)   | 759121 | 1          | N.A.       | 1         | (5-10 km)  | (5-10 km)  |
| 402983                       | Mitikapasi              | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | ( $<5$ km)           | (5-10 km)  | (10+ km)   | 759128 | (10+ km)   | (10+ km)   | (5-10 km) | (5-10 km)  | (5-10 km)  |
| 402984                       | Sarapa                  | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (5-10 km)  | (10+ km)   | 759121 | 1          | N.A.       | (5-10 km) | (5-10 km)  | (5-10 km)  |
| 402985                       | Raghunathapur           | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | (10+ km)             | (10+ km)   | (10+ km)   | 759121 | (5-10 km)  | (5-10 km)  | 1         | (5-10 km)  | (5-10 km)  |
| 402986                       | Nuagan                  | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | ( $<5$ km)           | (5-10 km)  | (5-10 km)  | 759102 | 1          | N.A.       | 1         | (10+ km)   | (10+ km)   |
| 402987                       | Mahatala                | N                       | N    | N  | Y  | Y  | N         | N | Y   | N   | N  | (10+ km)             | (10+ km)   | (10+ km)   | 759102 | (10+ km)   | (10+ km)   | 1         | (5-10 km)  | (5-10 km)  |
| 402989                       | Paikpurinakot           | N                       | Y    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | 1                    | (10+ km)   | (10+ km)   | 759121 | 1          | N.A.       | 1         | (10+ km)   | (10+ km)   |



## AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)

## EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.

| Town/<br>village<br><br>code | Town/village<br>name | DRINKING WATER FACILITY |      |    |    |    |           |   |     |     |    | COMMUNICATION SYSTEM |           |           |        |           |           |           |           |           |  |
|------------------------------|----------------------|-------------------------|------|----|----|----|-----------|---|-----|-----|----|----------------------|-----------|-----------|--------|-----------|-----------|-----------|-----------|-----------|--|
|                              |                      | TWT                     | TWUT | CW | UW | HP | TW/<br>BW | S | R/C | T/P | WO | PO                   | SPO       | P&T       | PIN    | T         | PCO       | MPC       | IC/CSC    | PCF       |  |
| 402991                       | Jhaduberani          | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759121 | (<5 km)   | (<5 km)   | 1         | (10+ km)  | (10+ km)  |  |
|                              | Sub distt.: Balimi   |                         |      |    |    |    |           |   |     |     |    |                      |           |           |        |           |           |           |           |           |  |
| 402993                       | Beruanpal            | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | (5-10 km)            | 1         | (5-10 km) | 759121 | 1         | N.A.      | 1         | (10+ km)  | (10+ km)  |  |
| 402994                       | Gandijhara           | N                       | Y    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | (5-10 km)            | (<5 km)   | (5-10 km) | 759121 | (5-10 km) | (5-10 km) | 1         | (10+ km)  | (10+ km)  |  |
| 402995                       | Galapada             | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | (5-10 km)            | (<5 km)   | (5-10 km) | 759121 | 1         | N.A.      | 1         | (10+ km)  | (10+ km)  |  |
| 402996                       | Bhanupada            | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | (5-10 km)            | (<5 km)   | (5-10 km) | 759121 | (5-10 km) | (5-10 km) | 1         | (10+ km)  | (10+ km)  |  |
| 402997                       | Chitipada            | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (<5 km)              | (<5 km)   | (<5 km)   | 759121 | (<5 km)   | (<5 km)   | 1         | (10+ km)  | (10+ km)  |  |
| 402998                       | Nimabahali           | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (5-10 km) | (<5 km)   | 759121 | 1         | N.A.      | 1         | (10+ km)  | (10+ km)  |  |
| 402999                       | Kothalu              | N                       | Y    | N  | Y  | Y  | N         | N | N   | Y   | N  | (5-10 km)            | (<5 km)   | (5-10 km) | 759121 | 1         | N.A.      | 1         | (5-10 km) | (5-10 km) |  |
| 403000                       | Jhadabandha          | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (<5 km)   | (10+ km)  | 759121 | 1         | N.A.      | 1         | (<5 km)   | (<5 km)   |  |
| 403001                       | Madhupur             | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759121 | (10+ km)  | (10+ km)  | 1         | (10+ km)  | (10+ km)  |  |
| 403002                       | Nua                  | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | Y  | (<5 km)              | (<5 km)   | (10+ km)  | 759020 | 1         | N.A.      | 1         | (10+ km)  | 1         |  |
| 403003                       | Thokar               | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | Y  | (<5 km)              | (<5 km)   | (<5 km)   | 759020 | 1         | N.A.      | 1         | (10+ km)  | (10+ km)  |  |
| 403004                       | Barasingha           | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (10+ km)  | 759020 | 1         | 1         | 1         | (5-10 km) | 1         |  |
| 403005                       | Tarkabeda            | N                       | N    | N  | Y  | Y  | N         | Y | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759121 | 1         | 1         | 1         | (5-10 km) | (5-10 km) |  |
| 403006                       | Kadala               | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759121 | 1         | N.A.      | 1         | (10+ km)  | 1         |  |
| 403007                       | Benipathara          | N                       | N    | N  | Y  | Y  | N         | Y | N   | Y   | N  | (<5 km)              | (<5 km)   | (10+ km)  | 759121 | (<5 km)   | (<5 km)   | (5-10 km) | (10+ km)  | (10+ km)  |  |
| 403008                       | Badamunda            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759121 | 1         | N.A.      | 1         | (10+ km)  | (10+ km)  |  |
| 403009                       | Kantimili            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759121 | 1         | 1         | 1         | (10+ km)  | (10+ km)  |  |
| 403010                       | Sanamunda            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759121 | 1         | 1         | 1         | (10+ km)  | (10+ km)  |  |
| 403011                       | Solanali             | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (10+ km)  | (10+ km)  | 759121 | (<5 km)   | (<5 km)   | 1         | (10+ km)  | (10+ km)  |  |
| 403012                       | Jharabeda            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (10+ km)  | (10+ km)  | 759121 | (10+ km)  | 1         | 1         | (10+ km)  | (10+ km)  |  |
| 403013                       | Nuapada              | N                       | Y    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (<5 km)   | (10+ km)  | 759121 | 1         | N.A.      | 1         | (10+ km)  | (10+ km)  |  |
| 403014                       | Patala               | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759121 | 1         | 1         | 1         | (10+ km)  | 1         |  |
| 403015                       | Bankidi              | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759121 | 1         | N.A.      | 1         | (10+ km)  | (10+ km)  |  |
| 403016                       | Panuberani           | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759121 | (10+ km)  | (10+ km)  | 1         | (10+ km)  | (10+ km)  |  |
| 403017                       | Dahanimara           | N                       | N    | N  | Y  | Y  | N         | Y | N   | Y   | N  | (<5 km)              | (10+ km)  | (10+ km)  | 759121 | (<5 km)   | (<5 km)   | 1         | (10+ km)  | (10+ km)  |  |
| 403018                       | Khalapal             | N                       | N    | N  | Y  | Y  | N         | Y | N   | Y   | N  | (<5 km)              | (10+ km)  | (10+ km)  | 759121 | (<5 km)   | (<5 km)   | 1         | (10+ km)  | (10+ km)  |  |
| 403019                       | Nagiaberani          | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759121 | (5-10 km) | (5-10 km) | 1         | (10+ km)  | (10+ km)  |  |
| 403020                       | Iswarapur            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (10+ km)  | (10+ km)  | 759121 | (<5 km)   | (<5 km)   | 1         | (10+ km)  | (10+ km)  |  |
| 403021                       | Gotiaberani          | N                       | N    | N  | Y  | Y  | N         | Y | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759121 | (<5 km)   | (<5 km)   | 1         | (10+ km)  | (10+ km)  |  |
| 403022                       | Kantamila            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759121 | (<5 km)   | (<5 km)   | 1         | (10+ km)  | (10+ km)  |  |
| 403024                       | Mahalunda            | N                       | Y    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (10+ km)  | (10+ km)  | 759121 | 1         | N.A.      | 1         | (10+ km)  | (10+ km)  |  |
| 403025                       | Bedanali             | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (<5 km)   | (10+ km)  | 759121 | (<5 km)   | (<5 km)   | 1         | (10+ km)  | (10+ km)  |  |
| 403026                       | Maguberani           | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759020 | (<5 km)   | (<5 km)   | 1         | (10+ km)  | (10+ km)  |  |
| 403027                       | Krushnachandrapur    | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (10+ km)  | 759020 | 1         | N.A.      | 1         | (10+ km)  | (10+ km)  |  |
| 403028                       | Gulehi               | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759020 | (10+ km)  | (10+ km)  | 1         | (10+ km)  | (10+ km)  |  |
| 403029                       | Dudurokot            | N                       | Y    | N  | Y  | Y  | Y         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759020 | 1         | 1         | 1         | (5-10 km) | 1         |  |
| 403030                       | Bramhanamara         | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (10+ km)  | 759020 | 1         | N.A.      | 1         | (5-10 km) | (5-10 km) |  |
| 403031                       | Kumursinga           | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | Y  | (<5 km)              | (5-10 km) | (5-10 km) | 759121 | (5-10 km) | 1         | 1         | (5-10 km) | (5-10 km) |  |
| 403032                       | Ranjagola            | N                       | Y    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (<5 km)   | (10+ km)  | 759020 | 1         | 1         | 1         | 1         | 1         |  |
| 403033                       | Asarada              | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (10+ km)  | 759020 | (10+ km)  | 1         | 1         | (5-10 km) | (5-10 km) |  |
| 403034                       | Balimi               | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | 1         | (<5 km)   | 759020 | 1         | 1         | 1         | (<5 km)   | (<5 km)   |  |

**AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)**

**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br><br>code | Town/village<br>name | DRINKING WATER FACILITY |      |    |    |    |           |   |     |     |    | COMMUNICATION SYSTEM |           |           |        |           |           |           |           |           |
|------------------------------|----------------------|-------------------------|------|----|----|----|-----------|---|-----|-----|----|----------------------|-----------|-----------|--------|-----------|-----------|-----------|-----------|-----------|
|                              |                      | TWT                     | TWUT | CW | UW | HP | TW/<br>BW | S | R/C | T/P | WO | PO                   | SPO       | P&T       | PIN    | T         | PCO       | MPC       | IC/CSC    | PCF       |
| 403035                       | Kukuta               | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (<5 km)   | (<5 km)   | 759020 | 1         | 1         | 1         | (<5 km)   | 1         |
| 403036                       | Sanahindol           | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | 1                    | (10+ km)  | (10+ km)  | 759020 | 1         | 1         | 1         | (<5 km)   | (<5 km)   |
| 403037                       | Nandapur             | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (5-10 km) | (10+ km)  | 759020 | 1         | N.A.      | 1         | (5-10 km) | (5-10 km) |
| 403038                       | Gurilo               | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759020 | (10+ km)  | (10+ km)  | 1         | (<5 km)   | (<5 km)   |
|                              | Sub distt.: Hindol   |                         |      |    |    |    |           |   |     |     |    |                      |           |           |        |           |           |           |           |           |
| 403040                       | Chhelachheli         | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (10+ km)  | 759020 | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  | (10+ km)  |
| 403041                       | Kalihundi            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (5-10 km)            | (10+ km)  | (10+ km)  | 759022 | (10+ km)  | (10+ km)  | 1         | (10+ km)  | (10+ km)  |
| 403042                       | Tutupada             | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (5-10 km)            | (10+ km)  | (10+ km)  | 759020 | (10+ km)  | (10+ km)  | 1         | (10+ km)  | (10+ km)  |
| 403043                       | Tangisal             | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (5-10 km) | (10+ km)  | 759020 | (<5 km)   | (<5 km)   | 1         | (10+ km)  | (10+ km)  |
| 403044                       | Balasar              | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (10+ km)  | (10+ km)  | 759020 | 1         | 1         | 1         | (10+ km)  | (10+ km)  |
| 403045                       | Hatura               | N                       | Y    | N  | Y  | Y  | N         | N | N   | Y   | N  | 1                    | (10+ km)  | (10+ km)  | 759020 | 1         | 1         | 1         | (10+ km)  | (10+ km)  |
| 403046                       | Jayapanga            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759020 | (<5 km)   | (<5 km)   | 1         | (10+ km)  | (10+ km)  |
| 403047                       | Hariharapur          | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759020 | 1         | N.A.      | 1         | (10+ km)  | (10+ km)  |
| 403048                       | Bangu                | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)  | (<5 km)   | 759020 | (5-10 km) | (5-10 km) | 1         | (5-10 km) | (5-10 km) |
| 403049                       | Pada                 | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759020 | 1         | N.A.      | 1         | (10+ km)  | 1         |
| 403070                       | Kalanda              | N                       | N    | N  | Y  | Y  | N         | Y | N   | Y   | N  | 1                    | (5-10 km) | (5-10 km) | 759020 | 1         | N.A.      | 1         | (10+ km)  | (10+ km)  |
| 403072                       | Keutaganthi          | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (5-10 km) | (5-10 km) | 759022 | (<5 km)   | (<5 km)   | (5-10 km) | (<5 km)   | (<5 km)   |
| 403074                       | Baghadharia          | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759020 | 1         | 1         | 1         | 1         | (10+ km)  |
|                              | Sub distt.: Rasol    |                         |      |    |    |    |           |   |     |     |    |                      |           |           |        |           |           |           |           |           |
| 403094                       | Panchupada           | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | 1                    | (<5 km)   | (10+ km)  | 759020 | 1         | N.A.      | 1         | (10+ km)  | 1         |
| 403095                       | Jarada               | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (10+ km)  | 759021 | 1         | N.A.      | 1         | (5-10 km) | (5-10 km) |
| 403096                       | Haripur              | N                       | N    | N  | Y  | Y  | N         | Y | N   | Y   | N  | (10+ km)             | (5-10 km) | (10+ km)  | 759021 | 1         | N.A.      | 1         | (10+ km)  | (10+ km)  |
| 403097                       | Badabahal            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759020 | 1         | N.A.      | 1         | (10+ km)  | (10+ km)  |
| 403098                       | Giridharprasad       | N                       | N    | N  | Y  | Y  | N         | Y | N   | Y   | N  | 1                    | (5-10 km) | (5-10 km) | 759020 | 1         | N.A.      | 1         | (5-10 km) | 1         |
| 403099                       | Karanda              | N                       | N    | N  | Y  | Y  | Y         | N | N   | Y   | N  | 1                    | (<5 km)   | (<5 km)   | 759020 | 1         | 1         | 1         | (<5 km)   | 1         |
| 403100                       | Khanditiri           | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759020 | (10+ km)  | (10+ km)  | 1         | (5-10 km) | (5-10 km) |
| 403101                       | Brahmapur            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759019 | (10+ km)  | (10+ km)  | 1         | (5-10 km) | (5-10 km) |
| 403102                       | Bedapada             | N                       | N    | N  | Y  | Y  | Y         | Y | Y   | Y   | N  | 1                    | (5-10 km) | (5-10 km) | 759019 | 1         | 1         | 1         | (5-10 km) | 1         |
| 403117                       | Bhingira             | N                       | N    | N  | Y  | Y  | N         | Y | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759020 | (5-10 km) | (5-10 km) | 1         | (5-10 km) | (5-10 km) |
| 403119                       | Basanta pokhari      | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759020 | (5-10 km) | (5-10 km) | 1         | (5-10 km) | (5-10 km) |
| 403120                       | Thenga               | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (10+ km)  | 759021 | 1         | N.A.      | 1         | (5-10 km) | (5-10 km) |
| 403122                       | Gulugundi            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759021 | (10+ km)  | (10+ km)  | 1         | (5-10 km) | (5-10 km) |
|                              | District : Anugul    |                         |      |    |    |    |           |   |     |     |    |                      |           |           |        |           |           |           |           |           |
|                              | Sub distt.: Banarpal |                         |      |    |    |    |           |   |     |     |    |                      |           |           |        |           |           |           |           |           |
| 404141                       | Tentulihata          | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759128 | 1         | N.A.      | 1         | (5-10 km) | (5-10 km) |
| 404142                       | Apartipur            | N                       | N    | N  | N  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (<5 km)   | (<5 km)   | 759128 | 1         | N.A.      | 1         | (<5 km)   | (<5 km)   |
| 404145                       | Banarpal             | N                       | Y    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | 1         | (10+ km)  | 759128 | 1         | 1         | 1         | 1         | 1         |
| 404146                       | Joragadia            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (<5 km)   | (<5 km)   | 759128 | 1         | N.A.      | 1         | (<5 km)   | (<5 km)   |
| 404147                       | Birabahanpur         | N                       | N    | N  | N  | Y  | N         | Y | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759128 | 1         | N.A.      | 1         | (5-10 km) | (5-10 km) |
| 404148                       | Badakhali            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (5-10 km)            | 1         | (5-10 km) | 759128 | 1         | N.A.      | 1         | (5-10 km) | (5-10 km) |
| 404149                       | Bhagabatpur          | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (5-10 km)            | (<5 km)   | (5-10 km) | 759128 | 1         | N.A.      | 1         | (5-10 km) | (5-10 km) |

**AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)**

**EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| Town/<br>village<br><br>code | Town/village<br>name | DRINKING WATER FACILITY |      |    |    |    |           |   |     |     |    | COMMUNICATION SYSTEM |           |           |        |          |          |          |           |           |  |
|------------------------------|----------------------|-------------------------|------|----|----|----|-----------|---|-----|-----|----|----------------------|-----------|-----------|--------|----------|----------|----------|-----------|-----------|--|
|                              |                      | TWT                     | TWUT | CW | UW | HP | TW/<br>BW | S | R/C | T/P | WO | PO                   | SPO       | P&T       | PIN    | T        | PCO      | MPC      | IC/CSC    | PCF       |  |
| 404150                       | Narendrapur          | N                       | N    | N  | N  | Y  | N         | N | N   | Y   | N  | (5-10 km)            | (5-10 km) | (5-10 km) | 759128 | 1        | N.A.     | 1        | (5-10 km) | (5-10 km) |  |
| 404151                       | Chauridiha           | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (<5 km)   | (10+ km)  | 759128 | 1        | N.A.     | 1        | (<5 km)   | (<5 km)   |  |
| 404152                       | Jhajiribahal         | N                       | Y    | N  | Y  | Y  | N         | N | N   | Y   | N  | (5-10 km)            | (5-10 km) | (5-10 km) | 759128 | 1        | N.A.     | 1        | (5-10 km) | (5-10 km) |  |
| 404153                       | Gadasantri           | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (5-10 km)            | 1         | (5-10 km) | 759128 | 1        | 1        | 1        | (5-10 km) | 1         |  |
| 404155                       | Gangijodi            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (<5 km)   | (10+ km)  | 759128 | 1        | N.A.     | 1        | (5-10 km) | (5-10 km) |  |
| 404156                       | Tulasipal            | N                       | Y    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | 1         | (<5 km)   | 759128 | 1        | 1        | 1        | (<5 km)   | 1         |  |
| 404159                       | Languliabeda         | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (<5 km)   | (<5 km)   | 759128 | 1        | N.A.     | 1        | (<5 km)   | (<5 km)   |  |
| 404160                       | Rajibpur             | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (<5 km)              | (<5 km)   | (<5 km)   | 759128 | 1        | N.A.     | 1        | (<5 km)   | (<5 km)   |  |
| 404163                       | Purkia               | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (<5 km)   | (10+ km)  | 759128 | 1        | N.A.     | 1        | (10+ km)  | (10+ km)  |  |
| 404164                       | Arahat               | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (5-10 km)            | (<5 km)   | (5-10 km) | 759128 | 1        | 1        | 1        | (5-10 km) | (5-10 km) |  |
| 404165                       | Talatali             | N                       | Y    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (5-10 km)            | (5-10 km) | (10+ km)  | 759128 | 1        | N.A.     | 1        | (10+ km)  | (10+ km)  |  |
| 404166                       | Kusuna               | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (<5 km)   | (10+ km)  | 759128 | 1        | N.A.     | 1        | (10+ km)  | (10+ km)  |  |
| 404167                       | Kalandapal           | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | 1         | (10+ km)  | 759128 | 1        | N.A.     | 1        | (10+ km)  | (10+ km)  |  |
| 404168                       | Ramimunda            | N                       | N    | N  | Y  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (<5 km)   | (10+ km)  | 759128 | 1        | N.A.     | 1        | (10+ km)  | (10+ km)  |  |
| 404170                       | Fulapada             | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | (10+ km)             | 1         | (10+ km)  | 759029 | 1        | N.A.     | 1        | (10+ km)  | 1         |  |
| 404172                       | Rankasinga           | N                       | N    | N  | Y  | Y  | N         | Y | Y   | Y   | N  | (10+ km)             | (<5 km)   | (10+ km)  | 759040 | 1        | N.A.     | 1        | (10+ km)  | (10+ km)  |  |
| 404173                       | Juharpur             | N                       | N    | N  | N  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (5-10 km) | (10+ km)  | 759040 | 1        | N.A.     | 1        | (10+ km)  | (10+ km)  |  |
| 404174                       | Similichhuin         | N                       | N    | N  | N  | Y  | N         | N | Y   | Y   | N  | (10+ km)             | (5-10 km) | (10+ km)  | 759040 | 1        | N.A.     | 1        | (10+ km)  | (10+ km)  |  |
| 404175                       | Chakuriapal          | N                       | N    | N  | N  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759040 | (10+ km) | (10+ km) | 1        | (10+ km)  | (10+ km)  |  |
| 404178                       | Kainchhabahala       | N                       | N    | N  | N  | Y  | N         | Y | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759040 | 1        | N.A.     | 1        | (10+ km)  | (10+ km)  |  |
| 404179                       | Girdhabasa           | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (<5 km)   | (10+ km)  | 759029 | 1        | N.A.     | 1        | (10+ km)  | (10+ km)  |  |
| 404180                       | Tilapanga            | N                       | N    | N  | Y  | Y  | N         | Y | N   | Y   | N  | (10+ km)             | (<5 km)   | (10+ km)  | 759029 | (10+ km) | (10+ km) | 1        | (10+ km)  | (10+ km)  |  |
| 404181                       | Talamulasasan        | N                       | N    | N  | Y  | Y  | N         | Y | N   | Y   | N  | (10+ km)             | 1         | (10+ km)  | 759040 | 1        | 1        | 1        | (10+ km)  | 1         |  |
| 404182                       | Gadatalamul          | N                       | Y    | N  | N  | Y  | N         | Y | N   | Y   | Y  | (10+ km)             | 1         | (10+ km)  | 759040 | 1        | 1        | 1        | (10+ km)  | (10+ km)  |  |
| 404183                       | Harichandabasti      | N                       | N    | N  | N  | Y  | N         | Y | N   | Y   | N  | (10+ km)             | (<5 km)   | (<5 km)   | 759040 | 1        | N.A.     | 1        | (10+ km)  | (10+ km)  |  |
| 404184                       | Talmulpatna Basti    | N                       | Y    | N  | Y  | Y  | N         | Y | N   | Y   | N  | (10+ km)             | (<5 km)   | (<5 km)   | 759040 | 1        | 1        | 1        | (10+ km)  | (10+ km)  |  |
| 404187                       | Harichandajami       | N                       | N    | N  | N  | N  | N         | N | N   | N   | N  | (10+ km)             | (<5 km)   | (10+ km)  | 759040 | (<5 km)  | (<5 km)  | (10+ km) | (10+ km)  | (10+ km)  |  |
| 404189                       | Khandanali           | N                       | N    | N  | N  | N  | N         | N | N   | N   | N  | (10+ km)             | (<5 km)   | (10+ km)  | 759128 | (<5 km)  | (<5 km)  | 1        | (10+ km)  | (10+ km)  |  |
| 404190                       | Serenabeda           | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (10+ km)  | (10+ km)  | 759022 | 1        | N.A.     | 1        | (<5 km)   | (<5 km)   |  |
| Sub distt.: Bhusan Steer     |                      |                         |      |    |    |    |           |   |     |     |    |                      |           |           |        |          |          |          |           |           |  |
| 404195                       | Talabahal            | N                       | N    | N  | N  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759128 | 1        | N.A.     | 1        | (5-10 km) | (5-10 km) |  |
| 404196                       | Ganthigadia          | N                       | N    | N  | N  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (5-10 km) | (5-10 km) | 759128 | 1        | N.A.     | 1        | (5-10 km) | (5-10 km) |  |
| Sub distt.: Anugul           |                      |                         |      |    |    |    |           |   |     |     |    |                      |           |           |        |          |          |          |           |           |  |
| 404232                       | Kankinali            | N                       | N    | N  | Y  | Y  | N         | N | N   | Y   | N  | (10+ km)             | (<5 km)   | (10+ km)  | 759128 | 1        | N.A.     | 1        | (10+ km)  | (10+ km)  |  |

**SUMMARY OF AMENITIES AVAILABLE (CENSUS 2011) IN VILLAGES WITHIN THE STUDY AREA OF EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| AMENITIES                                                                        | NOS. | AMENITIES                                         | NOS. | AMENITIES                                   | NOS. |
|----------------------------------------------------------------------------------|------|---------------------------------------------------|------|---------------------------------------------|------|
| <b>EDUCATION FACILITIES</b>                                                      |      | <b>DRINKING WATER FACILITY</b>                    |      | <b>APPROACH TO VILLAGE</b>                  |      |
| PPS (Pre-Primary School)                                                         | 8    | TWT (Tap Water-Treated)                           | 0    | NH (National Highway)                       | 27   |
| PS (Primary school)                                                              | 254  | TWUT (Tap Water Untreated)                        | 16   | SH (State Highway)                          | 17   |
| MS (Middle school)                                                               | 126  | CW (Covered Well)                                 | 1    | MDR (Major District Road)                   | 40   |
| SS (Secondary school)                                                            | 61   | UW (Uncovered Well)                               | 182  | ODR (Other District Road)                   | 83   |
| SSS (Sr. Sec. School)                                                            | 20   | HP (Hand Pump)                                    | 193  | BTPR (Black Topped (pucca) Road)            | 119  |
| DCAS (Deg. College Arts & Science only)                                          | 9    | TW/ BW (Tube Wells/Borehole)                      | 8    | GCR (Gravel (kuchha) Roads)                 | 182  |
| EC ( Engg. College)                                                              | 3    | S (Spring)                                        | 41   | WBM (Water Bounded Macadam)                 | 27   |
| MC (Medicine College)                                                            | 2    | R/C (River/Canal)                                 | 77   | AWR (All Weather Road)                      | 134  |
| MI (Management Institute)                                                        | 3    | T/P (Tank/Pond/Lake)                              | 184  | NWR/C (Navigable Waterways (River/Canal))   | 34   |
| P (Polytechnic)                                                                  | 4    | WO (Others)                                       | 9    | FP (Foot Path)                              | 195  |
| VTS/ITI (Vocational Trg School/ITI)                                              | 12   |                                                   |      |                                             |      |
| NFTC (Non Formal Training Centre)                                                | 0    | <b>COMMUNICATION SYSTEM</b>                       |      | <b>BANKS AND COMMERCIAL SOCIETIES</b>       |      |
| SFD (School For Disabled)                                                        | 0    | PO (Post Office)                                  | 29   | ATM (ATM)                                   | 1    |
| EO (Others)                                                                      | 0    | SPO (Sub Post Office)                             | 11   | CB (Commercial bank)                        | 1    |
|                                                                                  |      | P&T (Post & Telegraph office)                     | 10   | COB (Co-operative bank)                     | 2    |
| <b>MEDICAL FACILITIES</b>                                                        |      | PIN (Village PIN code)                            | 195  | ACS (Agricultural Credit Societies)         | 4    |
| CHC (Community Health Centres )                                                  | 0    | T (Telephone (landline))                          | 126  | SHG (Self-Help Group (SHG))                 | 188  |
| PHC (Primary Health Centre)                                                      | 1    | PCO (Public Call Office/ Mobile PCO)              | 41   | PDS (Public Distribution System (PDS))      | 130  |
| PHSC (Primary Health Sub-Centre)                                                 | 25   | MPC (Mobile phone coverage)                       | 184  | M/RM (Mandis/Regular Market)                | 26   |
| MCWC (Maternity And Child Welfare Centre)                                        | 10   | IC/CSC (Internet Cafes/Common Service Centre)     | 5    | WH (Weekly Haat)                            | 34   |
| TBC (TB Clinic)                                                                  | 1    | PCF (Private Courier Facility)                    | 26   | AMS (Agricultural Marketing Society)        | 15   |
| HA (Hospital Allopathic)                                                         | 4    |                                                   |      | NCICDS (Nutritional Centres-ICDS)           | 43   |
| HAM (Hospital Alternative Medicine)                                              | 2    | <b>TRANSPORT SYSTEM</b>                           |      | NCAC (Nutritional Centres-Anganwadi Centre) | 176  |
| D (Dispensary)                                                                   | 11   | PBS (Public Bus Service)                          | 35   | NCO (Nutritional Centres-Others)            | 4    |
| VH (Veterinary Hospital)                                                         | 6    | PvtBS (Private Bus Service)                       | 61   | ASHA (ASHA)                                 | 187  |
| MHC (Mobile Health Clinic)                                                       | 0    | RS (Railway station)                              | 15   | CC-TV (Community Centre with/without TV)    | 73   |
| FWC (Family Welfare Centre)                                                      | 5    | MA (Auto/Modified Autos)                          | 86   |                                             |      |
| NGMF-OP (Non Govt. Med. facilities Out Patient)                                  | 2    | Taxi (Taxi)                                       | 54   | <b>SPORTS AND ENTERTAINMENT</b>             |      |
| NGMF-IOP (Non Govt. Med. facilities In And Out Patient)                          | 0    | Van (Vans)                                        | 11   | SF (Sports Field)                           | 92   |
|                                                                                  |      |                                                   |      |                                             |      |
| NGMF-C (Non Govt. Med. facilities Charitable)                                    | 0    | T (Tractors)                                      | 93   | SC/RC (Sports Club/Recreation Centre)       | 73   |
| NGMF-MBBS (Non Govt. Med. facilities Medical Practitioner with MBBS Degree )     | 7    | CPR-Man (Cycle-pulled Rickshaws (manual driven))  | 194  | C/VH (Cinema/Video Hall)                    | 1    |
|                                                                                  |      |                                                   |      |                                             |      |
|                                                                                  |      | CPR-Mec (Cycle-pulled Rickshaws (machine driven)) | 0    | PL (Public Library)                         | 15   |
| NGMF-OD (Non Govt. Med. facilities Medical Practitioner with other Degree )      | 1    | CDA (Carts Driven by Animals)                     | 179  | PRR (Public Reading Room)                   | 15   |
| NGMF-ND (Non Govt. Med. facilities Medical Practitioner with no Degree )         | 1    | S/R/FS (Sea/River/Ferry Service)                  | 30   | DNS (Daily Newspaper Supply)                | 186  |
|                                                                                  |      |                                                   |      | APS (Assembly Polling Station)              | 145  |
|                                                                                  |      | <b>POWER SUPPLY</b>                               |      | BDRO (Birth and Death Registration Office)  | 5    |
| NGMF-TPFH (Non Govt. Med. facilities Traditional Practitioner and Faith Healer ) | 1    | PSDU (Power Supply For Domestic Use)              | 180  |                                             |      |
| NGMF-MS (Non Govt. Med. facilities Medicine Shop )                               | 74   | PSIAU (Power Supply ForAgriculture Use)           | 70   |                                             |      |
|                                                                                  |      | PSCU (Power Supply For Commercial Use)            | 0    |                                             |      |
| NGMF-O (Non Govt. Med. facilities Others)                                        | 1    | PSALL (Power Supply For All Users)                | 64   |                                             |      |

**SUMMARY OF AMENITIES AVAILABLE (CENSUS 2011) IN TOWNS WITHIN THE STUDY AREA OF EXPANSION OF DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.**

| AMENITIES                                              | NOS. | AMENITIES                                           | NOS. | AMENITIES                                | NOS. |
|--------------------------------------------------------|------|-----------------------------------------------------|------|------------------------------------------|------|
| <b>EDUCATION</b>                                       |      | Private-MS Office (Nos.)                            | 0    | <b>WATER SUPPLY AND SANITATION</b>       |      |
| Govt. Primary School (Nos.)                            | 3    | Govt.-Desk Top Publishing (Nos.))                   | 0    | Latrines-Pit (Nos.)                      | 412  |
| Private Primary School (Nos.)                          | 0    | Private-Desk Top Publishing (Nos.)                  | 0    | Latrines-Flush/Pour Flush (Nos.)         | 791  |
| Govt. Middle School (Nos.)                             | 2    | Govt.-Vocational(Others) (Nos.))                    | 0    | Latrines-Service (Nos.)                  | 0    |
| Private Middle School (Nos.)                           | 0    | Private-Vocational(Others) (Nos.)                   | 0    | Latrines-Others (Nos.)                   | 9    |
| Govt. Secondary School (Nos.)                          | 2    | Govt.-Non Formal Education (Nos.))                  | 12   | Protected Water Supply Source-1          | 0    |
| Private Secondary School (Nos.)                        | 0    | Private-Non Formal Education (Nos.)                 | 0    | Capacity Source-1 (KL)                   | 0    |
| Govt. Senior Secondary School (Nos.)                   | 0    | Govt.-Special School for Disabled (Nos.))           | 0    | Protected Water Supply Source-2          | 0    |
| Private Senior Secondary School (Nos.)                 | 0    | Private-Special School for Disabled (Nos.)          | 0    | Capacity Source-2 (KL)                   | 0    |
| Govt. Degree College-Art Only (Nos.)                   | 0    | Govt.-Others(Specify) (Nos.))                       | 0    | Protected Water Supply Source-3          | 0    |
| Private Degree College-Art Only (Nos.)                 | 0    | Private-Others(Specify) (Nos.)                      | 0    | Capacity Source-3 (KL)                   | 0    |
| Govt. Degree College-Science Only (Nos.)               | 0    | <b>MEDICAL</b>                                      |      | Protected Water Supply Source-4          | 0    |
| Private Degree College-Science Only (Nos.)             | 0    | Hospital Allopathic (Nos.)                          | 0    | Capacity Source-4 (KL)                   | 0    |
| Govt. Degree College-Commerce Only (Nos.))             | 0    | Hospital Alternative Medicine (Nos.)                | 0    | Protected Water Supply Source-5          | 0    |
| Private Degree College-Commerce Only (Nos.)            | 0    | Dispensary/Health Centre (Nos.)                     | 2    | Capacity Source-5 (KL)                   | 0    |
| Govt. Degree College-Art and Science Only (Nos.))      | 0    | Family Welfare Centre (Nos.)                        | 0    | <b>TRANSPORT</b>                         |      |
| Private Degree College-Art and Science Only (Nos.)     | 0    | Maternity and Child Welfare Centre (Nos.)           | 0    | Bus Route Road Distance (in kms.)        | 0    |
| Govt. Degree College-Art and Commerce Only (Nos.))     | 0    | Maternity Home (Nos.)                               | 0    | Pucca Road Length (in kms.)              | 8.0  |
| Private Degree College-Art and Commerce Only (Nos.)    | 0    | Maternity Home Nearest facility Distance (in kms.)  | 6    | Kutcha Road Length (in kms.)             | 10   |
| Govt. Degree College-Art,Science and Commerce (Nos.))  | 0    | T.B. Hospital/ Clinic (Nos.)                        | 0    | <b>ENTERTAINMENT AND COMMODITY</b>       |      |
| Private Degree College-Art,Science and Commerce (Nos.) | 0    | Nursing Home (Nos.)                                 | 1    | Govt.-Stadium (Nos.))                    | 0    |
| Govt. Degree College-Law (Nos.))                       | 0    | Veterinary Hospital (Nos.)                          | 0    | Private-Stadium (Nos.)                   | 0    |
| Private Degree College-Law (Nos.)                      | 0    | Mobile Health Clinic (Nos.)                         | 0    | Govt.-Cinema Theatre (Nos.))             | 0    |
| Govt. Degree College-University (Nos.))                | 0    | Others (Nos.)                                       | 0    | Private-Cinema Theatre (Nos.)            | 0    |
| Private Degree College-University (Nos.)               | 0    | Non-Government Out-Patient (Nos.)                   | 0    | Govt.-Auditorium/Community Hall (Nos.))  | 0    |
| Govt. Degree College-Others (Nos.))                    | 0    | Non-Government In and Out Patient (Nos.)            | 0    | Private-Auditorium/Community Hall (Nos.) | 0    |
| Private Degree College-Others (Nos.)                   | 0    | Non-Government Charitable-Hospital/Nursing Home (No | 0    | Govt.-Public Library (Nos.))             | 0    |
| Govt.-Medical College (Nos.))                          | 0    | Non-Government Medicine Shop (Nos.)                 | 3    | Private-Public Library (Nos.)            | 0    |
| Private-Medical College (Nos.)                         | 0    | <b>ELECTRICITY</b>                                  |      | Govt.-Public Reading Room (Nos.))        | 0    |
| Govt.-Engineering College (Nos.))                      | 0    | Electricity-Domestic Connection (Nos.)              | 648  | Private-Public Reading Room (Nos.)       | 0    |
| Private-Engineering College (Nos.)                     | 0    | Electricity-Industrial Connection (Nos.)            | 4    | Manufactured Commodity (First)           | 0    |
| Govt.-Management Institute (Nos.))                     | 0    | Electricity-Commercial Connection (Nos.)            | 25   | Manufactured Commodity (Second)          | 0    |
| Private-Management Institute (Nos.)                    | 0    | Electricity-Road Lighting Connection (Nos.)         | 10   | Manufactured Commodity (Third)           | 0    |
| Govt.-Polytechnic (Nos.))                              | 0    | Electricity-Others Connection (Nos.)                | 10   | <b>HELP HOMES</b>                        |      |
| Private-Polytechnic (Nos.)                             | 0    | <b>FINANCIAL</b>                                    |      | Govt.-Orphanage Home (Nos.))             | 0    |
| Govt.-Shorthand (Nos.))                                | 0    | Nationalised Bank (Nos.)                            | 1    | Private-Orphanage Home (Nos.)            | 0    |
| Private-Shorthand (Nos.)                               | 0    | Private Commercial Bank (Nos.)                      | 0    | Govt.-Working Women's Hostel (Nos.))     | 0    |
| Govt.-Typewriting (Nos.))                              | 0    | Co-operative Bank (Nos.)                            | 0    | Private-Working Women's Hostel (Nos.)    | 0    |
| Private-Typewriting (Nos.)                             | 0    | Agricultural Credit Society (Nos.)                  | 2    | Govt.-Old Age Home (Nos.))               | 0    |
| Govt.-Shorthand and Typewriting (Nos.))                | 0    | Non-Agricultural Credit Society (Nos.)              | 0    | Private-Old Age Home (Nos.)              | 0    |
| Private-Shorthand and Typewriting (Nos.)               | 0    | <b>FIRE FIGHTING</b>                                |      |                                          |      |
| Govt.-MS Office (Nos.))                                | 0    | Fire Fighting Service (Status A(1)/NA(2))           | 4    |                                          |      |

# ISCSST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH

|                                                |                                                           |
|------------------------------------------------|-----------------------------------------------------------|
| CO STARTING                                    | ** S-55 2x20T IF DES + 25T LRF IF-03                      |
| TITLEONE EXPANSION IN EC UPTO 3.55 MTPA        | ** S-56 1x20T IF DES IF-04                                |
| STEEL IN JHARBANDH STEEL PLANT                 | ** S-57 2x20T IF DES + 25T LRF IF-05                      |
| TITLETWO PM10 EMISSIONS FROM ALL STACKS        | ** S-58 2x20T IF DES + 45T LRF IF-06                      |
| WITH FUGITIVE EMISSION SOURCES                 | ** S-59 2x20T IF DES + 45T LRF IF-07                      |
| MODELOPT DFAULT CONC RURAL                     | ** S-60 2x20T IF DES + 45T LRF IF-08                      |
| AVERTIME 24 PERIOD                             | ** S-61 90T EAF Fume Extraction+LRF Stack EAF-06          |
| POLLUTID PM10                                  | 01                                                        |
| RUNRNORT RUN                                   | ** S-62 1100T EAF Fume Extraction+LRF Stack EAF-02        |
| TERRHGTS ELEV                                  | ** S-63 Reheating Furnace Stack RH-11                     |
| CO FINISHED                                    | ** S-72 Crushing Section                                  |
| SO STARTING                                    | ** S-73 Raw Mill / Kiln (for 2300 TPD)                    |
| ** S-01 500 TPD Kiln WHRB Stack K-1            | ** S-74 Cement Plant Mill CP-1                            |
| ** S-12 600 TPD Kiln WHRB Stack K-3            | ** S-75 Bag Filling / Packing / Product Area              |
| ** S-13 600 TPD Kiln WHRB Stack K-5            | ** S-76 Crushing Section                                  |
| ** S-14 900 TPD Kiln WHRB Stack K-6            | ** S-77 Raw Mill / Kiln (for 2600 TPD)                    |
| ** S-15 DRI K-1 to K-4 in-plant Dedusting RMHS | ** S-78 Cement Plant Mill CP-1                            |
| ** S-16 0 CDH                                  | ** S-80 125 TPH FBB FBB-01                                |
| ** S-17 0 PSB                                  | ** S-81 125 TPH FBB FBB-03                                |
| ** S-18 DRI K-5 to K-7 in-plant Dedusting RMHS | ** S-82 125 TPH FBB FBB-05                                |
| ** S-19 0 CDH                                  | ** S-83 125 TPH FBB FBB-07                                |
| ** S-20 0 PSB                                  | ** S-84 125 TPH FBB FBB-09                                |
| ** S-21 ESP-Drying & Pre-heating in Travelling | ** S-85 250 TPH FBB FBB-11                                |
| ** S-22 ESP-Drying & Pre-heating in Travelling | ** S-86 250 TPH FBB FBB-13                                |
| ** S-23 ESP-Drying & Pre-heating in Travelling | ** S-87 Power Plant Raw Material in-plant Dedusting PP-01 |
| ** S-24 ESP-Drying & Pre-heating in Travelling | ** S-88 Power Plant Raw Material in-plant Dedusting PP-02 |
| ** S-25 ESP-Drying & Pre-heating in Travelling | ** S-89 Power Plant Raw Material in-plant Dedusting PP-03 |
| ** S-26 Raw Material Handling Stack            | ** S-90 Power Plant Raw Material in-plant Dedusting PP-04 |
| ** S-27 Finished Product Handling Stack        | ** FUGITIVE                                               |
| ** S-28 ESP-Drying & Pre-heating in Travelling | ** A-1 RAW MATERIAL PALLET PLANT                          |
| ** S-29 ESP-Drying & Pre-heating in Travelling | ** A-2 RAW MATERIAL COMPLEX                               |
| ** S-30 ESP-Drying & Pre-heating in Travelling | ** A-3 RAW MATERIAL COMPLEX                               |
| ** S-31 ESP-Drying & Pre-heating in Travelling | ** A-4 SOLID WASTE MANAGEMENT                             |
| ** S-32 ESP-Drying & Pre-heating in Travelling | ** A-5 SOLID WASTE MANAGEMENT                             |
| ** S-33 ESP-Drying & Pre-heating in Travelling | ** A-6 SOLID WASTE MANAGEMENT                             |
| ** S-34 ESP-Drying & Pre-heating in Travelling | ** A-7 SOLID WASTE MANAGEMENT                             |
| ** S-35 ESP-Drying & Pre-heating in Travelling | ** A-8 SOLID WASTE MANAGEMENT                             |
| ** S-36 ESP-Drying & Pre-heating in Travelling | ** A-9 SOLID WASTE MANAGEMENT                             |
| ** S-37 ESP-Drying & Pre-heating in Travelling | ** A-10 SOLID WASTE MANAGEMENT                            |
| ** S-38 Raw Material Handling Stack            | ** A-11 SLAG DUMP MANAGEMENT                              |
| ** S-39 Finished Product Handling Stack        | ** A-12 SLAG DUMP MANAGEMENT                              |
| ** S-42 Stove Stack (to WHRB 450 cum) BF-01    | ** A-13 SLAG DUMP MANAGEMENT                              |
| ** S-43 Stock House De-dusting BF-02           | ** A-14 SLAG DUMP MANAGEMENT                              |
| ** S-44 Stove Stack (to WHRB 600 cum) BF-05    | ** A-15 RAW MATERIAL STORAGE                              |
| ** S-45 Stock House De-dusting BF-06           | ** A-16 RAW MATERIAL STORAGE                              |
| ** S-46 Sinter Plant-Main Stack (80 m2) SP-MS  | ** LOCATION OF STACKS                                     |
| ** S-47 Sinter Plant-De-Dusting SP-DD          | SO LOCATION S-01 POINT 322375 2296443 93                  |
| ** S-48 Sinter Plant-Main Stack (110 m2) SP-MS | SO LOCATION S-02 POINT 322284 2296793 85                  |
| ** S-49 Sinter Plant-De-Dusting SP-DD          | SO LOCATION S-03 POINT 322258 2296474 93                  |
| ** S-50 Coke Oven 1x250000 TPA (to WHRB stack) | SO LOCATION S-04 POINT 322455 2296843 86                  |
| SP-MS                                          | SO LOCATION S-05 POINT 322594 2296777 90                  |
| ** S-51 Coke Oven 1x400000 TPA (to WHRB stack) |                                                           |
| SP-MS                                          |                                                           |
| ** S-52 Coke Oven 6x70000 TPA (to WHRB stack)  |                                                           |
| SP-MS                                          |                                                           |
| ** S-53 2x20T IF DES + 25T LRF IF-01           |                                                           |
| ** S-54 2x20T IF DES + 25T LRF IF-02           |                                                           |

# ISCSST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH

|                  |              |          |                |
|------------------|--------------|----------|----------------|
| SO LOCATION S-06 | POINT 322591 | 22966559 | 94             |
| SO LOCATION S-07 | POINT 322396 | 22967775 | 87             |
| SO LOCATION S-08 | POINT 322313 | 22968843 | 85             |
| SO LOCATION S-09 | POINT 322557 | 22968843 | 87             |
| SO LOCATION S-10 | POINT 322726 | 22968840 | 88             |
| SO LOCATION S-11 | POINT 322260 | 2296587  | 91             |
| SO LOCATION S-12 | POINT 322571 | 2296339  | 95             |
| SO LOCATION S-13 | POINT 322718 | 2296436  | 90             |
| SO LOCATION S-14 | POINT 322871 | 2296433  | 87             |
| SO LOCATION S-15 | POINT 322473 | 2296404  | 95             |
| SO LOCATION S-16 | POINT 322748 | 2296769  | 92             |
| SO LOCATION S-17 | POINT 322645 | 22966841 | 88             |
| SO LOCATION S-18 | POINT 322818 | 2296397  | 88             |
| SO LOCATION S-19 | POINT 322946 | 2296765  | 84             |
| SO LOCATION S-20 | POINT 322947 | 2296835  | 84             |
| SO LOCATION S-21 | POINT 321762 | 2296444  | 83             |
| SO LOCATION S-22 | POINT 321871 | 2296442  | 85             |
| SO LOCATION S-23 | POINT 321979 | 2296440  | 88             |
| SO LOCATION S-24 | POINT 322083 | 2296438  | 91             |
| SO LOCATION S-25 | POINT 322188 | 2296437  | 93             |
| SO LOCATION S-26 | POINT 322084 | 2296742  | 85             |
| SO LOCATION S-27 | POINT 321739 | 2296815  | 85             |
| SO LOCATION S-28 | POINT 320504 | 2296478  | 85             |
| SO LOCATION S-29 | POINT 320671 | 2296474  | 83             |
| SO LOCATION S-30 | POINT 320837 | 22966471 | 71             |
| SO LOCATION S-31 | POINT 321003 | 2296467  | 77             |
| SO LOCATION S-32 | POINT 320503 | 2296398  | 86             |
| SO LOCATION S-33 | POINT 320669 | 2296395  | 84             |
| SO LOCATION S-34 | POINT 320832 | 2296391  | 80             |
| SO LOCATION S-35 | POINT 321002 | 2296388  | 78             |
| SO LOCATION S-36 | POINT 319885 | 2296337  | 84             |
| SO LOCATION S-37 | POINT 320143 | 2296326  | 92             |
| SO LOCATION S-38 | POINT 320082 | 2296188  | 90             |
| SO LOCATION S-39 | POINT 320367 | 2296373  | 88             |
| SO LOCATION S-40 | POINT 321962 | 2297207  | 76             |
| SO LOCATION S-43 | POINT 322092 | 2297202  | 83             |
| SO LOCATION S-44 | POINT 322096 | 2297273  | 75             |
| SO LOCATION S-45 | POINT 320093 | 2297164  | 78             |
| SO LOCATION S-46 | POINT 321977 | 2296936  | 79             |
| SO LOCATION S-47 | POINT 322078 | 2296978  | 79             |
| SO LOCATION S-48 | POINT 320134 | 2297050  | 81             |
| SO LOCATION S-49 | POINT 320132 | 2296941  | 78             |
| SO LOCATION S-50 | POINT 323259 | 2297230  | 79             |
| SO LOCATION S-51 | POINT 323137 | 2297233  | 83             |
| SO LOCATION S-52 | POINT 322976 | 2296773  | 77             |
| SO LOCATION S-53 | POINT 321970 | 2296688  | 84             |
| SO LOCATION S-54 | POINT 322698 | 2296989  | 85             |
| SO LOCATION S-55 | POINT 322772 | 2296986  | 86             |
| SO LOCATION S-56 | POINT 322845 | 2296985  | 84             |
| SO LOCATION S-57 | POINT 322919 | 2296983  | 82             |
| SO LOCATION S-58 | POINT 322992 | 2296982  | 82             |
| SO LOCATION S-59 | POINT 323066 | 2296980  | 83             |
| SO LOCATION S-60 | POINT 323140 | 2296979  | 84             |
| SO LOCATION S-61 | POINT 323281 | 2297276  | 84             |
| SO LOCATION S-62 | POINT 320391 | 2297232  | 82             |
| SO LOCATION S-63 | POINT 322489 | 2297061  | 82             |
| SO LOCATION S-72 | POINT 322802 | 2297736  | 74             |
| SO LOCATION S-73 | POINT 322994 | 2297731  | 75             |
| SO LOCATION S-74 | POINT 323264 | 2297763  | 75             |
| SO LOCATION S-75 | POINT 323536 | 2297763  | 78             |
| SO LOCATION S-76 | POINT 322798 | 2297505  | 77             |
| SO LOCATION S-77 | POINT 322990 | 2297495  | 76             |
| SO LOCATION S-78 | POINT 323259 | 2297495  | 77             |
| SO LOCATION S-80 | POINT 323038 | 2296464  | 88             |
| SO LOCATION S-81 | POINT 323124 | 2296462  | 92             |
| SO LOCATION S-82 | POINT 323210 | 2296461  | 94             |
| SO LOCATION S-83 | POINT 323285 | 2296455  | 96             |
| SO LOCATION S-84 | POINT 323092 | 2296820  | 84             |
| SO LOCATION S-85 | POINT 323174 | 2296819  | 86             |
| SO LOCATION S-86 | POINT 323257 | 2296817  | 89             |
| SO LOCATION S-87 | POINT 323222 | 2296708  | 87             |
| SO LOCATION S-88 | POINT 323159 | 2296623  | 81             |
| SO LOCATION S-89 | POINT 322403 | 2296574  | 93             |
| SO LOCATION S-90 | POINT 322638 | 2296570  | 93             |
| SO LOCATION A-1  | AREA 321967  | 2296590  | 85             |
| SO LOCATION A-2  | AREA 320382  | 2296039  | 90             |
| SO LOCATION A-3  | AREA 319338  | 2296060  | 81             |
| SO LOCATION A-4  | AREA 320503  | 2295898  | 88             |
| SO LOCATION A-5  | AREA 320539  | 2295797  | 85             |
| SO LOCATION A-6  | AREA 320594  | 2295749  | 85             |
| SO LOCATION A-7  | AREA 320654  | 2295698  | 84             |
| SO LOCATION A-8  | AREA 320729  | 2295639  | 84             |
| SO LOCATION A-9  | AREA 320886  | 2295838  | 80             |
| SO LOCATION A-10 | AREA 320956  | 2295928  | 81             |
| SO LOCATION A-11 | AREA 321173  | 2297818  | 74             |
| SO LOCATION A-12 | AREA 321089  | 2297611  | 76             |
| SO LOCATION A-13 | AREA 321035  | 2297488  | 78             |
| SO LOCATION A-14 | AREA 321504  | 2297686  | 72             |
| SO LOCATION A-15 | AREA 322328  | 2296026  | 96             |
| SO LOCATION A-16 | AREA 322964  | 2296097  | 97             |
| SO SRCPARAM S-01 | 0.78125      | 80       | 423 18.13 2.75 |
| SO SRCPARAM S-12 | 0.90625      | 80       | 423 17.67 3    |
| SO SRCPARAM S-13 | 0.453125     | 80       | 423 8.83 3     |
| SO SRCPARAM S-14 | 1            | 80       | 423 19.49 3    |
| SO SRCPARAM S-15 | 0.375        | 35       | 323 12.56 2    |
| SO SRCPARAM S-16 | 0.203125     | 30       | 373 9.7 1.8    |
| SO SRCPARAM S-17 | 0.375        | 35       | 323 12.56 2    |
| SO SRCPARAM S-18 | 0.453125     | 35       | 323 12.54 2.2  |
| SO SRCPARAM S-19 | 0.25         | 30       | 373 9.67 2     |
| SO SRCPARAM S-20 | 0.453125     | 35       | 323 12.54 2.2  |
| SO SRCPARAM S-21 | 2.9375       | 90       | 440 12.69 6.5  |
| SO SRCPARAM S-22 | 2.9375       | 90       | 440 12.69 6.5  |
| SO SRCPARAM S-23 | 2.9375       | 90       | 440 12.69 6.5  |
| SO SRCPARAM S-24 | 2.9375       | 90       | 440 12.69 6.5  |
| SO SRCPARAM S-25 | 2.9375       | 90       | 440 12.69 6.5  |
| SO SRCPARAM S-26 | 0.28125      | 30       | 373 13.43 1.8  |
| SO SRCPARAM S-27 | 0.28125      | 30       | 373 13.43 1.8  |
| SO SRCPARAM S-28 | 1.355887     | 60       | 440 15.47 4    |
| SO SRCPARAM S-29 | 1.355887     | 60       | 440 15.47 4    |
| SO SRCPARAM S-30 | 1.355887     | 60       | 440 15.47 4    |
| SO SRCPARAM S-31 | 1.355887     | 60       | 440 15.47 4    |
| SO SRCPARAM S-32 | 1.355887     | 60       | 440 15.47 4    |

**ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH**

|                  |                      |      |                  |                      |                      |                  |                      |                      |                  |                      |                      |    |
|------------------|----------------------|------|------------------|----------------------|----------------------|------------------|----------------------|----------------------|------------------|----------------------|----------------------|----|
| SO SRCPARAM S-33 | 1.355887             | 60   | 440              | 15.47                | 4                    | SO SRCPARAM A-5  | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-5  | 2.71493664533829E-10 | 1                    |    |
| SO SRCPARAM S-34 | 1.355887             | 60   | 440              | 15.47                | 4                    | 109.6407         | 194.1483             | 0                    | 4                | DISCCART 322807      | 2298978              | 74 |
| SO SRCPARAM S-35 | 1.355887             | 60   | 440              | 15.47                | 4                    | SO SRCPARAM A-6  | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-6  | 2.71493664533829E-10 | 1                    |    |
| SO SRCPARAM S-36 | 1.355887             | 60   | 440              | 15.47                | 4                    | 57.3047          | 45.1073              | 0                    | 4                | DISCCART 322813      | 2299531              | 67 |
| SO SRCPARAM S-37 | 1.355887             | 60   | 440              | 15.47                | 4                    | SO SRCPARAM A-7  | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-7  | 2.71493664533829E-10 | 1                    |    |
| SO SRCPARAM S-38 | 0.13125              | 30   | 373              | 6.27                 | 1.8                  | 216.9145         | 287.2999             | 137                  | 4                | DISCCART 322830      | 2300192              | 76 |
| SO SRCPARAM S-39 | 0.046875             | 30   | 373              | 2.24                 | 1.8                  | SO SRCPARAM A-8  | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-8  | 2.71493664533829E-10 | 1                    |    |
| SO SRCPARAM S-40 | 0.4375               | 30   | 423              | 13.54                | 1.8                  | 112.4453         | 55.9388              | 0                    | 4                | DISCCART 322842      | 2302299              | 70 |
| SO SRCPARAM S-41 | 0.290625             | 47   | 313              | 11.65                | 1.8                  | SO SRCPARAM A-9  | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-9  | 2.71493664533829E-10 | 1                    |    |
| SO SRCPARAM S-42 | 0.25                 | 30   | 423              | 13.54                | 1.8                  | 65.8719          | 151.6386             | 0                    | 4                | DISCCART 322901      | 2307834              | 60 |
| SO SRCPARAM S-43 | 0.290625             | 47   | 313              | 13.66                | 2.2                  | SO SRCPARAM A-10 | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-10 | 2.71493664533829E-10 | 1                    |    |
| SO SRCPARAM S-44 | 0.4375               | 30   | 423              | 15.86                | 2.2                  | 38.8078          | 65.2744              | 0                    | 4                | DISCCART 323063      | 2298803              | 67 |
| SO SRCPARAM S-45 | 0.509375             | 47   | 313              | 13.66                | 2.2                  | SO SRCPARAM A-11 | 4.75113912934201E-10 | 1                    | SO SRCPARAM A-11 | 4.75113912934201E-10 | 1                    |    |
| SO SRCPARAM S-46 | 2.703125             | 55   | 423              | 18.97                | 5                    | 237.41           | 74.7882              | 0                    | 4                | DISCCART 324076      | 2299817              | 58 |
| SO SRCPARAM S-47 | 0.5                  | 45   | 313              | 16.23                | 2                    | SO SRCPARAM A-12 | 4.75113912934201E-10 | 1                    | SO SRCPARAM A-12 | 4.75113912934201E-10 | 1                    |    |
| SO SRCPARAM S-48 | 3.7                  | 80   | 423              | 15.36                | 6.5                  | 390.3435         | 198.3284             | 0                    | 4                | DISCCART 324289      | 2300335              | 65 |
| SO SRCPARAM S-49 | 0.853125             | 55   | 313              | 17.72                | 2.5                  | SO SRCPARAM A-13 | 4.75113912934201E-10 | 1                    | SO SRCPARAM A-13 | 4.75113912934201E-10 | 1                    |    |
| SO SRCPARAM S-50 | 0.546875             | 85   | 493              | 17.89                | 2.5                  | 44.2434          | 216.0915             | 0                    | 4                | DISCCART 324503      | 2300842              | 61 |
| SO SRCPARAM S-51 | 0.90625              | 100  | 493              | 18.1                 | 3.2                  | SO SRCPARAM A-14 | 4.75113912934201E-10 | 1                    | SO SRCPARAM A-14 | 4.75113912934201E-10 | 1                    |    |
| SO SRCPARAM S-52 | 0.90625              | 100  | 493              | 18.1                 | 3.2                  | 44.5043          | 76.2365              | 0                    | 4                | DISCCART 324930      | 2301856              | 58 |
| SO SRCPARAM S-53 | 0.28125              | 30.5 | 373              | 10.88                | 2                    | 637.068          | 202.9619             | 0                    | 4                | DISCCART 325784      | 2303896              | 57 |
| SO SRCPARAM S-54 | 0.28125              | 30.5 | 373              | 10.88                | 2                    | SO SRCPARAM A-15 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-15 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-55 | 0.28125              | 30.5 | 373              | 10.88                | 2                    | SO SRCPARAM A-16 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-16 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-56 | 0.28125              | 30.5 | 373              | 13.43                | 1.8                  | 82.5805          | 126.813              | 0                    | 4                | DISCCART 325909      | 2299864              | 72 |
| SO SRCPARAM S-57 | 0.28125              | 30.5 | 373              | 10.88                | 2                    | SO SRCPARAM A-17 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-17 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-58 | 0.28125              | 30.5 | 373              | 10.88                | 2                    | SO SRCPARAM A-18 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-18 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-59 | 0.28125              | 30.5 | 373              | 10.88                | 2                    | SO SRCPARAM A-19 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-19 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-60 | 0.28125              | 30.5 | 373              | 10.88                | 2                    | SO SRCPARAM A-20 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-20 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-61 | 1.959375             | 60   | 403              | 20.47                | 4                    | SO SRCPARAM A-21 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-21 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-62 | 2.39375              | 70   | 403              | 16.01                | 5                    | SO SRCPARAM A-22 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-22 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-63 | 0.289688             | 60   | 638              | 8.52                 | 3                    | SO SRCPARAM A-23 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-23 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-64 | 0.490625             | 30   | 318              | 17                   | 2                    | SO SRCPARAM A-24 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-24 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-65 | 2.2                  | 80   | 393              | 20                   | 4                    | SO SRCPARAM A-25 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-25 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-66 | 2.96875              | 60   | 336              | 21                   | 4                    | SO SRCPARAM A-26 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-26 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-67 | 0.09375              | 35   | 351              | 16                   | 1                    | SO SRCPARAM A-27 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-27 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-68 | 0.41875              | 30   | 318              | 17                   | 2                    | SO SRCPARAM A-28 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-28 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-69 | 1.875                | 80   | 393              | 20                   | 4                    | SO SRCPARAM A-29 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-29 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-70 | 2.528125             | 60   | 336              | 21                   | 4                    | SO SRCPARAM A-30 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-30 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-71 | 0.710938             | 90   | 423              | 17.11                | 2.7                  | SO SRCPARAM A-31 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-31 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-72 | 0.710938             | 90   | 423              | 17.11                | 2.7                  | SO SRCPARAM A-32 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-32 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-73 | 0.710938             | 90   | 423              | 17.11                | 2.7                  | SO SRCPARAM A-33 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-33 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-74 | 0.710938             | 90   | 423              | 17.11                | 2.7                  | SO SRCPARAM A-34 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-34 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-75 | 0.710938             | 90   | 423              | 17.11                | 2.7                  | SO SRCPARAM A-35 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-35 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-76 | 0.710938             | 90   | 423              | 17.11                | 2.7                  | SO SRCPARAM A-36 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-36 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-77 | 1.875                | 80   | 393              | 20                   | 4                    | SO SRCPARAM A-37 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-37 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-78 | 2.528125             | 60   | 336              | 21                   | 4                    | SO SRCPARAM A-38 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-38 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-79 | 0.710938             | 90   | 423              | 17.11                | 2.7                  | SO SRCPARAM A-39 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-39 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-80 | 0.710938             | 90   | 423              | 17.11                | 2.7                  | SO SRCPARAM A-40 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-40 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-81 | 0.710938             | 90   | 423              | 17.11                | 2.7                  | SO SRCPARAM A-41 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-41 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-82 | 0.710938             | 90   | 423              | 17.11                | 2.7                  | SO SRCPARAM A-42 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-42 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-83 | 0.710938             | 90   | 423              | 17.11                | 2.7                  | SO SRCPARAM A-43 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-43 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-84 | 0.710938             | 90   | 423              | 17.11                | 2.7                  | SO SRCPARAM A-44 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-44 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-85 | 1.421875             | 110  | 423              | 17.28                | 3.8                  | SO SRCPARAM A-45 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-45 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-86 | 0.710938             | 110  | 423              | 17.11                | 2.7                  | SO SRCPARAM A-46 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-46 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-87 | 0.421875             | 45   | 323              | 9.04                 | 2.5                  | SO SRCPARAM A-47 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-47 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-88 | 0.421875             | 45   | 323              | 9.04                 | 2.5                  | SO SRCPARAM A-48 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-48 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-89 | 0.421875             | 45   | 323              | 9.04                 | 2.5                  | SO SRCPARAM A-49 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-49 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM S-90 | 0.421875             | 45   | 323              | 9.04                 | 2.5                  | SO SRCPARAM A-50 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-50 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM A-1  | 9.85153399327559E-10 | 1    | SO SRCPARAM A-1  | 9.85153399327559E-10 | 1                    | SO SRCPARAM A-51 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-51 | 4.92576699663779E-10 | 1                    |    |
| 181.011          | 168.4097             | 126  | 4                | SO SRCPARAM A-2      | 9.85153399327559E-10 | 1                | SO SRCPARAM A-52     | 4.92576699663779E-10 | 1                | SO SRCPARAM A-52     | 4.92576699663779E-10 | 1  |
| SO SRCPARAM A-2  | 9.85153399327559E-10 | 1    | SO SRCPARAM A-3  | 9.85153399327559E-10 | 1                    | SO SRCPARAM A-53 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-53 | 4.92576699663779E-10 | 1                    |    |
| 625.6192         | 280.2479             | 0    | 4                | SO SRCPARAM A-4      | 9.85153399327559E-10 | 1                | SO SRCPARAM A-54     | 4.92576699663779E-10 | 1                | SO SRCPARAM A-54     | 4.92576699663779E-10 | 1  |
| SO SRCPARAM A-3  | 9.85153399327559E-10 | 1    | SO SRCPARAM A-5  | 9.85153399327559E-10 | 1                    | SO SRCPARAM A-55 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-55 | 4.92576699663779E-10 | 1                    |    |
| 668.0226         | 280.2479             | 0    | 4                | SO SRCPARAM A-6      | 9.85153399327559E-10 | 1                | SO SRCPARAM A-56     | 4.92576699663779E-10 | 1                | SO SRCPARAM A-56     | 4.92576699663779E-10 | 1  |
| SO SRCPARAM A-4  | 2.71493664533829E-10 | 1    | SO SRCPARAM A-7  | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-57 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-57 | 4.92576699663779E-10 | 1                    |    |
| 34.895           | 98.703               | 0    | 4                | SO SRCPARAM A-8      | 2.71493664533829E-10 | 1                | SO SRCPARAM A-58     | 4.92576699663779E-10 | 1                | SO SRCPARAM A-58     | 4.92576699663779E-10 | 1  |
| SO SRCPARAM A-5  | 2.71493664533829E-10 | 1    | SO SRCPARAM A-9  | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-59 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-59 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM A-6  | 2.71493664533829E-10 | 1    | SO SRCPARAM A-10 | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-60 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-60 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM A-7  | 2.71493664533829E-10 | 1    | SO SRCPARAM A-11 | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-61 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-61 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM A-8  | 2.71493664533829E-10 | 1    | SO SRCPARAM A-12 | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-62 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-62 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM A-9  | 2.71493664533829E-10 | 1    | SO SRCPARAM A-13 | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-63 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-63 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM A-10 | 2.71493664533829E-10 | 1    | SO SRCPARAM A-14 | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-64 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-64 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM A-11 | 2.71493664533829E-10 | 1    | SO SRCPARAM A-15 | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-65 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-65 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM A-12 | 2.71493664533829E-10 | 1    | SO SRCPARAM A-16 | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-66 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-66 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM A-13 | 2.71493664533829E-10 | 1    | SO SRCPARAM A-17 | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-67 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-67 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM A-14 | 2.71493664533829E-10 | 1    | SO SRCPARAM A-18 | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-68 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-68 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM A-15 | 2.71493664533829E-10 | 1    | SO SRCPARAM A-19 | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-69 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-69 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM A-16 | 2.71493664533829E-10 | 1    | SO SRCPARAM A-20 | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-70 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-70 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM A-17 | 2.71493664533829E-10 | 1    | SO SRCPARAM A-21 | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-71 | 4.92576699663779E-10 | 1                    | SO SRCPARAM A-71 | 4.92576699663779E-10 | 1                    |    |
| SO SRCPARAM A-18 | 2.71493664533829E-10 | 1    | SO SRCPARAM A-22 | 2.71493664533829E-10 | 1                    | SO SRCPARAM A-72 | 4.92576699663779E-1  |                      |                  |                      |                      |    |

ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH

DISCCART 320275 2297853 68 DISCCART 327125 2296902 95  
DISCCART 319767 2298069 71 DISCCART 322586 2303927 72  
DISCCART 319270 2298285 70 DISCCART 325628 2291636 118  
DISCCART 318762 2298500 68 DISCCART 324283 2299557 74  
DISCCART 317756 2298943 80 DISCCART 321688 2294449 98  
DISCCART 315746 2299806 96 DISCCART 319933 2295352 94  
DISCCART 312730 2301113 95 DISCCART 320660 2297853 77  
DISCCART 321640 2297949 71 RE FINISHED  
DISCCART 321259 2298352 66 ME STARTING  
DISCCART 320868 2298744 66 INPUTFIL ORI\JB\OCT2020\DK19S.MET  
DISCCART 320487 2299135 65 ANEMHGT 5.0  
DISCCART 320106 2299538 78 SURFDATA 99999 2019 XXX  
DISCCART 319725 2299929 81 UAIRDATA 99999 2019 XXX  
DISCCART 318963 2300724 90 WDROTATE 180  
DISCCART 317429 2302302 78 ME FINISHED  
DISCCART 315143 2304674 86 OU STARTING  
DISCCART 322175 2298309 76 OU RECTABLE 24 FIRST  
DISCCART 321972 2298820 68 OU MAXTABLE 24 50  
DISCCART 321769 2299332 61 OU PLOTFILE 24 ALL FIRST ORI\JB\OCT2020\JB-  
DISCCART 321567 2299843 70 PM10.PLT  
DISCCART 321354 2300366 70 OU FINISHED  
DISCCART 321151 2300877 75  
DISCCART 320745 2301900 71 \*\*\*\*\*  
DISCCART 319934 2303957 69 \*\*\* SETUP Finishes Successfully \*\*\*  
DISCCART 318708 2307038 78 \*\*\*\*\*  
\*\* AT AAQ  
DISCCART 321119 2297297 75

\*\*\* ISCT3 - VERSION 95250 \*\*\* \*\*\* EXPANSION IN EC UPTO 3.55 MTPA STEEL IN JHARBANDH STEEL PLANT \*\*\* 10/20/20  
\*\*\* PM10 EMISSIONS FROM ALL STACKS WITH FUGITIVE EMISSION SOURCES \*\*\* 10:42:02  
\*\*MODELOPTs: CONC RURAL ELEV DEFAULT

\*\*\* MODEL SETUP OPTIONS SUMMARY \*\*\*  
-----

\*\*Intermediate Terrain Processing is Selected

\*\*Model Is Setup For Calculation of Average CONCentration Values.

-- SCAVENGING/DEPOSITION LOGIC --

\*\*Model Uses NO DRY DEPLETION. DDPLETE = F

\*\*Model Uses NO WET DEPLETION. WDPLETE = F

\*\*NO WET SCAVENGING Data Provided.

\*\*Model Does NOT Use GRIDDED TERRAIN Data for Depletion Calculations

\*\*Model Uses RURAL Dispersion.

\*\*Model Uses Regulatory DEFAULT Options:

1. Final Plume Rise.
2. Stack-tip Downwash.
3. Buoyancy-induced Dispersion.
4. Use Calms Processing Routine.
5. Not Use Missing Data Processing Routine.
6. Default Wind Profile Exponents.
7. Default Vertical Potential Temperature Gradients.
8. "Upper Bound" Values for Supersquat Buildings.

ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH

9. No Exponential Decay for RURAL Mode

\*\*Model Accepts Receptors on ELEV Terrain.

\*\*Model Assumes No FLAGPOLE Receptor Heights.

\*\*Model Calculates 1 Short Term Average(s) of: 24-HR  
and Calculates PERIOD Averages

\*\*This Run Includes: 95 Source(s); 1 Source Group(s); and 172 Receptor(s)

\*\*The Model Assumes A Pollutant Type of: PM10

\*\*Model Set To Continue RUNNING After the Setup Testing.

\*\*Output Options Selected:

Model Outputs Tables of PERIOD Averages by Receptor

Model Outputs Tables of Highest Short Term Values by Receptor (RECTABLE Keyword)

Model Outputs Tables of Overall Maximum Short Term Values (MAXTABLE Keyword)

Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)

\*\*NOTE: The Following Flags May Appear Following CONC Values: c for Calm Hours  
m for Missing Hours  
b for Both Calm and Missing Hours

\*\*Misc. Inputs: Anem. Hgt. (m) = 5.00 ; Decay Coef. = .0000 ; Rot. Angle = 180.0  
Emission Units = GRAMS/SEC ; Emission Rate Unit Factor = .10000E+07  
Output Units = MICROGRAMS/M\*\*3

\*\*Input Runstream File: ORI\JB\OCT2020\JB-PM10.INP ; \*\*Output Print File: ORI\JB\OCT2020\JB-  
PM10.OUT

\*\*\* POINT SOURCE DATA \*\*\*

| SOURCE PART. | NO. | EMISSION RATE |          |          |          | BASE STACK |         |    |    | STACK     | STACK      | EXIT VEL.  | DIA.    | BUILDING |
|--------------|-----|---------------|----------|----------|----------|------------|---------|----|----|-----------|------------|------------|---------|----------|
|              |     | ID            | CATS.    | PM10     | PM2.5    | SO2        | NO2     | X  | Y  | ELEV. (M) | HEIGHT (M) | TEMP. (°K) | (M/SEC) | EXISTS   |
| S-01         | 0   | 7.81E-01      | 4.49E-01 | 1.95E+01 | 7.31E-02 | 322375     | 2296443 | 93 | 80 | 423       | 18.13      | 2.75NO     |         |          |
| S-12         | 0   | 9.06E-01      | 5.21E-01 | 2.34E+01 | 4.39E-02 | 322571     | 2296439 | 95 | 80 | 423       | 17.67      | 3NO        |         |          |
| S-13         | 0   | 4.53E-01      | 2.61E-01 | 1.17E+01 | 4.39E-02 | 322718     | 2296436 | 90 | 80 | 423       | 8.83       | 3NO        |         |          |
| S-14         | 0   | 1.00E+00      | 5.75E-01 | 3.52E+01 | 1.32E-01 | 322871     | 2296433 | 87 | 80 | 423       | 19.49      | 3NO        |         |          |
| S-15         | 0   | 3.75E-01      | 2.16E-01 | 0.00E+00 | 0.00E+00 | 322473     | 2296404 | 95 | 35 | 323       | 12.56      | 2NO        |         |          |
| S-16         | 0   | 2.03E-01      | 1.17E-01 | 0.00E+00 | 0.00E+00 | 322748     | 2296769 | 92 | 30 | 373       | 9.7        | 1.8NO      |         |          |
| S-17         | 0   | 3.75E-01      | 2.16E-01 | 0.00E+00 | 0.00E+00 | 322645     | 2296841 | 88 | 35 | 323       | 12.56      | 2NO        |         |          |
| S-18         | 0   | 4.53E-01      | 2.61E-01 | 0.00E+00 | 0.00E+00 | 322818     | 2296397 | 88 | 35 | 323       | 12.54      | 2.2NO      |         |          |
| S-19         | 0   | 2.50E-01      | 1.44E-01 | 0.00E+00 | 0.00E+00 | 322946     | 2296765 | 84 | 30 | 373       | 9.67       | 2NO        |         |          |
| S-20         | 0   | 4.53E-01      | 2.61E-01 | 0.00E+00 | 0.00E+00 | 322947     | 2296835 | 84 | 35 | 323       | 12.54      | 2.2NO      |         |          |
| S-21         | 0   | 2.94E+00      | 1.69E+00 | 6.88E-01 | 2.32E-02 | 321871     | 2296444 | 83 | 90 | 440       | 12.69      | 6.5NO      |         |          |
| S-22         | 0   | 2.94E+00      | 1.69E+00 | 6.88E-01 | 2.32E-02 | 321871     | 2296442 | 85 | 90 | 440       | 12.69      | 6.5NO      |         |          |
| S-23         | 0   | 2.94E+00      | 1.69E+00 | 6.88E-01 | 2.32E-02 | 321979     | 2296440 | 88 | 90 | 440       | 12.69      | 6.5NO      |         |          |
| S-24         | 0   | 2.94E+00      | 1.69E+00 | 6.88E-01 | 2.32E-02 | 322088     | 2296438 | 91 | 90 | 440       | 12.69      | 6.5NO      |         |          |
| S-25         | 0   | 2.94E+00      | 1.69E+00 | 6.88E-01 | 2.32E-02 | 322183     | 2296437 | 93 | 90 | 440       | 12.69      | 6.5NO      |         |          |
| S-26         | 0   | 2.81E-01      | 1.62E-01 | 0.00E+00 | 0.00E+00 | 322084     | 2296742 | 85 | 30 | 373       | 13.43      | 1.8NO      |         |          |
| S-27         | 0   | 2.81E-01      | 1.62E-01 | 0.00E+00 | 0.00E+00 | 321739     | 2296815 | 85 | 30 | 373       | 13.43      | 1.8NO      |         |          |
| S-28         | 0   | 1.36E+00      | 7.80E-01 | 1.84E-01 | 6.19E-03 | 320504     | 2296478 | 85 | 60 | 440       | 15.47      | 4NO        |         |          |
| S-29         | 0   | 1.36E+00      | 7.80E-01 | 1.84E-01 | 6.19E-03 | 320671     | 2296474 | 83 | 60 | 440       | 15.47      | 4NO        |         |          |
| S-30         | 0   | 1.36E+00      | 7.80E-01 | 1.84E-01 | 6.19E-03 | 320837     | 2296471 | 80 | 60 | 440       | 15.47      | 4NO        |         |          |



ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH

| NO.  | SOURCE PART. | EMISSION RATE |          |          |          | BASE STACK |         |        |       | STACK | STACK | BUILDING |       |       |       |        |
|------|--------------|---------------|----------|----------|----------|------------|---------|--------|-------|-------|-------|----------|-------|-------|-------|--------|
|      |              | PM2.5         | SO2      | NO2      | X        | Y          | ELEV.   | HEIGHT | TEMP. |       |       |          | EXIT  | VEL.  | DIA.  | EXISTS |
| ID   | CATS.        | PM10          | PM2.5    | SEC      | NO2      | (M)        | (M)     | (M)    | (M)   | (M)   | (M)   | (M)      | (M)   | (M)   | (M)   | (M)    |
| S-31 | 0            | 1.36E+00      | 7.80E-01 | 1.84E-01 | 6.19E-03 | 321003     | 2296467 | 77     | 60    | 440   | 15.47 | 4NO      | 4NO   | 4NO   | 4NO   | 4NO    |
| S-32 | 0            | 1.36E+00      | 7.80E-01 | 1.84E-01 | 6.19E-03 | 320503     | 2296398 | 86     | 60    | 440   | 15.47 | 4NO      | 4NO   | 4NO   | 4NO   | 4NO    |
| S-33 | 0            | 1.36E+00      | 7.80E-01 | 1.84E-01 | 6.19E-03 | 320689     | 2296395 | 84     | 60    | 440   | 15.47 | 4NO      | 4NO   | 4NO   | 4NO   | 4NO    |
| S-34 | 0            | 1.36E+00      | 7.80E-01 | 1.84E-01 | 6.19E-03 | 320835     | 2296391 | 80     | 60    | 440   | 15.47 | 4NO      | 4NO   | 4NO   | 4NO   | 4NO    |
| S-35 | 0            | 1.36E+00      | 7.80E-01 | 1.84E-01 | 6.19E-03 | 321002     | 2296388 | 78     | 60    | 440   | 15.47 | 4NO      | 4NO   | 4NO   | 4NO   | 4NO    |
| S-36 | 0            | 1.36E+00      | 7.80E-01 | 1.84E-01 | 6.19E-03 | 319885     | 2296337 | 84     | 60    | 440   | 15.47 | 4NO      | 4NO   | 4NO   | 4NO   | 4NO    |
| S-37 | 0            | 1.36E+00      | 7.80E-01 | 1.84E-01 | 6.19E-03 | 320143     | 2296326 | 92     | 60    | 440   | 15.47 | 4NO      | 4NO   | 4NO   | 4NO   | 4NO    |
| S-38 | 0            | 1.31E-01      | 7.55E-02 | 0.00E+00 | 0.00E+00 | 320082     | 2296188 | 90     | 30    | 373   | 6.27  | 1.8NO    | 1.8NO | 1.8NO | 1.8NO | 1.8NO  |
| S-39 | 0            | 4.69E-02      | 2.70E-02 | 0.00E+00 | 0.00E+00 | 320367     | 2296373 | 88     | 30    | 373   | 2.24  | 1.8NO    | 1.8NO | 1.8NO | 1.8NO | 1.8NO  |
| S-42 | 0            | 2.50E-01      | 1.44E-01 | 4.44E+00 | 3.33E+00 | 321962     | 2297207 | 76     | 30    | 423   | 13.54 | 1.8NO    | 1.8NO | 1.8NO | 1.8NO | 1.8NO  |
| S-43 | 0            | 2.91E-01      | 1.67E-01 | 0.00E+00 | 0.00E+00 | 322189     | 2297202 | 83     | 47    | 313   | 11.65 | 1.8NO    | 1.8NO | 1.8NO | 1.8NO | 1.8NO  |
| S-44 | 0            | 4.38E-01      | 2.52E-01 | 7.78E+00 | 5.83E+00 | 320093     | 2297273 | 75     | 30    | 423   | 15.86 | 2.2NO    | 2.2NO | 2.2NO | 2.2NO | 2.2NO  |
| S-45 | 0            | 5.09E-01      | 2.93E-01 | 0.00E+00 | 0.00E+00 | 320093     | 2297164 | 78     | 47    | 313   | 13.66 | 2.2NO    | 2.2NO | 2.2NO | 2.2NO | 2.2NO  |
| S-46 | 0            | 2.70E+00      | 1.55E+00 | 1.20E+01 | 5.45E-02 | 321937     | 2296936 | 79     | 55    | 423   | 18.97 | 5NO      | 5NO   | 5NO   | 5NO   | 5NO    |
| S-47 | 0            | 5.00E-01      | 2.88E-01 | 0.00E+00 | 0.00E+00 | 322078     | 2296978 | 79     | 45    | 313   | 16.23 | 2NO      | 2NO   | 2NO   | 2NO   | 2NO    |
| S-48 | 0            | 3.70E+00      | 2.13E+00 | 1.03E+01 | 3.90E-02 | 320134     | 2297050 | 81     | 80    | 423   | 15.36 | 6.5NO    | 6.5NO | 6.5NO | 6.5NO | 6.5NO  |
| S-49 | 0            | 8.53E-01      | 4.91E-01 | 0.00E+00 | 0.00E+00 | 320132     | 2296941 | 78     | 55    | 313   | 17.72 | 2.5NO    | 2.5NO | 2.5NO | 2.5NO | 2.5NO  |
| S-50 | 0            | 5.47E-01      | 3.14E-01 | 1.35E+00 | 1.21E-03 | 323259     | 2297230 | 79     | 85    | 493   | 17.89 | 2.5NO    | 2.5NO | 2.5NO | 2.5NO | 2.5NO  |
| S-51 | 0            | 9.06E-01      | 5.21E-01 | 2.27E+00 | 2.03E-03 | 323137     | 2297233 | 83     | 100   | 493   | 18.1  | 3.2NO    | 3.2NO | 3.2NO | 3.2NO | 3.2NO  |
| S-52 | 0            | 9.06E-01      | 5.21E-01 | 2.16E+00 | 1.93E-03 | 319750     | 2296773 | 77     | 100   | 493   | 18.1  | 3.2NO    | 3.2NO | 3.2NO | 3.2NO | 3.2NO  |
| S-53 | 0            | 2.81E-01      | 1.62E-01 | 0.00E+00 | 0.00E+00 | 322624     | 2296989 | 84     | 30.5  | 373   | 10.88 | 2NO      | 2NO   | 2NO   | 2NO   | 2NO    |
| S-54 | 0            | 2.81E-01      | 1.62E-01 | 0.00E+00 | 0.00E+00 | 322698     | 2296988 | 85     | 30.5  | 373   | 10.88 | 2NO      | 2NO   | 2NO   | 2NO   | 2NO    |
| S-55 | 0            | 2.81E-01      | 1.62E-01 | 0.00E+00 | 0.00E+00 | 322772     | 2296986 | 86     | 30.5  | 373   | 10.88 | 2NO      | 2NO   | 2NO   | 2NO   | 2NO    |
| S-56 | 0            | 2.81E-01      | 1.62E-01 | 0.00E+00 | 0.00E+00 | 322845     | 2296985 | 84     | 30.5  | 373   | 13.43 | 1.8NO    | 1.8NO | 1.8NO | 1.8NO | 1.8NO  |
| S-57 | 0            | 2.81E-01      | 1.62E-01 | 0.00E+00 | 0.00E+00 | 322919     | 2296983 | 82     | 30.5  | 373   | 10.88 | 2NO      | 2NO   | 2NO   | 2NO   | 2NO    |
| S-58 | 0            | 2.81E-01      | 1.62E-01 | 0.00E+00 | 0.00E+00 | 322992     | 2296982 | 82     | 30.5  | 373   | 10.88 | 2NO      | 2NO   | 2NO   | 2NO   | 2NO    |
| S-59 | 0            | 2.81E-01      | 1.62E-01 | 0.00E+00 | 0.00E+00 | 323066     | 2296980 | 83     | 30.5  | 373   | 10.88 | 2NO      | 2NO   | 2NO   | 2NO   | 2NO    |
| S-60 | 0            | 2.81E-01      | 1.62E-01 | 0.00E+00 | 0.00E+00 | 323140     | 2296979 | 84     | 30.5  | 373   | 10.88 | 2NO      | 2NO   | 2NO   | 2NO   | 2NO    |
| S-61 | 0            | 1.96E+00      | 1.13E+00 | 0.00E+00 | 0.00E+00 | 322381     | 2297276 | 84     | 60    | 403   | 20.47 | 4NO      | 4NO   | 4NO   | 4NO   | 4NO    |
| S-62 | 0            | 2.39E+00      | 1.38E+00 | 0.00E+00 | 0.00E+00 | 320391     | 2297232 | 82     | 70    | 403   | 16.01 | 5NO      | 5NO   | 5NO   | 5NO   | 5NO    |
| S-63 | 0            | 2.90E-01      | 1.67E-01 | 4.53E+00 | 2.95E+00 | 322489     | 2297061 | 82     | 60    | 638   | 8.52  | 3NO      | 3NO   | 3NO   | 3NO   | 3NO    |
| S-72 | 0            | 4.91E-01      | 2.82E-01 | 0.00E+00 | 0.00E+00 | 322802     | 2297736 | 74     | 30    | 318   | 17    | 2NO      | 2NO   | 2NO   | 2NO   | 2NO    |
| S-73 | 0            | 2.20E+00      | 1.27E+00 | 7.61E-01 | 1.22E+00 | 322994     | 2297731 | 73     | 80    | 393   | 20    | 4NO      | 4NO   | 4NO   | 4NO   | 4NO    |
| S-74 | 0            | 2.97E+00      | 1.71E+00 | 0.00E+00 | 0.00E+00 | 323264     | 2297726 | 75     | 60    | 336   | 21    | 4NO      | 4NO   | 4NO   | 4NO   | 4NO    |
| S-75 | 0            | 9.38E-02      | 5.39E-02 | 0.00E+00 | 0.00E+00 | 323536     | 2297763 | 78     | 35    | 351   | 16    | 1NO      | 1NO   | 1NO   | 1NO   | 1NO    |
| S-76 | 0            | 4.19E-01      | 2.41E-01 | 0.00E+00 | 0.00E+00 | 322798     | 2297505 | 77     | 30    | 318   | 17    | 2NO      | 2NO   | 2NO   | 2NO   | 2NO    |
| S-77 | 0            | 1.88E+00      | 1.08E+00 | 8.60E-01 | 1.38E+00 | 322990     | 2297500 | 76     | 80    | 393   | 20    | 4NO      | 4NO   | 4NO   | 4NO   | 4NO    |
| S-78 | 0            | 2.53E+00      | 1.45E+00 | 0.00E+00 | 0.00E+00 | 323259     | 2297495 | 77     | 60    | 336   | 21    | 4NO      | 4NO   | 4NO   | 4NO   | 4NO    |
| S-80 | 0            | 7.11E-01      | 4.09E-01 | 6.32E+00 | 6.32E+00 | 323038     | 2296464 | 88     | 90    | 423   | 17.11 | 2.7NO    | 2.7NO | 2.7NO | 2.7NO | 2.7NO  |
| S-81 | 0            | 7.11E-01      | 4.09E-01 | 6.32E+00 | 6.32E+00 | 323124     | 2296462 | 92     | 90    | 423   | 17.11 | 2.7NO    | 2.7NO | 2.7NO | 2.7NO | 2.7NO  |
| S-82 | 0            | 7.11E-01      | 4.09E-01 | 6.32E+00 | 6.32E+00 | 323210     | 2296461 | 94     | 90    | 423   | 17.11 | 2.7NO    | 2.7NO | 2.7NO | 2.7NO | 2.7NO  |
| S-83 | 0            | 7.11E-01      | 4.09E-01 | 6.32E+00 | 6.32E+00 | 323285     | 2296459 | 96     | 90    | 423   | 17.11 | 2.7NO    | 2.7NO | 2.7NO | 2.7NO | 2.7NO  |
| S-84 | 0            | 7.11E-01      | 4.09E-01 | 6.32E+00 | 6.32E+00 | 323092     | 2296820 | 84     | 90    | 423   | 17.11 | 2.7NO    | 2.7NO | 2.7NO | 2.7NO | 2.7NO  |
| S-85 | 0            | 1.42E+00      | 8.18E-01 | 1.26E+01 | 1.26E+01 | 323174     | 2296819 | 86     | 110   | 423   | 17.28 | 3.8NO    | 3.8NO | 3.8NO | 3.8NO | 3.8NO  |
| S-86 | 0            | 7.11E-01      | 4.09E-01 | 6.32E+00 | 6.32E+00 | 323257     | 2296817 | 89     | 110   | 423   | 17.11 | 2.7NO    | 2.7NO | 2.7NO | 2.7NO | 2.7NO  |
| S-87 | 0            | 4.22E-01      | 2.43E-01 | 0.00E+00 | 0.00E+00 | 323222     | 2296708 | 87     | 45    | 323   | 9.04  | 2.5NO    | 2.5NO | 2.5NO | 2.5NO | 2.5NO  |
| S-88 | 0            | 4.22E-01      | 2.43E-01 | 0.00E+00 | 0.00E+00 | 323159     | 2296623 | 88     | 45    | 323   | 9.04  | 2.5NO    | 2.5NO | 2.5NO | 2.5NO | 2.5NO  |
| S-89 | 0            | 4.22E-01      | 2.43E-01 | 0.00E+00 | 0.00E+00 | 322403     | 2296574 | 91     | 45    | 323   | 9.04  | 2.5NO    | 2.5NO | 2.5NO | 2.5NO | 2.5NO  |
| S-90 | 0            | 4.22E-01      | 2.43E-01 | 0.00E+00 | 0.00E+00 | 322638     | 2296570 | 93     | 45    | 323   | 9.04  | 2.5NO    | 2.5NO | 2.5NO | 2.5NO | 2.5NO  |

| *** AREA SOURCE DATA *** |           |             |                           |        |                   |    |                |            |             |     |           |               |
|--------------------------|-----------|-------------|---------------------------|--------|-------------------|----|----------------|------------|-------------|-----|-----------|---------------|
| NO.                      | SOURCE ID | PART. CATS. | EMISSION RATE (GRAMS/SEC) |        | COORD (SW CORNER) |    | BASE ELEV. (M) | HEIGHT (M) | OF AREA (M) |     | Y-DIM (M) | ORIENT. INIT. |
|                          |           |             | PM10                      | PM2.5  | X                 | Y  |                |            |             |     |           |               |
| A-1                      | 0         | 9.85E-10    | 5.66E-10                  | 321967 | 2296590           | 85 | 1              | 181.01     | 168.41      | 126 | 4         |               |
| A-2                      | 0         | 9.85E-10    | 5.66E-10                  | 320382 | 2296039           | 90 | 1              | 625.82     | 280.25      | 0   | 4         |               |
| A-3                      | 0         | 9.85E-10    | 5.66E-10                  | 319338 | 2296060           | 81 | 1              | 668.02     | 280.25      | 0   | 4         |               |
| A-4                      | 0         | 2.71E-10    | 1.56E-10                  | 320503 | 2295898           | 88 | 1              | 34.9       | 98.7        | 0   | 4         |               |
| A-5                      | 0         | 2.71E-10    | 1.56E-10                  | 320539 | 2295797           | 85 | 1              | 109.64     | 194.15      | 0   | 4         |               |
| A-6                      | 0         | 2.71E-10    | 1.56E-10                  | 320594 | 2295749           | 85 | 1              | 57.3       | 45.11       | 0   | 4         |               |
| A-7                      | 0         | 2.71E-10    | 1.56E-10                  | 320654 | 2295698           | 84 | 1              | 216.91     | 287.3       | 137 | 4         |               |
| A-8                      | 0         | 2.71E-10    | 1.56E-10                  | 320729 | 2295639           | 84 | 1              | 112.45     | 55.94       | 0   | 4         |               |
| A-9                      | 0         | 2.71E-10    | 1.56E-10                  | 320886 | 2295638           | 80 | 1              | 65.87      | 151.64      | 0   | 4         |               |
| A-10                     | 0         | 4.75E-10    | 2.73E-10                  | 320956 | 2295928           | 81 | 1              | 38.81      | 65.27       | 0   | 4         |               |
| A-11                     | 0         | 4.75E-10    | 2.73E-10                  | 321173 | 2297818           | 74 | 1              | 237.41     | 74.79       | 0   | 4         |               |
| A-12                     | 0         | 4.75E-10    | 2.73E-10                  | 321089 | 2297611           | 76 | 1              | 390.34     | 198.33      | 0   | 4         |               |
| A-13                     | 0         | 4.75E-10    | 2.73E-10                  | 321035 | 2297488           | 78 | 1              | 44.24      | 216.09      | 0   | 4         |               |
| A-14                     | 0         | 4.75E-10    | 2.73E-10                  | 321504 | 2297686           | 72 | 1              | 44.5       | 76.24       | 0   | 4         |               |
| A-15                     | 0         | 4.93E-10    | 2.83E-10                  | 322328 | 2296026           | 96 | 1              | 637.07     | 202.96      | 0   | 4         |               |
| A-16                     | 0         | 4.93E-10    | 2.83E-10                  | 322964 | 2296097           | 97 | 1              | 82.58      | 126.81      | 0   | 4         |               |

\*\*\* SOURCE IDs DEFINING SOURCE GROUPS \*\*\*

GROUP ID

SOURCE IDs

ALL S-01, S-02, S-03, S-04, S-05, S-06, S-07, S-08, S-09, S-10, S-11, S-12, S-13, S-14, S-15, S-16, S-17, S-18, S-19, S-20, S-21, S-22, S-23, S-24, S-25, S-26, S-27, S-28, S-29, S-30, S-31, S-32, S-33, S-34, S-35, S-36, S-37, S-38, S-39, S-42, S-43, S-44, S-45, S-46, S-47, S-48, S-49, S-50, S-51, S-52, S-53, S-54, S-55, S-56, S-57, S-58, S-59, S-60, S-61, S-62, S-63, S-72, S-73, S-74, S-75, S-76, S-77, S-78, S-80, S-81, S-82, S-83, S-84, S-85, S-86, S-87, S-88, S-89, S-90, A-1, A-2, A-3, A-4, A-5, A-6, A-7, A-8, A-9, A-10, A-11, A-12, A-13, A-14, A-15, A-16,

## ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH

\*\*\* ISCT3 - VERSION 95250 \*\*\*

|                                                                     |     |          |
|---------------------------------------------------------------------|-----|----------|
| *** EXPANSION IN EC UPTO 3.55 MTPA STEEL IN JHARBANDH STEEL PLANT   | *** | 10/20/20 |
| ***** PM10 EMISSIONS FROM ALL STACKS WITH FUGITIVE EMISSION SOURCES | *** | 10:42:02 |

\*\*MODELOPTS: CONC      RURAL ELEV      DFAULT

\*\*\* DISCRETE CARTESIAN RECEPTORS \*\*\*

(X-COORD, Y-COORD, ZELEV, ZFLAG)

(METERS)

|  |                       |        |      |                       |        |      |
|--|-----------------------|--------|------|-----------------------|--------|------|
|  | (322795.0, 2297792.0, | 76.0,  | .0); | (322795.0, 2297843.0, | 74.0,  | .0); |
|  | (323693.0, 2297668.0, | 79.0,  | .0); | (324096.0, 2297301.0, | 90.0,  | .0); |
|  | (323545.0, 2296759.0, | 99.0,  | .0); | (323497.0, 2296459.0, | 106.0, | .0); |
|  | (323455.0, 2296074.0, | 133.0, | .0); | (323095.0, 2296075.0, | 103.0, | .0); |
|  | (322776.0, 2295945.0, | 101.0, | .0); | (322425.0, 2295915.0, | 99.0,  | .0); |
|  | (322166.0, 2296154.0, | 91.0,  | .0); | (320491.0, 2295833.0, | 86.0,  | .0); |
|  | (319544.0, 2296801.0, | 81.0,  | .0); | (320990.0, 2297542.0, | 77.0,  | .0); |
|  | (321980.0, 2297600.0, | 76.0,  | .0); | (322432.0, 2297655.0, | 83.0,  | .0); |
|  | (322408.0, 2297709.0, | 80.0,  | .0); | (323783.0, 2296753.0, | 147.0, | .0); |
|  | (323706.0, 2296366.0, | 113.0, | .0); | (323484.0, 2296048.0, | 133.0, | .0); |
|  | (323159.0, 2295830.0, | 141.0, | .0); | (322773.0, 2295756.0, | 121.0, | .0); |
|  | (322389.0, 2295838.0, | 97.0,  | .0); | (322068.0, 2296062.0, | 87.0,  | .0); |
|  | (322801.0, 2298424.0, | 77.0,  | .0); | (322807.0, 2298978.0, | 74.0,  | .0); |
|  | (322813.0, 2299531.0, | 67.0,  | .0); | (322819.0, 2300085.0, | 62.0,  | .0); |
|  | (322824.0, 2300638.0, | 67.0,  | .0); | (322830.0, 2301192.0, | 76.0,  | .0); |
|  | (322842.0, 2302299.0, | 70.0,  | .0); | (322865.0, 2304513.0, | 59.0,  | .0); |
|  | (322901.0, 2307834.0, | 60.0,  | .0); | (323425.0, 2298296.0, | 69.0,  | .0); |
|  | (323638.0, 2298803.0, | 67.0,  | .0); | (323862.0, 2299310.0, | 60.0,  | .0); |
|  | (324076.0, 2299817.0, | 58.0,  | .0); | (324289.0, 2300335.0, | 65.0,  | .0); |
|  | (324503.0, 2300842.0, | 61.0,  | .0); | (324930.0, 2301856.0, | 58.0,  | .0); |
|  | (325784.0, 2303896.0, | 57.0,  | .0); | (327075.0, 2306949.0, | 67.0,  | .0); |
|  | (323952.0, 2297925.0, | 86.0,  | .0); | (324352.0, 2298319.0, | 79.0,  | .0); |
|  | (324741.0, 2298703.0, | 75.0,  | .0); | (325130.0, 2299086.0, | 69.0,  | .0); |
|  | (325519.0, 2299481.0, | 73.0,  | .0); | (325909.0, 2299864.0, | 72.0,  | .0); |
|  | (326687.0, 2300642.0, | 63.0,  | .0); | (328254.0, 2302187.0, | 53.0,  | .0); |
|  | (330599.0, 2304511.0, | 63.0,  | .0); | (324311.0, 2297390.0, | 92.0,  | .0); |
|  | (324813.0, 2297595.0, | 90.0,  | .0); | (325325.0, 2297800.0, | 81.0,  | .0); |
|  | (325827.0, 2298005.0, | 79.0,  | .0); | (326339.0, 2298210.0, | 79.0,  | .0); |
|  | (326841.0, 2298415.0, | 76.0,  | .0); | (327856.0, 2298837.0, | 75.0,  | .0); |
|  | (329884.0, 2299657.0, | 66.0,  | .0); | (332926.0, 2300900.0, | 53.0,  | .0); |
|  | (324429.0, 2296746.0, | 148.0, | .0); | (324970.0, 2296741.0, | 96.0,  | .0); |
|  | (325522.0, 2296735.0, | 99.0,  | .0); | (326064.0, 2296729.0, | 108.0, | .0); |
|  | (326615.0, 2296724.0, | 115.0, | .0); | (327157.0, 2296718.0, | 93.0,  | .0); |
|  | (328250.0, 2296707.0, | 94.0,  | .0); | (330437.0, 2296685.0, | 76.0,  | .0); |
|  | (333717.0, 2296652.0, | 53.0,  | .0); | (324297.0, 2296117.0, | 105.0, | .0); |
|  | (324795.0, 2295901.0, | 107.0, | .0); | (325303.0, 2295685.0, | 107.0, | .0); |
|  | (325801.0, 2295470.0, | 115.0, | .0); | (326309.0, 2295243.0, | 113.0, | .0); |
|  | (326806.0, 2295028.0, | 116.0, | .0); | (327812.0, 2294597.0, | 97.0,  | .0); |
|  | (329824.0, 2293724.0, | 104.0, | .0); | (332842.0, 2292431.0, | 80.0,  | .0); |
|  | (323927.0, 2295578.0, | 107.0, | .0); | (324319.0, 2295186.0, | 111.0, | .0); |
|  | (324700.0, 2294795.0, | 128.0, | .0); | (325081.0, 2294392.0, | 115.0, | .0); |
|  | (325463.0, 2294011.0, | 110.0, | .0); | (325844.0, 2294358.0, | 100.0, | .0); |
|  | (326606.0, 2292801.0, | 103.0, | .0); | (328144.0, 2291227.0, | 91.0,  | .0); |

## ISCS T3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH

[illegible]

ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH

\*\*\* ISCST3 - VERSION 95250 \*\*\*  
\*\*\* EXPANSION IN EC UPTO 3.55 MTPA STEEL IN JHARBANDH STEEL PLANT \*\*\* 10/20/20  
\*\*\* PM10 EMISSIONS FROM ALL STACKS WITH FUGITIVE EMISSION SOURCES \*\*\* 10:42:02  
\*\*MODELOPTs: CONC RURAL ELEV DFAULT

\*\*\* METEOROLOGICAL DAYS SELECTED FOR PROCESSING \*\*\*

(1=YES; 0=NO)

1111111111 1111111111 1111111111 1111111111 1111111111 1111111111  
1111111111 1111111111 1111111111 1111111111 1111111111 1111111111  
1111111111 1111111111 1111111111 1111111111 1111111111 1111111111  
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1111111111 1111111111 1111111111 1111111111 1111111111 1111111111  
1111111111 111111

NOTE: METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.

\*\*\* UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES \*\*\*  
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

\*\*\* WIND PROFILE EXPONENTS \*\*\*

| STABILITY CATEGORY | 1          | 2          | 3          | 4          | 5          | 6          |
|--------------------|------------|------------|------------|------------|------------|------------|
| A                  | .70000E-01 | .70000E-01 | .70000E-01 | .70000E-01 | .70000E-01 | .70000E-01 |
| B                  | .70000E-01 | .70000E-01 | .70000E-01 | .70000E-01 | .70000E-01 | .70000E-01 |
| C                  | .10000E+00 | .10000E+00 | .10000E+00 | .10000E+00 | .10000E+00 | .10000E+00 |
| D                  | .15000E+00 | .15000E+00 | .15000E+00 | .15000E+00 | .15000E+00 | .15000E+00 |
| E                  | .35000E+00 | .35000E+00 | .35000E+00 | .35000E+00 | .35000E+00 | .35000E+00 |
| F                  | .55000E+00 | .55000E+00 | .55000E+00 | .55000E+00 | .55000E+00 | .55000E+00 |

\*\*\* VERTICAL POTENTIAL TEMPERATURE GRADIENTS \*\*\*  
(DEGREES KELVIN PER METER)

| STABILITY CATEGORY | 1          | 2          | 3          | 4          | 5          | 6          |
|--------------------|------------|------------|------------|------------|------------|------------|
| A                  | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| B                  | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| C                  | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| D                  | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| E                  | .20000E-01 | .20000E-01 | .20000E-01 | .20000E-01 | .20000E-01 | .20000E-01 |
| F                  | .35000E-01 | .35000E-01 | .35000E-01 | .35000E-01 | .35000E-01 | .35000E-01 |

ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH

\*\*\* ISCST3 - VERSION 95250 \*\*\*  
\*\*\* EXPANSION IN EC UPTO 3.55 MTPA STEEL IN JHARBANDH STEEL PLANT \*\*\* 10/20/20  
\*\*\* PM10 EMISSIONS FROM ALL STACKS WITH FUGITIVE EMISSION SOURCES \*\*\* 10:42:02  
\*\*MODELOPTs: CONC RURAL ELEV DFAULT

\*\*\* THE FIRST 24 HOURS OF METEOROLOGICAL DATA \*\*\*

FILE: ORI\B\OCT2020\DK19S.MET FORMAT: 412,2F9.4,F6.1,I2,2F7.1,F9.4,I10.1,F8.4,I4,F7.2)  
SURFACE STATION NO.: 99999 UPPER AIR STATION NO.: 99999  
NAME: XXX  
YEAR: 2019

| YEAR | MM | DD | HH | VECTOR | (M/S) | (K)   | CLASS | RURAL  | URBAN  | (M/S) | (M) | (mm/HR)     |
|------|----|----|----|--------|-------|-------|-------|--------|--------|-------|-----|-------------|
| 19   | 3  | 1  | 1  | 187.9  | 3.90  | 297.3 | 4     | 333.0  | 333.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 2  | 284.3  | 3.10  | 297.4 | 4     | 333.0  | 333.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 3  | 272.4  | 1.80  | 296.4 | 6     | 303.0  | 303.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 4  | 247.0  | 1.60  | 296.8 | 6     | 283.0  | 283.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 5  | 243.5  | 2.30  | 295.9 | 5     | 228.0  | 228.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 6  | 265.0  | 1.40  | 297.1 | 1     | 253.0  | 253.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 7  | 233.4  | 1.10  | 297.7 | 1     | 358.0  | 358.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 8  | 309.9  | .70   | 298.7 | 1     | 530.0  | 530.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 9  | 247.6  | .50   | 298.8 | 1     | 715.0  | 715.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 10 | 229.3  | .80   | 302.0 | 1     | 950.0  | 950.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 11 | 181.2  | .90   | 304.7 | 1     | 1140.0 | 1140.0 | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 12 | 285.2  | .60   | 305.1 | 1     | 1258.0 | 1258.0 | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 13 | 271.1  | 3.70  | 305.7 | 2     | 1303.0 | 1303.0 | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 14 | 249.1  | 1.90  | 305.5 | 1     | 1315.0 | 1315.0 | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 15 | 254.4  | 1.80  | 308.0 | 1     | 1305.0 | 1305.0 | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 16 | 259.7  | .60   | 306.1 | 1     | 1255.0 | 1255.0 | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 17 | 305.7  | 2.20  | 306.6 | 2     | 1150.0 | 1150.0 | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 18 | 236.0  | 5.70  | 306.4 | 3     | 948.0  | 948.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 19 | 304.8  | 4.40  | 303.9 | 2     | 735.0  | 735.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 20 | 259.1  | 3.40  | 301.4 | 4     | 445.0  | 445.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 21 | 253.7  | 3.50  | 301.2 | 4     | 488.0  | 488.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 22 | 244.6  | 3.20  | 299.8 | 4     | 428.0  | 428.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 23 | 267.2  | 2.50  | 299.6 | 5     | 408.0  | 408.0  | .0000 | .0  | .0000 0 .00 |
| 19   | 3  | 1  | 24 | 286.7  | .00   | 297.6 | 6     | 393.0  | 393.0  | .0000 | .0  | .0000 0 .00 |

\*\*\* NOTES: STABILITY CLASS 1=A, 2=B, 3=C, 4=D, 5=E AND 6=F.

FLOW VECTOR IS DIRECTION TOWARD WHICH WIND IS BLOWING.

**ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH**

\*\*\* ISCST3 - VERSION 95250 \*\*\*      \*\*\* EXPANSION IN EC UPTO 3.55 MTPA STEEL IN JHARBANDH STEEL PLANT      \*\*\*      10/20/20  
 \*\*\* PM10 EMISSIONS FROM ALL STACKS WITH FUGITIVE EMISSION SOURCES      \*\*\*      10:42:02  
 \*\*MODELOPTs: CONC      RURAL      ELEV      DFAULT

\*\*\* THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION      VALUES FOR SOURCE GROUP: ALL      \*\*\*  
 INCLUDING SOURCE(S):      S-01      S-02      S-03      S-04      S-05      S-06      S-07  
 S-08      S-09      S-10      S-11      S-12      S-13      S-14      S-15      S-16      S-17      S-18      S-19  
 S-20      S-21      S-22      S-23      S-24      S-25      S-26      S-27      S-28      S-29      S-30      . . .

\*\*\* DISCRETE CARTESIAN RECEPTOR POINTS \*\*\*

| ** CONC OF PM10 |             |          |            | IN MICROGRAMS/M**3 |             | **        |            |
|-----------------|-------------|----------|------------|--------------------|-------------|-----------|------------|
| X-COORD (M)     | Y-COORD (M) | CONC     | (YYMMDDHH) | X-COORD (M)        | Y-COORD (M) | CONC      | (YYMMDDHH) |
| 322795.00       | 2297792.00  | 8.25319  | (19052524) | 323238.00          | 2297843.00  | 6.80687   | (19051324) |
| 323693.00       | 2297668.00  | 6.76284  | (19051724) | 324096.00          | 2297301.00  | 8.37255c  | (19030124) |
| 323545.00       | 2296759.00  | 11.55029 | (19052724) | 323497.00          | 2296459.00  | 11.98454  | (19040824) |
| 323455.00       | 2296074.00  | 13.67649 | (19040824) | 323059.00          | 2296075.00  | 9.36655   | (19052824) |
| 322776.00       | 2295945.00  | 10.20462 | (19052824) | 322425.00          | 2295915.00  | 5.31261   | (19031324) |
| 322166.00       | 2296154.00  | 6.55150  | (19052924) | 320491.00          | 2295833.00  | 5.85842   | (19052924) |
| 319544.00       | 2296801.00  | 6.44926  | (19052924) | 320990.00          | 2297542.00  | 6.31021c  | (19051924) |
| 321980.00       | 2297600.00  | 8.83335  | (19052424) | 322432.00          | 2297655.00  | 9.29654   | (19053024) |
| 322408.00       | 2297709.00  | 8.84261  | (19053024) | 323783.00          | 2296753.00  | 21.43648c | (19030124) |
| 323706.00       | 2296366.00  | 12.62982 | (19040824) | 323484.00          | 2296048.00  | 13.82718  | (19040824) |
| 323159.00       | 2295830.00  | 13.03420 | (19052824) | 322773.00          | 2295756.00  | 14.18460  | (19052824) |
| 322389.00       | 2295838.00  | 4.93861  | (19031324) | 322068.00          | 2296062.00  | 5.76142   | (19052924) |
| 322801.00       | 2298424.00  | 8.37981  | (19052524) | 322807.00          | 2298978.00  | 7.42154   | (19052524) |
| 322813.00       | 2299531.00  | 6.60416  | (19052524) | 322819.00          | 2300085.00  | 5.96882   | (19052524) |
| 322824.00       | 2300638.00  | 5.54938  | (19052524) | 322830.00          | 2301192.00  | 5.33130   | (19052524) |
| 322842.00       | 2302299.00  | 4.67901  | (19052524) | 322865.00          | 2304513.00  | 3.81752   | (19052524) |
| 322901.00       | 2307834.00  | 3.08513  | (19052524) | 323425.00          | 2298296.00  | 5.98893   | (19051324) |
| 323638.00       | 2298803.00  | 6.04596  | (19050324) | 323862.00          | 2299310.00  | 4.97613   | (19050324) |
| 324076.00       | 2299817.00  | 4.24878  | (19050324) | 324289.00          | 2300335.00  | 4.03839   | (19041424) |
| 324503.00       | 2300842.00  | 3.67334  | (19041424) | 324930.00          | 2301856.00  | 3.22507   | (19041424) |
| 325784.00       | 2303896.00  | 2.59569  | (19041424) | 327075.00          | 2306949.00  | 2.17274   | (19041424) |
| 323952.00       | 2297925.00  | 8.16350  | (19051724) | 324352.00          | 2298319.00  | 7.41599   | (19051724) |
| 324741.00       | 2298703.00  | 6.22992  | (19051724) | 325130.00          | 2299086.00  | 5.20655   | (19051724) |
| 325519.00       | 2299481.00  | 4.59277  | (19051724) | 325909.00          | 2299864.00  | 4.07288   | (19051724) |
| 326687.00       | 2300642.00  | 3.26058  | (19051724) | 328254.00          | 2302187.00  | 2.45284   | (19051724) |
| 330599.00       | 2304511.00  | 2.02071  | (19051724) | 324311.00          | 2297390.00  | 8.16072c  | (19030124) |
| 324813.00       | 2297595.00  | 6.97317c | (19030124) | 325325.00          | 2297800.00  | 5.64152c  | (19030124) |
| 325827.00       | 2298005.00  | 5.26744  | (19041624) | 326339.00          | 2298210.00  | 5.13225   | (19041624) |
| 326841.00       | 2298415.00  | 4.77153  | (19041624) | 327856.00          | 2298837.00  | 4.33489   | (19041624) |
| 329884.00       | 2299657.00  | 3.57101  | (19041624) | 332926.00          | 2300900.00  | 2.84632   | (19041624) |

ISCST3 Model for Expansion of Dhenkanal Steel Plant (upto 3.55 MTPA), Odisha of RML

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**ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH**

|           |            |          |            |           |            |          |            |
|-----------|------------|----------|------------|-----------|------------|----------|------------|
| 324429.00 | 2296746.00 | 16.83935 | (19040824) | 324970.00 | 2296741.00 | 6.52560  | (19052724) |
| 325522.00 | 2296735.00 | 5.91390  | (19052724) | 326064.00 | 2296729.00 | 5.45964  | (19052724) |
| 326615.00 | 2296724.00 | 5.11802c | (19030124) | 327157.00 | 2296718.00 | 4.34581  | (19052724) |
| 328250.00 | 2296707.00 | 3.64429  | (19052724) | 330437.00 | 2296685.00 | 2.72315  | (19052724) |
| 333717.00 | 2296652.00 | 1.96542  | (19052724) | 324297.00 | 2296117.00 | 7.80214  | (19040824) |
| 324795.00 | 2295901.00 | 6.57415  | (19040824) | 325303.00 | 2295685.00 | 5.68707  | (19040824) |
| 325801.00 | 2295470.00 | 6.10237  | (19040824) | 326309.00 | 2295243.00 | 5.24532  | (19040824) |
| 326806.00 | 2295028.00 | 5.17276  | (19040824) | 327812.00 | 2294597.00 | 3.16921  | (19040824) |
| 329824.00 | 2293724.00 | 2.42901  | (19040824) | 332842.00 | 2292431.00 | 1.47037  | (19040824) |
| 323927.00 | 2295578.00 | 7.65511  | (19040824) | 324319.00 | 2295186.00 | 6.76007  | (19040824) |
| 324700.00 | 2294795.00 | 6.89473  | (19040824) | 325081.00 | 2294392.00 | 5.19989  | (19040824) |
| 325463.00 | 2294001.00 | 4.22285  | (19040824) | 325844.00 | 2293598.00 | 3.46614  | (19040824) |
| 326606.00 | 2292815.00 | 2.98893  | (19040824) | 328142.00 | 2291227.00 | 2.26015  | (19040824) |
| 330441.00 | 2288857.00 | 1.86322  | (19040824) | 323392.00 | 2295229.00 | 5.81852  | (19041524) |
| 323595.00 | 2294718.00 | 4.74660  | (19041524) | 323809.00 | 2294195.00 | 4.01615  | (19041524) |
| 324012.00 | 2293684.00 | 3.21651  | (19041524) | 324214.00 | 2293172.00 | 2.70431  | (19041524) |
| 324417.00 | 2292661.00 | 2.34102  | (19041524) | 324823.00 | 2291627.00 | 1.98008  | (19052724) |
| 325636.00 | 2289581.00 | 1.26899  | (19041524) | 326865.00 | 2286491.00 | 1.27871  | (19052724) |
| 322766.00 | 2295103.00 | 7.65999  | (19052824) | 322760.00 | 2294549.00 | 7.32961  | (19052824) |
| 322754.00 | 2293996.00 | 7.96509  | (19052824) | 322749.00 | 2293442.00 | 7.52271  | (19052824) |
| 322743.00 | 2292889.00 | 5.92605  | (19052824) | 322737.00 | 2292335.00 | 5.28728  | (19052824) |
| 322725.00 | 2291228.00 | 4.14205  | (19052824) | 322702.00 | 2289014.00 | 2.68723  | (19052824) |
| 322667.00 | 2285693.00 | 1.71484  | (19052824) | 322143.00 | 2295242.00 | 5.92654  | (19030224) |
| 321929.00 | 2294735.00 | 2.57076  | (19041524) | 321715.00 | 2294217.00 | 2.71726  | (19041524) |
| 321502.00 | 2293710.00 | 2.63490  | (19052824) | 321277.00 | 2293203.00 | 2.53675  | (19052824) |
| 321064.00 | 2292696.00 | 2.26373  | (19052824) | 320636.00 | 2291671.00 | 2.07737  | (19030224) |
| 319781.00 | 2289643.00 | 2.46680  | (19050524) | 318488.00 | 2286579.00 | 1.53146  | (19030224) |
| 321615.00 | 2295602.00 | 4.07208  | (19052924) | 321226.00 | 2295219.00 | 3.72851  | (19052924) |
| 320826.00 | 2294836.00 | 3.32657  | (19052924) | 320437.00 | 2294441.00 | 2.90109  | (19052924) |
| 320047.00 | 2294058.00 | 2.65474  | (19052924) | 319657.00 | 2293663.00 | 2.50757  | (19052924) |
| 318878.00 | 2292897.00 | 2.08012  | (19052924) | 317310.00 | 2291341.00 | 1.65883  | (19052924) |
| 314971.00 | 2289020.00 | 1.16131  | (19052924) | 321267.00 | 2296148.00 | 5.74309  | (19052924) |
| 320755.00 | 2295944.00 | 5.91009  | (19052924) | 320253.00 | 2295739.00 | 5.83772  | (19052924) |
| 319740.00 | 2295534.00 | 5.52424  | (19052924) | 319238.00 | 2295318.00 | 4.86199  | (19052924) |
| 318725.00 | 2295113.00 | 4.38720  | (19052924) | 317711.00 | 2294703.00 | 3.65243  | (19052924) |
| 315681.00 | 2293872.00 | 2.59864  | (19052924) | 312636.00 | 2292644.00 | 1.55782  | (19052924) |
| 319504.00 | 2296798.00 | 6.23611  | (19052924) | 318962.00 | 2296804.00 | 4.85606  | (19052924) |
| 318410.00 | 2296810.00 | 4.15648  | (19052924) | 317317.00 | 2296822.00 | 3.19381  | (19052924) |
| 315130.00 | 2296846.00 | 2.20562  | (19052924) | 311850.00 | 2296882.00 | 1.52005  | (19052924) |
| 320773.00 | 2297637.00 | 5.85977c | (19051924) | 320275.00 | 2297853.00 | 5.12996  | (19052424) |
| 319767.00 | 2298069.00 | 6.70786  | (19052424) | 319270.00 | 2298285.00 | 5.97162c | (19051924) |
| 318762.00 | 2298500.00 | 5.76588c | (19051924) | 317756.00 | 2298943.00 | 5.54642c | (19051924) |
| 315746.00 | 2299806.00 | 5.15289c | (19051924) | 312730.00 | 2301113.00 | 4.06498c | (19051924) |
| 321640.00 | 2297949.00 | 7.19831  | (19052024) | 321259.00 | 2298352.00 | 6.29855  | (19052024) |

ISCST3 Model for Expansion of Dhenkanal Steel Plant (upto 3.55 MTPA), Odisha of RML

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**ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH**

|           |            |          |            |           |            |          |            |
|-----------|------------|----------|------------|-----------|------------|----------|------------|
| 320868.00 | 2298744.00 | 5.80329  | (19052024) | 320487.00 | 2299135.00 | 5.37593  | (19052024) |
| 320106.00 | 2299538.00 | 5.61600  | (19053024) | 319725.00 | 2299929.00 | 5.60490  | (19053024) |
| 318963.00 | 2300724.00 | 5.52168  | (19052024) | 317429.00 | 2302302.00 | 3.90718  | (19052424) |
| 315143.00 | 2304674.00 | 3.29072  | (19052024) | 322175.00 | 2298309.00 | 9.20983  | (19053024) |
| 321972.00 | 2298820.00 | 8.56212  | (19053024) | 321769.00 | 2299332.00 | 7.58263  | (19053024) |
| 321567.00 | 2299843.00 | 7.19802  | (19053024) | 321354.00 | 2300366.00 | 6.62377  | (19053024) |
| 321151.00 | 2300877.00 | 6.28959  | (19053024) | 320745.00 | 2301900.00 | 5.47711  | (19053024) |
| 319934.00 | 2303957.00 | 4.60029  | (19053024) | 318708.00 | 2307038.00 | 3.75630  | (19053024) |
| 321119.00 | 2297297.00 | 6.16193c | (19051924) | 327125.00 | 2296902.00 | 4.20409  | (19052724) |
| 322586.00 | 2303927.00 | 4.16867  | (19052524) | 325628.00 | 2291636.00 | 1.75633  | (19052724) |
| 324283.00 | 2299557.00 | 4.94935  | (19041424) | 321688.00 | 2294449.00 | 2.79173  | (19041524) |
| 319933.00 | 2295352.00 | 6.04418  | (19052924) | 320660.00 | 2297853.00 | 5.97971c | (19051924) |

| *** THE MAXIMUM 50 24-HR AVERAGE CONCENTRATION |           |               |                             | VALUES FOR SOURCE GROUP: ALL |          |               |                             |
|------------------------------------------------|-----------|---------------|-----------------------------|------------------------------|----------|---------------|-----------------------------|
| RANK                                           | CONC      | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    | RANK                         | CONC     | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    |
| 1.                                             | 21.43648c | (19030124) AT | ( 323783.00, 2296753.00) DC | 26.                          | 13.98431 | (19033124) AT | ( 323783.00, 2296753.00) DC |
| 2.                                             | 21.32815  | (19041124) AT | ( 323783.00, 2296753.00) DC | 27.                          | 13.82718 | (19040824) AT | ( 323484.00, 2296048.00) DC |
| 3.                                             | 19.93677  | (19040824) AT | ( 323783.00, 2296753.00) DC | 28.                          | 13.77813 | (19031424) AT | ( 323783.00, 2296753.00) DC |
| 4.                                             | 19.93550  | (19052624) AT | ( 323783.00, 2296753.00) DC | 29.                          | 13.72945 | (19042524) AT | ( 324429.00, 2296746.00) DC |
| 5.                                             | 19.87599  | (19043024) AT | ( 323783.00, 2296753.00) DC | 30.                          | 13.67649 | (19040824) AT | ( 323455.00, 2296074.00) DC |
| 6.                                             | 18.82522  | (19052724) AT | ( 323783.00, 2296753.00) DC | 31.                          | 13.57231 | (19051724) AT | ( 323783.00, 2296753.00) DC |
| 7.                                             | 18.04510  | (19042524) AT | ( 323783.00, 2296753.00) DC | 32.                          | 13.31813 | (19030524) AT | ( 323783.00, 2296753.00) DC |
| 8.                                             | 17.86438  | (19040324) AT | ( 323783.00, 2296753.00) DC | 33.                          | 13.25154 | (19041224) AT | ( 323783.00, 2296753.00) DC |
| 9.                                             | 17.62008  | (19041724) AT | ( 323783.00, 2296753.00) DC | 34.                          | 13.03420 | (19052824) AT | ( 323159.00, 2295830.00) DC |
| 10.                                            | 17.53475  | (19041624) AT | ( 323783.00, 2296753.00) DC | 35.                          | 12.66280 | (19052624) AT | ( 324429.00, 2296746.00) DC |
| 11.                                            | 17.14911  | (19040724) AT | ( 323783.00, 2296753.00) DC | 36.                          | 12.63247 | (19051324) AT | ( 324429.00, 2296746.00) DC |
| 12.                                            | 16.83935  | (19040824) AT | ( 324429.00, 2296746.00) DC | 37.                          | 12.62982 | (19040824) AT | ( 323706.00, 2296366.00) DC |
| 13.                                            | 16.79792  | (19051324) AT | ( 323783.00, 2296753.00) DC | 38.                          | 12.37278 | (19041324) AT | ( 324429.00, 2296746.00) DC |
| 14.                                            | 16.37162  | (19041124) AT | ( 324429.00, 2296746.00) DC | 39.                          | 12.35601 | (19041724) AT | ( 324429.00, 2296746.00) DC |
| 15.                                            | 15.60375  | (19041324) AT | ( 323783.00, 2296753.00) DC | 40.                          | 12.33643 | (19051424) AT | ( 323783.00, 2296753.00) DC |
| 16.                                            | 15.38670  | (19051024) AT | ( 323783.00, 2296753.00) DC | 41.                          | 11.98454 | (19040824) AT | ( 323497.00, 2296459.00) DC |
| 17.                                            | 15.14597  | (19031924) AT | ( 323783.00, 2296753.00) DC | 42.                          | 11.93433 | (19040924) AT | ( 323455.00, 2296074.00) DC |
| 18.                                            | 14.99494  | (19032124) AT | ( 323783.00, 2296753.00) DC | 43.                          | 11.86554 | (19040324) AT | ( 324429.00, 2296746.00) DC |
| 19.                                            | 14.72450  | (19040924) AT | ( 323783.00, 2296753.00) DC | 44.                          | 11.70269 | (19040924) AT | ( 323484.00, 2296048.00) DC |
| 20.                                            | 14.65284  | (19042324) AT | ( 323783.00, 2296753.00) DC | 45.                          | 11.63499 | (19052724) AT | ( 324429.00, 2296746.00) DC |
| 21.                                            | 14.45972c | (19030124) AT | ( 324429.00, 2296746.00) DC | 46.                          | 11.55029 | (19052724) AT | ( 323545.00, 2296759.00) DC |
| 22.                                            | 14.18460  | (19052824) AT | ( 322773.00, 2295756.00) DC | 47.                          | 11.53613 | (19031224) AT | ( 323783.00, 2296753.00) DC |
| 23.                                            | 14.15422  | (19030824) AT | ( 323783.00, 2296753.00) DC | 48.                          | 11.33086 | (19030724) AT | ( 323783.00, 2296753.00) DC |
| 24.                                            | 14.14904  | (19043024) AT | ( 324429.00, 2296746.00) DC | 49.                          | 11.03241 | (19031624) AT | ( 323783.00, 2296753.00) DC |
| 25.                                            | 14.01452  | (19040424) AT | ( 323783.00, 2296753.00) DC | 50.                          | 10.99355 | (19030624) AT | ( 323783.00, 2296753.00) DC |

ISCST3 Model for Expansion of Dhenkanal Steel Plant (upto 3.55 MTPA), Odisha of RML

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**ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH**

\*\*\* ISCST3 - VERSION 95250 \*\*\*      \*\*\* EXPANSION IN EC UPTO 3.55 MTPA STEEL IN JHARBANDH STEEL PLANT      \*\*\* 10/20/20

\*\*\* PM2.5 EMISSIONS FROM ALL STACKS WITH FUGITIVE EMISSION SOURCES      \*\*\* 10:44:21

\*\*\*MODELOPTs: CONC      RURAL      ELEV      DFAULT

\*\*\* THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION      VALUES FOR SOURCE GROUP: ALL      \*\*\*

INCLUDING SOURCE(S):      S-01      , S-02      , S-03      , S-04      , S-05      , S-06      , S-07      ,

S-08      , S-09      , S-10      , S-11      , S-12      , S-13      , S-14      , S-15      , S-16      , S-17      , S-18      , S-19      ,

S-20      , S-21      , S-22      , S-23      , S-24      , S-25      , S-26      , S-27      , S-28      , S-29      , S-30      , . . . ,

\*\*\* DISCRETE CARTESIAN RECEPTOR POINTS \*\*\*

**\*\* CONC OF PM2.5 IN MICROGRAMS/M\*\*3****\*\***

| X-COORD (M) | Y-COORD (M) | CONC     | (YYMMDDHH) | X-COORD (M) | Y-COORD (M) | CONC      | (YYMMDDHH) |
|-------------|-------------|----------|------------|-------------|-------------|-----------|------------|
| 322795.00   | 2297792.00  | 4.74559  | (19052524) | 323238.00   | 2297843.00  | 3.91395   | (19051324) |
| 323693.00   | 2297668.00  | 3.88863  | (19051724) | 324096.00   | 2297301.00  | 4.81422c  | (19030124) |
| 323545.00   | 2296759.00  | 6.64142  | (19052724) | 323497.00   | 2296459.00  | 6.89111   | (19040824) |
| 323455.00   | 2296074.00  | 7.86399  | (19040824) | 323059.00   | 2296075.00  | 5.38577   | (19052824) |
| 322776.00   | 2295945.00  | 5.86766  | (19052824) | 322425.00   | 2295915.00  | 3.05475   | (19031324) |
| 322166.00   | 2296154.00  | 3.76711  | (19052924) | 320491.00   | 2295833.00  | 3.36859   | (19052924) |
| 319544.00   | 2296801.00  | 3.70832  | (19052924) | 320990.00   | 2297542.00  | 3.62837c  | (19051924) |
| 321980.00   | 2297600.00  | 5.07917  | (19052424) | 322432.00   | 2297655.00  | 5.34551   | (19053024) |
| 322408.00   | 2297709.00  | 5.08450  | (19053024) | 323783.00   | 2296753.00  | 12.32598c | (19030124) |
| 323706.00   | 2296366.00  | 7.26215  | (19040824) | 323484.00   | 2296048.00  | 7.95062   | (19040824) |
| 323159.00   | 2295830.00  | 7.49467  | (19052824) | 322773.00   | 2295756.00  | 8.15615   | (19052824) |
| 322389.00   | 2295838.00  | 2.83970  | (19031324) | 322068.00   | 2296062.00  | 3.31281   | (19052924) |
| 322801.00   | 2298424.00  | 4.81839  | (19052524) | 322807.00   | 2298978.00  | 4.26739   | (19052524) |
| 322813.00   | 2299531.00  | 3.79739  | (19052524) | 322819.00   | 2300085.00  | 3.43207   | (19052524) |
| 322824.00   | 2300638.00  | 3.19089  | (19052524) | 322830.00   | 2301192.00  | 3.06550   | (19052524) |
| 322842.00   | 2302299.00  | 2.69043  | (19052524) | 322865.00   | 2304513.00  | 2.19507   | (19052524) |
| 322901.00   | 2307834.00  | 1.77395  | (19052524) | 323425.00   | 2298296.00  | 3.44364   | (19051324) |
| 323638.00   | 2298803.00  | 3.47642  | (19050324) | 323862.00   | 2299310.00  | 2.86128   | (19050324) |
| 324076.00   | 2299817.00  | 2.44305  | (19050324) | 324289.00   | 2300335.00  | 2.32207   | (19041424) |
| 324503.00   | 2300842.00  | 2.11217  | (19041424) | 324930.00   | 2301856.00  | 1.85442   | (19041424) |
| 325784.00   | 2303896.00  | 1.49252  | (19041424) | 327075.00   | 2306949.00  | 1.24933   | (19041424) |
| 323952.00   | 2297925.00  | 4.69401  | (19051724) | 324352.00   | 2298319.00  | 4.26419   | (19051724) |
| 324741.00   | 2298703.00  | 3.58220  | (19051724) | 325130.00   | 2299086.00  | 2.99377   | (19051724) |
| 325519.00   | 2299481.00  | 2.64084  | (19051724) | 325909.00   | 2299864.00  | 2.34190   | (19051724) |
| 326687.00   | 2300642.00  | 1.87484  | (19051724) | 328254.00   | 2302187.00  | 1.41038   | (19051724) |
| 330599.00   | 2304511.00  | 1.16191  | (19051724) | 324311.00   | 2297390.00  | 4.69242c  | (19030124) |
| 324813.00   | 2297595.00  | 4.00957c | (19030124) | 325325.00   | 2297800.00  | 3.24387c  | (19030124) |
| 325827.00   | 2298005.00  | 3.02878  | (19041624) | 326339.00   | 2298210.00  | 2.95104   | (19041624) |
| 326841.00   | 2298415.00  | 2.74363  | (19041624) | 327856.00   | 2298837.00  | 2.49256   | (19041624) |
| 329884.00   | 2299657.00  | 2.05333  | (19041624) | 332926.00   | 2300900.00  | 1.63663   | (19041624) |

ISCST3 Model for Expansion of Dhenkanal Steel Plant (upto 3.55 MTPA), Odisha of RML

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**ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH**

|           |            |          |            |           |            |          |            |
|-----------|------------|----------|------------|-----------|------------|----------|------------|
| 324429.00 | 2296746.00 | 9.68263  | (19040824) | 324970.00 | 2296741.00 | 3.75221  | (19052724) |
| 325522.00 | 2296735.00 | 3.40049  | (19052724) | 326064.00 | 2296729.00 | 3.13929  | (19052724) |
| 326615.00 | 2296724.00 | 2.94286c | (19030124) | 327157.00 | 2296718.00 | 2.49884  | (19052724) |
| 328250.00 | 2296707.00 | 2.09547  | (19052724) | 330437.00 | 2296685.00 | 1.56581  | (19052724) |
| 333717.00 | 2296652.00 | 1.13011  | (19052724) | 324297.00 | 2296117.00 | 4.48623  | (19040824) |
| 324795.00 | 2295901.00 | 3.78014  | (19040824) | 325303.00 | 2295685.00 | 3.27007  | (19040824) |
| 325801.00 | 2295470.00 | 3.50886  | (19040824) | 326309.00 | 2295243.00 | 3.01606  | (19040824) |
| 326806.00 | 2295028.00 | 2.97434  | (19040824) | 327812.00 | 2294597.00 | 1.82230  | (19040824) |
| 329824.00 | 2293724.00 | 1.39668  | (19040824) | 332842.00 | 2292431.00 | .84546   | (19040824) |
| 323927.00 | 2295578.00 | 4.40169  | (19040824) | 324319.00 | 2295186.00 | 3.88704  | (19040824) |
| 324700.00 | 2294795.00 | 3.96447  | (19040824) | 325081.00 | 2294392.00 | 2.98994  | (19040824) |
| 325463.00 | 2294001.00 | 2.42814  | (19040824) | 325844.00 | 2293598.00 | 1.99303  | (19040824) |
| 326606.00 | 2292815.00 | 1.71863  | (19040824) | 328142.00 | 2291227.00 | 1.29959  | (19040824) |
| 330441.00 | 2288857.00 | 1.07135  | (19040824) | 323392.00 | 2295229.00 | 3.34565  | (19041524) |
| 323595.00 | 2294718.00 | 2.72930  | (19041524) | 323809.00 | 2294195.00 | 2.30929  | (19041524) |
| 324012.00 | 2293684.00 | 1.84949  | (19041524) | 324214.00 | 2293172.00 | 1.55498  | (19041524) |
| 324417.00 | 2292661.00 | 1.34609  | (19041524) | 324823.00 | 2291627.00 | 1.13855  | (19052724) |
| 325636.00 | 2289581.00 | .72967   | (19041524) | 326865.00 | 2286491.00 | .73526   | (19052724) |
| 322766.00 | 2295103.00 | 4.40450  | (19052824) | 322760.00 | 2294549.00 | 4.21453  | (19052824) |
| 322754.00 | 2293996.00 | 4.57993  | (19052824) | 322749.00 | 2293442.00 | 3.25555  | (19052824) |
| 322743.00 | 2292889.00 | 3.40748  | (19052824) | 322737.00 | 2292335.00 | 3.04018  | (19052824) |
| 322725.00 | 2291228.00 | 2.38168  | (19052824) | 322702.00 | 2289014.00 | 1.54516  | (19052824) |
| 322667.00 | 2285693.00 | .98603   | (19052824) | 322143.00 | 2295242.00 | 3.40776  | (19030224) |
| 321929.00 | 2294735.00 | 1.47819  | (19041524) | 321715.00 | 2294217.00 | 1.56243  | (19041524) |
| 321502.00 | 2293710.00 | 1.51506  | (19052824) | 321277.00 | 2293203.00 | 1.45863  | (19052824) |
| 321064.00 | 2292696.00 | 1.30164  | (19052824) | 320636.00 | 2291671.00 | 1.19449  | (19030224) |
| 319781.00 | 2289643.00 | 1.41841  | (19050524) | 318488.00 | 2286579.00 | .88059   | (19030224) |
| 321615.00 | 2295602.00 | 2.34144  | (19052924) | 321226.00 | 2295219.00 | 2.14389  | (19052924) |
| 320826.00 | 2294836.00 | 1.91278  | (19052924) | 320437.00 | 2294441.00 | 1.66813  | (19052924) |
| 320047.00 | 2294058.00 | 1.52647  | (19052924) | 319657.00 | 2293663.00 | 1.44186  | (19052924) |
| 318878.00 | 2292897.00 | 1.19607  | (19052924) | 317310.00 | 2291341.00 | .95383   | (19052924) |
| 314971.00 | 2289020.00 | .66775   | (19052924) | 321267.00 | 2296148.00 | 3.30227  | (19052924) |
| 320755.00 | 2295944.00 | 3.39830  | (19052924) | 320253.00 | 2295739.00 | 3.35669  | (19052924) |
| 319740.00 | 2295534.00 | 3.17643  | (19052924) | 319238.00 | 2295318.00 | 2.79565  | (19052924) |
| 318725.00 | 2295113.00 | 2.52264  | (19052924) | 317711.00 | 2294703.00 | 2.10015  | (19052924) |
| 315681.00 | 2293872.00 | 1.49422  | (19052924) | 312636.00 | 2292644.00 | .89575   | (19052924) |
| 319504.00 | 2296798.00 | 3.58577  | (19052924) | 318962.00 | 2296804.00 | 2.79723  | (19052924) |
| 318410.00 | 2296810.00 | 2.38998  | (19052924) | 317317.00 | 2296822.00 | 1.83644  | (19052924) |
| 315130.00 | 2296846.00 | 1.26823  | (19052924) | 311850.00 | 2296882.00 | .87403   | (19052924) |
| 320773.00 | 2297637.00 | 3.36937c | (19051924) | 320275.00 | 2297853.00 | 2.94973  | (19052424) |
| 319767.00 | 2298069.00 | 3.85702  | (19052424) | 319270.00 | 2298285.00 | 3.43368c | (19051924) |
| 318762.00 | 2298500.00 | 3.31538c | (19051924) | 317756.00 | 2298943.00 | 3.18919c | (19051924) |
| 315746.00 | 2299806.00 | 2.96292c | (19051924) | 312730.00 | 2301113.00 | 2.33736c | (19051924) |
| 321640.00 | 2297949.00 | 4.13903  | (19052024) | 321259.00 | 2298352.00 | 3.62167  | (19052024) |

ISCST3 Model for Expansion of Dhenkanal Steel Plant (upto 3.55 MTPA), Odisha of RML

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**ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH**

|           |            |          |            |           |            |          |            |
|-----------|------------|----------|------------|-----------|------------|----------|------------|
| 320868.00 | 2298744.00 | 3.33689  | (19052024) | 320487.00 | 2299135.00 | 3.09116  | (19052024) |
| 320106.00 | 2299538.00 | 3.22920  | (19053024) | 319725.00 | 2299929.00 | 3.22282  | (19053024) |
| 318963.00 | 2300724.00 | 3.17496  | (19052024) | 317429.00 | 2302302.00 | 2.24663  | (19052424) |
| 315143.00 | 2304674.00 | 1.89217  | (19052024) | 322175.00 | 2298309.00 | 5.29565  | (19053024) |
| 321972.00 | 2298820.00 | 4.92322  | (19053024) | 321769.00 | 2299332.00 | 4.36001  | (19053024) |
| 321567.00 | 2299843.00 | 4.13886  | (19053024) | 321354.00 | 2300366.00 | 3.80867  | (19053024) |
| 321151.00 | 2300877.00 | 3.61651  | (19053024) | 320745.00 | 2301900.00 | 3.14934  | (19053024) |
| 319934.00 | 2303957.00 | 2.64516  | (19053024) | 318708.00 | 2307038.00 | 2.15987  | (19053024) |
| 321119.00 | 2297297.00 | 3.54311c | (19051924) | 327125.00 | 2296902.00 | 2.41735  | (19052724) |
| 322586.00 | 2303927.00 | 2.39698  | (19052524) | 325628.00 | 2291636.00 | 1.00989  | (19052724) |
| 324283.00 | 2299557.00 | 2.84588  | (19041424) | 321688.00 | 2294449.00 | 1.60524  | (19041524) |
| 319933.00 | 2295352.00 | 3.47540  | (19052924) | 320660.00 | 2297853.00 | 3.43833c | (19051924) |

| *** THE MAXIMUM 50 24-HR AVERAGE CONCENTRATION |           |               |                             | VALUES FOR SOURCE GROUP: ALL |         |               |                             | ***  |           |               |                             |
|------------------------------------------------|-----------|---------------|-----------------------------|------------------------------|---------|---------------|-----------------------------|------|-----------|---------------|-----------------------------|
| RANK                                           | CONC      | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    | RANK                         | CONC    | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    | RANK | CONC      | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    |
| 1.                                             | 12.32598c | (19030124) AT | ( 323783.00, 2296753.00) DC | 26.                          | 8.04098 | (19033124) AT | ( 323783.00, 2296753.00) DC | 1.   | 12.32598c | (19030124) AT | ( 323783.00, 2296753.00) DC |
| 2.                                             | 12.26369  | (19041124) AT | ( 323783.00, 2296753.00) DC | 27.                          | 7.95062 | (19040824) AT | ( 323484.00, 2296048.00) DC | 2.   | 12.26369  | (19041124) AT | ( 323783.00, 2296753.00) DC |
| 3.                                             | 11.46364  | (19040824) AT | ( 323783.00, 2296753.00) DC | 28.                          | 7.92243 | (19031424) AT | ( 323783.00, 2296753.00) DC | 3.   | 11.46364  | (19040824) AT | ( 323783.00, 2296753.00) DC |
| 4.                                             | 11.46291  | (19052624) AT | ( 323783.00, 2296753.00) DC | 29.                          | 7.89443 | (19042524) AT | ( 324429.00, 2296746.00) DC | 4.   | 11.46291  | (19052624) AT | ( 323783.00, 2296753.00) DC |
| 5.                                             | 11.42869  | (19043024) AT | ( 323783.00, 2296753.00) DC | 30.                          | 7.86399 | (19040824) AT | ( 323455.00, 2296074.00) DC | 5.   | 11.42869  | (19043024) AT | ( 323783.00, 2296753.00) DC |
| 6.                                             | 10.82450  | (19052724) AT | ( 323783.00, 2296753.00) DC | 31.                          | 7.80408 | (19051724) AT | ( 323783.00, 2296753.00) DC | 6.   | 10.82450  | (19052724) AT | ( 323783.00, 2296753.00) DC |
| 7.                                             | 10.37594  | (19042524) AT | ( 323783.00, 2296753.00) DC | 32.                          | 7.65792 | (19030524) AT | ( 323783.00, 2296753.00) DC | 7.   | 10.37594  | (19042524) AT | ( 323783.00, 2296753.00) DC |
| 8.                                             | 10.27202  | (19040324) AT | ( 323783.00, 2296753.00) DC | 33.                          | 7.61963 | (19041224) AT | ( 323783.00, 2296753.00) DC | 8.   | 10.27202  | (19040324) AT | ( 323783.00, 2296753.00) DC |
| 9.                                             | 10.13155  | (19041724) AT | ( 323783.00, 2296753.00) DC | 34.                          | 7.49467 | (19052824) AT | ( 323159.00, 2295830.00) DC | 9.   | 10.13155  | (19041724) AT | ( 323783.00, 2296753.00) DC |
| 10.                                            | 10.08248  | (19041624) AT | ( 323783.00, 2296753.00) DC | 35.                          | 7.28111 | (19052624) AT | ( 324429.00, 2296746.00) DC | 10.  | 10.08248  | (19041624) AT | ( 323783.00, 2296753.00) DC |
| 11.                                            | 9.86074   | (19040724) AT | ( 323783.00, 2296753.00) DC | 36.                          | 7.26367 | (19051324) AT | ( 324429.00, 2296746.00) DC | 11.  | 9.86074   | (19040724) AT | ( 323783.00, 2296753.00) DC |
| 12.                                            | 9.68263   | (19040824) AT | ( 324429.00, 2296746.00) DC | 37.                          | 7.26215 | (19040824) AT | ( 323706.00, 2296366.00) DC | 12.  | 9.68263   | (19040824) AT | ( 324429.00, 2296746.00) DC |
| 13.                                            | 9.65881   | (19051324) AT | ( 323783.00, 2296753.00) DC | 38.                          | 7.11434 | (19041324) AT | ( 324429.00, 2296746.00) DC | 13.  | 9.65881   | (19051324) AT | ( 323783.00, 2296753.00) DC |
| 14.                                            | 9.41369   | (19041124) AT | ( 324429.00, 2296746.00) DC | 39.                          | 7.10471 | (19041724) AT | ( 324429.00, 2296746.00) DC | 14.  | 9.41369   | (19041124) AT | ( 324429.00, 2296746.00) DC |
| 15.                                            | 8.97216   | (19041324) AT | ( 323783.00, 2296753.00) DC | 40.                          | 7.09345 | (19051424) AT | ( 323783.00, 2296753.00) DC | 15.  | 8.97216   | (19041324) AT | ( 323783.00, 2296753.00) DC |
| 16.                                            | 8.84735   | (19051024) AT | ( 323783.00, 2296753.00) DC | 41.                          | 6.89111 | (19040824) AT | ( 323497.00, 2296459.00) DC | 16.  | 8.84735   | (19051024) AT | ( 323783.00, 2296753.00) DC |
| 17.                                            | 8.70894   | (19031924) AT | ( 323783.00, 2296753.00) DC | 42.                          | 6.86224 | (19040924) AT | ( 323455.00, 2296074.00) DC | 17.  | 8.70894   | (19031924) AT | ( 323783.00, 2296753.00) DC |
| 18.                                            | 8.62210   | (19032124) AT | ( 323783.00, 2296753.00) DC | 43.                          | 6.82269 | (19040324) AT | ( 324429.00, 2296746.00) DC | 18.  | 8.62210   | (19032124) AT | ( 323783.00, 2296753.00) DC |
| 19.                                            | 8.46660   | (19040924) AT | ( 323783.00, 2296753.00) DC | 44.                          | 6.72905 | (19040924) AT | ( 323484.00, 2296048.00) DC | 19.  | 8.46660   | (19040924) AT | ( 323783.00, 2296753.00) DC |
| 20.                                            | 8.42539   | (19042324) AT | ( 323783.00, 2296753.00) DC | 45.                          | 6.69011 | (19052724) AT | ( 324429.00, 2296746.00) DC | 20.  | 8.42539   | (19042324) AT | ( 323783.00, 2296753.00) DC |
| 21.                                            | 8.31435c  | (19030124) AT | ( 324429.00, 2296746.00) DC | 46.                          | 6.64142 | (19052724) AT | ( 323545.00, 2296759.00) DC | 21.  | 8.31435c  | (19030124) AT | ( 324429.00, 2296746.00) DC |
| 22.                                            | 8.15615   | (19052824) AT | ( 322773.00, 2295756.00) DC | 47.                          | 6.63327 | (19031224) AT | ( 323783.00, 2296753.00) DC | 22.  | 8.15615   | (19052824) AT | ( 322773.00, 2295756.00) DC |
| 23.                                            | 8.13868   | (19030824) AT | ( 323783.00, 2296753.00) DC | 48.                          | 6.51525 | (19030724) AT | ( 323783.00, 2296753.00) DC | 23.  | 8.13868   | (19030824) AT | ( 323783.00, 2296753.00) DC |
| 24.                                            | 8.13570   | (19043024) AT | ( 324429.00, 2296746.00) DC | 49.                          | 6.34364 | (19031624) AT | ( 323783.00, 2296753.00) DC | 24.  | 8.13570   | (19043024) AT | ( 324429.00, 2296746.00) DC |
| 25.                                            | 8.05835   | (19040424) AT | ( 323783.00, 2296753.00) DC | 50.                          | 6.32129 | (19030624) AT | ( 323783.00, 2296753.00) DC | 25.  | 8.05835   | (19040424) AT | ( 323783.00, 2296753.00) DC |

ISCST3 Model for Expansion of Dhenkanal Steel Plant (upto 3.55 MTPA), Odisha of RML

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**ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH**

\*\*\* ISCST3 - VERSION 95250 \*\*\*      \*\*\* EXPANSION IN EC UPTO 3.55 MTPA STEEL IN JHARBANDH STEEL PLANT      \*\*\*      10/20/20  
 \*\*\* SO2 EMISSIONS FROM ALL STACKS      \*\*\*      10:46:41  
 \*\*MODELOPTs: CONC      RURAL      ELEV      DFAULT  
 \*\*\* THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION      VALUES FOR SOURCE GROUP: ALL      \*\*\*  
 INCLUDING SOURCE(S):      S-01      S-12      S-13      S-14      S-21      S-22      S-23      ,  
 S-24      , S-25      , S-28      , S-29      , S-30      , S-31      , S-32      , S-33      , S-34      , S-35      , S-36      , S-37      ,  
 S-42      , S-44      , S-46      , S-48      , S-50      , S-51      , S-52      , S-63      , S-73      , S-77      , S-80      , . . . ,

\*\*\* DISCRETE CARTESIAN RECEPTOR POINTS \*\*\*

**\*\* CONC OF SO2 IN MICROGRAMS/M\*\*3**

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| X-COORD (M) | Y-COORD (M) | CONC      | (YYMMDDHH) | X-COORD (M) | Y-COORD (M) | CONC      | (YYMMDDHH) |
|-------------|-------------|-----------|------------|-------------|-------------|-----------|------------|
| 322795.00   | 2297792.00  | 31.20754  | (19052524) | 323238.00   | 2297843.00  | 27.76533  | (19052524) |
| 323693.00   | 2297668.00  | 17.83527  | (19051724) | 324096.00   | 2297301.00  | 28.73425  | (19051724) |
| 323545.00   | 2296759.00  | 16.29510c | (19030124) | 323497.00   | 2296459.00  | 24.73024  | (19052724) |
| 323455.00   | 2296074.00  | 31.25385  | (19040824) | 323059.00   | 2296075.00  | 8.54261   | (19040824) |
| 322776.00   | 2295945.00  | 5.67849   | (19041524) | 322425.00   | 2295915.00  | 12.96313  | (19052924) |
| 322166.00   | 2296154.00  | 19.24255  | (19052924) | 320491.00   | 2295833.00  | 17.59113  | (19031624) |
| 319544.00   | 2296801.00  | 15.04245  | (19052924) | 320990.00   | 2297542.00  | 32.16713c | (19051924) |
| 321980.00   | 2297600.00  | 33.67469  | (19053024) | 322432.00   | 2297655.00  | 35.11639  | (19052424) |
| 322773.00   | 2295756.00  | 13.62671  | (19041524) | 323159.00   | 2295830.00  | 22.31454  | (19040824) |
| 323484.00   | 2296048.00  | 32.68936  | (19040824) | 323706.00   | 2296366.00  | 35.31443  | (19052724) |
| 323783.00   | 2296753.00  | 26.55408c | (19030124) | 322408.00   | 2297709.00  | 35.32741  | (19052424) |
| 322068.00   | 2296062.00  | 23.09889  | (19052924) | 322389.00   | 2295838.00  | 12.96001  | (19052924) |
| 322801.00   | 2298424.00  | 28.57533  | (19052524) | 322807.00   | 2298978.00  | 24.90949  | (19052524) |
| 322813.00   | 2299531.00  | 21.64181  | (19052524) | 322819.00   | 2300085.00  | 19.04296  | (19052524) |
| 322824.00   | 2300638.00  | 16.94013  | (19052524) | 322830.00   | 2301192.00  | 15.34228  | (19052524) |
| 322842.00   | 2302299.00  | 12.93320  | (19052524) | 322865.00   | 2304513.00  | 10.10222  | (19052524) |
| 322901.00   | 2307834.00  | 8.03965   | (19052524) | 323425.00   | 2298296.00  | 23.69692  | (19052524) |
| 323638.00   | 2298803.00  | 18.56204  | (19051224) | 323862.00   | 2299310.00  | 15.64749  | (19050324) |
| 324076.00   | 2299817.00  | 13.61033  | (19050324) | 324289.00   | 2300335.00  | 12.38357  | (19050324) |
| 324503.00   | 2300842.00  | 10.62181  | (19050324) | 324930.00   | 2301856.00  | 8.39987   | (19050324) |
| 325784.00   | 2303896.00  | 6.84395   | (19041424) | 327075.00   | 2306949.00  | 6.04389   | (19041424) |
| 323952.00   | 2297925.00  | 17.42822  | (19051724) | 324352.00   | 2298319.00  | 15.60107  | (19051724) |
| 324741.00   | 2298703.00  | 13.38221  | (19051724) | 325130.00   | 2299086.00  | 11.56265  | (19051724) |
| 325519.00   | 2299481.00  | 10.25686  | (19051724) | 325909.00   | 2299864.00  | 9.23875   | (19051724) |
| 326687.00   | 2300642.00  | 7.68034   | (19051724) | 328254.00   | 2302187.00  | 6.04487   | (19051724) |
| 330599.00   | 2304511.00  | 5.03668   | (19051724) | 324311.00   | 2297390.00  | 26.69816  | (19051724) |
| 324813.00   | 2297595.00  | 20.82825  | (19051724) | 325325.00   | 2297800.00  | 15.54132  | (19051724) |
| 325827.00   | 2298005.00  | 12.17651  | (19051724) | 326339.00   | 2298210.00  | 10.23555c | (19030124) |
| 326841.00   | 2298415.00  | 9.27278c  | (19030124) | 327856.00   | 2298837.00  | 8.20215   | (19041624) |
| 329884.00   | 2299657.00  | 7.77237   | (19041624) | 332926.00   | 2300900.00  | 7.04428   | (19041624) |

ISCST3 Model for Expansion of Dhenkanal Steel Plant (upto 3.55 MTPA), Odisha of RML

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**ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH**

|           |            |           |            |           |            |           |            |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 324429.00 | 2296746.00 | 26.49643  | (19052724) | 324970.00 | 2296741.00 | 19.65134  | (19052724) |
| 325522.00 | 2296735.00 | 17.18540  | (19052724) | 326064.00 | 2296729.00 | 15.65703  | (19052724) |
| 326615.00 | 2296724.00 | 14.06344  | (19052724) | 327157.00 | 2296718.00 | 12.19427  | (19052724) |
| 328250.00 | 2296707.00 | 10.16158  | (19052724) | 330437.00 | 2296685.00 | 7.58269   | (19052724) |
| 333717.00 | 2296652.00 | 5.50508   | (19052724) | 324297.00 | 2296117.00 | 28.50338  | (19052724) |
| 324795.00 | 2295901.00 | 19.71253  | (19052724) | 325303.00 | 2295685.00 | 19.01385  | (19040824) |
| 325801.00 | 2295470.00 | 17.92734  | (19040824) | 326309.00 | 2295243.00 | 15.83318  | (19040824) |
| 326806.00 | 2295028.00 | 14.24651  | (19040824) | 327812.00 | 2294597.00 | 10.11876  | (19040824) |
| 329824.00 | 2293724.00 | 7.34709   | (19040824) | 332842.00 | 2292431.00 | 4.33096   | (19040824) |
| 323927.00 | 2295578.00 | 25.38322  | (19040824) | 324319.00 | 2295186.00 | 23.31525  | (19033124) |
| 324700.00 | 2294795.00 | 20.89738  | (19040824) | 325081.00 | 2294392.00 | 15.13915  | (19033124) |
| 325463.00 | 2294001.00 | 11.90172  | (19033124) | 325844.00 | 2293598.00 | 9.59126   | (19033124) |
| 326606.00 | 2292815.00 | 7.48486   | (19040824) | 328142.00 | 2291227.00 | 5.24162   | (19040824) |
| 330441.00 | 2288857.00 | 4.99453   | (19040824) | 323392.00 | 2295229.00 | 25.34683  | (19041524) |
| 323595.00 | 2294718.00 | 21.82156  | (19041524) | 323809.00 | 2294195.00 | 17.29991  | (19041524) |
| 324012.00 | 2293684.00 | 13.22421  | (19041524) | 324214.00 | 2293172.00 | 10.37316  | (19041524) |
| 324417.00 | 2292661.00 | 8.39067   | (19041524) | 324823.00 | 2291627.00 | 5.80482   | (19041524) |
| 325636.00 | 2289581.00 | 3.58670   | (19041524) | 326865.00 | 2286491.00 | 3.37748   | (19052724) |
| 322766.00 | 2295103.00 | 18.63197  | (19052824) | 322760.00 | 2294549.00 | 22.17568  | (19052824) |
| 322754.00 | 2293996.00 | 24.15787  | (19052824) | 322749.00 | 2293442.00 | 23.29276  | (19052824) |
| 322743.00 | 2292889.00 | 17.45168  | (19052824) | 322737.00 | 2292335.00 | 15.48852  | (19052824) |
| 322725.00 | 2291228.00 | 12.08364  | (19052824) | 322702.00 | 2289014.00 | 7.63746   | (19052824) |
| 322667.00 | 2285693.00 | 4.72218   | (19052824) | 322143.00 | 2295242.00 | 15.21893  | (19031324) |
| 321929.00 | 2294735.00 | 10.55508  | (19031324) | 321715.00 | 2294217.00 | 8.50774   | (19031324) |
| 321502.00 | 2293710.00 | 6.77546   | (19031324) | 321277.00 | 2293203.00 | 5.35725   | (19031324) |
| 321064.00 | 2292696.00 | 4.39535   | (19031324) | 320636.00 | 2291671.00 | 4.29283   | (19030224) |
| 319781.00 | 2289643.00 | 5.62711   | (19030224) | 318488.00 | 2286579.00 | 4.11660   | (19030224) |
| 321615.00 | 2295602.00 | 23.16130  | (19052924) | 321226.00 | 2295219.00 | 17.49673  | (19052924) |
| 320826.00 | 2294836.00 | 14.67299  | (19052924) | 320437.00 | 2294441.00 | 12.77286  | (19052924) |
| 320047.00 | 2294058.00 | 11.66036  | (19052924) | 319657.00 | 2293663.00 | 10.84163  | (19052924) |
| 318878.00 | 2292897.00 | 9.63445   | (19052924) | 317310.00 | 2291341.00 | 7.31148   | (19052924) |
| 314971.00 | 2289020.00 | 4.98307   | (19052924) | 321267.00 | 2296148.00 | 23.04145  | (19052924) |
| 320755.00 | 2295944.00 | 19.56694  | (19031624) | 320253.00 | 2295739.00 | 16.14538  | (19031624) |
| 319740.00 | 2295534.00 | 14.60428  | (19031624) | 319238.00 | 2295318.00 | 12.72197  | (19031624) |
| 318725.00 | 2295113.00 | 10.77136  | (19031624) | 317711.00 | 2294703.00 | 8.68433   | (19031624) |
| 315681.00 | 2293872.00 | 6.40024   | (19031624) | 312636.00 | 2292644.00 | 4.61367   | (19031624) |
| 319504.00 | 2296798.00 | 15.08271  | (19052924) | 318962.00 | 2296804.00 | 12.68617  | (19052924) |
| 318410.00 | 2296810.00 | 10.42063  | (19052924) | 317317.00 | 2296822.00 | 7.83361   | (19052924) |
| 315130.00 | 2296846.00 | 5.47416   | (19052924) | 311850.00 | 2296882.00 | 3.84268   | (19052924) |
| 320773.00 | 2297637.00 | 29.29175c | (19051924) | 320275.00 | 2297853.00 | 23.92919c | (19051924) |
| 319767.00 | 2298069.00 | 20.70380c | (19051924) | 319270.00 | 2298285.00 | 19.43509c | (19051924) |
| 318762.00 | 2298500.00 | 17.55616c | (19051924) | 317756.00 | 2298943.00 | 14.96484c | (19051924) |
| 315746.00 | 2299806.00 | 11.91900c | (19051924) | 312730.00 | 2301113.00 | 8.69523c  | (19051924) |
| 321640.00 | 2297949.00 | 33.23432  | (19053024) | 321259.00 | 2298352.00 | 25.42510  | (19053024) |

ISCST3 Model for Expansion of Dhenkanal Steel Plant (upto 3.55 MTPA), Odisha of RML

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**ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH**

|           |            |           |            |           |            |           |            |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 320868.00 | 2298744.00 | 20.63342  | (19053024) | 320487.00 | 2299135.00 | 17.73423  | (19053024) |
| 320106.00 | 2299538.00 | 16.77068  | (19053024) | 319725.00 | 2299929.00 | 15.72692  | (19053024) |
| 318963.00 | 2300724.00 | 14.81409  | (19052024) | 317429.00 | 2302302.00 | 10.98926  | (19052024) |
| 315143.00 | 2304674.00 | 9.45385   | (19052024) | 322175.00 | 2298309.00 | 34.81524  | (19052424) |
| 321972.00 | 2298820.00 | 31.06029  | (19052424) | 321769.00 | 2299332.00 | 27.28905  | (19052424) |
| 321567.00 | 2299843.00 | 24.15620  | (19052424) | 321354.00 | 2300366.00 | 21.43449  | (19052424) |
| 321151.00 | 2300877.00 | 19.28422  | (19052424) | 320745.00 | 2301900.00 | 16.41261  | (19053024) |
| 319934.00 | 2303957.00 | 13.60480  | (19053024) | 318708.00 | 2307038.00 | 11.46877  | (19053024) |
| 321119.00 | 2297297.00 | 32.89106c | (19051924) | 327125.00 | 2296902.00 | 11.06063  | (19052724) |
| 322586.00 | 2303927.00 | 11.21080  | (19052524) | 325628.00 | 2291636.00 | 5.29529   | (19041724) |
| 324283.00 | 2299557.00 | 11.93797  | (19041424) | 321688.00 | 2294449.00 | 9.33641   | (19031324) |
| 319933.00 | 2295352.00 | 13.43361  | (19031624) | 320660.00 | 2297853.00 | 28.10283c | (19051924) |

| *** THE MAXIMUM 50 24-HR AVERAGE CONCENTRATION |           |               |                             | VALUES FOR SOURCE GROUP: ALL |           |               |                             |
|------------------------------------------------|-----------|---------------|-----------------------------|------------------------------|-----------|---------------|-----------------------------|
| RANK                                           | CONC      | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    | RANK                         | CONC      | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    |
| 1.                                             | 35.32741  | (19052424) AT | ( 322408.00, 2297709.00) DC | 26.                          | 28.20746  | (19051824) AT | ( 321980.00, 2297600.00) DC |
| 2.                                             | 35.31443  | (19052724) AT | ( 323706.00, 2296366.00) DC | 27.                          | 28.10283c | (19051924) AT | ( 320660.00, 2297853.00) DC |
| 3.                                             | 35.11639  | (19052424) AT | ( 322432.00, 2297655.00) DC | 28.                          | 27.76533  | (19052524) AT | ( 323238.00, 2297843.00) DC |
| 4.                                             | 34.81524  | (19052424) AT | ( 322175.00, 2298309.00) DC | 29.                          | 27.68457  | (19051824) AT | ( 321640.00, 2297949.00) DC |
| 5.                                             | 34.40340  | (19053024) AT | ( 322432.00, 2297655.00) DC | 30.                          | 27.28905  | (19052424) AT | ( 321769.00, 2299332.00) DC |
| 6.                                             | 34.39580  | (19053024) AT | ( 322408.00, 2297709.00) DC | 31.                          | 26.91114  | (19033024) AT | ( 320990.00, 2297542.00) DC |
| 7.                                             | 33.67469  | (19053024) AT | ( 321980.00, 2297600.00) DC | 32.                          | 26.69816  | (19051724) AT | ( 324311.00, 2297390.00) DC |
| 8.                                             | 33.23432  | (19053024) AT | ( 321640.00, 2297949.00) DC | 33.                          | 26.55408c | (19030124) AT | ( 323783.00, 2296753.00) DC |
| 9.                                             | 33.22562  | (19052424) AT | ( 321980.00, 2297600.00) DC | 34.                          | 26.49643  | (19052724) AT | ( 324429.00, 2296746.00) DC |
| 10.                                            | 32.98264  | (19052424) AT | ( 321640.00, 2297949.00) DC | 35.                          | 26.27327  | (19052324) AT | ( 322175.00, 2298309.00) DC |
| 11.                                            | 32.89106c | (19051924) AT | ( 321119.00, 2297297.00) DC | 36.                          | 26.17413  | (19052024) AT | ( 320990.00, 2297542.00) DC |
| 12.                                            | 32.68936  | (19040824) AT | ( 323484.00, 2296048.00) DC | 37.                          | 25.59138  | (19051824) AT | ( 322408.00, 2297709.00) DC |
| 13.                                            | 32.46495  | (19053024) AT | ( 322175.00, 2298309.00) DC | 38.                          | 25.44529  | (19033024) AT | ( 320773.00, 2297637.00) DC |
| 14.                                            | 32.16713c | (19051924) AT | ( 320990.00, 2297542.00) DC | 39.                          | 25.42510  | (19053024) AT | ( 321259.00, 2298352.00) DC |
| 15.                                            | 31.29420  | (19052324) AT | ( 322432.00, 2297655.00) DC | 40.                          | 25.38322  | (19040824) AT | ( 323927.00, 2295578.00) DC |
| 16.                                            | 31.25385  | (19040824) AT | ( 323455.00, 2296074.00) DC | 41.                          | 25.34683  | (19041524) AT | ( 323392.00, 2295229.00) DC |
| 17.                                            | 31.20754  | (19052524) AT | ( 322795.00, 2297792.00) DC | 42.                          | 25.31822  | (19053024) AT | ( 321769.00, 2299332.00) DC |
| 18.                                            | 31.06029  | (19052424) AT | ( 321972.00, 2298820.00) DC | 43.                          | 25.30974  | (19051824) AT | ( 322432.00, 2297655.00) DC |
| 19.                                            | 30.59948  | (19052324) AT | ( 322408.00, 2297709.00) DC | 44.                          | 25.16194  | (19033024) AT | ( 321119.00, 2297297.00) DC |
| 20.                                            | 29.50204  | (19052324) AT | ( 322795.00, 2297792.00) DC | 45.                          | 25.08388  | (19052324) AT | ( 322801.00, 2298424.00) DC |
| 21.                                            | 29.29175c | (19051924) AT | ( 320773.00, 2297637.00) DC | 46.                          | 25.03179c | (19030124) AT | ( 324429.00, 2296746.00) DC |
| 22.                                            | 28.86606  | (19053024) AT | ( 321972.00, 2298820.00) DC | 47.                          | 24.90949  | (19052524) AT | ( 322807.00, 2298978.00) DC |
| 23.                                            | 28.73425  | (19051724) AT | ( 324096.00, 2297301.00) DC | 48.                          | 24.90932  | (19052024) AT | ( 320660.00, 2297853.00) DC |
| 24.                                            | 28.57533  | (19052524) AT | ( 322801.00, 2298424.00) DC | 49.                          | 24.72024  | (19052724) AT | ( 323497.00, 2296459.00) DC |
| 25.                                            | 28.50338  | (19052724) AT | ( 324297.00, 2296117.00) DC | 50.                          | 24.41987  | (19033124) AT | ( 323927.00, 2295578.00) DC |

ISCST3 Model for Expansion of Dhenkanal Steel Plant (upto 3.55 MTPA), Odisha of RML

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**ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH**

\*\*\* ISCST3 - VERSION 95250 \*\*\*      \*\*\* EXPANSION IN EC UPTO 3.55 MTPA STEEL IN JHARBANDH STEEL PLANT      \*\*\*      10/20/20

\*\*\* NO2 EMISSIONS FROM ALL STACKS      \*\*\*      10:46:56

\*\*\*MODELOPTs: CONC      RURAL      ELEV      DFAULT

\*\*\* THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION      VALUES FOR SOURCE GROUP: ALL      \*\*\*

INCLUDING SOURCE(S):      S-01      S-12      S-13      S-14      S-21      S-22      S-23      ,

S-24      ,      S-25      ,      S-28      ,      S-29      ,      S-30      ,      S-31      ,      S-32      ,      S-33      ,      S-34      ,      S-35      ,      S-36      ,      S-37      ,

S-42      ,      S-44      ,      S-46      ,      S-48      ,      S-50      ,      S-51      ,      S-52      ,      S-63      ,      S-73      ,      S-77      ,      S-80      ,      . . . ,

\*\*\* DISCRETE CARTESIAN RECEPTOR POINTS \*\*\*

**\*\* CONC OF NO2 IN MICROGRAMS/M\*\*3**

\*\*

| X-COORD (M) | Y-COORD (M) | CONC     | (YYMMDDHH) | X-COORD (M) | Y-COORD (M) | CONC      | (YYMMDDHH) |
|-------------|-------------|----------|------------|-------------|-------------|-----------|------------|
| 322795.00   | 2297792.00  | 14.42518 | (19053024) | 323238.00   | 2297843.00  | 13.58927  | (19052524) |
| 323693.00   | 2297668.00  | 6.64141  | (19032724) | 324096.00   | 2297301.00  | 10.09753  | (19051724) |
| 323545.00   | 2296759.00  | 3.32597  | (19041124) | 323497.00   | 2296459.00  | 3.54989   | (19040824) |
| 323455.00   | 2296074.00  | 7.42132  | (19040824) | 323059.00   | 2296075.00  | 3.46088   | (19040824) |
| 322776.00   | 2295945.00  | 3.47573  | (19040224) | 322425.00   | 2295915.00  | 10.17525  | (19052924) |
| 322166.00   | 2296154.00  | 10.85265 | (19052924) | 320491.00   | 2295833.00  | 5.85922   | (19031624) |
| 319544.00   | 2296801.00  | 7.02377  | (19052924) | 320990.00   | 2297542.00  | 11.05111c | (19051924) |
| 321980.00   | 2297600.00  | 12.46241 | (19052024) | 322432.00   | 2297655.00  | 13.70656  | (19052424) |
| 322408.00   | 2297709.00  | 13.88581 | (19052424) | 323783.00   | 2296753.00  | 8.77385   | (19041124) |
| 323706.00   | 2296366.00  | 5.45573  | (19040824) | 323484.00   | 2296048.00  | 7.63130   | (19040824) |
| 323159.00   | 2295830.00  | 7.37244  | (19052824) | 322773.00   | 2295756.00  | 4.83289   | (19031324) |
| 322389.00   | 2295838.00  | 9.32830  | (19052924) | 322068.00   | 2296062.00  | 9.97960   | (19052924) |
| 322801.00   | 2298424.00  | 10.59790 | (19053024) | 322807.00   | 2298978.00  | 9.04780   | (19052324) |
| 322813.00   | 2299531.00  | 7.77318  | (19052524) | 322819.00   | 2300085.00  | 6.97792   | (19052524) |
| 322824.00   | 2300638.00  | 6.25816  | (19052524) | 322830.00   | 2301192.00  | 5.69459   | (19052524) |
| 322842.00   | 2302299.00  | 4.86091  | (19052524) | 322865.00   | 2304513.00  | 3.89567   | (19052524) |
| 322901.00   | 2307834.00  | 3.22673  | (19052524) | 323425.00   | 2298296.00  | 12.01132  | (19052524) |
| 323638.00   | 2298803.00  | 9.25420  | (19032724) | 323862.00   | 2299310.00  | 7.61582   | (19032724) |
| 324076.00   | 2299817.00  | 6.31249  | (19032724) | 324289.00   | 2300335.00  | 5.36974   | (19050324) |
| 324503.00   | 2300842.00  | 4.51847  | (19050324) | 324930.00   | 2301856.00  | 3.44053   | (19050324) |
| 325784.00   | 2303896.00  | 2.39885  | (19050324) | 327075.00   | 2306949.00  | 1.87331   | (19041424) |
| 323952.00   | 2297925.00  | 6.56715  | (19042924) | 324352.00   | 2298319.00  | 5.59585   | (19052624) |
| 324741.00   | 2298703.00  | 4.64603  | (19051724) | 325130.00   | 2299086.00  | 4.00140   | (19051724) |
| 325519.00   | 2299481.00  | 3.55809  | (19051724) | 325909.00   | 2299864.00  | 3.18722   | (19051724) |
| 326687.00   | 2300642.00  | 2.64424  | (19051724) | 328254.00   | 2302187.00  | 2.09689   | (19051724) |
| 330599.00   | 2304511.00  | 1.74036  | (19051724) | 324311.00   | 2297390.00  | 9.90824   | (19051724) |
| 324813.00   | 2297595.00  | 8.34138  | (19051724) | 325325.00   | 2297800.00  | 6.38002   | (19051724) |
| 325827.00   | 2298005.00  | 5.26822c | (19030124) | 326339.00   | 2298210.00  | 4.67754c  | (19030124) |
| 326841.00   | 2298415.00  | 4.21168c | (19030124) | 327856.00   | 2298837.00  | 3.60598c  | (19030124) |
| 329884.00   | 2299657.00  | 2.77762c | (19030124) | 332926.00   | 2300900.00  | 2.58095   | (19041624) |

ISCST3 Model for Expansion of Dhenkanal Steel Plant (upto 3.55 MTPA), Odisha of RML

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**ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH**

|           |            |          |            |           |            |          |            |
|-----------|------------|----------|------------|-----------|------------|----------|------------|
| 324429.00 | 2296746.00 | 12.01701 | (19052724) | 324970.00 | 2296741.00 | 8.74556  | (19052724) |
| 325522.00 | 2296735.00 | 7.36769  | (19052724) | 326064.00 | 2296729.00 | 6.62773  | (19052724) |
| 326615.00 | 2296724.00 | 5.83763  | (19052724) | 327157.00 | 2296718.00 | 4.97227  | (19052724) |
| 328250.00 | 2296707.00 | 4.07061  | (19052724) | 330437.00 | 2296685.00 | 2.97726  | (19052724) |
| 333717.00 | 2296652.00 | 2.12278  | (19052724) | 324297.00 | 2296117.00 | 8.89507  | (19040424) |
| 324795.00 | 2295901.00 | 9.99660  | (19040824) | 325303.00 | 2295685.00 | 9.26168  | (19040824) |
| 325801.00 | 2295470.00 | 8.51435  | (19040824) | 326309.00 | 2295243.00 | 7.38644  | (19040824) |
| 326806.00 | 2295028.00 | 6.57474  | (19040824) | 327812.00 | 2294597.00 | 4.49346  | (19040824) |
| 329824.00 | 2293724.00 | 3.21208  | (19040824) | 332842.00 | 2292431.00 | 1.75728  | (19040824) |
| 323927.00 | 2295578.00 | 7.91996  | (19040824) | 324319.00 | 2295186.00 | 8.53147  | (19033124) |
| 324700.00 | 2294795.00 | 7.75798  | (19033124) | 325081.00 | 2294392.00 | 5.95310  | (19033124) |
| 325463.00 | 2294001.00 | 4.67433  | (19033124) | 325844.00 | 2293598.00 | 3.73892  | (19033124) |
| 326606.00 | 2292815.00 | 2.91350  | (19033124) | 328142.00 | 2291227.00 | 2.01949  | (19033124) |
| 330441.00 | 2288857.00 | 1.79538  | (19040824) | 323392.00 | 2295229.00 | 11.57006 | (19052824) |
| 323595.00 | 2294718.00 | 9.41970  | (19052824) | 323809.00 | 2294195.00 | 6.53166  | (19052824) |
| 324012.00 | 2293684.00 | 4.55537  | (19041524) | 324214.00 | 2293172.00 | 3.56921  | (19041524) |
| 324417.00 | 2292661.00 | 2.87767  | (19041524) | 324823.00 | 2291627.00 | 1.96548  | (19041524) |
| 325636.00 | 2289581.00 | 1.20282  | (19041524) | 326865.00 | 2286491.00 | 1.48547  | (19052724) |
| 322766.00 | 2295103.00 | 6.19817  | (19031124) | 322760.00 | 2294549.00 | 6.27620  | (19031124) |
| 322754.00 | 2293996.00 | 6.93456  | (19052824) | 322749.00 | 2293442.00 | 8.44950  | (19052824) |
| 322743.00 | 2292889.00 | 6.54928  | (19052824) | 322737.00 | 2292335.00 | 6.36443  | (19052824) |
| 322725.00 | 2291228.00 | 5.45157  | (19052824) | 322702.00 | 2289014.00 | 3.56546  | (19052824) |
| 322667.00 | 2285693.00 | 2.08774  | (19052824) | 322143.00 | 2295242.00 | 6.13336  | (19031324) |
| 321929.00 | 2294735.00 | 3.83771  | (19031324) | 321715.00 | 2294217.00 | 2.82916  | (19031324) |
| 321502.00 | 2293710.00 | 2.18544  | (19031324) | 321277.00 | 2293203.00 | 1.69839  | (19031324) |
| 321064.00 | 2292696.00 | 1.40808  | (19030224) | 320636.00 | 2291671.00 | 1.75948  | (19030224) |
| 319781.00 | 2289643.00 | 2.61023  | (19030224) | 318488.00 | 2286579.00 | 2.23757  | (19030224) |
| 321615.00 | 2295602.00 | 7.69304  | (19052924) | 321226.00 | 2295219.00 | 6.13901  | (19052924) |
| 320826.00 | 2294836.00 | 5.32543  | (19052924) | 320437.00 | 2294441.00 | 4.74075  | (19052924) |
| 320047.00 | 2294058.00 | 4.37856  | (19052924) | 319657.00 | 2293663.00 | 4.27295  | (19052924) |
| 318878.00 | 2292897.00 | 3.72954  | (19052924) | 317310.00 | 2291341.00 | 2.84799  | (19052924) |
| 314971.00 | 2289020.00 | 1.93623  | (19052924) | 321267.00 | 2296148.00 | 6.87535  | (19031624) |
| 320755.00 | 2295944.00 | 6.77042  | (19031624) | 320253.00 | 2295739.00 | 5.33354  | (19031624) |
| 319740.00 | 2295534.00 | 5.15364  | (19031624) | 319238.00 | 2295318.00 | 4.53295  | (19031624) |
| 318725.00 | 2295113.00 | 3.81943  | (19031624) | 317711.00 | 2294703.00 | 3.28591  | (19052924) |
| 315681.00 | 2293872.00 | 2.85497  | (19052924) | 312636.00 | 2292644.00 | 1.93924  | (19052924) |
| 319504.00 | 2296798.00 | 7.08579  | (19052924) | 318962.00 | 2296804.00 | 5.33848  | (19052924) |
| 318410.00 | 2296810.00 | 4.80295  | (19052124) | 317317.00 | 2296822.00 | 3.22493  | (19052124) |
| 315130.00 | 2296846.00 | 2.12120  | (19050224) | 311850.00 | 2296882.00 | 1.34763  | (19052924) |
| 320773.00 | 2297637.00 | 9.64077c | (19051924) | 320275.00 | 2297853.00 | 7.73798c | (19051924) |
| 319767.00 | 2298069.00 | 6.91489c | (19051924) | 319270.00 | 2298285.00 | 7.00628c | (19051924) |
| 318762.00 | 2298500.00 | 6.45880c | (19051924) | 317756.00 | 2298943.00 | 5.54613c | (19051924) |
| 315746.00 | 2299806.00 | 4.56245c | (19051924) | 312730.00 | 2301113.00 | 3.39321c | (19051924) |
| 321640.00 | 2297949.00 | 12.85526 | (19052024) | 321259.00 | 2298352.00 | 10.81463 | (19052024) |

ISCST3 Model for Expansion of Dhenkanal Steel Plant (upto 3.55 MTPA), Odisha of RML

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**ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH**

|           |            |           |            |           |            |          |            |
|-----------|------------|-----------|------------|-----------|------------|----------|------------|
| 320868.00 | 2298744.00 | 9.18615   | (19052024) | 320487.00 | 2299135.00 | 7.92923  | (19052024) |
| 320106.00 | 2299538.00 | 7.47022   | (19052024) | 319725.00 | 2299929.00 | 6.76482  | (19052024) |
| 318963.00 | 2300724.00 | 7.15518   | (19052024) | 317429.00 | 2302302.00 | 4.81223  | (19052024) |
| 315143.00 | 2304674.00 | 3.95562   | (19052024) | 322175.00 | 2298309.00 | 14.58580 | (19052424) |
| 321972.00 | 2298820.00 | 13.07701  | (19052424) | 321769.00 | 2299332.00 | 11.48556 | (19052424) |
| 321567.00 | 2299843.00 | 10.14013  | (19052424) | 321354.00 | 2300366.00 | 8.92734  | (19052424) |
| 321151.00 | 2300877.00 | 7.98227   | (19052424) | 320745.00 | 2301900.00 | 6.58104  | (19052424) |
| 319934.00 | 2303957.00 | 5.18521   | (19053024) | 318708.00 | 2307038.00 | 4.32772  | (19053024) |
| 321119.00 | 2297297.00 | 10.58886c | (19051924) | 327125.00 | 2296902.00 | 4.49937  | (19052724) |
| 322586.00 | 2303927.00 | 4.35580   | (19052524) | 325628.00 | 2291636.00 | 2.48071  | (19040924) |
| 324283.00 | 2299557.00 | 5.24869   | (19051224) | 321688.00 | 2294449.00 | 3.16687  | (19031324) |
| 319933.00 | 2295352.00 | 4.80296   | (19052924) | 320660.00 | 2297853.00 | 9.88623c | (19051924) |

| *** THE MAXIMUM 50 24-HR AVERAGE CONCENTRATION |           |               |                             | VALUES FOR SOURCE GROUP: ALL |           |               |                             | ***  |      |               |                          |
|------------------------------------------------|-----------|---------------|-----------------------------|------------------------------|-----------|---------------|-----------------------------|------|------|---------------|--------------------------|
| RANK                                           | CONC      | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    | RANK                         | CONC      | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    | RANK | CONC | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE |
| 1.                                             | 14.58580  | (19052424) AT | ( 322175.00, 2298309.00) DC | 26.                          | 10.61910  | (19032724) AT | ( 323425.00, 2298296.00) DC |      |      |               |                          |
| 2.                                             | 14.42518  | (19053024) AT | ( 322795.00, 2297792.00) DC | 27.                          | 10.59790  | (19053024) AT | ( 322801.00, 2298424.00) DC |      |      |               |                          |
| 3.                                             | 13.95672  | (19052424) AT | ( 322795.00, 2297792.00) DC | 28.                          | 10.58886c | (19051924) AT | ( 321119.00, 2297297.00) DC |      |      |               |                          |
| 4.                                             | 13.88581  | (19052424) AT | ( 322408.00, 2297709.00) DC | 29.                          | 10.52700  | (19052324) AT | ( 322801.00, 2298424.00) DC |      |      |               |                          |
| 5.                                             | 13.70656  | (19052424) AT | ( 322432.00, 2297655.00) DC | 30.                          | 10.47413c | (19051924) AT | ( 321640.00, 2297949.00) DC |      |      |               |                          |
| 6.                                             | 13.67442  | (19053024) AT | ( 322408.00, 2297709.00) DC | 31.                          | 10.33422  | (19051824) AT | ( 322408.00, 2297709.00) DC |      |      |               |                          |
| 7.                                             | 13.58927  | (19052524) AT | ( 323238.00, 2297843.00) DC | 32.                          | 10.30111  | (19051824) AT | ( 321640.00, 2297949.00) DC |      |      |               |                          |
| 8.                                             | 13.57713  | (19053024) AT | ( 322432.00, 2297655.00) DC | 33.                          | 10.17525  | (19052924) AT | ( 322425.00, 2295915.00) DC |      |      |               |                          |
| 9.                                             | 13.07701  | (19052424) AT | ( 321972.00, 2298820.00) DC | 34.                          | 10.16074  | (19051824) AT | ( 322432.00, 2297655.00) DC |      |      |               |                          |
| 10.                                            | 12.98777  | (19053024) AT | ( 322175.00, 2298309.00) DC | 35.                          | 10.14013  | (19052424) AT | ( 321567.00, 2299843.00) DC |      |      |               |                          |
| 11.                                            | 12.85526  | (19052024) AT | ( 321640.00, 2297949.00) DC | 36.                          | 10.09753  | (19051724) AT | ( 324096.00, 2297301.00) DC |      |      |               |                          |
| 12.                                            | 12.46241  | (19052024) AT | ( 321980.00, 2297600.00) DC | 37.                          | 9.99660   | (19040824) AT | ( 324795.00, 2295901.00) DC |      |      |               |                          |
| 13.                                            | 12.01701  | (19052724) AT | ( 324429.00, 2296746.00) DC | 38.                          | 9.98965   | (19053024) AT | ( 321640.00, 2297949.00) DC |      |      |               |                          |
| 14.                                            | 12.01132  | (19052524) AT | ( 323425.00, 2298296.00) DC | 39.                          | 9.97960   | (19052924) AT | ( 322068.00, 2296062.00) DC |      |      |               |                          |
| 15.                                            | 11.95045c | (19051924) AT | ( 321980.00, 2297600.00) DC | 40.                          | 9.90824   | (19051724) AT | ( 324311.00, 2297390.00) DC |      |      |               |                          |
| 16.                                            | 11.82774  | (19052324) AT | ( 323238.00, 2297843.00) DC | 41.                          | 9.90079   | (19052424) AT | ( 322801.00, 2298424.00) DC |      |      |               |                          |
| 17.                                            | 11.57006  | (19052824) AT | ( 323392.00, 2295229.00) DC | 42.                          | 9.88623c  | (19051924) AT | ( 320660.00, 2297853.00) DC |      |      |               |                          |
| 18.                                            | 11.56021c | (19030124) AT | ( 324429.00, 2296746.00) DC | 43.                          | 9.86583   | (19053024) AT | ( 321769.00, 2299332.00) DC |      |      |               |                          |
| 19.                                            | 11.48556  | (19052424) AT | ( 321769.00, 2299332.00) DC | 44.                          | 9.73442   | (19032724) AT | ( 323238.00, 2297843.00) DC |      |      |               |                          |
| 20.                                            | 11.39893  | (19053024) AT | ( 321972.00, 2298820.00) DC | 45.                          | 9.64077c  | (19051924) AT | ( 320773.00, 2297637.00) DC |      |      |               |                          |
| 21.                                            | 11.36473  | (19052324) AT | ( 322795.00, 2297792.00) DC | 46.                          | 9.50565   | (19052424) AT | ( 321640.00, 2297949.00) DC |      |      |               |                          |
| 22.                                            | 11.05111c | (19051924) AT | ( 320990.00, 2297542.00) DC | 47.                          | 9.49868   | (19051424) AT | ( 322801.00, 2298424.00) DC |      |      |               |                          |
| 23.                                            | 10.97148  | (19051424) AT | ( 322795.00, 2297792.00) DC | 48.                          | 9.41970   | (19052824) AT | ( 323595.00, 2294718.00) DC |      |      |               |                          |
| 24.                                            | 10.85265  | (19052924) AT | ( 322166.00, 2296154.00) DC | 49.                          | 9.37886   | (19042624) AT | ( 322801.00, 2298424.00) DC |      |      |               |                          |
| 25.                                            | 10.81463  | (19052024) AT | ( 321259.00, 2298352.00) DC | 50.                          | 9.34699   | (19051624) AT | ( 323238.00, 2297843.00) DC |      |      |               |                          |

ISCST3 Model for Expansion of Dhenkanal Steel Plant (upto 3.55 MTPA), Odisha of RML

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ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH

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*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

*** Message Summary : ISCST3 Model Execution ***

----- Summary of Total Messages -----

A Total of      0 Fatal Error Message(s)
A Total of      0 Warning Message(s)
A Total of      2 Informational Message(s)

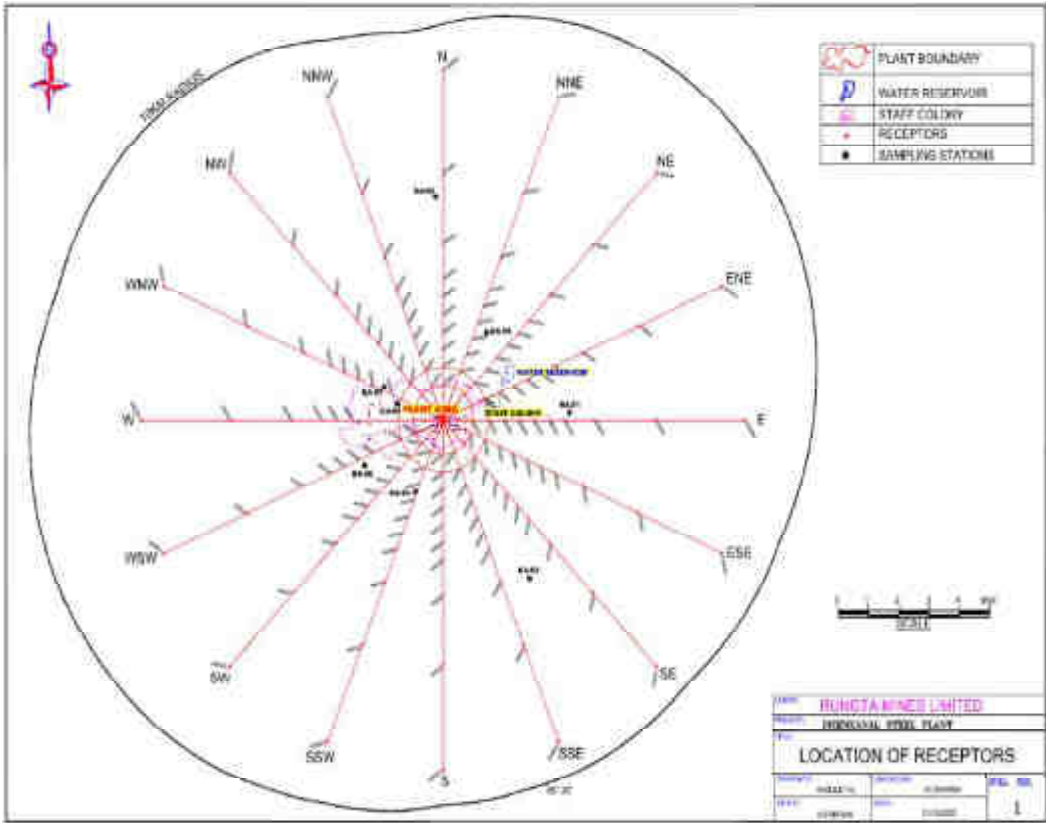
A Total of      2 Calm Hours Identified

***** FATAL ERROR MESSAGES *****
*** NONE ***

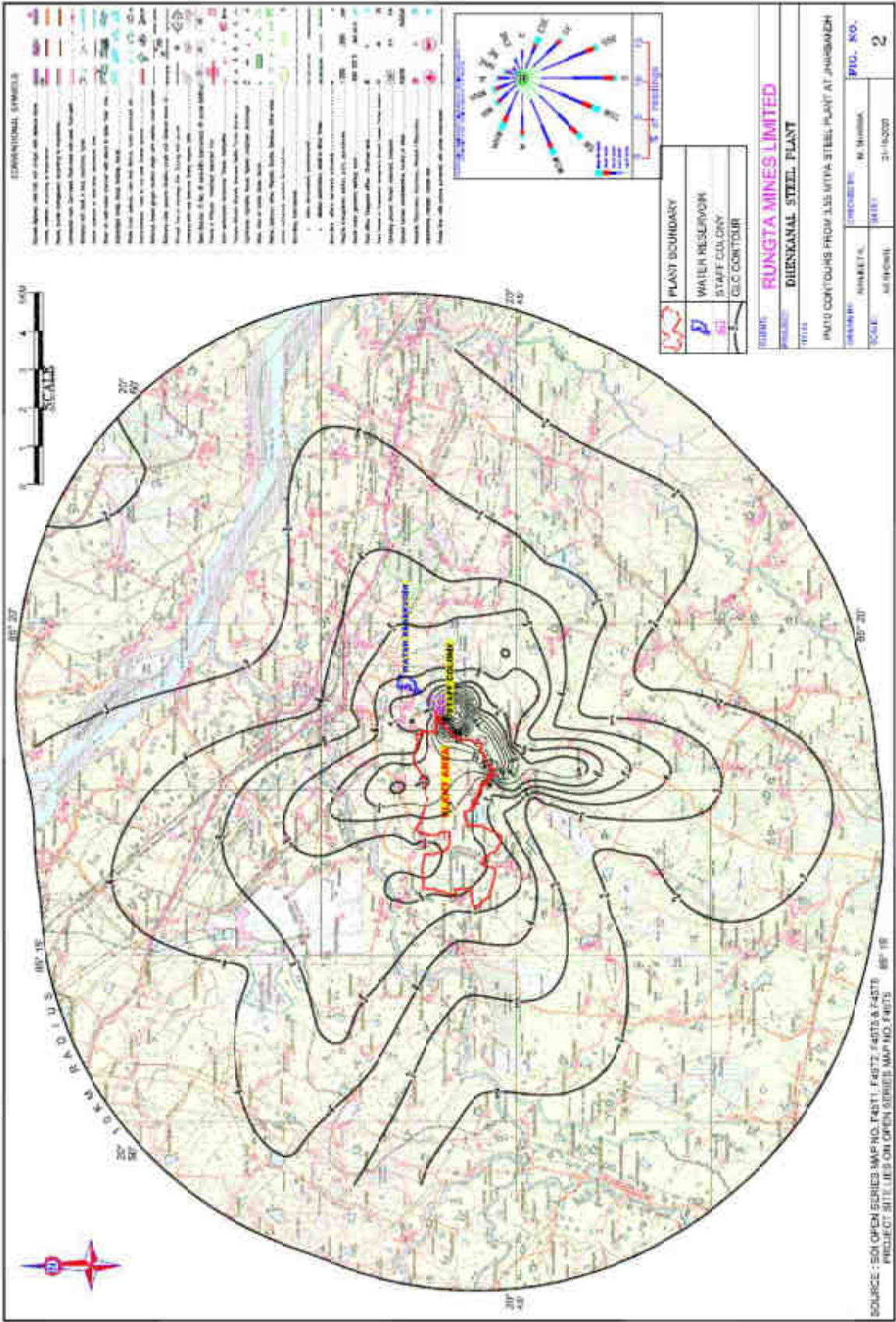
***** WARNING MESSAGES *****
*** NONE ***

*****
*** ISCST3 Finishes Successfully ***
*****
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ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH

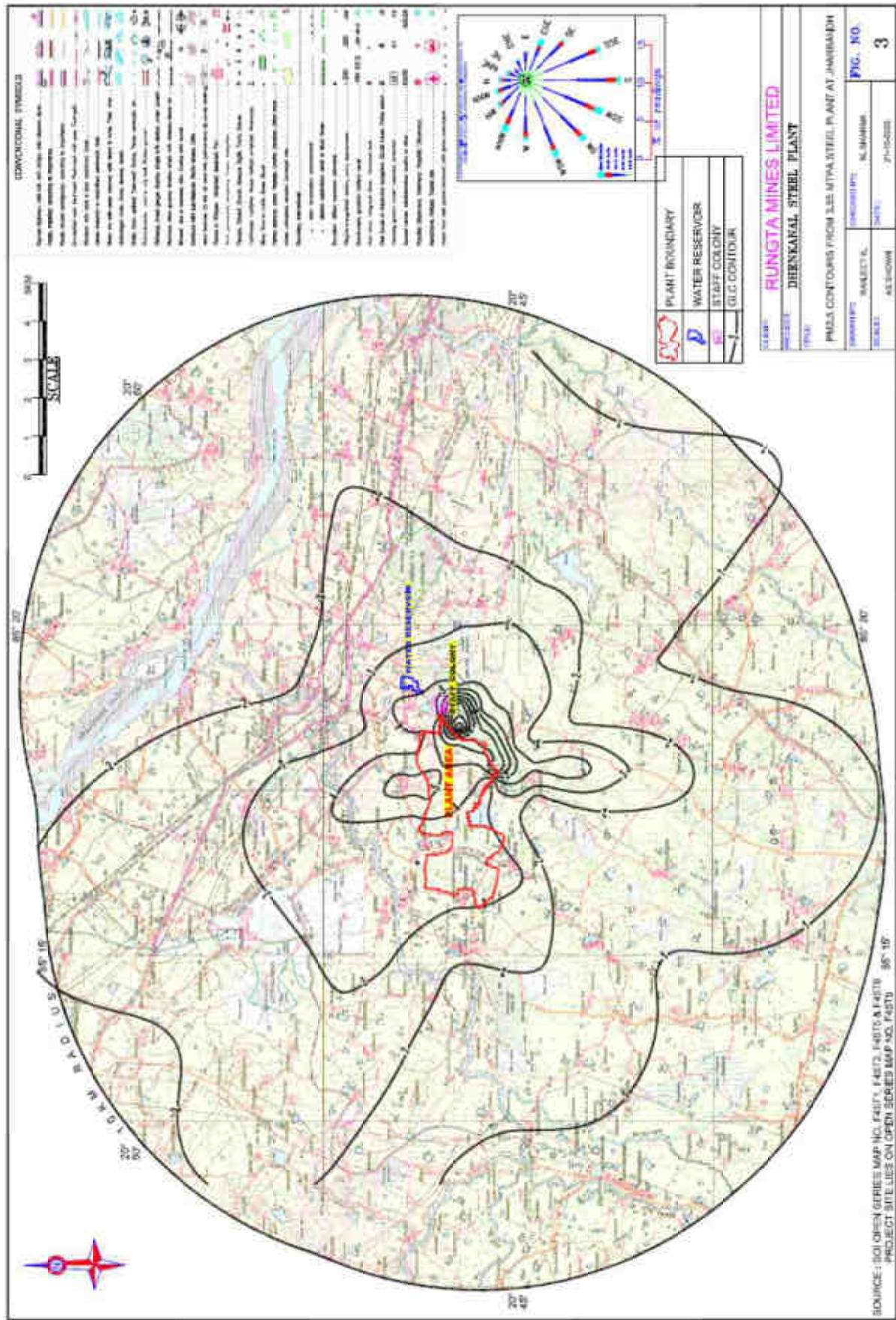


ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH



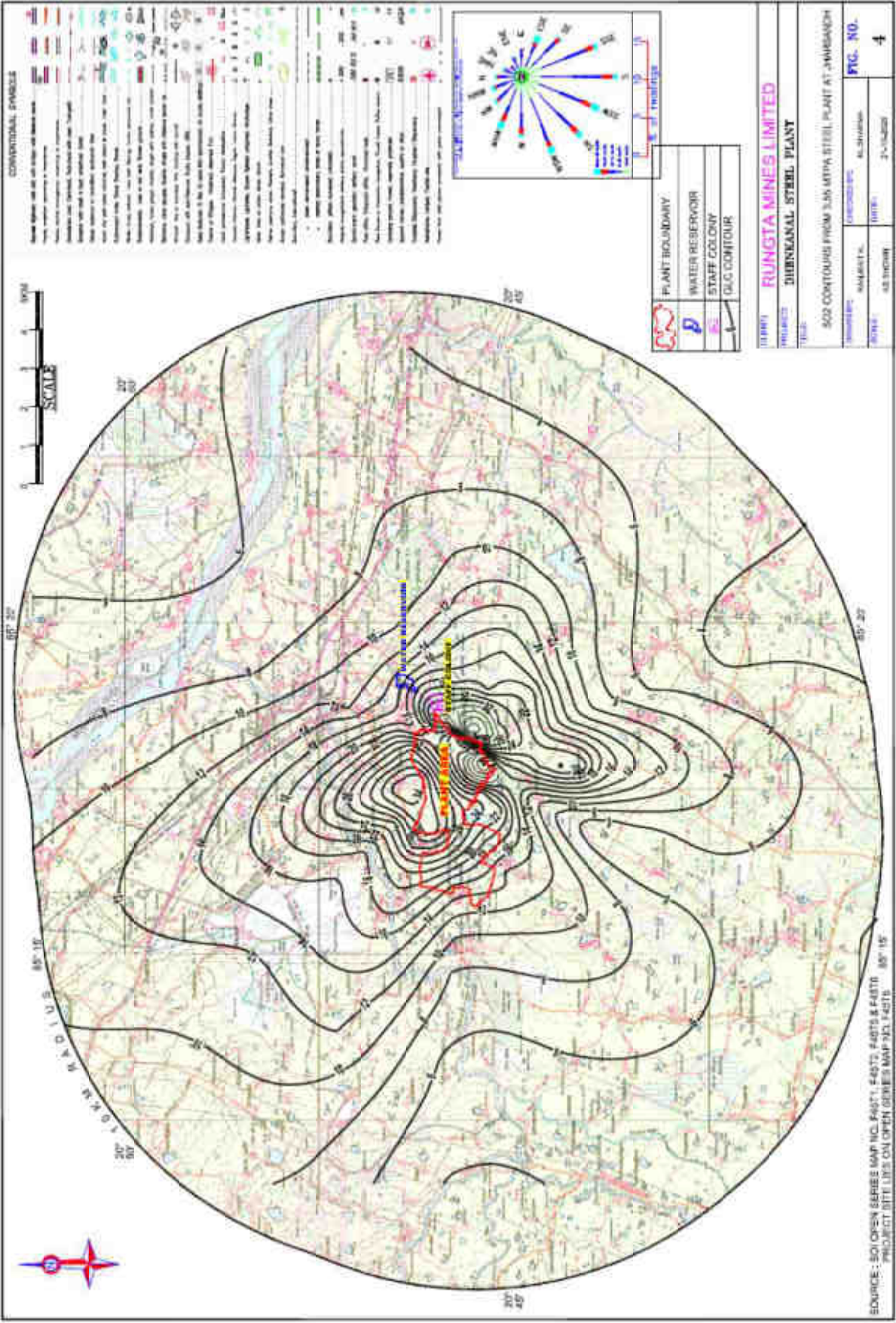


## ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH



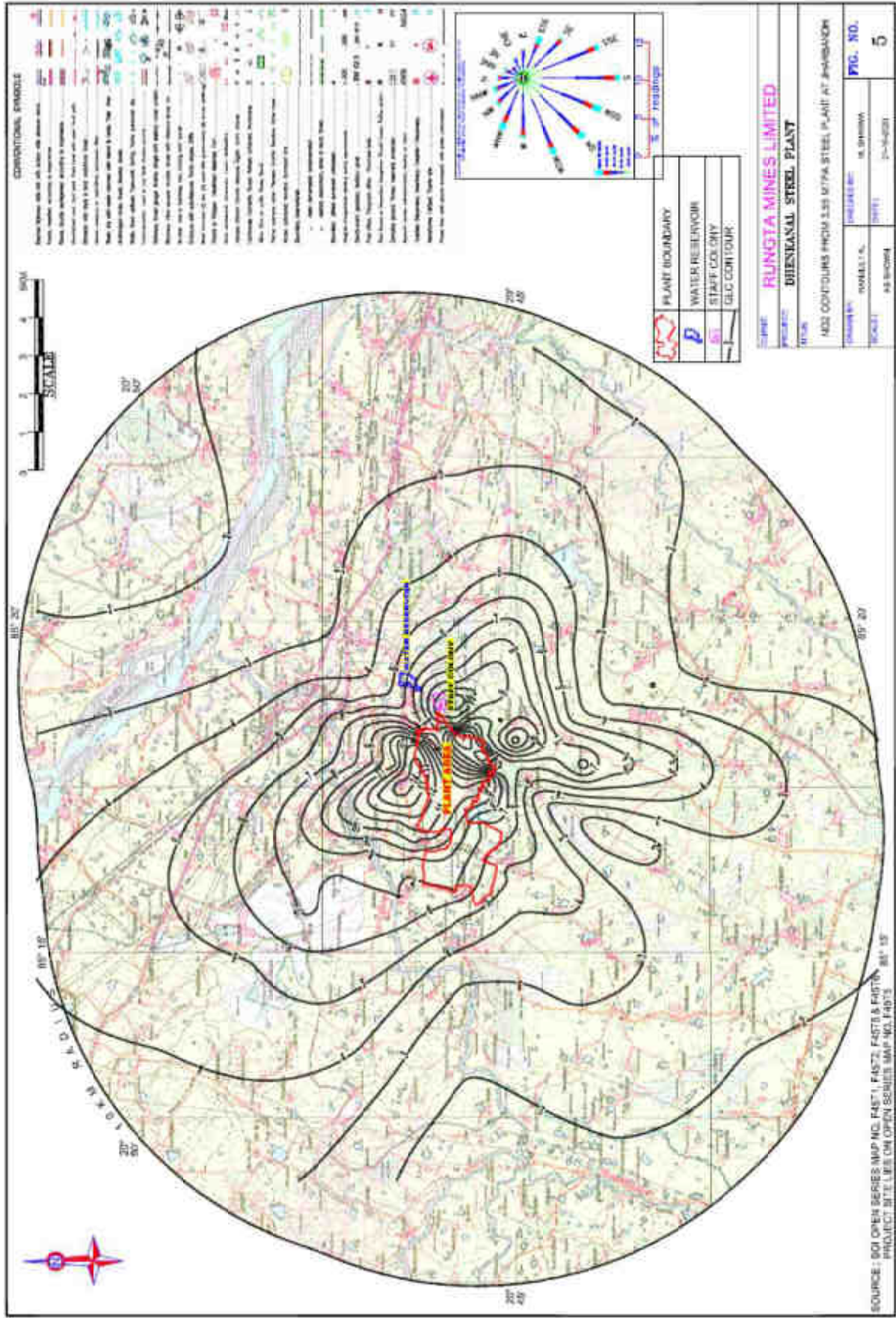


ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH





ISCST3 MODEL FOR PROPOSED 3.55 MTPA STEEL PLANT AT JHARBANDH



| ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH<br>(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020) |                               |                               | ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH<br>(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020) |                          |                                        |
|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------------------------|
| CO STARTING                                                                                                                    | SO LOCATION S-58 POINT 322992 | 2296982 82                    | SO SRCPARAM S-27                                                                                                               | 0.28125 30 373 13.43 1.8 | SO SRCPARAM A-2 2.1811072299914E-10 1  |
| TITLEONE AS PER EC DT 04-06-2020 FOR 3.0 MTPA                                                                                  | SO LOCATION S-59 POINT 323066 | 2296980 83                    | SO SRCPARAM S-28                                                                                                               | 1.355887 60 440 15.47 4  | 625.6192 280.2479 0 4                  |
| STEEL IN JHARBANDH STEEL PLANT                                                                                                 | SO LOCATION S-60 POINT 323140 | 2296979 84                    | SO SRCPARAM S-29                                                                                                               | 1.355887 60 440 15.47 4  | SO SRCPARAM A-3 2.18110722999141E-10 1 |
| TITLETWO PM10 EMISSIONS FROM ALL STACKS                                                                                        | SO LOCATION S-61 POINT 322381 | 2297276 84                    | SO SRCPARAM S-30                                                                                                               | 1.355887 60 440 15.47 4  | 668.0226 280.2479 0 4                  |
| WITH FUGITIVE EMISSION SOURCES                                                                                                 | SO LOCATION S-62 POINT 320391 | 2297232 82                    | SO SRCPARAM S-31                                                                                                               | 1.355887 60 440 15.47 4  | SO SRCPARAM A-4 6.46000859137509E-11 1 |
| MODELOPT DEFAULT CONC RURAL                                                                                                    | SO LOCATION S-63 POINT 322489 | 2297061 82                    | SO SRCPARAM S-32                                                                                                               | 1.355887 60 440 15.47 4  | 34.895 98.703 0 4                      |
| AVERTIME 24 PERIOD                                                                                                             | SO LOCATION S-72 POINT 322802 | 2297736 74                    | SO SRCPARAM S-33                                                                                                               | 1.355887 60 440 15.47 4  | SO SRCPARAM A-5 6.46000859137509E-11 1 |
| POLLUTID PM10                                                                                                                  | SO LOCATION S-73 POINT 322994 | 2297731 73                    | SO SRCPARAM S-34                                                                                                               | 1.355887 60 440 15.47 4  | 109.6407 194.1483 0 4                  |
| RUNORNOT RUN                                                                                                                   | SO LOCATION S-74 POINT 323264 | 2297726 75                    | SO SRCPARAM S-35                                                                                                               | 1.355887 60 440 15.47 4  | SO SRCPARAM A-6 6.46000859137509E-11 1 |
| TERRHGT5 ELEV                                                                                                                  | SO LOCATION S-75 POINT 323536 | 2297763 78                    | SO SRCPARAM S-36                                                                                                               | 1.355887 60 440 15.47 4  | 57.3047 45.1073 0 4                    |
| CO FINISHED                                                                                                                    | SO LOCATION S-76 POINT 322798 | 2297505 77                    | SO SRCPARAM S-37                                                                                                               | 1.355887 60 440 15.47 4  | SO SRCPARAM A-7 6.46000859137509E-11 1 |
| SO STARTING                                                                                                                    | SO LOCATION S-77 POINT 322990 | 2297500 76                    | SO SRCPARAM S-38                                                                                                               | 0.13125 30 373 6.27 1.8  | 216.9145 287.2999 137 4                |
| SO LOCATION S-01 POINT 322375                                                                                                  | 2296443 93                    | SO LOCATION S-78 POINT 323259 | 2297495 77                                                                                                                     | SO SRCPARAM S-39         | 0.046875 30 373 2.24 1.8               |
| SO LOCATION S-12 POINT 322571                                                                                                  | 2296439 95                    | SO LOCATION S-80 POINT 323038 | 2296464 88                                                                                                                     | SO SRCPARAM S-40         | 0.046875 30 373 2.24 1.8               |
| SO LOCATION S-14 POINT 322871                                                                                                  | 2296433 87                    | SO LOCATION S-81 POINT 323124 | 2296462 92                                                                                                                     | SO SRCPARAM S-42         | 0.25 30 423 13.54 1.8                  |
| SO LOCATION S-15 POINT 322473                                                                                                  | 2296404 95                    | SO LOCATION S-82 POINT 323210 | 2296461 94                                                                                                                     | SO SRCPARAM S-43         | 0.290625 47 313 11.65 1.8              |
| SO LOCATION S-16 POINT 322748                                                                                                  | 2296769 92                    | SO LOCATION S-83 POINT 323285 | 2296459 96                                                                                                                     | SO SRCPARAM S-44         | 0.4375 30 423 15.86 2.2                |
| SO LOCATION S-17 POINT 322645                                                                                                  | 2296841 88                    | SO LOCATION S-84 POINT 323092 | 2296820 84                                                                                                                     | SO SRCPARAM S-45         | 0.509375 47 313 13.66 2.2              |
| SO LOCATION S-18 POINT 322818                                                                                                  | 2296397 88                    | SO LOCATION S-85 POINT 323174 | 2296819 86                                                                                                                     | SO SRCPARAM S-46         | 2.703125 55 423 18.97 5                |
| SO LOCATION S-19 POINT 322946                                                                                                  | 2296765 84                    | SO LOCATION S-86 POINT 323257 | 2296817 89                                                                                                                     | SO SRCPARAM S-47         | 0.5 45 313 16.23 2                     |
| SO LOCATION S-20 POINT 322947                                                                                                  | 2296835 84                    | SO LOCATION S-87 POINT 323222 | 2296708 87                                                                                                                     | SO SRCPARAM S-48         | 3.7 80 423 15.36 6.5                   |
| SO LOCATION S-21 POINT 321762                                                                                                  | 2296444 83                    | SO LOCATION S-88 POINT 323159 | 2296623 88                                                                                                                     | SO SRCPARAM S-49         | 0.853125 55 313 17.72 2.5              |
| SO LOCATION S-22 POINT 321871                                                                                                  | 2296442 85                    | SO LOCATION S-89 POINT 322403 | 2296574 91                                                                                                                     | SO SRCPARAM S-50         | 0.546875 85 493 17.89 2.5              |
| SO LOCATION S-23 POINT 321979                                                                                                  | 2296440 88                    | SO LOCATION S-90 POINT 322638 | 2296570 93                                                                                                                     | SO SRCPARAM S-51         | 0.90625 100 493 18.1 3.2               |
| SO LOCATION S-24 POINT 322088                                                                                                  | 2296438 91                    | SO LOCATION A-1 AREA 321967   | 2296590 85                                                                                                                     | SO SRCPARAM S-52         | 0.90625 100 493 18.1 3.2               |
| SO LOCATION S-25 POINT 322183                                                                                                  | 2296437 93                    | SO LOCATION A-2 AREA 320382   | 2296603 90                                                                                                                     | SO SRCPARAM S-53         | 0.28125 30.5 373 10.88 2               |
| SO LOCATION S-26 POINT 322084                                                                                                  | 2296427 85                    | SO LOCATION A-3 AREA 319338   | 2296606 81                                                                                                                     | SO SRCPARAM S-54         | 0.28125 30.5 373 10.88 2               |
| SO LOCATION S-27 POINT 321739                                                                                                  | 2296815 85                    | SO LOCATION A-4 AREA 320503   | 2295898 88                                                                                                                     | SO SRCPARAM S-55         | 0.28125 30.5 373 10.88 2               |
| SO LOCATION S-28 POINT 320504                                                                                                  | 2296478 85                    | SO LOCATION A-5 AREA 320539   | 2295797 85                                                                                                                     | SO SRCPARAM S-56         | 0.28125 30.5 373 13.43 1.8             |
| SO LOCATION S-29 POINT 320671                                                                                                  | 2296474 83                    | SO LOCATION A-6 AREA 320594   | 2295749 85                                                                                                                     | SO SRCPARAM S-57         | 0.28125 30.5 373 10.88 2               |
| SO LOCATION S-30 POINT 320837                                                                                                  | 2296471 80                    | SO LOCATION A-7 AREA 320654   | 2295698 84                                                                                                                     | SO SRCPARAM S-58         | 0.28125 30.5 373 10.88 2               |
| SO LOCATION S-31 POINT 321003                                                                                                  | 2296467 77                    | SO LOCATION A-8 AREA 320729   | 2295639 84                                                                                                                     | SO SRCPARAM S-59         | 0.28125 30.5 373 10.88 2               |
| SO LOCATION S-32 POINT 320503                                                                                                  | 2296398 86                    | SO LOCATION A-9 AREA 320886   | 2295838 80                                                                                                                     | SO SRCPARAM S-60         | 0.28125 30.5 373 10.88 2               |
| SO LOCATION S-33 POINT 320669                                                                                                  | 2296395 84                    | SO LOCATION A-10 AREA 320956  | 2295928 81                                                                                                                     | SO SRCPARAM S-61         | 1.959375 60 403 20.47 4                |
| SO LOCATION S-34 POINT 320835                                                                                                  | 2296391 80                    | SO LOCATION A-11 AREA 321173  | 2297818 74                                                                                                                     | SO SRCPARAM S-62         | 3.484375 70 403 23.3 5                 |
| SO LOCATION S-35 POINT 321002                                                                                                  | 2296388 78                    | SO LOCATION A-12 AREA 321089  | 2297611 76                                                                                                                     | SO SRCPARAM S-63         | 0.289688 60 638 8.52 3                 |
| SO LOCATION S-36 POINT 319885                                                                                                  | 2296337 84                    | SO LOCATION A-13 AREA 321035  | 2297488 78                                                                                                                     | SO SRCPARAM S-72         | 0.490625 30 318 17 2                   |
| SO LOCATION S-37 POINT 320143                                                                                                  | 2296326 92                    | SO LOCATION A-14 AREA 321504  | 2297686 72                                                                                                                     | SO SRCPARAM S-73         | 2.2 80 393 20 4                        |
| SO LOCATION S-38 POINT 320082                                                                                                  | 2296188 90                    | SO LOCATION A-15 AREA 322328  | 2296026 96                                                                                                                     | SO SRCPARAM S-74         | 2.96875 60 336 21 4                    |
| SO LOCATION S-39 POINT 320367                                                                                                  | 2296373 88                    | SO LOCATION A-16 AREA 322964  | 2296097 97                                                                                                                     | SO SRCPARAM S-75         | 0.09375 35 351 16 1                    |
| SO LOCATION S-42 POINT 321962                                                                                                  | 2297207 76                    | SO SRCPARAM S-01              | 0.78125 80 423 18.13 2.75                                                                                                      | SO SRCPARAM S-76         | 0.41875 30 318 17 2                    |
| SO LOCATION S-43 POINT 322189                                                                                                  | 2297202 83                    | SO SRCPARAM S-12              | 0.90625 80 423 17.67 3                                                                                                         | SO SRCPARAM S-77         | 1.875 80 393 20 4                      |
| SO LOCATION S-44 POINT 320096                                                                                                  | 2297273 75                    | SO SRCPARAM S-14              | 0.90625 80 423 17.67 3                                                                                                         | SO SRCPARAM S-78         | 2.528125 60 336 21 4                   |
| SO LOCATION S-45 POINT 320993                                                                                                  | 2297164 78                    | SO SRCPARAM S-15              | 0.375 35 323 12.56 2                                                                                                           | SO SRCPARAM S-80         | 0.710938 90 423 17.11 2.7              |
| SO LOCATION S-46 POINT 321937                                                                                                  | 2296936 79                    | SO SRCPARAM S-16              | 0.203125 30 373 9.7 1.8                                                                                                        | SO SRCPARAM S-81         | 0.710938 90 423 17.11 2.7              |
| SO LOCATION S-47 POINT 322078                                                                                                  | 2296978 79                    | SO SRCPARAM S-17              | 0.375 35 323 12.56 2                                                                                                           | SO SRCPARAM S-82         | 0.710938 90 423 17.11 2.7              |
| SO LOCATION S-48 POINT 320134                                                                                                  | 2297050 81                    | SO SRCPARAM S-18              | 0.453125 35 323 12.54 2.2                                                                                                      | SO SRCPARAM S-83         | 0.710938 90 423 17.11 2.7              |
| SO LOCATION S-49 POINT 320132                                                                                                  | 2296941 78                    | SO SRCPARAM S-19              | 0.25 30 373 9.67 2                                                                                                             | SO SRCPARAM S-84         | 0.710938 90 423 17.11 2.7              |
| SO LOCATION S-50 POINT 323259                                                                                                  | 2297230 79                    | SO SRCPARAM S-20              | 0.453125 35 323 12.54 2.2                                                                                                      | SO SRCPARAM S-85         | 1.421875 110 423 17.28 3.8             |
| SO LOCATION S-51 POINT 323137                                                                                                  | 2297233 83                    | SO SRCPARAM S-21              | 2.9375 90 440 12.69 6.5                                                                                                        | SO SRCPARAM S-86         | 0.710938 110 423 17.11 2.7             |
| SO LOCATION S-52 POINT 319750                                                                                                  | 2296773 77                    | SO SRCPARAM S-22              | 2.9375 90 440 12.69 6.5                                                                                                        | SO SRCPARAM S-87         | 0.421875 45 323 9.04 2.5               |
| SO LOCATION S-53 POINT 322624                                                                                                  | 2296989 84                    | SO SRCPARAM S-23              | 2.9375 90 440 12.69 6.5                                                                                                        | SO SRCPARAM S-88         | 0.421875 45 323 9.04 2.5               |
| SO LOCATION S-54 POINT 322698                                                                                                  | 2296988 85                    | SO SRCPARAM S-24              | 2.9375 90 440 12.69 6.5                                                                                                        | SO SRCPARAM S-89         | 0.421875 45 323 9.04 2.5               |
| SO LOCATION S-55 POINT 322772                                                                                                  | 2296986 86                    | SO SRCPARAM S-25              | 2.9375 90 440 12.69 6.5                                                                                                        | SO SRCPARAM S-90         | 0.421875 45 323 9.04 2.5               |
| SO LOCATION S-56 POINT 322845                                                                                                  | 2296985 84                    | SO SRCPARAM S-26              | 0.28125 30 373 13.43 1.8                                                                                                       |                          |                                        |
| SO LOCATION S-57 POINT 322919                                                                                                  | 2296983 82                    |                               |                                                                                                                                |                          |                                        |

ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH  
(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)

|                                               |         |     |                 |         |     |
|-----------------------------------------------|---------|-----|-----------------|---------|-----|
| DISCCART 323159                               | 2295830 | 141 | DISCCART 326806 | 2295028 | 116 |
| DISCCART 322773                               | 2295756 | 121 | DISCCART 327812 | 2294597 | 97  |
| DISCCART 322389                               | 2295838 | 97  | DISCCART 329824 | 2293724 | 104 |
| DISCCART 322068                               | 2296062 | 87  | DISCCART 328242 | 2292431 | 80  |
| ** All directions at 1500 2000 2500 3000 3500 |         |     |                 |         |     |
| 4000 5000 7000 10000 m                        |         |     | DISCCART 323927 | 2295578 | 107 |
| DISCCART 322801                               | 2298424 | 77  | DISCCART 324319 | 2295186 | 111 |
| DISCCART 322807                               | 2298978 | 74  | DISCCART 324700 | 2294795 | 128 |
| DISCCART 322813                               | 2299531 | 67  | DISCCART 325081 | 2294392 | 115 |
| DISCCART 322819                               | 2300085 | 62  | DISCCART 325463 | 2294001 | 110 |
| DISCCART 322824                               | 2300638 | 67  | DISCCART 325844 | 2293598 | 100 |
| DISCCART 322830                               | 2301192 | 76  | DISCCART 326606 | 2292815 | 103 |
| DISCCART 322842                               | 2302299 | 70  | DISCCART 328142 | 2291227 | 91  |
| DISCCART 322865                               | 2304513 | 59  | DISCCART 330441 | 2288857 | 111 |
| DISCCART 322901                               | 2307834 | 60  | DISCCART 323392 | 2295229 | 114 |
| DISCCART 323425                               | 2298296 | 69  | DISCCART 323595 | 2294718 | 110 |
| DISCCART 323638                               | 2298803 | 67  | DISCCART 323809 | 2294195 | 118 |
| DISCCART 323862                               | 2299310 | 60  | DISCCART 324012 | 2293684 | 112 |
| DISCCART 324076                               | 2299817 | 58  | DISCCART 324214 | 2293172 | 107 |
| DISCCART 324289                               | 2300335 | 65  | DISCCART 324417 | 2292661 | 112 |
| DISCCART 324503                               | 2300842 | 61  | DISCCART 324823 | 2291627 | 116 |
| DISCCART 324930                               | 2301856 | 58  | DISCCART 325636 | 2289581 | 105 |
| DISCCART 325784                               | 2303896 | 57  | DISCCART 326865 | 2286491 | 114 |
| DISCCART 327075                               | 2306949 | 67  | DISCCART 322766 | 2295103 | 96  |
| DISCCART 323952                               | 2297925 | 86  | DISCCART 322754 | 2293996 | 123 |
| DISCCART 324352                               | 2298319 | 79  | DISCCART 322749 | 2293442 | 134 |
| DISCCART 324741                               | 2298703 | 75  | DISCCART 322743 | 2292889 | 121 |
| DISCCART 325130                               | 2299086 | 69  | DISCCART 322737 | 2292335 | 125 |
| DISCCART 325519                               | 2299481 | 73  | DISCCART 322725 | 2291228 | 131 |
| DISCCART 325909                               | 2299864 | 72  | DISCCART 322702 | 2289014 | 130 |
| DISCCART 326687                               | 2300642 | 63  | DISCCART 322667 | 2285693 | 123 |
| DISCCART 328254                               | 2302187 | 53  | DISCCART 322143 | 2295242 | 124 |
| DISCCART 330599                               | 2304511 | 63  | DISCCART 321929 | 2294735 | 88  |
| DISCCART 324311                               | 2297390 | 92  | DISCCART 321715 | 2294217 | 97  |
| DISCCART 324813                               | 2297595 | 90  | DISCCART 321502 | 2293710 | 102 |
| DISCCART 325325                               | 2297800 | 81  | DISCCART 321277 | 2293203 | 97  |
| DISCCART 325827                               | 2298005 | 79  | DISCCART 321064 | 2292696 | 100 |
| DISCCART 326339                               | 2298210 | 79  | DISCCART 320636 | 2291671 | 116 |
| DISCCART 326841                               | 2298415 | 76  | DISCCART 319781 | 2289643 | 131 |
| DISCCART 327856                               | 2298837 | 75  | DISCCART 318488 | 2286579 | 118 |
| DISCCART 329884                               | 2299657 | 66  | DISCCART 321615 | 2295602 | 82  |
| DISCCART 332926                               | 2300900 | 53  | DISCCART 321226 | 2295219 | 89  |
| DISCCART 324429                               | 2296746 | 148 | DISCCART 320826 | 2294836 | 94  |
| DISCCART 324970                               | 2296741 | 96  | DISCCART 320437 | 2294441 | 97  |
| DISCCART 325522                               | 2296735 | 99  | DISCCART 320047 | 2294058 | 101 |
| DISCCART 326064                               | 2296729 | 108 | DISCCART 319657 | 2293663 | 98  |
| DISCCART 326615                               | 2296724 | 115 | DISCCART 318878 | 2292897 | 112 |
| DISCCART 327157                               | 2296718 | 93  | DISCCART 317310 | 2291341 | 116 |
| DISCCART 328250                               | 2296707 | 94  | DISCCART 314971 | 2289020 | 104 |
| DISCCART 330437                               | 2296685 | 76  | DISCCART 321267 | 2296148 | 78  |
| DISCCART 333717                               | 2296652 | 53  | DISCCART 317400 | 2295534 | 86  |
| DISCCART 324297                               | 2296117 | 105 | DISCCART 320755 | 2295944 | 79  |
| DISCCART 324795                               | 2295901 | 107 | DISCCART 320253 | 2295739 | 89  |
| DISCCART 325303                               | 2295685 | 107 | DISCCART 319740 | 2295534 | 86  |
| DISCCART 325801                               | 2295470 | 115 | DISCCART 319238 | 2295318 | 84  |
| DISCCART 326309                               | 2295243 | 113 | DISCCART 318725 | 2295113 | 83  |
|                                               |         |     | DISCCART 317711 | 2294703 | 82  |

ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH  
(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)

|                 |         |    |                                     |         |     |
|-----------------|---------|----|-------------------------------------|---------|-----|
| DISCCART 315681 | 2293872 | 94 | DISCCART 319934                     | 2303957 | 69  |
| DISCCART 312636 | 2292644 | 89 | DISCCART 318708                     | 2307038 | 78  |
| DISCCART 319504 | 2296798 | 71 | ** AT AAQ                           |         |     |
| DISCCART 318962 | 2296804 | 77 | DISCCART 321119                     | 2297297 | 75  |
| DISCCART 318410 | 2296810 | 82 | DISCCART 327125                     | 2296902 | 95  |
| DISCCART 317317 | 2296822 | 74 | DISCCART 322586                     | 2303927 | 72  |
| DISCCART 315130 | 2296846 | 81 | DISCCART 325628                     | 2291636 | 118 |
| DISCCART 311850 | 2296882 | 83 | DISCCART 324283                     | 2299557 | 74  |
| DISCCART 320773 | 2297637 | 76 | DISCCART 321688                     | 2294449 | 98  |
| DISCCART 320275 | 2297853 | 68 | DISCCART 319933                     | 2295352 | 94  |
| DISCCART 319767 | 2298069 | 71 | DISCCART 320660                     | 2297853 | 77  |
| DISCCART 319270 | 2298285 | 70 | RE FINISHED                         |         |     |
| DISCCART 318762 | 2298500 | 68 | ME STARTING                         |         |     |
| DISCCART 317756 | 2298943 | 80 | INPUTFIL ORI\JB\OCT2020\DK19S.MET   |         |     |
| DISCCART 315746 | 2299806 | 96 | ANEMHGT 5.0                         |         |     |
| DISCCART 312730 | 2301113 | 95 | SURFDATA 99999 2019 XXX             |         |     |
| DISCCART 321640 | 2297949 | 71 | UAI RDATA 99999 2019 XXX            |         |     |
| DISCCART 321259 | 2298352 | 66 | WDROTATE 180                        |         |     |
| DISCCART 320868 | 2298744 | 66 | ME FINISHED                         |         |     |
| DISCCART 320487 | 2299135 | 65 | OU STARTING                         |         |     |
| DISCCART 320106 | 2299538 | 78 | OU RECTABLE 24 FIRST                |         |     |
| DISCCART 319725 | 2299929 | 81 | OU MAXTABLE 24 50                   |         |     |
| DISCCART 318963 | 2300724 | 90 | OU PLOTFILE 24 ALL FIRST            |         |     |
| DISCCART 317429 | 2302302 | 78 | ORI\JB\OCT2020\300PM10.PLT          |         |     |
| DISCCART 315143 | 2304674 | 86 | OU FINISHED                         |         |     |
| DISCCART 322175 | 2298309 | 76 | *****                               |         |     |
| DISCCART 321972 | 2298820 | 68 | *** SETUP Finishes Successfully *** |         |     |
| DISCCART 321769 | 2299332 | 61 | *****                               |         |     |
| DISCCART 321567 | 2299843 | 70 | *****                               |         |     |
| DISCCART 321354 | 2300366 | 70 | *****                               |         |     |
| DISCCART 321151 | 2300877 | 75 | *****                               |         |     |
| DISCCART 320745 | 2301900 | 71 | *****                               |         |     |

\*\*\* ISCST3 - VERSION 95250 \*\*\* \*\* AS PER EC DT 04-06-2020 FOR 3.0 MTPA STEEL IN JHARBANDH STEEL PLANT \*\*\* 10/20/20  
\*\*\* PM10 EMISSIONS FROM ALL STACKS WITH FUGITIVE EMISSION SOURCES \*\*\* 16:49:53  
\*\*MODELOPTs: CONC RURAL ELEV DFAULT

\*\*\* MODEL SETUP OPTIONS SUMMARY \*\*\*

\*\*Intermediate Terrain Processing is Selected

\*\*Model Is Setup For Calculation of Average CONcentration Values.

-- SCAVENGING/DEPOSITION LOGIC --

\*\*Model Uses NO DRY DEPLETION. DDPLETE = F

\*\*Model Uses NO WET DEPLETION. WDPLETE = F

\*\*NO WET SCAVENGING Data Provided.

\*\*Model Does NOT Use GRIDDED TERRAIN Data for Depletion Calculations

\*\*Model Uses RURAL Dispersion.

\*\*Model Uses Regulatory DEFAULT Options:

1. Final Plume Rise.

2. Stack-tip Downwash.



**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH**  
**(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

\*\*\*Model Accepts Receptors on ELEV Terrain.

\*\*\*Model Assumes No FLAGPOLE Receptor Heights.

\*\*\*Model Calculates 1 Short Term Average(s) of: 24-HR and Calculates PERIOD Averages

**\*\*This Run Includes: 95 Source(s); 1 Source Group(s); and 172 Receptor(s)**

**\*\*The Model Assumes A Pollutant Type of: PM10**

**\*\*Model Set To Continue RUNNING After the Setup Testing.**

\*\*\*Output Options Selected:

Model Outputs Tables of PERIOD Averages by Receptor  
Model Outputs Tables of Highest Short Term Values by Receptor (RECTABLE Keyword)  
Model Outputs Tables of Overall Maximum Short Term Values (MAXTABLE Keyword)  
Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)

\*\*\*NOTE: The Following Flags May Appear Following CONC Values: c for Calm Hours  
m for Missing Hours  
b for Both Calm and Missing Hours

```

***Misc. Inputs: Anem. Hgt. (m) = 5.00 ; Decay Coef. = .0000 ; Rot. Angle = 180.0
Emission Units = GRAMS/SEC ; Emission Rate Unit Factor = .10000E+07
Output Units = MICROGRAMS/M**3

```

```

***Input Runstream File: ORI\JB\OCT2020\300PM10.INP
ORI\JB\OCT2020\300PM10.OUT
; **Output Print File:

```

\*\*\* POINT SOURCE DATA \*\*\*

| NO. | SOURCE PART. |          | EMISSION RATE |          |        |         |    | BASE STACK |           |            | STACK | STACK | STACK | BUILDING |
|-----|--------------|----------|---------------|----------|--------|---------|----|------------|-----------|------------|-------|-------|-------|----------|
|     |              |          | PM10          | PM2.5    | SO2    | NO2     | X  | Y          | ELEV. (M) | HEIGHT (M) |       |       |       |          |
| 0   | 7.81E-01     | 4.49E-01 | 1.95E+01      | 7.31E-02 | 322375 | 2296443 | 93 | 80         | 423       | 18.13      | 2.8NO |       |       |          |
| 0   | 9.06E-01     | 5.21E-01 | 2.34E+01      | 4.39E-02 | 322571 | 2296439 | 95 | 80         | 423       | 17.67      | 3NO   |       |       |          |
| 0   | 9.06E-01     | 5.21E-01 | 2.34E+01      | 4.39E-02 | 322871 | 2296433 | 87 | 80         | 423       | 17.67      | 3NO   |       |       |          |
| 0   | 3.75E-01     | 2.16E-01 | 0.00E+00      | 0.00E+00 | 322473 | 2296404 | 95 | 35         | 323       | 12.56      | 2NO   |       |       |          |
| 0   | 2.03E-01     | 1.17E-01 | 0.00E+00      | 0.00E+00 | 322748 | 2296769 | 92 | 30         | 373       | 9.7        | 1.8NO |       |       |          |
| 0   | 3.75E-01     | 2.16E-01 | 0.00E+00      | 0.00E+00 | 322645 | 2296841 | 88 | 35         | 323       | 12.56      | 2NO   |       |       |          |
| 0   | 4.53E-01     | 2.61E-01 | 0.00E+00      | 0.00E+00 | 322818 | 2296397 | 88 | 35         | 323       | 12.54      | 2.2NO |       |       |          |
| 0   | 2.50E-01     | 1.44E-01 | 0.00E+00      | 0.00E+00 | 322946 | 2296765 | 84 | 30         | 373       | 9.67       | 2NO   |       |       |          |
| 0   | 4.53E-01     | 2.61E-01 | 0.00E+00      | 0.00E+00 | 322947 | 2296835 | 84 | 35         | 323       | 12.54      | 2.2NO |       |       |          |
| 0   | 2.94E+00     | 1.69E+00 | 6.88E-01      | 2.32E-02 | 321762 | 2296444 | 83 | 90         | 440       | 12.69      | 6.5NO |       |       |          |
| 0   | 2.94E+00     | 1.69E+00 | 6.88E-01      | 2.32E-02 | 321871 | 2296442 | 85 | 90         | 440       | 12.69      | 6.5NO |       |       |          |
| 0   | 2.94E+00     | 1.69E+00 | 6.88E-01      | 2.32E-02 | 321979 | 2296440 | 88 | 90         | 440       | 12.69      | 6.5NO |       |       |          |
| 0   | 2.94E+00     | 1.69E+00 | 6.88E-01      | 2.32E-02 | 322088 | 2296438 | 91 | 90         | 440       | 12.69      | 6.5NO |       |       |          |

**ISCS T3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH**  
**(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

| NO.  | SOURCE | PART.    | EMISSION RATE |          |          |        |         | BASE STACK |           |     |       | STACK TEMP. (°C) | STACK EXITS | BUILDING DIA. |     |
|------|--------|----------|---------------|----------|----------|--------|---------|------------|-----------|-----|-------|------------------|-------------|---------------|-----|
|      |        |          | PM10          | PM2.5    | SO2      | NO2    | X       | Y          | ELEV. (M) |     |       |                  |             |               |     |
| ID   | CATS.  |          |               |          |          |        | (M)     | (M)        |           |     |       | (M)              | (M)         | (M)           | (M) |
| S-25 | 0      | 2.94E+00 | 1.69E+00      | 6.88E-01 | 2.32E-02 | 322183 | 2296437 | 93         | 90        | 440 | 12.69 | 6.5NO            |             |               |     |
| S-26 | 0      | 2.81E-01 | 1.62E-01      | 0.00E+00 | 0.00E+00 | 322084 | 2296742 | 85         | 30        | 373 | 13.43 | 1.8NO            |             |               |     |
| S-27 | 0      | 2.81E-01 | 1.62E-01      | 0.00E+00 | 0.00E+00 | 321739 | 2296815 | 85         | 30        | 373 | 13.43 | 1.8NO            |             |               |     |
| S-28 | 0      | 1.36E+00 | 7.80E-01      | 1.84E-01 | 6.19E-03 | 320504 | 2296478 | 85         | 60        | 440 | 15.47 | 4NO              |             |               |     |
| S-29 | 0      | 1.36E+00 | 7.80E-01      | 1.84E-01 | 6.19E-03 | 320671 | 2296474 | 83         | 60        | 440 | 15.47 | 4NO              |             |               |     |
| S-30 | 0      | 1.36E+00 | 7.80E-01      | 1.84E-01 | 6.19E-03 | 320837 | 2296471 | 80         | 60        | 440 | 15.47 | 4NO              |             |               |     |
| S-31 | 0      | 1.36E+00 | 7.80E-01      | 1.84E-01 | 6.19E-03 | 320933 | 2296467 | 77         | 60        | 440 | 15.47 | 4NO              |             |               |     |
| S-32 | 0      | 1.36E+00 | 7.80E-01      | 1.84E-01 | 6.19E-03 | 320503 | 2296398 | 86         | 60        | 440 | 15.47 | 4NO              |             |               |     |
| S-33 | 0      | 1.36E+00 | 7.80E-01      | 1.84E-01 | 6.19E-03 | 320669 | 2296395 | 84         | 60        | 440 | 15.47 | 4NO              |             |               |     |
| S-34 | 0      | 1.36E+00 | 7.80E-01      | 1.84E-01 | 6.19E-03 | 320835 | 2296391 | 80         | 60        | 440 | 15.47 | 4NO              |             |               |     |
| S-35 | 0      | 1.36E+00 | 7.80E-01      | 1.84E-01 | 6.19E-03 | 321002 | 2296388 | 78         | 60        | 440 | 15.47 | 4NO              |             |               |     |
| S-36 | 0      | 1.36E+00 | 7.80E-01      | 1.84E-01 | 6.19E-03 | 319885 | 2296337 | 84         | 60        | 440 | 15.47 | 4NO              |             |               |     |
| S-37 | 0      | 1.36E+00 | 7.80E-01      | 1.84E-01 | 6.19E-03 | 320143 | 2296326 | 92         | 60        | 440 | 15.47 | 4NO              |             |               |     |
| S-38 | 0      | 1.31E-01 | 7.55E-02      | 0.00E+00 | 0.00E+00 | 320082 | 2296188 | 90         | 30        | 373 | 6.27  | 1.8NO            |             |               |     |
| S-39 | 0      | 4.69E-02 | 2.70E-02      | 0.00E+00 | 0.00E+00 | 320367 | 2296373 | 88         | 30        | 373 | 2.24  | 1.8NO            |             |               |     |
| S-42 | 0      | 2.50E-01 | 1.44E-01      | 4.44E+00 | 3.33E+00 | 321962 | 2297207 | 76         | 30        | 423 | 13.54 | 1.8NO            |             |               |     |
| S-43 | 0      | 2.91E-01 | 1.67E-01      | 0.00E+00 | 0.00E+00 | 322189 | 2297202 | 83         | 47        | 313 | 11.65 | 1.8NO            |             |               |     |
| S-44 | 0      | 4.38E-01 | 2.52E-01      | 7.78E+00 | 5.83E+00 | 320096 | 2297273 | 75         | 30        | 423 | 15.86 | 2.2NO            |             |               |     |
| S-45 | 0      | 5.09E-01 | 2.93E-01      | 0.00E+00 | 0.00E+00 | 320093 | 2297164 | 78         | 47        | 313 | 13.66 | 2.2NO            |             |               |     |
| S-46 | 0      | 2.70E+00 | 1.55E+00      | 1.20E-01 | 5.45E-02 | 321937 | 2296936 | 79         | 55        | 423 | 18.97 | 5NO              |             |               |     |
| S-47 | 0      | 5.00E-01 | 2.88E-01      | 0.00E+00 | 0.00E+00 | 322078 | 2296978 | 79         | 45        | 313 | 16.23 | 2NO              |             |               |     |
| S-48 | 0      | 3.70E+00 | 2.13E+00      | 1.03E-01 | 3.90E-02 | 320134 | 2297050 | 81         | 80        | 423 | 15.36 | 6.5NO            |             |               |     |
| S-49 | 0      | 8.53E-01 | 4.91E-01      | 0.00E+00 | 0.00E+00 | 320132 | 2296941 | 78         | 55        | 313 | 17.72 | 2.5NO            |             |               |     |
| S-50 | 0      | 5.47E-01 | 3.14E-01      | 1.35E+00 | 1.21E-03 | 323259 | 2297230 | 79         | 85        | 493 | 17.89 | 2.5NO            |             |               |     |
| S-51 | 0      | 9.06E-01 | 5.21E-01      | 2.27E+00 | 2.03E-03 | 319750 | 2297233 | 83         | 100       | 493 | 18.1  | 3.2NO            |             |               |     |
| S-52 | 0      | 9.06E-01 | 5.21E-01      | 2.16E+00 | 1.93E-03 | 319750 | 2296773 | 77         | 100       | 493 | 18.1  | 3.2NO            |             |               |     |
| S-53 | 0      | 2.81E-01 | 1.62E-01      | 0.00E+00 | 0.00E+00 | 322624 | 2296989 | 84         | 31        | 373 | 10.88 | 2NO              |             |               |     |
| S-54 | 0      | 2.81E-01 | 1.62E-01      | 0.00E+00 | 0.00E+00 | 322772 | 2296986 | 86         | 31        | 373 | 10.88 | 2NO              |             |               |     |
| S-55 | 0      | 2.81E-01 | 1.62E-01      | 0.00E+00 | 0.00E+00 | 322845 | 2296985 | 84         | 31        | 373 | 13.43 | 1.8NO            |             |               |     |
| S-56 | 0      | 2.81E-01 | 1.62E-01      | 0.00E+00 | 0.00E+00 | 322992 | 2296983 | 82         | 31        | 373 | 10.88 | 2NO              |             |               |     |
| S-57 | 0      | 2.81E-01 | 1.62E-01      | 0.00E+00 | 0.00E+00 | 322992 | 2296982 | 82         | 31        | 373 | 10.88 | 2NO              |             |               |     |
| S-58 | 0      | 2.81E-01 | 1.62E-01      | 0.00E+00 | 0.00E+00 | 323066 | 2296980 | 83         | 31        | 373 | 10.88 | 2NO              |             |               |     |
| S-59 | 0      | 2.81E-01 | 1.62E-01      | 0.00E+00 | 0.00E+00 | 323140 | 2296979 | 84         | 31        | 373 | 10.88 | 2NO              |             |               |     |
| S-60 | 0      | 2.81E-01 | 1.62E-01      | 0.00E+00 | 0.00E+00 | 323381 | 2297276 | 84         | 60        | 403 | 20.47 | 4NO              |             |               |     |
| S-61 | 0      | 1.96E+00 | 1.13E+00      | 0.00E+00 | 0.00E+00 | 320391 | 2297232 | 82         | 70        | 403 | 23.3  | 5NO              |             |               |     |
| S-62 | 0      | 3.48E+00 | 2.00E+00      | 0.00E+00 | 0.00E+00 | 322889 | 2297061 | 82         | 60        | 638 | 8.52  | 3NO              |             |               |     |
| S-63 | 0      | 2.90E-01 | 1.67E-01      | 4.53E+00 | 2.95E+00 | 322480 | 2297061 | 82         | 30        | 318 | 17    | 2NO              |             |               |     |
| S-72 | 0      | 4.91E-01 | 2.82E-01      | 0.00E+00 | 0.00E+00 | 322994 | 2297731 | 73         | 80        | 393 | 20    | 4NO              |             |               |     |
| S-73 | 0      | 2.20E+00 | 1.27E+00      | 7.61E-01 | 1.22E+00 | 322994 | 2297731 | 73         | 80        | 393 | 20    | 4NO              |             |               |     |
| S-74 | 0      | 2.97E+00 | 1.71E+00      | 0.00E+00 | 0.00E+00 | 323264 | 2297726 | 75         | 60        | 336 | 21    | 4NO              |             |               |     |
| S-75 | 0      | 9.38E-02 | 5.39E-02      | 0.00E+00 | 0.00E+00 | 323536 | 2297763 | 77         | 35        | 351 | 16    | 1NO              |             |               |     |
| S-76 | 0      | 4.19E-01 | 2.41E-01      | 0.00E+00 | 0.00E+00 | 322798 | 2297505 | 77         | 30        | 318 | 17    | 2NO              |             |               |     |
| S-77 | 0      | 1.88E+00 | 1.08E+00      | 8.60E-01 | 1.38E+00 | 322990 | 2297500 | 76         | 80        | 393 | 20    | 4NO              |             |               |     |
| S-78 | 0      | 2.53E+00 | 1.45E+00      | 0.00E+00 | 0.00E+00 | 323259 | 2297495 | 77         | 60        | 336 | 21    | 4NO              |             |               |     |
| S-80 | 0      | 7.11E-01 | 4.09E-01      | 6.32E+00 | 6.32E+00 | 323038 | 2296464 | 88         | 90        | 423 | 17.11 | 2.7NO            |             |               |     |
| S-81 | 0      | 7.11E-01 | 4.09E-01      | 6.32E+00 | 6.32E+00 | 323124 | 2296462 | 92         | 90        | 423 | 17.11 | 2.7NO            |             |               |     |
| S-82 | 0      | 7.11E-01 | 4.09E-01      | 6.32E+00 | 6.32E+00 | 323210 | 2296461 | 94         | 90        | 423 | 17.11 | 2.7NO            |             |               |     |
| S-83 | 0      | 7.11E-01 | 4.09E-01      | 6.32E+00 | 6.32E+00 | 323285 | 2296459 | 96         | 90        | 423 | 17.11 | 2.7NO            |             |               |     |
| S-84 | 0      | 7.11E-01 | 4.09E-01      | 6.32E+00 | 6.32E+00 | 323092 | 2296820 | 84         | 90        | 423 | 17.11 | 2.7NO            |             |               |     |
| S-85 | 0      | 1.42E+00 | 8.18E-01      | 1.26E+01 | 1.26E+01 | 323174 | 2296819 | 86         | 110       | 423 | 17.28 | 3.8NO            |             |               |     |
| S-86 | 0      | 7.11E-01 | 4.09E-01      | 6.32E+00 | 6.32E+00 | 323257 | 2296817 | 89         | 110       | 423 | 17.11 | 2.7NO            |             |               |     |
| S-87 | 0      | 4.22E-01 | 2.43E-01      | 0.00E+00 | 0.00E+00 | 323222 | 2296708 | 87         | 45        | 323 | 9.04  | 2.5NO            |             |               |     |
| S-88 | 0      | 4.22E-01 | 2.43E-01      | 0.00E+00 | 0.00E+00 | 323159 | 2296623 | 88         | 45        | 323 | 9.04  | 2.5NO            |             |               |     |
| S-89 | 0      | 4.22E-01 | 2.43E-01      | 0.00E+00 | 0.00E+00 | 322403 | 2296574 | 91         | 45        | 323 | 9.04  | 2.5NO            |             |               |     |
| S-90 | 0      | 4.22E-01 | 2.43E-01      | 0.00E+00 | 0.00E+00 | 322638 | 2296570 | 93         | 45        | 323 | 9.04  | 2.5NO            |             |               |     |

ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH  
(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)

ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH  
(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)

\*\*\* AREA SOURCE DATA \*\*\*

| SOURCE ID | NO. PART. CATS. | EMISSION RATE (GRAMS/SEC) |          | COORD (SW CORNER) |         | BASE ELEV. (M) | RELEASE HEIGHT (M) | X-DIM OF AREA (M) | Y-DIM OF AREA (M) | ORIENT. OF AREA (DEG) | INIT. SZ (M) |
|-----------|-----------------|---------------------------|----------|-------------------|---------|----------------|--------------------|-------------------|-------------------|-----------------------|--------------|
|           |                 | PM10                      | PM2.5    | X                 | Y       |                |                    |                   |                   |                       |              |
| A-1       |                 | 0 2.18E-10                | 1.25E-10 | 321987            | 2296590 | 85             |                    | 1                 | 181.01            | 168.41                | 126          |
| A-2       |                 | 0 1.18E-10                | 1.25E-10 | 320382            | 2296639 | 90             |                    | 1                 | 625.62            | 280.25                | 0            |
| A-3       |                 | 0 2.18E-10                | 1.25E-10 | 319338            | 2296600 | 81             |                    | 1                 | 668.02            | 280.25                | 0            |
| A-4       |                 | 0 6.46E-11                | 3.71E-11 | 320503            | 2295898 | 88             |                    | 1                 | 34.9              | 98.7                  | 0            |
| A-5       |                 | 0 6.46E-11                | 3.71E-11 | 320539            | 2295797 | 85             |                    | 1                 | 109.64            | 194.15                | 0            |
| A-6       |                 | 0 6.46E-11                | 3.71E-11 | 320594            | 2295749 | 85             |                    | 1                 | 57.3              | 45.11                 | 0            |
| A-7       |                 | 0 6.46E-11                | 3.71E-11 | 320654            | 2295698 | 84             |                    | 1                 | 216.91            | 287.3                 | 137          |
| A-8       |                 | 0 6.46E-11                | 3.71E-11 | 320729            | 2295639 | 84             |                    | 1                 | 112.45            | 55.94                 | 0            |
| A-9       |                 | 0 6.46E-11                | 3.71E-11 | 320886            | 2295638 | 80             |                    | 1                 | 65.87             | 151.64                | 0            |
| A-10      |                 | 0 6.46E-11                | 3.71E-11 | 320956            | 2295628 | 81             |                    | 1                 | 33.81             | 65.27                 | 0            |
| A-11      |                 | 0 3.96E-11                | 1.95E-11 | 321173            | 2297818 | 74             |                    | 1                 | 237.41            | 74.79                 | 0            |
| A-12      |                 | 0 3.96E-11                | 1.95E-11 | 321089            | 2297611 | 76             |                    | 1                 | 390.34            | 198.33                | 0            |
| A-13      |                 | 0 3.96E-11                | 1.95E-11 | 321035            | 2297488 | 78             |                    | 1                 | 44.24             | 216.09                | 0            |
| A-14      |                 | 0 3.96E-11                | 1.95E-11 | 320962            | 2297686 | 72             |                    | 1                 | 44.5              | 76.24                 | 0            |
| A-15      |                 | 0 1.09E-10                | 6.27E-11 | 322328            | 2296602 | 96             |                    | 1                 | 637.07            | 202.96                | 0            |
| A-16      |                 | 0 1.09E-10                | 6.27E-11 | 322964            | 2296607 | 97             |                    | 1                 | 82.58             | 126.81                | 0            |

\*\*\* SOURCE IDS DEFINING SOURCE GROUPS \*\*\*

SOURCE IDS

ALL S-01, S-12, S-14, S-15, S-16, S-17, S-18, S-19, S-20, S-21, S-22, S-23, S-24, S-25, S-26, S-27, S-28, S-29, S-30, S-31, S-32, S-33, S-34, S-35, S-36, S-37, S-38, S-39, S-42, S-43, S-44, S-45, S-46, S-47, S-48, S-49, S-50, S-51, S-52, S-53, S-54, S-55, S-56, S-57, S-58, S-59, S-60, S-61, S-62, S-63, S-72, S-73, S-74, S-75, S-76, S-77, S-78, S-80, S-81, S-82, S-83, S-84, S-85, S-86, S-87, S-88, S-89, S-90, A-1, A-2, A-3, A-4, A-5, A-6, A-7, A-8, A-9, A-10, A-11, A-12, A-13, A-14, A-15, A-16,

\*\*\* DISCRETE CARTESIAN RECEPTORS \*\*\*

## (X-COORD, Y-COORD, ZELEV, ZFLAG) (METERS)

|                       |        |    |                       |        |    |
|-----------------------|--------|----|-----------------------|--------|----|
| (322795.0, 2297792.0, | 76.0,  | .0 | (323238.0, 2297843.0, | 74.0,  | .0 |
| (323693.0, 2297668.0, | 79.0,  | .0 | (324096.0, 2297301.0, | 90.0,  | .0 |
| (323545.0, 2296759.0, | 99.0,  | .0 | (323497.0, 2296459.0, | 106.0, | .0 |
| (323455.0, 2296074.0, | 133.0, | .0 | (323055.0, 2296075.0, | 103.0, | .0 |
| (322776.0, 2295945.0, | 101.0, | .0 | (322425.0, 2295915.0, | 99.0,  | .0 |
| (322166.0, 2296154.0, | 91.0,  | .0 | (320491.0, 2295833.0, | 86.0,  | .0 |
| (319544.0, 2296801.0, | 76.0,  | .0 | (320990.0, 2297542.0, | 77.0,  | .0 |
| (321980.0, 2297600.0, | 81.0,  | .0 | (322432.0, 2297655.0, | 83.0,  | .0 |
| (322408.0, 2297709.0, | 80.0,  | .0 | (323783.0, 2296753.0, | 147.0, | .0 |
| (323706.0, 2296366.0, | 113.0, | .0 | (323484.0, 2296048.0, | 133.0, | .0 |
| (323159.0, 2295830.0, | 141.0, | .0 | (322773.0, 2295756.0, | 121.0, | .0 |
| (322389.0, 2295838.0, | 97.0,  | .0 | (322068.0, 2296062.0, | 87.0,  | .0 |
| (322801.0, 2298424.0, | 77.0,  | .0 | (322807.0, 2298978.0, | 74.0,  | .0 |
| (322813.0, 2299531.0, | 67.0,  | .0 | (322819.0, 2300085.0, | 62.0,  | .0 |
| (322824.0, 2300638.0, | 67.0,  | .0 | (322830.0, 2301192.0, | 76.0,  | .0 |
| (322842.0, 2302299.0, | 70.0,  | .0 | (322865.0, 2304513.0, | 59.0,  | .0 |
| (322901.0, 2307834.0, | 60.0,  | .0 | (323425.0, 2298296.0, | 69.0,  | .0 |
| (322638.0, 2298803.0, | 67.0,  | .0 | (323862.0, 2299310.0, | 60.0,  | .0 |
| (324076.0, 2299817.0, | 58.0,  | .0 | (324289.0, 2300335.0, | 55.0,  | .0 |

**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH**  
**(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

| STABILITY CATEGORY | WIND SPEED CATEGORY |            |            |            |            |            |
|--------------------|---------------------|------------|------------|------------|------------|------------|
|                    | 1                   | 2          | 3          | 4          | 5          | 6          |
| A                  | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| B                  | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| C                  | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| D                  | .00000E+00          | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 | .00000E+00 |
| E                  | .20000E-01          | .20000E-01 | .20000E-01 | .20000E-01 | .20000E-01 | .20000E-01 |
| F                  | .35000E-01          | .35000E-01 | .35000E-01 | .35000E-01 | .35000E-01 | .35000E-01 |

**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH  
(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

|                       |       |      |                       |        |      |
|-----------------------|-------|------|-----------------------|--------|------|
| (319767.0, 2298069.0, | 71.0, | 0.0; | (319270.0, 2298285.0, | 70.0,  | 0.0; |
| (318762.0, 2298500.0, | 68.0, | 0.0; | (317756.0, 2298943.0, | 80.0,  | 0.0; |
| (315746.0, 2299806.0, | 96.0, | 0.0; | (312730.0, 230113.0,  | 95.0,  | 0.0; |
| (321640.0, 2297949.0, | 71.0, | 0.0; | (321259.0, 2298352.0, | 66.0,  | 0.0; |
| (320868.0, 2298744.0, | 66.0, | 0.0; | (320487.0, 2299135.0, | 65.0,  | 0.0; |
| (320106.0, 2299538.0, | 78.0, | 0.0; | (319725.0, 2299929.0, | 81.0,  | 0.0; |
| (318963.0, 2300724.0, | 90.0, | 0.0; | (317429.0, 2302302.0, | 78.0,  | 0.0; |
| (315134.0, 2304674.0, | 86.0, | 0.0; | (322175.0, 2298309.0, | 76.0,  | 0.0; |
| (321972.0, 2298820.0, | 68.0, | 0.0; | (321769.0, 2299332.0, | 61.0,  | 0.0; |
| (321567.0, 2299843.0, | 70.0, | 0.0; | (321354.0, 2300366.0, | 70.0,  | 0.0; |
| (321151.0, 2300877.0, | 75.0, | 0.0; | (320745.0, 2301900.0, | 71.0,  | 0.0; |
| (319934.0, 2303957.0, | 69.0, | 0.0; | (318708.0, 2307038.0, | 78.0,  | 0.0; |
| (321119.0, 2297297.0, | 75.0, | 0.0; | (327125.0, 2296902.0, | 95.0,  | 0.0; |
| (322586.0, 2303927.0, | 72.0, | 0.0; | (325628.0, 2291636.0, | 118.0, | 0.0; |
| (324283.0, 2299557.0, | 74.0, | 0.0; | (321688.0, 2294449.0, | 97.0,  | 0.0; |
| (319933.0, 2299352.0, | 94.0, | 0.0; | (320660.0, 2297853.0, | 77.0,  | 0.0; |

\*\*\* METEOROLOGICAL DAYS SELECTED FOR PROCESSING \*\*\*  
(1=YES; 0=NO)

[illegible]

NOTE: METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.

\*\*\* UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES \*\*\*  
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

## \*\*\* WIND PROFILE EXPONENTS \*\*\*

| STABILITY<br>CATEGORY | WIND PROFILE EXPONENT |           |           |           |           |           |
|-----------------------|-----------------------|-----------|-----------|-----------|-----------|-----------|
|                       | 1                     | 2         | 3         | 4         | 5         | 6         |
| A                     | .7000E-01             | .7000E-01 | .7000E-01 | .7000E-01 | .7000E-01 | .7000E-01 |
| B                     | .7000E-01             | .7000E-01 | .7000E-01 | .7000E-01 | .7000E-01 | .7000E-01 |
| C                     | .1000E+00             | .1000E+00 | .1000E+00 | .1000E+00 | .1000E+00 | .1000E+00 |
| D                     | .1500E+00             | .1500E+00 | .1500E+00 | .1500E+00 | .1500E+00 | .1500E+00 |
| E                     | .3500E+00             | .3500E+00 | .3500E+00 | .3500E+00 | .3500E+00 | .3500E+00 |
| F                     | .5500E+00             | .5500E+00 | .5500E+00 | .5500E+00 | .5500E+00 | .5500E+00 |

\*\*\* VERTICAL POTENTIAL TEMPERATURE GRADIENTS \*\*\*  
(DEGREES KELVIN PER METER)

**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH  
(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

\*\*\* ISCST3 - VERSION 95250 \*\*\*

\*\*\* AS PER EC DT 04-06-2020 FOR 3.0 MTPA STEEL IN JHARBANDH STEEL PLANT \*\*\* 10/20/20  
\*\*\* PM10 EMISSIONS FROM ALL STACKS WITH FUGITIVE EMISSION SOURCES \*\*\* 16:49:53

\*\*MODELOPTs: CONC RURAL ELEV DFAULT

\*\*\* THE FIRST 24 HOURS OF METEOROLOGICAL DATA \*\*\*

FILE: OR\B\OCT2020\DK19S.MET FORMAT: 412,219.4,F6,1,12,2F7,1,f9,4,f10,1,f8,4,f7,2)  
SURFACE STATION NO.: 99999 UPPER AIR STATION NO.: 99999

NAME: XXX NAME: XXX  
YEAR: 2019 YEAR: 2019

| YEAR | MM | DD | HH | VECTOR | (M/S) | (K)   | CLASS | RURAL  | URBAN  | (M/S) | (M) | (M)   | (mm/hr) |
|------|----|----|----|--------|-------|-------|-------|--------|--------|-------|-----|-------|---------|
| 19   | 3  | 1  | 1  | 187.9  | 3.90  | 297.3 | 4     | 333.0  | 333.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 2  | 284.3  | 3.10  | 297.4 | 4     | 333.0  | 333.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 3  | 272.4  | 1.80  | 296.4 | 6     | 303.0  | 303.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 4  | 247.0  | 1.60  | 296.8 | 6     | 283.0  | 283.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 5  | 243.5  | 2.30  | 295.9 | 5     | 228.0  | 228.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 6  | 265.0  | 1.40  | 297.1 | 1     | 253.0  | 253.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 7  | 233.4  | 1.10  | 297.7 | 1     | 358.0  | 358.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 8  | 309.9  | .70   | 298.7 | 1     | 530.0  | 530.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 9  | 247.6  | .50   | 298.8 | 1     | 715.0  | 715.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 10 | 229.3  | .80   | 302.0 | 1     | 950.0  | 950.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 11 | 181.2  | .90   | 304.7 | 1     | 1140.0 | 1140.0 | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 12 | 285.2  | .60   | 305.1 | 1     | 1258.0 | 1258.0 | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 13 | 271.1  | 3.70  | 305.7 | 2     | 1303.0 | 1303.0 | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 14 | 249.1  | 1.90  | 305.5 | 1     | 1315.0 | 1315.0 | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 15 | 254.4  | 1.80  | 308.0 | 1     | 1305.0 | 1305.0 | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 16 | 259.7  | .60   | 306.1 | 1     | 1255.0 | 1255.0 | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 17 | 305.7  | 2.20  | 306.6 | 2     | 1150.0 | 1150.0 | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 18 | 236.0  | 5.70  | 306.4 | 3     | 948.0  | 948.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 19 | 304.8  | 4.40  | 303.9 | 2     | 735.0  | 735.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 20 | 259.1  | 3.40  | 301.4 | 4     | 445.0  | 445.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 21 | 253.7  | 3.50  | 301.2 | 4     | 488.0  | 488.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 22 | 244.6  | 3.20  | 299.8 | 4     | 428.0  | 428.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 23 | 267.2  | 2.50  | 299.6 | 5     | 408.0  | 408.0  | .0000 | .0  | .0000 | 0 .00   |
| 19   | 3  | 1  | 24 | 286.7  | .00   | 297.6 | 6     | 393.0  | 393.0  | .0000 | .0  | .0000 | 0 .00   |

\*\*\* NOTES: STABILITY CLASS 1=A, 2=B, 3=C, 4=D, 5=E AND 6=F.  
FLOW VECTOR IS DIRECTION TOWARD WHICH WIND IS BLOWING.

**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH  
(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

10/20/20  
16:49:53

\*\*\* ISCST3 - VERSION 95250 \*\*\*  
\*\*\* AS PER EC DT 04-06-2020 FOR 3.0 MTPA STEEL IN JHARBANDH STEEL PLANT \*\*\*  
\*\*\* PM10 EMISSIONS FROM ALL STACKS WITH FUGITIVE EMISSION SOURCES \*\*\*  
\*\*MODELOPTs: CONC RURAL ELEV DFAULT

\*\*\* THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL \*\*\*  
INCLUDING SOURCE(S): S-01 , S-12 , S-14 , S-15 , S-16 , S-17 , S-18 ,  
S-19 , S-20 , S-21 , S-22 , S-23 , S-24 , S-25 , S-26 , S-27 , S-28 , S-29 , S-30 ,  
S-31 , S-32 , S-33 , S-34 , S-35 , S-36 , S-37 , S-38 , S-39 , S-42 , S-43 , . . . ,

\*\*\* DISCRETE CARTESIAN RECEPTOR POINTS \*\*\*

**\*\* CONC OF PM10 IN MICROGRAMS/M\*\*3 \*\***

| X-COORD (M) | Y-COORD (M) | CONC     | (YYMMDDHH) | X-COORD (M) | Y-COORD (M) | CONC     | (YYMMDDHH) |
|-------------|-------------|----------|------------|-------------|-------------|----------|------------|
| 322795.00   | 2297792.00  | 8.08767  | (19052524) | 323238.00   | 2297843.00  | 6.70182  | (19051324) |
| 323693.00   | 2297668.00  | 6.71360  | (19051724) | 324096.00   | 2297301.00  | 8.25783c | (19030124) |
| 323545.00   | 2296759.00  | 11.57807 | (19052724) | 323497.00   | 2296459.00  | 11.99422 | (19040824) |
| 323455.00   | 2296074.00  | 13.46401 | (19040824) | 323059.00   | 2296075.00  | 9.36639  | (19052824) |
| 322776.00   | 2295945.00  | 10.18872 | (19052824) | 322425.00   | 2295915.00  | 5.29321  | (19031324) |
| 322166.00   | 2296154.00  | 6.43746  | (19052924) | 320491.00   | 2295833.00  | 5.80180  | (19052924) |
| 319544.00   | 2296801.00  | 6.37138  | (19052924) | 320990.00   | 2297542.00  | 6.22543c | (19051924) |
| 321980.00   | 2297600.00  | 8.62500  | (19052424) | 322432.00   | 2297655.00  | 9.14841  | (19053024) |
| 322408.00   | 2297709.00  | 8.70264  | (19053024) | 323783.00   | 2296753.00  | 21.31154 | (19041124) |
| 323706.00   | 2296366.00  | 12.63314 | (19040824) | 323484.00   | 2296048.00  | 13.61219 | (19040824) |
| 323159.00   | 2295830.00  | 13.03525 | (19052824) | 322773.00   | 2295756.00  | 14.05321 | (19052824) |
| 322389.00   | 2295838.00  | 4.91213  | (19031324) | 322068.00   | 2296062.00  | 5.58141  | (19052924) |
| 322801.00   | 2298424.00  | 8.26330  | (19052524) | 322807.00   | 2298978.00  | 7.32864  | (19052524) |
| 322813.00   | 2299531.00  | 6.52475  | (19052524) | 322819.00   | 2300085.00  | 5.89604  | (19052524) |
| 322824.00   | 2300638.00  | 5.47731  | (19052524) | 322830.00   | 2301192.00  | 5.25702  | (19052524) |
| 322842.00   | 2302299.00  | 4.60193  | (19052524) | 322865.00   | 2304513.00  | 3.74444  | (19052524) |
| 322901.00   | 2307834.00  | 3.02525  | (19052524) | 323425.00   | 2298296.00  | 5.88638  | (19051324) |
| 323638.00   | 2298803.00  | 5.97764  | (19050324) | 323862.00   | 2299310.00  | 4.92147  | (19050324) |
| 324076.00   | 2299817.00  | 4.19969  | (19050324) | 324289.00   | 2300335.00  | 4.00169  | (19041424) |
| 324503.00   | 2300842.00  | 3.64030  | (19041424) | 324930.00   | 2301856.00  | 3.19638  | (19041424) |
| 325784.00   | 2303896.00  | 2.57352  | (19041424) | 327075.00   | 2306949.00  | 2.15249  | (19041424) |
| 323952.00   | 2297925.00  | 8.11991  | (19051724) | 324352.00   | 2298319.00  | 7.38031  | (19051724) |
| 324741.00   | 2298703.00  | 6.20154  | (19051724) | 325130.00   | 2299086.00  | 5.18499  | (19051724) |
| 325519.00   | 2299481.00  | 4.57724  | (19051724) | 325909.00   | 2299864.00  | 4.06171  | (19051724) |
| 326687.00   | 2300642.00  | 3.25581  | (19051724) | 328254.00   | 2302187.00  | 2.45191  | (19051724) |
| 330599.00   | 2304511.00  | 2.01835  | (19051724) | 324311.00   | 2297390.00  | 8.05418c | (19030124) |
| 324813.00   | 2297595.00  | 6.88350c | (19030124) | 325325.00   | 2297800.00  | 5.56448c | (19030124) |
| 325827.00   | 2298005.00  | 5.22337  | (19041624) | 326339.00   | 2298210.00  | 5.08717  | (19041624) |
| 326841.00   | 2298415.00  | 4.72661  | (19041624) | 327856.00   | 2298837.00  | 4.28944  | (19041624) |

**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH  
(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

|           |            |          |            |           |            |          |            |
|-----------|------------|----------|------------|-----------|------------|----------|------------|
| 329884.00 | 2299657.00 | 3.52805  | (19041624) | 332926.00 | 2300900.00 | 2.80887  | (19041624) |
| 324429.00 | 2296746.00 | 16.79415 | (19040824) | 324970.00 | 2296741.00 | 6.52515  | (19052724) |
| 325522.00 | 2296735.00 | 5.91268  | (19052724) | 326064.00 | 2296729.00 | 5.45753  | (19052724) |
| 326615.00 | 2296724.00 | 5.08515  | (19052724) | 327157.00 | 2296718.00 | 4.34566  | (19052724) |
| 328250.00 | 2296707.00 | 3.64460  | (19052724) | 330437.00 | 2296685.00 | 2.72395  | (19052724) |
| 333717.00 | 2296652.00 | 1.96623  | (19052724) | 324297.00 | 2296117.00 | 7.77874  | (19040824) |
| 324795.00 | 2295901.00 | 6.53803  | (19040824) | 325303.00 | 2295685.00 | 5.65093  | (19040824) |
| 325801.00 | 2295470.00 | 6.06811  | (19040824) | 326309.00 | 2295243.00 | 5.21461  | (19040824) |
| 326806.00 | 2295028.00 | 5.14448  | (19040824) | 327812.00 | 2294597.00 | 3.14901  | (19040824) |
| 329824.00 | 2293724.00 | 2.41274  | (19040824) | 332842.00 | 2292431.00 | 1.45891  | (19040824) |
| 323927.00 | 2295578.00 | 7.52709  | (19040824) | 324319.00 | 2295186.00 | 6.65399  | (19040824) |
| 324700.00 | 2294795.00 | 6.80641  | (19040824) | 325081.00 | 2294392.00 | 5.14988  | (19040824) |
| 325463.00 | 2294001.00 | 4.19235  | (19040824) | 325844.00 | 2293598.00 | 3.45079  | (19040824) |
| 326606.00 | 2292815.00 | 2.98620  | (19040824) | 328142.00 | 2291227.00 | 2.26629  | (19040824) |
| 330441.00 | 2288857.00 | 1.86380  | (19040824) | 323392.00 | 2295229.00 | 5.67017  | (19041524) |
| 323595.00 | 2294718.00 | 4.63670  | (19041524) | 323809.00 | 2294195.00 | 3.93783  | (19041524) |
| 324012.00 | 2293684.00 | 3.16125  | (19041524) | 324214.00 | 2293172.00 | 2.66460  | (19041524) |
| 324417.00 | 2292661.00 | 2.31174  | (19041524) | 324823.00 | 2291627.00 | 1.96827  | (19052724) |
| 325636.00 | 2289581.00 | 1.26140  | (19041524) | 326865.00 | 2286491.00 | 1.27156  | (19052724) |
| 322766.00 | 2295103.00 | 7.52323  | (19052824) | 322760.00 | 2294549.00 | 7.21808  | (19052824) |
| 322754.00 | 2293996.00 | 7.87198  | (19052824) | 322749.00 | 2293442.00 | 7.44592  | (19052824) |
| 322743.00 | 2292889.00 | 5.87139  | (19052824) | 322737.00 | 2292335.00 | 5.24320  | (19052824) |
| 322725.00 | 2291228.00 | 4.11495  | (19052824) | 322702.00 | 2289014.00 | 2.68248  | (19052824) |
| 322667.00 | 2285693.00 | 1.72061  | (19052824) | 322143.00 | 2295242.00 | 5.88403  | (19030224) |
| 321929.00 | 2294735.00 | 2.59218  | (19041524) | 321715.00 | 2294217.00 | 2.74630  | (19041524) |
| 321502.00 | 2293710.00 | 2.66085  | (19052824) | 321277.00 | 2293203.00 | 2.58134  | (19052824) |
| 321064.00 | 2292696.00 | 2.31241  | (19052824) | 320636.00 | 2291671.00 | 2.07005  | (19030224) |
| 319781.00 | 2289643.00 | 2.46286  | (19050524) | 318488.00 | 2286579.00 | 1.52469  | (19030224) |
| 321615.00 | 2295602.00 | 3.95063  | (19052924) | 321226.00 | 2295219.00 | 3.63883  | (19052924) |
| 320826.00 | 2294836.00 | 3.25204  | (19052924) | 320437.00 | 2294441.00 | 2.83636  | (19052924) |
| 320047.00 | 2294058.00 | 2.59422  | (19052924) | 319657.00 | 2293663.00 | 2.45357  | (19052924) |
| 318878.00 | 2292897.00 | 2.03516  | (19052924) | 317310.00 | 2291341.00 | 1.62764  | (19052924) |
| 314971.00 | 2289020.00 | 1.14248  | (19052924) | 321267.00 | 2296148.00 | 5.65363  | (19052924) |
| 320755.00 | 2295944.00 | 5.84554  | (19052924) | 320253.00 | 2295739.00 | 5.78825  | (19052924) |
| 319740.00 | 2295534.00 | 5.48962  | (19052924) | 319238.00 | 2295318.00 | 4.83868  | (19052924) |
| 318725.00 | 2295113.00 | 4.36915  | (19052924) | 317711.00 | 2294703.00 | 3.63017  | (19052924) |
| 315681.00 | 2293872.00 | 2.56709  | (19052924) | 312636.00 | 2292644.00 | 1.51699  | (19052924) |
| 319504.00 | 2296798.00 | 6.15924  | (19052924) | 318962.00 | 2296804.00 | 4.86165  | (19052924) |
| 318410.00 | 2296810.00 | 4.19217  | (19052924) | 317317.00 | 2296822.00 | 3.23618  | (19052924) |
| 315130.00 | 2296846.00 | 2.23483  | (19052924) | 311850.00 | 2296882.00 | 1.53831  | (19052924) |
| 320773.00 | 2297637.00 | 5.78433c | (19051924) | 320275.00 | 2297853.00 | 5.09708  | (19052424) |
| 319767.00 | 2298069.00 | 6.48060  | (19052424) | 319270.00 | 2298285.00 | 5.77518c | (19051924) |
| 318762.00 | 2298500.00 | 5.57449c | (19051924) | 317756.00 | 2298943.00 | 5.40221c | (19051924) |

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**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH  
(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

|           |            |          |            |           |            |          |            |
|-----------|------------|----------|------------|-----------|------------|----------|------------|
| 315746.00 | 2299806.00 | 5.06121c | (19051924) | 312730.00 | 2301113.00 | 4.00826c | (19051924) |
| 321640.00 | 2297949.00 | 7.13255  | (19052024) | 321259.00 | 2298352.00 | 6.23760  | (19052024) |
| 320868.00 | 2298744.00 | 5.74685  | (19052024) | 320487.00 | 2299135.00 | 5.32457  | (19052024) |
| 320106.00 | 2299538.00 | 5.48725  | (19053024) | 319725.00 | 2299929.00 | 5.48690  | (19053024) |
| 318963.00 | 2300724.00 | 5.47508  | (19052024) | 317429.00 | 2302302.00 | 3.85284  | (19052024) |
| 315143.00 | 2304674.00 | 3.25846  | (19052024) | 322175.00 | 2298309.00 | 9.12212  | (19053024) |
| 321972.00 | 2298820.00 | 8.49563  | (19053024) | 321769.00 | 2299332.00 | 7.52817  | (19053024) |
| 321567.00 | 2299843.00 | 7.14905  | (19053024) | 321354.00 | 2300366.00 | 6.57849  | (19053024) |
| 321151.00 | 2300877.00 | 6.24391  | (19053024) | 320745.00 | 2301900.00 | 5.43005  | (19053024) |
| 319934.00 | 2303957.00 | 4.55298  | (19053024) | 318708.00 | 2307038.00 | 3.71522  | (19053024) |
| 321119.00 | 2297297.00 | 6.06829c | (19051924) | 327125.00 | 2296902.00 | 4.20262  | (19052724) |
| 322586.00 | 2303927.00 | 4.08796  | (19052524) | 325628.00 | 2291636.00 | 1.75071  | (19052724) |
| 324283.00 | 2299557.00 | 4.89022  | (19041424) | 321688.00 | 2294449.00 | 2.82331  | (19041524) |
| 319933.00 | 2295352.00 | 6.00135  | (19052924) | 320660.00 | 2297853.00 | 5.90950c | (19051924) |

| *** THE MAXIMUM 50 24-HR AVERAGE CONCENTRATION |           |               |                             | VALUES FOR SOURCE GROUP: ALL |          |               |                             | ***  |           |               |                             |
|------------------------------------------------|-----------|---------------|-----------------------------|------------------------------|----------|---------------|-----------------------------|------|-----------|---------------|-----------------------------|
| RANK                                           | CONC      | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    | RANK                         | CONC     | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    | RANK | CONC      | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    |
| 1.                                             | 21.31154  | (19041124) AT | ( 323783.00, 2296753.00) DC | 26.                          | 13.89547 | (19033124) AT | ( 323783.00, 2296753.00) DC | 1.   | 21.31154  | (19041124) AT | ( 323783.00, 2296753.00) DC |
| 2.                                             | 21.24568c | (19030124) AT | ( 323783.00, 2296753.00) DC | 27.                          | 13.74876 | (19031424) AT | ( 323783.00, 2296753.00) DC | 2.   | 21.24568c | (19030124) AT | ( 323783.00, 2296753.00) DC |
| 3.                                             | 19.91225  | (19040824) AT | ( 323783.00, 2296753.00) DC | 28.                          | 13.72573 | (19042524) AT | ( 324429.00, 2296746.00) DC | 3.   | 19.91225  | (19040824) AT | ( 323783.00, 2296753.00) DC |
| 4.                                             | 19.90033  | (19052624) AT | ( 323783.00, 2296753.00) DC | 29.                          | 13.61219 | (19040824) AT | ( 323484.00, 2296048.00) DC | 4.   | 19.90033  | (19052624) AT | ( 323783.00, 2296753.00) DC |
| 5.                                             | 19.79624  | (19043024) AT | ( 323783.00, 2296753.00) DC | 30.                          | 13.48710 | (19051724) AT | ( 323783.00, 2296753.00) DC | 5.   | 19.79624  | (19043024) AT | ( 323783.00, 2296753.00) DC |
| 6.                                             | 18.82952  | (19052724) AT | ( 323783.00, 2296753.00) DC | 31.                          | 13.46401 | (19040824) AT | ( 323455.00, 2296074.00) DC | 6.   | 18.82952  | (19052724) AT | ( 323783.00, 2296753.00) DC |
| 7.                                             | 18.04398  | (19042524) AT | ( 323783.00, 2296753.00) DC | 32.                          | 13.31295 | (19030524) AT | ( 323783.00, 2296753.00) DC | 7.   | 18.04398  | (19042524) AT | ( 323783.00, 2296753.00) DC |
| 8.                                             | 17.84433  | (19040324) AT | ( 323783.00, 2296753.00) DC | 33.                          | 13.25067 | (19041224) AT | ( 323783.00, 2296753.00) DC | 8.   | 17.84433  | (19040324) AT | ( 323783.00, 2296753.00) DC |
| 9.                                             | 17.55411  | (19041724) AT | ( 323783.00, 2296753.00) DC | 34.                          | 13.03525 | (19052824) AT | ( 323159.00, 2295830.00) DC | 9.   | 17.55411  | (19041724) AT | ( 323783.00, 2296753.00) DC |
| 10.                                            | 17.35100  | (19041624) AT | ( 323783.00, 2296753.00) DC | 35.                          | 12.63314 | (19040824) AT | ( 323706.00, 2296366.00) DC | 10.  | 17.35100  | (19041624) AT | ( 323783.00, 2296753.00) DC |
| 11.                                            | 17.08638  | (19040724) AT | ( 323783.00, 2296753.00) DC | 36.                          | 12.62778 | (19052624) AT | ( 324429.00, 2296746.00) DC | 11.  | 17.08638  | (19040724) AT | ( 323783.00, 2296753.00) DC |
| 12.                                            | 16.79415  | (19040824) AT | ( 324429.00, 2296746.00) DC | 37.                          | 12.60582 | (19051324) AT | ( 324429.00, 2296746.00) DC | 12.  | 16.79415  | (19040824) AT | ( 324429.00, 2296746.00) DC |
| 13.                                            | 16.77288  | (19051324) AT | ( 323783.00, 2296753.00) DC | 38.                          | 12.37197 | (19041324) AT | ( 324429.00, 2296746.00) DC | 13.  | 16.77288  | (19051324) AT | ( 323783.00, 2296753.00) DC |
| 14.                                            | 16.36403  | (19041124) AT | ( 324429.00, 2296746.00) DC | 39.                          | 12.30460 | (19041724) AT | ( 324429.00, 2296746.00) DC | 14.  | 16.36403  | (19041124) AT | ( 324429.00, 2296746.00) DC |
| 15.                                            | 15.60241  | (19041324) AT | ( 323783.00, 2296753.00) DC | 40.                          | 12.28719 | (19051424) AT | ( 323783.00, 2296753.00) DC | 15.  | 15.60241  | (19041324) AT | ( 323783.00, 2296753.00) DC |
| 16.                                            | 15.19199  | (19051024) AT | ( 323783.00, 2296753.00) DC | 41.                          | 11.99422 | (19040824) AT | ( 323497.00, 2296459.00) DC | 16.  | 15.19199  | (19051024) AT | ( 323783.00, 2296753.00) DC |
| 17.                                            | 15.12269  | (19031924) AT | ( 323783.00, 2296753.00) DC | 42.                          | 11.82194 | (19040324) AT | ( 324429.00, 2296746.00) DC | 17.  | 15.12269  | (19031924) AT | ( 323783.00, 2296753.00) DC |
| 18.                                            | 14.99447  | (19032124) AT | ( 323783.00, 2296753.00) DC | 43.                          | 11.79443 | (19040924) AT | ( 323455.00, 2296074.00) DC | 18.  | 14.99447  | (19032124) AT | ( 323783.00, 2296753.00) DC |
| 19.                                            | 14.72588  | (19040924) AT | ( 323783.00, 2296753.00) DC | 44.                          | 11.62317 | (19052724) AT | ( 324429.00, 2296746.00) DC | 19.  | 14.72588  | (19040924) AT | ( 323783.00, 2296753.00) DC |
| 20.                                            | 14.64708  | (19042324) AT | ( 323783.00, 2296753.00) DC | 45.                          | 11.57807 | (19052724) AT | ( 323545.00, 2296759.00) DC | 20.  | 14.64708  | (19042324) AT | ( 323783.00, 2296753.00) DC |
| 21.                                            | 14.32334c | (19030124) AT | ( 324429.00, 2296746.00) DC | 46.                          | 11.56207 | (19040924) AT | ( 323484.00, 2296048.00) DC | 21.  | 14.32334c | (19030124) AT | ( 324429.00, 2296746.00) DC |
| 22.                                            | 14.13473  | (19030824) AT | ( 323783.00, 2296753.00) DC | 47.                          | 11.51873 | (19031224) AT | ( 323783.00, 2296753.00) DC | 22.  | 14.13473  | (19030824) AT | ( 323783.00, 2296753.00) DC |
| 23.                                            | 14.06714  | (19043024) AT | ( 324429.00, 2296746.00) DC | 48.                          | 11.23240 | (19030724) AT | ( 323783.00, 2296753.00) DC | 23.  | 14.06714  | (19043024) AT | ( 324429.00, 2296746.00) DC |
| 24.                                            | 14.05321  | (19052824) AT | ( 322773.00, 2295756.00) DC | 49.                          | 10.99069 | (19031624) AT | ( 323783.00, 2296753.00) DC | 24.  | 14.05321  | (19052824) AT | ( 322773.00, 2295756.00) DC |
| 25.                                            | 13.90744  | (19040424) AT | ( 323783.00, 2296753.00) DC | 50.                          | 10.95469 | (19030624) AT | ( 323783.00, 2296753.00) DC | 25.  | 13.90744  | (19040424) AT | ( 323783.00, 2296753.00) DC |

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**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH**  
**(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

\*\*\* ISCST3 - VERSION 95250 \*\*\*      \*\*\* AS PER EC DT 04-06-2020 FOR 3.0 MTPA STEEL IN JHARBANDH STEEL PLANT \*\*\*      10/20/20  
 \*\*\* PM2.5 EMISSIONS FROM ALL STACKS WITH FUGITIVE EMISSION SOURCES \*\*\*      16:43:57  
 \*\*MODELOPTs: CONC      RURAL ELEV      DEFAULT

\*\*\* THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL \*\*\*  
 INCLUDING SOURCE(S):      S-01      , S-12      , S-14      , S-15      , S-16      , S-17      , S-18      ,  
 S-19      , S-20      , S-21      , S-22      , S-23      , S-24      , S-25      , S-26      , S-27      , S-28      , S-29      , S-30      ,  
 S-31      , S-32      , S-33      , S-34      , S-35      , S-36      , S-37      , S-38      , S-39      , S-42      , S-43      , . . . ,

\*\*\* DISCRETE CARTESIAN RECEPTOR POINTS \*\*\*

**\*\* CONC OF PM2.5 IN MICROGRAMS/M\*\*3**

**\*\***

| X-COORD (M) | Y-COORD (M) | CONC     | (YYMMDDHH) | X-COORD (M) | Y-COORD (M) | CONC     | (YYMMDDHH) |
|-------------|-------------|----------|------------|-------------|-------------|----------|------------|
| 322795.00   | 2297792.00  | 4.65041  | (19052524) | 323238.00   | 2297843.00  | 3.85355  | (19051324) |
| 323693.00   | 2297668.00  | 3.86032  | (19051724) | 324096.00   | 2297301.00  | 4.74826c | (19030124) |
| 323545.00   | 2296759.00  | 6.65739  | (19052724) | 323497.00   | 2296459.00  | 6.89668  | (19040824) |
| 323455.00   | 2296074.00  | 7.74182  | (19040824) | 323059.00   | 2296075.00  | 5.38567  | (19052824) |
| 322776.00   | 2295945.00  | 5.85851  | (19052824) | 322425.00   | 2295915.00  | 3.04360  | (19031324) |
| 322166.00   | 2296154.00  | 3.70154  | (19052924) | 320491.00   | 2295833.00  | 3.33603  | (19052924) |
| 319544.00   | 2296801.00  | 3.66355  | (19052924) | 320990.00   | 2297542.00  | 3.57962c | (19051924) |
| 321980.00   | 2297600.00  | 4.95938  | (19052424) | 322432.00   | 2297655.00  | 5.26034  | (19053024) |
| 322408.00   | 2297709.00  | 5.00402  | (19053024) | 323783.00   | 2296753.00  | 12.25414 | (19041124) |
| 323706.00   | 2296366.00  | 7.26406  | (19040824) | 323484.00   | 2296048.00  | 7.82701  | (19040824) |
| 323159.00   | 2295830.00  | 7.49527  | (19052824) | 322773.00   | 2295756.00  | 8.08060  | (19052824) |
| 322389.00   | 2295838.00  | 2.82448  | (19031324) | 322068.00   | 2296062.00  | 3.20931  | (19052924) |
| 322801.00   | 2298424.00  | 4.75140  | (19052524) | 322807.00   | 2298978.00  | 4.21397  | (19052524) |
| 322813.00   | 2299531.00  | 3.75173  | (19052524) | 322819.00   | 2300085.00  | 3.39023  | (19052524) |
| 322824.00   | 2300638.00  | 3.14945  | (19052524) | 322830.00   | 2301192.00  | 3.02279  | (19052524) |
| 322842.00   | 2302299.00  | 2.64611  | (19052524) | 322865.00   | 2304513.00  | 2.15305  | (19052524) |
| 322901.00   | 2307834.00  | 1.73952  | (19052524) | 323425.00   | 2298296.00  | 3.38467  | (19051324) |
| 323638.00   | 2298803.00  | 3.43714  | (19050324) | 323862.00   | 2299310.00  | 2.82984  | (19050324) |
| 324076.00   | 2299817.00  | 2.41482  | (19050324) | 324289.00   | 2300335.00  | 2.30097  | (19041424) |
| 324503.00   | 2300842.00  | 2.09317  | (19041424) | 324930.00   | 2301856.00  | 1.83792  | (19041424) |
| 325784.00   | 2303896.00  | 1.47977  | (19041424) | 327075.00   | 2306949.00  | 1.23768  | (19041424) |
| 323952.00   | 2297925.00  | 4.66895  | (19051724) | 324352.00   | 2298319.00  | 4.24368  | (19051724) |
| 324741.00   | 2298703.00  | 3.56588  | (19051724) | 325130.00   | 2299086.00  | 2.98137  | (19051724) |
| 325519.00   | 2299481.00  | 2.63191  | (19051724) | 325909.00   | 2299864.00  | 2.33548  | (19051724) |
| 326687.00   | 2300642.00  | 1.87209  | (19051724) | 328254.00   | 2302187.00  | 1.40985  | (19051724) |
| 330599.00   | 2304511.00  | 1.16055  | (19051724) | 324311.00   | 2297390.00  | 4.63116c | (19030124) |
| 324813.00   | 2297595.00  | 3.95802c | (19030124) | 325325.00   | 2297800.00  | 3.19958c | (19030124) |
| 325827.00   | 2298005.00  | 3.00343  | (19041624) | 326339.00   | 2298210.00  | 2.92512  | (19041624) |
| 326841.00   | 2298415.00  | 2.71780  | (19041624) | 327856.00   | 2298837.00  | 2.46643  | (19041624) |

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**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH**  
**(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

|           |            |          |            |           |            |          |            |
|-----------|------------|----------|------------|-----------|------------|----------|------------|
| 329884.00 | 2299657.00 | 2.02863  | (19041624) | 332926.00 | 2300900.00 | 1.61510  | (19041624) |
| 324429.00 | 2296746.00 | 9.65664  | (19040824) | 324970.00 | 2296741.00 | 3.75196  | (19052724) |
| 325522.00 | 2296735.00 | 3.39979  | (19052724) | 326064.00 | 2296729.00 | 3.13808  | (19052724) |
| 326615.00 | 2296724.00 | 2.92396  | (19052724) | 327157.00 | 2296718.00 | 2.49875  | (19052724) |
| 328250.00 | 2296707.00 | 2.09564  | (19052724) | 330437.00 | 2296685.00 | 1.56627  | (19052724) |
| 333717.00 | 2296652.00 | 1.13058  | (19052724) | 324297.00 | 2296117.00 | 4.47278  | (19040824) |
| 324795.00 | 2295901.00 | 3.75937  | (19040824) | 325303.00 | 2295685.00 | 3.24929  | (19040824) |
| 325801.00 | 2295470.00 | 3.48916  | (19040824) | 326309.00 | 2295243.00 | 2.99840  | (19040824) |
| 326806.00 | 2295028.00 | 2.95807  | (19040824) | 327812.00 | 2294597.00 | 1.81068  | (19040824) |
| 329824.00 | 2293724.00 | 1.38732  | (19040824) | 332842.00 | 2292431.00 | .83887   | (19040824) |
| 323927.00 | 2295578.00 | 4.32807  | (19040824) | 324319.00 | 2295186.00 | 3.82605  | (19040824) |
| 324700.00 | 2294795.00 | 3.91369  | (19040824) | 325081.00 | 2294392.00 | 2.96118  | (19040824) |
| 325463.00 | 2294001.00 | 2.41060  | (19040824) | 325844.00 | 2293598.00 | 1.98420  | (19040824) |
| 326606.00 | 2292815.00 | 1.71706  | (19040824) | 328142.00 | 2291227.00 | 1.30312  | (19040824) |
| 330441.00 | 2288857.00 | 1.07168  | (19040824) | 323392.00 | 2295229.00 | 3.26035  | (19041524) |
| 323595.00 | 2294718.00 | 2.66610  | (19041524) | 323809.00 | 2294195.00 | 2.26425  | (19041524) |
| 324012.00 | 2293684.00 | 1.81772  | (19041524) | 324214.00 | 2293172.00 | 1.53214  | (19041524) |
| 324417.00 | 2292661.00 | 1.32925  | (19041524) | 324823.00 | 2291627.00 | 1.13175  | (19052724) |
| 325636.00 | 2289581.00 | .72531   | (19041524) | 326865.00 | 2286491.00 | .73115   | (19052724) |
| 322766.00 | 2295103.00 | 4.32586  | (19052824) | 322760.00 | 2294549.00 | 4.15040  | (19052824) |
| 322754.00 | 2293996.00 | 4.52639  | (19052824) | 322749.00 | 2293442.00 | 4.28140  | (19052824) |
| 322743.00 | 2292889.00 | 3.37605  | (19052824) | 322737.00 | 2292335.00 | 3.01484  | (19052824) |
| 322725.00 | 2291228.00 | 2.36610  | (19052824) | 322702.00 | 2289014.00 | 1.54243  | (19052824) |
| 322667.00 | 2285693.00 | .98935   | (19052824) | 322143.00 | 2295242.00 | 3.38332  | (19030224) |
| 321929.00 | 2294735.00 | 1.49050  | (19041524) | 321715.00 | 2294217.00 | 1.57912  | (19041524) |
| 321502.00 | 2293710.00 | 1.52999  | (19052824) | 321277.00 | 2293203.00 | 1.48427  | (19052824) |
| 321064.00 | 2292696.00 | 1.32963  | (19052824) | 320636.00 | 2291671.00 | 1.19028  | (19030224) |
| 319781.00 | 2289643.00 | 1.41615  | (19050524) | 318488.00 | 2286579.00 | .87670   | (19030224) |
| 321615.00 | 2295602.00 | 2.27161  | (19052924) | 321226.00 | 2295219.00 | 2.09233  | (19052924) |
| 320826.00 | 2294836.00 | 1.86993  | (19052924) | 320437.00 | 2294441.00 | 1.63091  | (19052924) |
| 320047.00 | 2294058.00 | 1.49168  | (19052924) | 319657.00 | 2293663.00 | 1.41080  | (19052924) |
| 318878.00 | 2292897.00 | 1.17022  | (19052924) | 317310.00 | 2291341.00 | .93589   | (19052924) |
| 314971.00 | 2289020.00 | .65693   | (19052924) | 321267.00 | 2296148.00 | 3.25084  | (19052924) |
| 320755.00 | 2295944.00 | 3.36119  | (19052924) | 320253.00 | 2295739.00 | 3.32824  | (19052924) |
| 319740.00 | 2295534.00 | 3.15653  | (19052924) | 319238.00 | 2295318.00 | 2.78224  | (19052924) |
| 318725.00 | 2295113.00 | 2.51226  | (19052924) | 317711.00 | 2294703.00 | 2.08735  | (19052924) |
| 315681.00 | 2293872.00 | 1.47608  | (19052924) | 312636.00 | 2292644.00 | .87227   | (19052924) |
| 319504.00 | 2296798.00 | 3.54157  | (19052924) | 318962.00 | 2296804.00 | 2.79545  | (19052924) |
| 318410.00 | 2296810.00 | 2.41050  | (19052924) | 317317.00 | 2296822.00 | 1.86080  | (19052924) |
| 315130.00 | 2296846.00 | 1.28503  | (19052924) | 311850.00 | 2296882.00 | .88453   | (19052924) |
| 320773.00 | 2297637.00 | 3.32599c | (19051924) | 320275.00 | 2297853.00 | 2.93082  | (19052424) |
| 319767.00 | 2298069.00 | 3.72635  | (19052424) | 319270.00 | 2298285.00 | 3.32073c | (19051924) |
| 318762.00 | 2298500.00 | 3.20533c | (19051924) | 317756.00 | 2298943.00 | 3.10627c | (19051924) |

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**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH  
(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

|           |            |           |            |           |            |           |            |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 329884.00 | 2299657.00 | 6.50231   | (19041624) | 332926.00 | 2300900.00 | 5.95169   | (19041624) |
| 324429.00 | 2296746.00 | 23.67198  | (19052724) | 324970.00 | 2296741.00 | 17.44993  | (19052724) |
| 325522.00 | 2296735.00 | 15.17363  | (19052724) | 326064.00 | 2296729.00 | 13.79653  | (19052724) |
| 326615.00 | 2296724.00 | 12.35435  | (19052724) | 327157.00 | 2296718.00 | 10.70207  | (19052724) |
| 328250.00 | 2296707.00 | 8.90271   | (19052724) | 330437.00 | 2296685.00 | 6.63324   | (19052724) |
| 333717.00 | 2296652.00 | 4.80782   | (19052724) | 324297.00 | 2296117.00 | 23.59388  | (19052724) |
| 324795.00 | 2295901.00 | 17.41949  | (19040824) | 325303.00 | 2295685.00 | 16.74959  | (19040824) |
| 325801.00 | 2295470.00 | 15.79638  | (19040824) | 326309.00 | 2295243.00 | 13.96300  | (19040824) |
| 326806.00 | 2295028.00 | 12.58188  | (19040824) | 327812.00 | 2294597.00 | 8.92865   | (19040824) |
| 329824.00 | 2293724.00 | 6.52469   | (19040824) | 332842.00 | 2292431.00 | 3.82284   | (19040824) |
| 323927.00 | 2295578.00 | 21.36768  | (19040824) | 324319.00 | 2295186.00 | 19.46796  | (19033124) |
| 324700.00 | 2294795.00 | 17.85716  | (19040824) | 325081.00 | 2294392.00 | 12.94360  | (19040824) |
| 325463.00 | 2294001.00 | 10.18379  | (19033124) | 325844.00 | 2293598.00 | 8.22457   | (19033124) |
| 326606.00 | 2292815.00 | 6.56509   | (19040824) | 328142.00 | 2291227.00 | 4.60642   | (19040824) |
| 330441.00 | 2288857.00 | 4.34389   | (19040824) | 323392.00 | 2295229.00 | 19.34813  | (19041524) |
| 323595.00 | 2294718.00 | 17.17180  | (19041524) | 323809.00 | 2294195.00 | 13.81650  | (19041524) |
| 324012.00 | 2293684.00 | 10.60556  | (19041524) | 324214.00 | 2293172.00 | 8.33147   | (19041524) |
| 324417.00 | 2292661.00 | 6.89463   | (19041724) | 324823.00 | 2291627.00 | 4.83020   | (19041724) |
| 325636.00 | 2289581.00 | 2.94812   | (19030824) | 326865.00 | 2286491.00 | 3.04457   | (19052724) |
| 322766.00 | 2295103.00 | 14.12943  | (19052824) | 322760.00 | 2294549.00 | 18.03962  | (19052824) |
| 322754.00 | 2293996.00 | 20.26224  | (19052824) | 322749.00 | 2293442.00 | 19.84449  | (19052824) |
| 322743.00 | 2292889.00 | 14.97105  | (19052824) | 322737.00 | 2292335.00 | 13.36100  | (19052824) |
| 322725.00 | 2291228.00 | 10.48352  | (19052824) | 322702.00 | 2289014.00 | 6.67431   | (19052824) |
| 322667.00 | 2285693.00 | 4.14257   | (19052824) | 322143.00 | 2295242.00 | 13.01919  | (19031324) |
| 321929.00 | 2294735.00 | 8.99680   | (19031324) | 321715.00 | 2294217.00 | 7.23841   | (19031324) |
| 321502.00 | 2293710.00 | 5.78676   | (19031324) | 321277.00 | 2293203.00 | 4.59102   | (19031324) |
| 321064.00 | 2292696.00 | 3.77732   | (19031324) | 320636.00 | 2291671.00 | 3.69564   | (19030224) |
| 319781.00 | 2289643.00 | 5.16527   | (19030224) | 318488.00 | 2286579.00 | 3.84415   | (19030224) |
| 321615.00 | 2295602.00 | 18.61807  | (19052924) | 321226.00 | 2295219.00 | 14.11949  | (19052924) |
| 320826.00 | 2294836.00 | 11.87989  | (19052924) | 320437.00 | 2294441.00 | 10.35272  | (19052924) |
| 320047.00 | 2294058.00 | 9.47144   | (19052924) | 319657.00 | 2293663.00 | 8.91857   | (19052924) |
| 318878.00 | 2292897.00 | 7.91108   | (19052924) | 317310.00 | 2291341.00 | 6.05160   | (19052924) |
| 314971.00 | 2289020.00 | 4.15841   | (19052924) | 321267.00 | 2296148.00 | 19.43606  | (19052924) |
| 320755.00 | 2295944.00 | 16.37386  | (19031624) | 320253.00 | 2295739.00 | 13.36430  | (19031624) |
| 319740.00 | 2295534.00 | 12.23208  | (19031624) | 319238.00 | 2295318.00 | 10.67238  | (19031624) |
| 318725.00 | 2295113.00 | 8.97475   | (19031624) | 317711.00 | 2294703.00 | 7.24467   | (19031624) |
| 315681.00 | 2293872.00 | 5.53904   | (19052924) | 312636.00 | 2292644.00 | 3.89463   | (19031624) |
| 319504.00 | 2296798.00 | 13.80297  | (19052924) | 318962.00 | 2296804.00 | 11.55004  | (19052924) |
| 318410.00 | 2296810.00 | 9.40263   | (19052924) | 317317.00 | 2296822.00 | 6.99089   | (19052924) |
| 315130.00 | 2296846.00 | 4.84767   | (19052924) | 311850.00 | 2296882.00 | 3.38972   | (19052924) |
| 320773.00 | 2297637.00 | 26.00567c | (19051924) | 320275.00 | 2297853.00 | 21.31146c | (19051924) |
| 319767.00 | 2298069.00 | 18.51536c | (19051924) | 319270.00 | 2298285.00 | 17.55118c | (19051924) |
| 318762.00 | 2298500.00 | 15.90881c | (19051924) | 317756.00 | 2298943.00 | 13.57180c | (19051924) |

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**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH  
(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

|           |            |           |            |           |            |           |            |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 315746.00 | 2299806.00 | 10.81761c | (19051924) | 312730.00 | 2301113.00 | 7.88599c  | (19051924) |
| 321640.00 | 2297949.00 | 28.62815  | (19053024) | 321259.00 | 2298352.00 | 21.82072  | (19053024) |
| 320868.00 | 2298744.00 | 17.66644  | (19053024) | 320487.00 | 2299135.00 | 15.20494  | (19053024) |
| 320106.00 | 2299538.00 | 14.50834  | (19053024) | 319725.00 | 2299929.00 | 13.71476  | (19053024) |
| 318963.00 | 2300724.00 | 13.00745  | (19052024) | 317429.00 | 2302302.00 | 9.48294   | (19052024) |
| 315143.00 | 2304674.00 | 8.12229   | (19052024) | 322175.00 | 2298309.00 | 28.96816  | (19052424) |
| 321972.00 | 2298820.00 | 26.14586  | (19052424) | 321769.00 | 2299332.00 | 23.12773  | (19052424) |
| 321567.00 | 2299843.00 | 20.55804  | (19052424) | 321354.00 | 2300366.00 | 18.32297  | (19053024) |
| 321151.00 | 2300877.00 | 16.95719  | (19053024) | 320745.00 | 2301900.00 | 14.68158  | (19053024) |
| 319934.00 | 2303957.00 | 12.17406  | (19053024) | 318708.00 | 2307038.00 | 10.25206  | (19053024) |
| 321119.00 | 2297297.00 | 28.98054c | (19051924) | 327125.00 | 2296902.00 | 9.70990   | (19052724) |
| 322586.00 | 2303927.00 | 9.72569   | (19052524) | 325628.00 | 2291636.00 | 4.52025   | (19040924) |
| 324283.00 | 2299557.00 | 9.62952   | (19041424) | 321688.00 | 2294449.00 | 7.91744   | (19031324) |
| 319933.00 | 2295352.00 | 11.48010  | (19052924) | 320660.00 | 2297853.00 | 25.01317c | (19051924) |

| *** THE MAXIMUM 50 24-HR AVERAGE CONCENTRATION |           |               |                             | VALUES FOR SOURCE GROUP: ALL |      |               |                          | ***                         |      |               |                          |
|------------------------------------------------|-----------|---------------|-----------------------------|------------------------------|------|---------------|--------------------------|-----------------------------|------|---------------|--------------------------|
| RANK                                           | CONC      | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    | RANK                         | CONC | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE | RANK                        | CONC | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE |
| 1.                                             | 28.98054c | (19051924)    | AT ( 321119.00, 2297297.00) | DC                           | 26.  | 23.37537      | (19051824)               | AT ( 321640.00, 2297949.00) | DC   |               |                          |
| 2.                                             | 28.96816  | (19052424)    | AT ( 322175.00, 2298309.00) | DC                           | 27.  | 23.34943      | (19052324)               | AT ( 322795.00, 2297792.00) | DC   |               |                          |
| 3.                                             | 28.62815  | (19053024)    | AT ( 321640.00, 2297949.00) | DC                           | 28.  | 23.26643      | (19051724)               | AT ( 324096.00, 2297301.00) | DC   |               |                          |
| 4.                                             | 28.51621c | (19051924)    | AT ( 320990.00, 2297542.00) | DC                           | 29.  | 23.12773      | (19052424)               | AT ( 321769.00, 2299332.00) | DC   |               |                          |
| 5.                                             | 28.34669  | (19053024)    | AT ( 322175.00, 2298309.00) | DC                           | 30.  | 22.90209      | (19052524)               | AT ( 323238.00, 2297843.00) | DC   |               |                          |
| 6.                                             | 28.24894  | (19053024)    | AT ( 322408.00, 2297709.00) | DC                           | 31.  | 22.68694      | (19051824)               | AT ( 321980.00, 2297600.00) | DC   |               |                          |
| 7.                                             | 28.24657  | (19052424)    | AT ( 322408.00, 2297709.00) | DC                           | 32.  | 22.67842      | (19053024)               | AT ( 321769.00, 2299332.00) | DC   |               |                          |
| 8.                                             | 27.96881  | (19053024)    | AT ( 322432.00, 2297655.00) | DC                           | 33.  | 22.33702      | (19033024)               | AT ( 320990.00, 2297542.00) | DC   |               |                          |
| 9.                                             | 27.92503  | (19052424)    | AT ( 322432.00, 2297655.00) | DC                           | 34.  | 21.82072      | (19053024)               | AT ( 321259.00, 2298352.00) | DC   |               |                          |
| 10.                                            | 27.67161  | (19052424)    | AT ( 321640.00, 2297949.00) | DC                           | 35.  | 21.81335      | (19051724)               | AT ( 324311.00, 2297390.00) | DC   |               |                          |
| 11.                                            | 27.37808  | (19053024)    | AT ( 321980.00, 2297600.00) | DC                           | 36.  | 21.75097      | (19052024)               | AT ( 320990.00, 2297542.00) | DC   |               |                          |
| 12.                                            | 27.03159  | (19052724)    | AT ( 323706.00, 2296366.00) | DC                           | 37.  | 21.70214      | (19052324)               | AT ( 322175.00, 2298309.00) | DC   |               |                          |
| 13.                                            | 26.14586  | (19052424)    | AT ( 321972.00, 2298820.00) | DC                           | 38.  | 21.47950c     | (19030124)               | AT ( 324429.00, 2296746.00) | DC   |               |                          |
| 14.                                            | 26.00567c | (19051924)    | AT ( 320773.00, 2297637.00) | DC                           | 39.  | 21.43804c     | (19030124)               | AT ( 323783.00, 2296753.00) | DC   |               |                          |
| 15.                                            | 25.93175  | (19040824)    | AT ( 323484.00, 2296048.00) | DC                           | 40.  | 21.36768      | (19040824)               | AT ( 323927.00, 2295578.00) | DC   |               |                          |
| 16.                                            | 25.92589  | (19052424)    | AT ( 321980.00, 2297600.00) | DC                           | 41.  | 21.31958      | (19051824)               | AT ( 322408.00, 2297709.00) | DC   |               |                          |
| 17.                                            | 25.66593  | (19053024)    | AT ( 321972.00, 2298820.00) | DC                           | 42.  | 21.31146c     | (19051924)               | AT ( 320275.00, 2297853.00) | DC   |               |                          |
| 18.                                            | 25.01317c | (19051924)    | AT ( 320660.00, 2297853.00) | DC                           | 43.  | 21.21798      | (19033024)               | AT ( 320773.00, 2297637.00) | DC   |               |                          |
| 19.                                            | 24.70689  | (19040824)    | AT ( 323455.00, 2296074.00) | DC                           | 44.  | 21.02116      | (19052524)               | AT ( 322807.00, 2298978.00) | DC   |               |                          |
| 20.                                            | 24.52278  | (19052524)    | AT ( 322795.00, 2297792.00) | DC                           | 45.  | 20.97017      | (19051824)               | AT ( 322432.00, 2297655.00) | DC   |               |                          |
| 21.                                            | 24.03765  | (19052324)    | AT ( 322432.00, 2297655.00) | DC                           | 46.  | 20.81527      | (19052024)               | AT ( 320660.00, 2297853.00) | DC   |               |                          |
| 22.                                            | 23.75035  | (19052324)    | AT ( 322408.00, 2297709.00) | DC                           | 47.  | 20.79695      | (19052324)               | AT ( 322801.00, 2298424.00) | DC   |               |                          |
| 23.                                            | 23.72799  | (19052524)    | AT ( 322801.00, 2298424.00) | DC                           | 48.  | 20.55804      | (19052424)               | AT ( 321567.00, 2299843.00) | DC   |               |                          |
| 24.                                            | 23.67198  | (19052724)    | AT ( 324429.00, 2296746.00) | DC                           | 49.  | 20.49556      | (19033024)               | AT ( 320660.00, 2297853.00) | DC   |               |                          |
| 25.                                            | 23.59388  | (19052724)    | AT ( 324297.00, 2296117.00) | DC                           | 50.  | 20.33736      | (19053024)               | AT ( 321567.00, 2299843.00) | DC   |               |                          |

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**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH**  
**(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

\*\*\* ISCST3 - VERSION 95250 \*\*\*      \*\*\* AS PER EC DT 04-06-2020 FOR 3.0 MTPA STEEL IN JHARBANDH STEEL PLANT \*\*\*      10/20/20  
 \*\*\* NO2 EMISSIONS FROM ALL STACKS \*\*\*      16:46:29  
 \*\*MODELOPTs: CONC      RURAL ELEV      DEFAULT

\*\*\* THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL \*\*\*  
 INCLUDING SOURCE(S):      S-01      , S-12      , S-14      , S-21      , S-22      , S-23      , S-24      ,  
 S-25      , S-28      , S-29      , S-30      , S-31      , S-32      , S-33      , S-34      , S-35      , S-36      , S-37      , S-42      ,  
 S-44      , S-46      , S-48      , S-50      , S-51      , S-52      , S-63      , S-73      , S-77      , S-80      , S-81      , . . . ,

\*\*\* DISCRETE CARTESIAN RECEPTOR POINTS \*\*\*

**\*\* CONC OF NO2 IN MICROGRAMS/M\*\*3**

| X-COORD (M) | Y-COORD (M) | CONC     | (YYMMDDHH) | X-COORD (M) | Y-COORD (M) | CONC      | (YYMMDDHH) |
|-------------|-------------|----------|------------|-------------|-------------|-----------|------------|
| 322795.00   | 2297792.00  | 14.40802 | (19053024) | 323238.00   | 2297843.00  | 13.56081  | (19052524) |
| 323693.00   | 2297668.00  | 6.63527  | (19032724) | 324096.00   | 2297301.00  | 10.06698  | (19051724) |
| 323545.00   | 2296759.00  | 3.32411  | (19041124) | 323497.00   | 2296459.00  | 3.54975   | (19040824) |
| 323455.00   | 2296074.00  | 7.39146  | (19040824) | 323059.00   | 2296075.00  | 3.45921   | (19040824) |
| 322776.00   | 2295945.00  | 3.47514  | (19040224) | 322425.00   | 2295915.00  | 10.16828  | (19052924) |
| 322166.00   | 2296154.00  | 10.82975 | (19052924) | 320491.00   | 2295833.00  | 5.84373   | (19031624) |
| 319544.00   | 2296801.00  | 7.01658  | (19052924) | 320990.00   | 2297542.00  | 11.02800c | (19051924) |
| 321980.00   | 2297600.00  | 12.44337 | (19052024) | 322432.00   | 2297655.00  | 13.66581  | (19052424) |
| 322408.00   | 2297709.00  | 13.84559 | (19052424) | 323783.00   | 2296753.00  | 8.76848   | (19041124) |
| 323706.00   | 2296366.00  | 5.45417  | (19040824) | 323484.00   | 2296048.00  | 7.59979   | (19040824) |
| 323159.00   | 2295830.00  | 7.37081  | (19052824) | 322773.00   | 2295756.00  | 4.82613   | (19031324) |
| 322389.00   | 2295838.00  | 9.31893  | (19052924) | 322068.00   | 2296062.00  | 9.94642   | (19052924) |
| 322801.00   | 2298424.00  | 10.58601 | (19053024) | 322807.00   | 2298978.00  | 9.02825   | (19052324) |
| 322813.00   | 2299531.00  | 7.75508  | (19052524) | 322819.00   | 2300085.00  | 6.96236   | (19052524) |
| 322824.00   | 2300638.00  | 6.24443  | (19052524) | 322830.00   | 2301192.00  | 5.68218   | (19052524) |
| 322842.00   | 2302299.00  | 4.85062  | (19052524) | 322865.00   | 2304513.00  | 3.88795   | (19052524) |
| 322901.00   | 2307834.00  | 3.22087  | (19052524) | 323425.00   | 2298296.00  | 11.99018  | (19052524) |
| 323638.00   | 2298803.00  | 9.23985  | (19032724) | 323862.00   | 2299310.00  | 7.60477   | (19032724) |
| 324076.00   | 2299817.00  | 6.30367  | (19032724) | 324289.00   | 2300335.00  | 5.36216   | (19032724) |
| 324503.00   | 2300842.00  | 4.50922  | (19050324) | 324930.00   | 2301856.00  | 3.43332   | (19050324) |
| 325784.00   | 2303896.00  | 2.39379  | (19050324) | 327075.00   | 2306949.00  | 1.86869   | (19041424) |
| 323952.00   | 2297925.00  | 6.55672  | (19042924) | 324352.00   | 2298319.00  | 5.58659   | (19052624) |
| 324741.00   | 2298703.00  | 4.63710  | (19051724) | 325130.00   | 2299086.00  | 3.99348   | (19051724) |
| 325519.00   | 2299481.00  | 3.55103  | (19051724) | 325909.00   | 2299864.00  | 3.18078   | (19051724) |
| 326687.00   | 2300642.00  | 2.63883  | (19051724) | 328254.00   | 2302187.00  | 2.09262   | (19051724) |
| 330599.00   | 2304511.00  | 1.73678  | (19051724) | 324311.00   | 2297390.00  | 9.88065   | (19051724) |
| 324813.00   | 2297595.00  | 8.32113  | (19051724) | 325325.00   | 2297800.00  | 6.36557   | (19051724) |
| 325827.00   | 2298005.00  | 5.26039c | (19030124) | 326339.00   | 2298210.00  | 4.67053c  | (19030124) |
| 326841.00   | 2298415.00  | 4.20534c | (19030124) | 327856.00   | 2298837.00  | 3.60036c  | (19030124) |

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**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH**  
**(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

|           |            |          |            |           |            |          |            |
|-----------|------------|----------|------------|-----------|------------|----------|------------|
| 329884.00 | 2299657.00 | 2.77316c | (19030124) | 332926.00 | 2300900.00 | 2.57516  | (19041624) |
| 324429.00 | 2296746.00 | 12.00145 | (19052724) | 324970.00 | 2296741.00 | 8.73317  | (19052724) |
| 325522.00 | 2296735.00 | 7.35637  | (19052724) | 326064.00 | 2296729.00 | 6.61726  | (19052724) |
| 326615.00 | 2296724.00 | 5.82802  | (19052724) | 327157.00 | 2296718.00 | 4.96387  | (19052724) |
| 328250.00 | 2296707.00 | 4.06352  | (19052724) | 330437.00 | 2296685.00 | 2.97192  | (19052724) |
| 333717.00 | 2296652.00 | 2.11886  | (19052724) | 324297.00 | 2296117.00 | 8.87684  | (19040424) |
| 324795.00 | 2295901.00 | 9.98358  | (19040824) | 325303.00 | 2295685.00 | 9.24870  | (19040824) |
| 325801.00 | 2295470.00 | 8.50214  | (19040824) | 326309.00 | 2295243.00 | 7.37577  | (19040824) |
| 326806.00 | 2295028.00 | 6.56528  | (19040824) | 327812.00 | 2294597.00 | 4.48671  | (19040824) |
| 329824.00 | 2293724.00 | 3.20747  | (19040824) | 332842.00 | 2292431.00 | 1.75442  | (19040824) |
| 323927.00 | 2295578.00 | 7.89920  | (19040824) | 324319.00 | 2295186.00 | 8.50967  | (19033124) |
| 324700.00 | 2294795.00 | 7.74068  | (19033124) | 325081.00 | 2294392.00 | 5.94044  | (19033124) |
| 325463.00 | 2294001.00 | 4.66456  | (19033124) | 325844.00 | 2293598.00 | 3.73116  | (19033124) |
| 326606.00 | 2292815.00 | 2.90793  | (19033124) | 328142.00 | 2291227.00 | 2.01585  | (19033124) |
| 330441.00 | 2288857.00 | 1.79176  | (19040824) | 323392.00 | 2295229.00 | 11.56490 | (19052824) |
| 323595.00 | 2294718.00 | 9.41462  | (19052824) | 323809.00 | 2294195.00 | 6.52763  | (19052824) |
| 324012.00 | 2293684.00 | 4.54179  | (19041524) | 324214.00 | 2293172.00 | 3.55875  | (19041524) |
| 324417.00 | 2292661.00 | 2.86930  | (19041524) | 324823.00 | 2291627.00 | 1.95975  | (19041524) |
| 325636.00 | 2289581.00 | 1.19935  | (19041524) | 326865.00 | 2286491.00 | 1.48368  | (19052724) |
| 322766.00 | 2295103.00 | 6.18017  | (19031124) | 322760.00 | 2294549.00 | 6.26066  | (19031124) |
| 322754.00 | 2293996.00 | 6.91250  | (19052824) | 322749.00 | 2293442.00 | 8.42936  | (19052824) |
| 322743.00 | 2292889.00 | 6.53490  | (19052824) | 322737.00 | 2292335.00 | 6.35199  | (19052824) |
| 322725.00 | 2291228.00 | 5.44217  | (19052824) | 322702.00 | 2289014.00 | 3.55984  | (19052824) |
| 322667.00 | 2285693.00 | 2.08439  | (19052824) | 322143.00 | 2295242.00 | 6.12155  | (19031324) |
| 321929.00 | 2294735.00 | 3.82921  | (19031324) | 321715.00 | 2294217.00 | 2.82218  | (19031324) |
| 321502.00 | 2293710.00 | 2.17998  | (19031324) | 321277.00 | 2293203.00 | 1.69415  | (19031324) |
| 321064.00 | 2292696.00 | 1.40483  | (19030224) | 320636.00 | 2291671.00 | 1.75615  | (19030224) |
| 319781.00 | 2289643.00 | 2.60763  | (19030224) | 318488.00 | 2286579.00 | 2.23603  | (19030224) |
| 321615.00 | 2295602.00 | 7.66937  | (19052924) | 321226.00 | 2295219.00 | 6.12133  | (19052924) |
| 320826.00 | 2294836.00 | 5.31083  | (19052924) | 320437.00 | 2294441.00 | 4.72808  | (19052924) |
| 320047.00 | 2294058.00 | 4.36707  | (19052924) | 319657.00 | 2293663.00 | 4.26281  | (19052924) |
| 318878.00 | 2292897.00 | 3.72037  | (19052924) | 317310.00 | 2291341.00 | 2.84122  | (19052924) |
| 314971.00 | 2289020.00 | 1.93180  | (19052924) | 321267.00 | 2296148.00 | 6.85837  | (19031624) |
| 320755.00 | 2295944.00 | 6.75395  | (19031624) | 320253.00 | 2295739.00 | 5.31910  | (19031624) |
| 319740.00 | 2295534.00 | 5.14129  | (19031624) | 319238.00 | 2295318.00 | 4.52226  | (19031624) |
| 318725.00 | 2295113.00 | 3.81006  | (19031624) | 317711.00 | 2294703.00 | 3.28135  | (19052924) |
| 315681.00 | 2293872.00 | 2.85187  | (19052924) | 312636.00 | 2292644.00 | 1.93717  | (19052924) |
| 319504.00 | 2296798.00 | 7.07864  | (19052924) | 318962.00 | 2296804.00 | 5.33214  | (19052924) |
| 318410.00 | 2296810.00 | 4.79966  | (19052124) | 317317.00 | 2296822.00 | 3.22214  | (19052124) |
| 315130.00 | 2296846.00 | 2.12058  | (19050224) | 311850.00 | 2296882.00 | 1.34509  | (19052924) |
| 320773.00 | 2297637.00 | 9.61987c | (19051924) | 320275.00 | 2297853.00 | 7.72114c | (19051924) |
| 319767.00 | 2298069.00 | 6.90075c | (19051924) | 319270.00 | 2298285.00 | 6.99407c | (19051924) |
| 318762.00 | 2298500.00 | 6.44809c | (19051924) | 317756.00 | 2298943.00 | 5.53713c | (19051924) |

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**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH**  
**(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

|           |            |           |            |           |            |          |            |
|-----------|------------|-----------|------------|-----------|------------|----------|------------|
| 315746.00 | 2299806.00 | 4.55539c  | (19051924) | 312730.00 | 2301113.00 | 3.38803c | (19051924) |
| 321640.00 | 2297949.00 | 12.83748  | (19052024) | 321259.00 | 2298352.00 | 10.79878 | (19052024) |
| 320868.00 | 2298744.00 | 9.17180   | (19052024) | 320487.00 | 2299135.00 | 7.91635  | (19052024) |
| 320106.00 | 2299538.00 | 7.45834   | (19052024) | 319725.00 | 2299929.00 | 6.75369  | (19052024) |
| 318963.00 | 2300724.00 | 7.14496   | (19052024) | 317429.00 | 2302302.00 | 4.80375  | (19052024) |
| 315143.00 | 2304674.00 | 3.94813   | (19052024) | 322175.00 | 2298309.00 | 14.55249 | (19052424) |
| 321972.00 | 2298820.00 | 13.04913  | (19052424) | 321769.00 | 2299332.00 | 11.46201 | (19052424) |
| 321567.00 | 2299843.00 | 10.11980  | (19052424) | 321354.00 | 2300366.00 | 8.90959  | (19052424) |
| 321151.00 | 2300877.00 | 7.96650   | (19052424) | 320745.00 | 2301900.00 | 6.56815  | (19052424) |
| 319934.00 | 2303957.00 | 5.17603   | (19053024) | 318708.00 | 2307038.00 | 4.32004  | (19053024) |
| 321119.00 | 2297297.00 | 10.56462c | (19051924) | 327125.00 | 2296902.00 | 4.49179  | (19052724) |
| 322586.00 | 2303927.00 | 4.34754   | (19052524) | 325628.00 | 2291636.00 | 2.47812  | (19040924) |
| 324283.00 | 2299557.00 | 5.24045   | (19051224) | 321688.00 | 2294449.00 | 3.15903  | (19031324) |
| 319933.00 | 2295352.00 | 4.79368   | (19052924) | 320660.00 | 2297853.00 | 9.86647c | (19051924) |

| *** THE MAXIMUM 50 24-HR AVERAGE CONCENTRATION |           |               |                             | VALUES FOR SOURCE GROUP: ALL |           |               |                             | ***  |           |               |                             |
|------------------------------------------------|-----------|---------------|-----------------------------|------------------------------|-----------|---------------|-----------------------------|------|-----------|---------------|-----------------------------|
| RANK                                           | CONC      | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    | RANK                         | CONC      | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    | RANK | CONC      | (YYMMDDHH) AT | RECEPTOR (XR,YR) OF TYPE    |
| 1.                                             | 14.55249  | (19052424) AT | ( 322175.00, 2298309.00) DC | 26.                          | 10.60110  | (19032724) AT | ( 323425.00, 2298296.00) DC | 51.  | 10.60110  | (19032724) AT | ( 323425.00, 2298296.00) DC |
| 2.                                             | 14.40802  | (19053024) AT | ( 322795.00, 2297792.00) DC | 27.                          | 10.58601  | (19053024) AT | ( 322801.00, 2298424.00) DC | 52.  | 10.58601  | (19053024) AT | ( 322801.00, 2298424.00) DC |
| 3.                                             | 13.93999  | (19052424) AT | ( 322795.00, 2297792.00) DC | 28.                          | 10.56462c | (19051924) AT | ( 321119.00, 2297297.00) DC | 53.  | 10.56462c | (19051924) AT | ( 321119.00, 2297297.00) DC |
| 4.                                             | 13.84559  | (19052424) AT | ( 322408.00, 2297709.00) DC | 29.                          | 10.50269  | (19052324) AT | ( 322801.00, 2298424.00) DC | 54.  | 10.50269  | (19052324) AT | ( 322801.00, 2298424.00) DC |
| 5.                                             | 13.66581  | (19052424) AT | ( 322432.00, 2297655.00) DC | 30.                          | 10.46301c | (19051924) AT | ( 321640.00, 2297949.00) DC | 55.  | 10.46301c | (19051924) AT | ( 321640.00, 2297949.00) DC |
| 6.                                             | 13.63792  | (19053024) AT | ( 322408.00, 2297709.00) DC | 31.                          | 10.30924  | (19051824) AT | ( 322408.00, 2297709.00) DC | 56.  | 10.30924  | (19051824) AT | ( 322408.00, 2297709.00) DC |
| 7.                                             | 13.56081  | (19052524) AT | ( 323238.00, 2297843.00) DC | 32.                          | 10.27772  | (19051824) AT | ( 321640.00, 2297949.00) DC | 57.  | 10.27772  | (19051824) AT | ( 321640.00, 2297949.00) DC |
| 8.                                             | 13.53925  | (19053024) AT | ( 322432.00, 2297655.00) DC | 33.                          | 10.16828  | (19052924) AT | ( 322425.00, 2295915.00) DC | 58.  | 10.16828  | (19052924) AT | ( 322425.00, 2295915.00) DC |
| 9.                                             | 13.04913  | (19052424) AT | ( 321972.00, 2298820.00) DC | 34.                          | 10.13532  | (19051824) AT | ( 322432.00, 2297655.00) DC | 59.  | 10.13532  | (19051824) AT | ( 322432.00, 2297655.00) DC |
| 10.                                            | 12.96137  | (19053024) AT | ( 322175.00, 2298309.00) DC | 35.                          | 10.11980  | (19052424) AT | ( 321567.00, 2299843.00) DC | 60.  | 10.11980  | (19052424) AT | ( 321567.00, 2299843.00) DC |
| 11.                                            | 12.83748  | (19052024) AT | ( 321640.00, 2297949.00) DC | 36.                          | 10.06698  | (19051724) AT | ( 324096.00, 2297301.00) DC | 61.  | 10.06698  | (19051724) AT | ( 324096.00, 2297301.00) DC |
| 12.                                            | 12.44337  | (19052024) AT | ( 321980.00, 2297600.00) DC | 37.                          | 9.98358   | (19040824) AT | ( 324795.00, 2295901.00) DC | 62.  | 9.98358   | (19040824) AT | ( 324795.00, 2295901.00) DC |
| 13.                                            | 12.00145  | (19052724) AT | ( 324429.00, 2296746.00) DC | 38.                          | 9.96405   | (19053024) AT | ( 321640.00, 2297949.00) DC | 63.  | 9.96405   | (19053024) AT | ( 321640.00, 2297949.00) DC |
| 14.                                            | 11.99018  | (19052524) AT | ( 323425.00, 2298296.00) DC | 39.                          | 9.94642   | (19052924) AT | ( 322068.00, 2296062.00) DC | 64.  | 9.94642   | (19052924) AT | ( 322068.00, 2296062.00) DC |
| 15.                                            | 11.93820c | (19051924) AT | ( 321980.00, 2297600.00) DC | 40.                          | 9.89037   | (19052424) AT | ( 322801.00, 2298424.00) DC | 65.  | 9.89037   | (19052424) AT | ( 322801.00, 2298424.00) DC |
| 16.                                            | 11.81666  | (19052324) AT | ( 323238.00, 2297843.00) DC | 41.                          | 9.88065   | (19051724) AT | ( 324311.00, 2297390.00) DC | 66.  | 9.88065   | (19051724) AT | ( 324311.00, 2297390.00) DC |
| 17.                                            | 11.56490  | (19052824) AT | ( 323392.00, 2295229.00) DC | 42.                          | 9.86647c  | (19051924) AT | ( 320660.00, 2297853.00) DC | 67.  | 9.86647c  | (19051924) AT | ( 320660.00, 2297853.00) DC |
| 18.                                            | 11.54182c | (19030124) AT | ( 324429.00, 2296746.00) DC | 43.                          | 9.84822   | (19053024) AT | ( 321769.00, 2299332.00) DC | 68.  | 9.84822   | (19053024) AT | ( 321769.00, 2299332.00) DC |
| 19.                                            | 11.46201  | (19052424) AT | ( 321769.00, 2299332.00) DC | 44.                          | 9.71361   | (19032724) AT | ( 323238.00, 2297843.00) DC | 69.  | 9.71361   | (19032724) AT | ( 323238.00, 2297843.00) DC |
| 20.                                            | 11.37779  | (19053024) AT | ( 321972.00, 2298820.00) DC | 45.                          | 9.61987c  | (19051924) AT | ( 320773.00, 2297637.00) DC | 70.  | 9.61987c  | (19051924) AT | ( 320773.00, 2297637.00) DC |
| 21.                                            | 11.32970  | (19052324) AT | ( 322795.00, 2297792.00) DC | 46.                          | 9.48413   | (19051424) AT | ( 322801.00, 2298424.00) DC | 71.  | 9.48413   | (19051424) AT | ( 322801.00, 2298424.00) DC |
| 22.                                            | 11.02800c | (19051924) AT | ( 320990.00, 2297542.00) DC | 47.                          | 9.47929   | (19052424) AT | ( 321640.00, 2297949.00) DC | 72.  | 9.47929   | (19052424) AT | ( 321640.00, 2297949.00) DC |
| 23.                                            | 10.95051  | (19051424) AT | ( 322795.00, 2297792.00) DC | 48.                          | 9.41462   | (19052824) AT | ( 323595.00, 2294718.00) DC | 73.  | 9.41462   | (19052824) AT | ( 323595.00, 2294718.00) DC |
| 24.                                            | 10.82975  | (19052924) AT | ( 322166.00, 2296154.00) DC | 49.                          | 9.35651   | (19042624) AT | ( 322801.00, 2298424.00) DC | 74.  | 9.35651   | (19042624) AT | ( 322801.00, 2298424.00) DC |
| 25.                                            | 10.79878  | (19052024) AT | ( 321259.00, 2298352.00) DC | 50.                          | 9.32876   | (19051624) AT | ( 323238.00, 2297843.00) DC | 75.  | 9.32876   | (19051624) AT | ( 323238.00, 2297843.00) DC |

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**ISCST3 MODEL FOR 3.0 MTPA STEEL PLANT AT JHARBANDH**  
**(WITH REVISED STACKS FOR CAPACITY SANCTIONED AS PER EC DATED 04/06/2020)**

\*\*\* RECEPTOR TYPES: GC = GRIDCART  
 GP = GRIDPOLR  
 DC = DISCCART  
 DP = DISCPOLR  
 BD = BOUNDARY

\*\*\* Message Summary : ISCST3 Model Execution \*\*\*

----- Summary of Total Messages -----

A Total of 0 Fatal Error Message(s)  
 A Total of 0 Warning Message(s)  
 A Total of 2 Informational Message(s)  
 A Total of 2 Calm Hours Identified

\*\*\*\*\* FATAL ERROR MESSAGES \*\*\*\*\*  
 \*\*\* NONE \*\*\*

\*\*\*\*\* WARNING MESSAGES \*\*\*\*\*  
 \*\*\* NONE \*\*\*

\*\*\*\*\*  
 \*\*\* ISCST3 Finishes Successfully \*\*\*  
 \*\*\*\*\*

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**MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE**  
**NOTIFICATION**

New Delhi, the 17th October, 2019

**S.O. 3744(E).**—In exercise of the powers conferred by clause (b) of sub-section (1) of section 12 and section 13 of the Environment (Protection) Act, 1986 (29 of 1986), read with rule 10 of the Environment (Protection) Rules, 1986, the Central Government hereby makes the following further amendments in the notification of the Government of India in the erstwhile Ministry of Environment and Forests, vide number S.O. 1174(E), dated the 18<sup>th</sup> July, 2007, namely: -

in the said notification, in the table, -

(i) for serial numbers 3, 6, 27, 32, 33, 35, 37, 44, 49, 50, 55, 58, 65, 66, 97, 98, 105, 107, 108, 110 and 112 the entries relating thereto, the following serial numbers and entries shall be substituted, namely: -

| (1) | (2)                                                                                                                                                                 | (3)                                                                                                                       | (4)                                                                                  |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| *3  | M/s Bhagavathi Ana Labs Pvt. Ltd.,<br>7-2-C7, 8th & 11, Industrial Estate, Sanath Nagar, Hyderabad-500018, Telangana                                                | (i) Mr. M.V. Raghavacharyulu<br>(ii) Ms. B. Radha Kumari                                                                  | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 <sup>th</sup> |
| *6  | M/s Jeedimetla Effluent Treatment Ltd.,<br>Plot No. 267, Phase-I, IDA-Jeedimetla, Hyderabad-500025, Telangana                                                       | (i) Mr. I. Srinivasa Rao<br>(ii) Mr. K. Venkata Subbareddy<br>(iii) Mr. Ch. Satish                                        | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 <sup>th</sup> |
| *27 | M/s Sreatch Labs Pvt. Ltd.,<br>II, No. 1 56/7, 2 <sup>nd</sup> Floor, S.M.R Chambers, Madanaguda, Hyderabad 500050, Telangana                                       | (i) Dr. Upendra M. Tripathi<br>(ii) Mr. Godavarthi Rambabu<br>(iii) Ms. I. Annapurna                                      | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 <sup>th</sup> |
| *32 | M/s Enviro-International<br>Plot No. 138/139, Udyog Khandall Estate,<br>Eco Tech-III, Greater Noida, G.B. Nagar-<br>201306, Uttar Pradesh                           | (i) Dr. Vipul Kumar<br>(ii) Mr. Ravinder Pal Marwah<br>(iii) Mrs. Manisha Srivastav                                       | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 <sup>th</sup> |
| *33 | M/s Shriram Institute for Industrial Research<br>(A unit of Shriram Scientific and Industrial<br>Research Foundation)<br>19 University Road, Delhi 110007           | (i) Dr. V.K. Verma<br>(ii) Dr. Jagdish Kumar<br>(iii) Dr. Mukesh Garg                                                     | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 <sup>th</sup> |
| *35 | M/s SGS India Pvt. Ltd.,<br>C8 Plot No. 512(P), Monza Hattapukuria,<br>Diamond Harbour Road, PO, Joka, Dist<br>South 24 Parganas, Kolkata 700104, West<br>Bengal    | (i) Mr. Satya Charan Manna<br>(ii) Mr. Monaj Roy<br>(iii) Mr. Sumalya Bhattacharjee                                       | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 <sup>th</sup> |
| *37 | M/s Metel (India) Limited,<br>W-408, Rabale MIDC, TTC Industrial Area,<br>Navi Mumbai 400701, Maharashtra                                                           | (i) Mrs. Shradha Sriam Kere<br>(ii) Ms. Neelima Dhonduram Dalvi<br>(iii) Ms. Surekha Sitaram Jandav                       | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 <sup>th</sup> |
| *44 | M/s Pragathi Labs & Consultants Pvt. Ltd.,<br>Plot No. B15 & 16, Industrial Estate, Behind<br>Pollution Control Board, Sanath Nagar,<br>Hyderabad-500018, Telangana | (i) Dr. Madala Ravi Kiran<br>(ii) Mr. Kamalakarpati Sreedhar<br>(iii) Mr. I. Rama Murthy                                  | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 <sup>th</sup> |
| *49 | M/s Padmaja Aerobiologicals Pvt. Ltd.,<br>"Nandan", Plot No. 36, Sector 24, Near<br>Bank of India, Turbhe, Navi Mumbai<br>400705, Maharashtra                       | (i) Dr. Nandkisher T. Joshi<br>(ii) Mr. Kishor P. Potekar<br>(iii) Mr. Ramesh B. Chandhari                                | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 <sup>th</sup> |
| *50 | M/s Shiva Test House<br>1 <sup>st</sup> Floor, Rajhans Niketan, Near Canal,<br>Rokumpura, Bailey Road, Patna 800014,<br>Bihar                                       | (i) Dr. Shibaaswar Prasad<br>(ii) Dr. (Mrs.) Shreyasee Prasad                                                             | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 <sup>th</sup> |
| *55 | M/s Anacon Laboratories Pvt. Ltd.,<br>IP-34, 35 Food Park, 5 Star Industrial Estate,<br>Butibori, Nagpur-441122, Maharashtra                                        | (i) Dr. Dattatraya Gajanan Garway<br>(ii) Dr. (Mrs.) Sugandha Dattatraya<br>Garway<br>(iii) Mrs. Kavita Sanjay Saygaunkar | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 <sup>th</sup> |

|      |                                                                                                                                                                             |                      |                                                                               |                                                                         |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| *58  | M/s Interstellar Testing Centre Private Limited<br>Plot No. 86, Industrial Area, Phase-I,<br>Panchkula-134109, Haryana                                                      | (i)<br>(ii)<br>(iii) | Dr. Parkash Kaur<br>Mr. Prem Kumar<br>Mr. Gautav Goyal                        | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024* |
| *59  | M/s Iuvireedesigns Pvt Labs<br>Leo Tower, Jambha Jn. Palativallom, Kochi<br>682025, Kerala                                                                                  | (i)<br>(ii)<br>(iii) | Dr. K.L. Anthony<br>Mrs. Susan Abraham<br>Ms. Jesty M.I                       | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024* |
| *66  | M/s J.M. EnviroLab Pvt. Ltd.<br>424, Ground Floor, Delyog Vihar, Phase IV,<br>Gurgaon, Haryana-122015                                                                       | (i)<br>(ii)<br>(iii) | Mr. Surendra Yadav<br>Mr. Raj Kumar Yadav<br>Mr. Ghanshyam Yadav              | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024* |
| *97  | M/s Min Mee R&D Laboratory<br>A-121, Paryavaran Complex, KGMOU Road,<br>New Delhi-110090                                                                                    | (i)<br>(ii)<br>(iii) | Mr. B.D. Sharma<br>Dr. Marisha Sharma<br>Ms. Rashmi Gupta                     | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024* |
| *98  | M/s Bhagyati Enviro Care Pvt. Ltd.<br>28, 29 & 30, Parmeshwar Estate-II, Opp.<br>AMCO Bank, Phase-I, GIDC Estate, Vatva,<br>Ahmedabad-382445 Gujarat                        | (i)<br>(ii)          | Mr. Shailesh Patel<br>Mr. Mahesh Oza                                          | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024* |
| *105 | M/s Azeemita Biotech (P) Ltd.<br>Kinetic Innovation Park, D-1 Block, Plot No.<br>18/1 Part, MIDC Chinchwad, Pune-411019,<br>Maharashtra                                     | (i)<br>(ii)<br>(iii) | Dr. Bikash Ajit Aich<br>Ms. Sarita Jayanti Upadhye<br>Dr. Neeta Hiten Zatakin | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024* |
| *107 | M/s EMTREC Consultants Pvt. Ltd.<br>D-66, Road No.2, Phase 1, Masari Chikawethi<br>Road, UPSIDC Industrial Area, Ghaziabad-<br>201009, Uttar Pradesh                        | (i)<br>(ii)<br>(iii) | Mr. Jeyanta Kumar Mehta<br>Mr. Mukesh Kumar<br>Mr. Om Parkash Singh           | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024* |
| *108 | M/s Visumtek Consultancy Pvt. Ltd.<br>Plot M22 & M23, Chandaka Industrial<br>Estate, Patia, Bhubaneswar-751024, Odisha                                                      | (i)<br>(ii)<br>(iii) | Mr. B.K. Mishra<br>Ms. Pooja Mohanty<br>Mrs. Chanchala Pattanalk              | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024* |
| *110 | M/s SMS Labs Services Private Limited<br>No. 39/6, Thiruvallur High Road,<br>Puduchelattam Post, Thirunavazhissai (Vial),<br>Ponnammalkei TK, Chennai-600124, Tamil<br>Nadu | (i)<br>(ii)<br>(iii) | Dr. K. Thulasi Ramani<br>Mr. K. Elakkiyathasan<br>Mr. R. Iyappan              | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024* |
| *112 | M/s Bureau Veritas (India) Pvt. Ltd., No.12,<br>Thiru Vi Ka Industrial Estate, Phase III,<br>Ekkattubungal Gindry, Chennai-600032,<br>Tamil Nadu                            | (i)<br>(ii)<br>(iii) | Mr. K. Hari Chandra Prasad<br>Mr. M. Ramesh<br>Mr. M. Shanthi                 | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024* |

(ii) after serial number 178 and the entries relating thereto, the following serial numbers and entries shall be inserted, namely: -

| (1)  | (2)                                                                                                               | (3)                  | (4)                                                                      |
|------|-------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------------|
| *179 | M/s Agss Analytical and Research Lab Pvt.<br>Ltd.<br>C/37/2, Lawrence Road Industrial Area,<br>Delhi-110035       | (i)<br>(ii)<br>(iii) | Dr. Shival Singh<br>Mr. Jaswant Ray<br>Mr. Lalit Kumar Agarwal           |
| 180  | M/s Alpha Test House<br>198/199, M.I.L, Phase I, Dabodurgarh<br>124507, Haryana                                   | (i)<br>(ii)<br>(iii) | Mr. Vivek Tyagi<br>Mr. Anup Singh<br>Ms. Pratibha Rawat                  |
| 181  | M/s Avantha Centre for Industrial Research<br>& Development<br>Paper Mill Campus, Yamuna Nagar-135061,<br>Haryana | (i)<br>(ii)<br>(iii) | Dr. Sunil Kumar<br>Dr. Subir Barnie<br>Mr. Vipul Gupta                   |
| 182  | M/s Cans Labs & Research Pvt. Ltd.,<br>S-78, First Floor, Okhla Industrial Area<br>Phase-II, New Delhi-110020     | (i)<br>(ii)<br>(iii) | Mr. Jagmohan Singh Chaudha<br>Mr. Souil Datt Paurwar<br>Ms. Nooris Naqvi |

|     |                                                                                                                                                                                                                                          |                      |                                                                                                   |                                                                       |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| 183 | M/s Centre for Environment and Food Technology Pvt. Ltd.<br>1 <sup>st</sup> & 2 <sup>nd</sup> Floor, DLF Industrial Area, Moti Nagar, New Delhi-110015                                                                                   | (i)<br>(ii)<br>(iii) | Mr. Hemant Singh<br>Mr. Manoj Singh<br>Ms. Shweta Sharma                                          | 17 <sup>th</sup> October 2019<br>To<br>16 <sup>th</sup> October, 2024 |
| 184 | M/s Eco Green Solution Systems Pvt. Ltd.<br>Plot #48/A-4, KJAFB Industrial Area,<br>Veerapuri Post, Doddaballapur, Bengaluru-<br>561203, Karnataka                                                                                       | (i)<br>(ii)<br>(iii) | Mr. P.Hanumantharath<br>Mr. Subas S.S<br>Mrs. Tushali Jagwani                                     | 17 <sup>th</sup> October,2019<br>To<br>16 <sup>th</sup> October, 2024 |
| 185 | M/s Ecosteps Laboratory Private Limited<br>D-79, Sector-6, Noida-201301, Uttar Pradesh                                                                                                                                                   | (i)<br>(ii)<br>(iii) | Ms. Sandmini Sbarua<br>Ms. Sneh Smita<br>Ms. Deep Shikha                                          | 17 <sup>th</sup> October 2019<br>To<br>16 <sup>th</sup> October, 2021 |
| 186 | M/s Enviro Tech Laboratories<br>Plot No. 62, 1 <sup>st</sup> Floor, H.P.I. Industrial Area,<br>Sector-82, Airport Road, S.A.S. Nagar,<br>Mohali, Punjab                                                                                  | (i)<br>(ii)<br>(iii) | Mr. Jasvra Singh<br>Mr. Anur Kumar<br>Ms. Manisha                                                 | 17 <sup>th</sup> October,2019<br>To<br>16 <sup>th</sup> October, 2021 |
| 187 | M/s Global Environment & Mining Services<br>3 <sup>rd</sup> Main Road, Basaveswara Badavane,<br>Hosapete-583201, Bellary District, Karnataka                                                                                             | (i)<br>(ii)<br>(iii) | Dr. Vikas Gupta<br>Ms. S. Sharmeen Banu<br>Mr. J Ravi Kumar                                       | 17 <sup>th</sup> October,2019<br>To<br>16 <sup>th</sup> October, 2024 |
| 188 | M/s Greenleaf Envirotech Pvt. Ltd.<br>301, Kankavati Complex, Singanpur -<br>Cauvery Road, Katargam, Surat-395004,<br>Gujarat                                                                                                            | (i)<br>(ii)<br>(iii) | Mr. Kalpesh Guedrabhai<br>Goli<br>Ms. Keta Prasadkhandra<br>Jariwala<br>Ms. Rekha Vaghajbhau Dave | 17 <sup>th</sup> October 2019<br>To<br>16 <sup>th</sup> October, 2021 |
| 189 | M/s Green Enviro<br>Sr. No. 45A/1 4A/4, "Parshuram" Taliphistan<br>Road, Hopoli, Pune 411003, Maharashtra                                                                                                                                | (i)<br>(ii)<br>(iii) | Mrs. Kanchan Prashant Rhatole<br>Mrs. Swati Manoj Joshi<br>Mr. Vinay Rautchandak<br>Gevande       | 17 <sup>th</sup> October 2019<br>To<br>16 <sup>th</sup> October, 2021 |
| 190 | M/s Green Vision Testing & Enviro Services<br>Plot No. 21, First Floor, Anna 2 Tower,<br>Karnapura Industrial Area, 22 Gedaun,<br>Jaipur-302006, Rajasthan                                                                               | (i)<br>(ii)          | Mr. Umesh Kumar Sharma<br>Mr. Mukesh Kumar Gupta                                                  | 17 <sup>th</sup> October,2019<br>To<br>16 <sup>th</sup> October, 2024 |
| 191 | M/s Global Enviro Laboratories<br>Plot No. 1, Khastha No. 15, Opposite Shree<br>Manan Dham Temple, Industrial Area 8KM<br>Milestone, Meerut Road, Ghaziabad-201003,<br>Uttar Pradesh                                                     | (i)<br>(ii)<br>(iii) | Mr. Arvind Kumar Srivastava<br>Mr. Rishad Parwez<br>Ms. Shikha Bhatnag                            | 17 <sup>th</sup> October,2019<br>To<br>16 <sup>th</sup> October, 2024 |
| 192 | M/s Interstellar Testing Centre Pvt. Ltd.<br>Plot No. 2, S. No.122A, Industrial Estate,<br>Perungudi, Chennai-600095, Tamil Nadu                                                                                                         | (i)<br>(ii)<br>(iii) | Mr. Tharon Kumar T.<br>Mr. Vijayanand M.<br>Mr. Prabakaran V.                                     | 17 <sup>th</sup> October,2019<br>To<br>16 <sup>th</sup> October, 2024 |
| 193 | M/s Jubilant Pharma & Chemical Lab.<br>Surya Gayatri CHS, Shop No. 10 to 15, Plot<br>No. 14/15, Sector No. 6, New Panvel (East),<br>Navi Mumbai-410206, Maharashtra                                                                      | (i)<br>(ii)<br>(iii) | Mrs. Ashwini Dinesh Mule<br>Mr. Meghnaadi Chaudhary<br>Thakur                                     | 17 <sup>th</sup> October,2019<br>To<br>16 <sup>th</sup> October, 2024 |
| 194 | M/s Metamorphosis Laboratory Private<br>Limited<br>Prakruti Bhavan, #200, 1 <sup>st</sup> & 2 <sup>nd</sup> Floor,<br>1st Cross 10 <sup>th</sup> Main, Behind Central Silk<br>Board, BIM Layout II Stage,<br>Bengaluru-560068, Karnataka | (i)<br>(ii)<br>(iii) | Dr. Shanth A. Thummaiah<br>Mr. Sreekanth Nair P<br>Mr. Suresh Babu H.S.                           | 17 <sup>th</sup> October 2019<br>To<br>16 <sup>th</sup> October, 2024 |
| 195 | M/s Nakshatra Enviro Services<br>46, Solitaire Industrial Park, Dahmi Kalau<br>Bagan, Jaipur-303007, Rajasthan                                                                                                                           | (i)<br>(ii)<br>(iii) | Mr. Jagdishan Sharma<br>Mrs. Meenu Sharma<br>Mr.Laxmi Chand Nagar                                 | 17 <sup>th</sup> October,2019<br>To<br>16 <sup>th</sup> October, 2024 |
| 196 | M/s Nirya Laboratories<br>81B, Sector-5, Charani Himmat-180015,<br>Jammu, Jammu & Kashmir                                                                                                                                                | (i)<br>(ii)<br>(iii) | Mr. Ravinder Kumar<br>Smt. Radha Devi<br>Mr. Ajay Sharma                                          | 17 <sup>th</sup> October,2019<br>To<br>16 <sup>th</sup> October, 2024 |
| 197 | M/s OneEarth Enviro Labs<br>1 <sup>st</sup> Floor, KSIA Building Baikampaly<br>Industrial Area Road, Mangaluru-575011,<br>Karnataka                                                                                                      | (i)<br>(ii)<br>(iii) | Mr. Murlidhar S.M<br>Mr. Dinesh S.M<br>Dr. Sandesh Kamath B.                                      | 17 <sup>th</sup> October,2019<br>To<br>16 <sup>th</sup> October, 2024 |

|     |                                                                                                                                                                                                  |                                                                                                     |                                                                        |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 198 | M/s Shree Krishna Analytical Services<br>A-5A1, Phase-II, Mayapuri Industrial Area,<br>New Delhi-110051                                                                                          | (i) Mr. Vinay Kumar<br>(ii) Mr. Narendra Kumar Girdi<br>(iii) Mr. Surjeet Das                       | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 |
| 199 | M/s Spectro Analytical Labs Limited,<br>S-1, GNEPIP, Surajpur Industrial Area,<br>Phase-V, Kasna, Greater Noida, Uttar<br>Pradesh                                                                | (i) Mr. Yogesh Malik<br>(ii) Mrs. Astha Vig<br>(iii) Mrs. Rikoni Rajput                             | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 |
| 200 | M/s Trans Thane Creek Waste Management<br>Association, P-123, TTC Industrial Area,<br>Near L&T Infotech, Shil Mahape Road,<br>Mahape, Navi Mumbai-40710                                          | (i) Dr. Nitin Ramabhadra Nirakar<br>(ii) Dr. Datta Baban Mandhate<br>(iii) Mr. Jayesh Narayan Idate | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 |
| 201 | M/s Vaa Analytical Labs Pvt. Ltd.<br>#77(502/503), 2 <sup>nd</sup> Floor, 21 <sup>st</sup> 'D' Cross<br>Muthuravasaeswamy Layout, St. Ignace Road,<br>Shulakadkanth, Bengaluru-560091, Karnataka | (i) Mrs. Nagalakshmi N.S<br>(ii) Mrs. Gummavathy M.K<br>(iii) Mrs. Apeksha Shenoy                   | 17 <sup>th</sup> October, 2019<br>To<br>16 <sup>th</sup> October, 2024 |

(P. No. Q. 15018/21/2017-CPW)

JIGMET TAKPA, Jt. Secy.

**Note :** The principal notification was published in the Gazette of India, Extraordinary, vide number S.O. 1174(E), dated the 18th July, 2007 and was last amended by notification No. S.O. 5768(E), dated the 15th November, 2018.



**National Accreditation Board for  
Testing and Calibration Laboratories**  
(A Constituent Board of Quality Council of India)



**CERTIFICATE OF ACCREDITATION**

**MIN MEC R & D LABORATORY**

has been assessed and accredited in accordance with the standard

**ISO/IEC 17025:2017**

**"General Requirements for the Competence of Testing &  
Calibration Laboratories"**

for its facilities at

A- 121, PARYAVARAN COMPLEX, IGNOU ROAD, NEW DELHI, SOUTH WEST, DELHI, INDIA

in the field of

**TESTING**

Certificate Number: TC-6337

Issue Date: 21/11/2019

Valid Until: 20/11/2021

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.  
(To see the scope of accreditation of this laboratory, you may also visit NABL website [www.nabl-india.org](http://www.nabl-india.org))

**Signed for and on behalf of NABL**



**N. Venkateswaran**  
Chief Executive Officer

§-15-16.

\* **IN THE HIGH COURT OF DELHI AT NEW DELHI**

+ LPA 108/2014 & C.M.No.2168/2014 (stay)

LPSILON PROJECTS PVT LTD ..... Appellant.

Versus

MINISTRY OF ENVIRONMENT  
AND FOREST & ORS

..... Respondents

+ LPA 110/2014 & C.M.No.2175/2014 (stay)

MIN MEC CONSULTANCY PVT LTD ..... Appellant

Versus

MINISTRY OF ENVIRONMENT  
AND FOREST & ORS

..... Respondents

**Present:-** Ms.Ruchi Kohli, Adv. with Mr.Yash Mishra, Adv.s. for  
the appellants.  
Mr.Rajeev Mehra, ASG with Mr.Sachin Datta,  
Mr.Kartik, Adv.s. for COF.

**CORAM:**  
**HON'BLE THE CHIEF JUSTICE**  
**HON'BLE MR. JUSTICE RAJIV SALATENDLAW**

**ORDER**

03.02.2014

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C.M.No.2170/2014 (exemptions) in LPA 108/2014

C.M.No.2176/2014 (exemptions) in LPA 110/2014

Exemptions allowed subject to all just exceptions.

LPA No.108/2014 & C.M.No.2169/2014 (delay in filing)

LPA No.110/2014

Issue notice. Learned counsel for the respondents No.1&2 accepts  
notice. Notice be also issued to remaining respondents No.3 to 5.

LPA's 108/2014 & 110/2014

page 1 of 2

Attested True Copy  
A.K.G.  
9/2/14  
Court Master  
High Court of Delhi  
New Delhi

List this matter on 14<sup>th</sup> March, 2014. In the facts obtaining, we are of  
the considered view that till the filing of the reply, on reasons of parity and  
comity of courts and uniformity in dealing with identical cases, the appellant  
shall also be allowed to prepare and present Environment Impact  
Assessment (EIA) report to the Central and State Government  
Environmental Appraisal Committees till 14<sup>th</sup> March, 2014

Dasti under signature of the Court Master.

CHIEF JUSTICE

RAJIV SALATENDLAW, J

FEBRUARY 03, 2014

'amb'

Attested True Copy  
A.K.G.  
9/2/14  
Court Master  
High Court of Delhi  
New Delhi

LPA's 108/2014 & 110/2014

page 2 of 2



## ANNEXURE : XXII Contd..

Subsequently the hearings at High Court of Delhi have been held on the following dates with the contents of the orders as follows:

| Date       | Content of order                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14.03.2014 | The Hon'ble Division bench could not assemble today. Renotify on 13.05.2014                                                                                                                                                                                                                                                                                                                                                                                     |
| 13.05.2014 | Re-notify for 14.08.2014,. Interim order to continue                                                                                                                                                                                                                                                                                                                                                                                                            |
| 14.08.2014 | An adjournment slip is moved by the learned counsel for the appellant. Renotify on 13.11.2014.                                                                                                                                                                                                                                                                                                                                                                  |
| 13.11.2014 | It is represented by the learned counsel for both the parties that transfer writ petitions are moved before the the Supreme Court of India for the transfer of several cases pending before different High Courts in which an identical issue is raised.<br>Hence, we deem it appropriate to adjourn the hearing.<br>Re-notify on 06.02.2015.<br>Interim orders to continue.                                                                                    |
| 06.02.2015 | It is represented that on 16.01.2015 notice has been ordered in the Transfer Petitions by the Supreme Court.<br>Re-notify on 25.05.2015.<br>Interim orders to continue.                                                                                                                                                                                                                                                                                         |
| 25.05.2015 | It is brought to our notice that the Transfer Petition before the Supreme Court of India stands posted to 11.08.2015.<br>Hence, call on 04.09.2015                                                                                                                                                                                                                                                                                                              |
| 04.09.2015 | Renotify on 01.12.2015                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 01.12.2015 | On joint request, call on 23.02.2016                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 23.02.2016 | It is brought to our notice that the Transfer Petition(s) (Civil) Nos. 1682-1722/2014 are still pending before the Hon'ble Supreme Court of India.<br>List on 11 <sup>th</sup> July 2016                                                                                                                                                                                                                                                                        |
| 11.07.2016 | It is stated that the Transfer Petition(s) (Civil) Nos. 1682-1722/2014 before Supreme Court are still pending.<br>Re-notify on 26.09.2016                                                                                                                                                                                                                                                                                                                       |
| 26.09.2016 | It is brought to our notice that the Transfer Petition(s) (Civil) Nos. 1682-1722/2014 are still pending before the Hon'ble Supreme Court of India.<br>List on 20.01.2017                                                                                                                                                                                                                                                                                        |
| 20.01.2017 | Since the proceedings before the Supreme Court are still pending, renotify on 04.07.2017.                                                                                                                                                                                                                                                                                                                                                                       |
| 04.07.2017 | Proceedings before the Supreme Court are still pending. Renotify on 04.12.2017.                                                                                                                                                                                                                                                                                                                                                                                 |
| 04.12.2017 | Learned counsel or the appelant states that transfer petition is still pending consideration before the Supreme Court and its is listed today before the Registrar for completion of pleadings.<br>List on 18 <sup>th</sup> July, 2018 in the category of "directions" for reporting the orders passed by the Supreme Court. In the event, the petition before the Supreme Court is decided before the next date, a copy of the order shall be placed on record |
| 18.07.2018 | 1. Hon'ble Division Bench has not assembled today as Hon'ble Ms. Justice Hima Kohli is busy attending workshop "Environmental Adjudication for the Green Bench Judges of Bhutan" to be held in Thimpu, Bhutan.<br>2. List on 14.11.2018                                                                                                                                                                                                                         |
| 14.11.2018 | Learned counsel for the appellants seeks an adjournment . At request, adjourned to 29.04.2019                                                                                                                                                                                                                                                                                                                                                                   |
| 29.04.2019 | In view of the fact that the transfer petition being Transfer Petition(s) (Civil) Nos. 1682-1722/2014 which were pending before the Hon'ble Supreme Court have been dismissed as withdrawn, this Court can now proceed with the matter.<br>Accordingly, list the matter for hearing in the category of 'After Notice Miscellaneous Matters' on 8 <sup>th</sup> August, 2019.<br>In the meanwhile, pleadings to be completed.<br>Interim orders to continue.     |
| 08.08.2019 | List on 3.03.2020                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 03.03.2020 | Next date of hearing is 19.05.2020                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 15.05.2020 | Court on its own motion "..... wherein the interim orders issued, as mentioned in our order dated 25 <sup>th</sup> March, 2020, were subsisting as on 15.05.2020 and expired or will expire thereafter, the same shall stand automatically extended till 15.06.2020 or until further orders ...."                                                                                                                                                               |
| 15.06.2020 | Court on its own motion "..... we hereby further extend the implementation of the directions contained in our order dated 25 <sup>th</sup> March, 2020 and 15 <sup>th</sup> May, 2020 till 15 <sup>th</sup> July, 2020 with the same terms and conditions"                                                                                                                                                                                                      |
| 13.07.2020 | Court on its own motion ".....we hereby further extend the implementation of the directions contained in our order dated 25 <sup>th</sup> March, 2020 and 15 <sup>th</sup> May, 2020 and 15 <sup>th</sup> June 2020, till 31 <sup>st</sup> August, 2020 with the same terms and conditions"                                                                                                                                                                     |
| 24.08.2020 | Court on its own motion ".....we hereby further extend the implementation of the directions contained in our orders dated 25 <sup>th</sup> March, 2020, 15 <sup>th</sup> May, 2020, 15 <sup>th</sup> June, 2020 and 13 <sup>th</sup> July, 2020, till 31 <sup>st</sup> October, 2020 with the same terms and conditions."                                                                                                                                       |

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\* **IN THE HIGH COURT OF DELHI AT NEW DELHI**

+ W.P.(C) 3665/2016

MRS. RANI GUPTA & ANR

----- Petitioners

Through Mr. Yash Mishra with Ms. Ruchi  
Kohli, Ms. Srishty Kohli and  
Ms. Nidhi Jaswal, Advocates.

versus

MINISTRY OF ENVIRONMENT FOREST AND CLIMATE  
CHANGE & ANR

----- Respondents

Through Mr. Sanjay Jain, ASG and Mr. Rajesh  
Gogna, CGSC with Mr. Tushar Sannu,  
Mr. Sumit Misra, Ms. Shreya Sinha  
and Mr. Shreshth Jain, Advocates.

**CORAM:**

**HON'BLE MR. JUSTICE MANMOHAN**

**ORDER**

% 03.05.2016

**C.M.No.15700/2016**

Exemption allowed, subject to all just exceptions.

Application stands disposed of.

**W.P.(C) No.3665/2016 & C.M.No.15699/2016**

Present writ petition has been filed challenging Notification dated 3<sup>rd</sup> March, 2016 whereby an amendment has been made to the Environmental Impact Assessment Notification, 2006 stating that the Environmental Consultant Organisations which are accredited for a particular sector and category of project for that project with the Quality Council of India (QCI) or National Accreditation Board for Education and Training (NABET) or any other agency which may be notified by the Ministry of Environment Forest and Climate Change shall be allowed to prepare the Environmental Impact Assessment

(EIA) report and Environmental Management Plan (EMP) of a project in that sector and to appear before the State or Central Expert Appraisal Committee.

Learned counsel for the petitioners states that the NABET had issued a scheme for accreditation of EIA Consultants organisations in January, 2010 and the respondent No.1 issued Office Memorandums dated 2<sup>nd</sup> December, 2009 and 18<sup>th</sup> March, 2010 stating that no final EIA or EMP prepared by non-accredited consultant would be entertained after 1<sup>st</sup> July, 2010.

He further states that petitioner No.1 submitted an application for accreditation in January, 2010. However, the same was rejected vide minutes of meeting dated 10<sup>th</sup> January, 2011 and petitioner No.1 challenged the said decision by virtue of a writ petition being W.P.(C) 7034/2012. However, the said writ petition was dismissed. The petitioner then preferred LPAs being LPA Nos.23/2014 and 110/2014, wherein the petitioners were allowed to prepare and present the Environmental Impact Assessment report to the Central and State Government Expert Appraisal Committee.

Learned counsel for the petitioners submits that the impugned notification dated 3<sup>rd</sup> March, 2016 is not only contrary to the aforesaid Division Order but also violative of Section 23 of the Environment Protection Act, 1986.

Issue notice.

Mr. Rajesh Gogna, CGSC accepts notice on behalf of the respondents. He prays for and is permitted to file a counter-affidavit within a period of four weeks. Rejoinder-affidavit, if any, be filed before the next date of hearing.

List on 12<sup>th</sup> August, 2016.

In the meantime, till the Division Bench varies, vacates or modifies the interim orders dated 17<sup>th</sup> January, 2014 and 3<sup>rd</sup> February, 2014 passed in LPA Nos.23 of 2014 and 110 of 2014, the petitioners are allowed to prepare and present Environmental Impact Assessment report to the Central and State Government Expert Appraisal Committee.

*Order dasti.*

MAY 03, 2016  
KA

MANMOHAN, J

S-1

\* IN THE HIGH COURT OF DELHI AT NEW DELHI

+ W.P.(C) 3665/2016

MRS. RANI GUPTA & ANR

..... Petitioners

Through: Mr Yash Mishra and Ms Srishty Kaul,  
Advocates.

versus

MINISTRY OF ENVIRONMENT FOREST AND CLIMATE  
CHANGE & ANR

..... Respondents

Through: Mr Rajesh Gogna, Advocate for R-1.

CORAM:

HON'BLE MR. JUSTICE SANJEEV SACHDEVA

ORDER

% 12.08.2016

W.P.(C) 3665/2016 & CM No.15699/2016(stay)

The counter-affidavits have not been filed. The respondents shall file their counter-affidavits within a period of four weeks. Rejoinders thereto, if any, be filed within four weeks thereafter.

Renotify on 14<sup>th</sup> March, 2017.

SANJEEV SACHDEVA, J

AUGUST 12, 2016

'sn'

**ANNEXURE : XXII Contd..**

Subsequently the hearings at High Court of Delhi have been held on the following dates with the contents of the orders as follows:

| <b>Date</b> | <b>Content of order</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14.03.2017  | Hon'ble Judge was on leave. Renotified on 21.08.2017                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 21.08.2017  | The learned counsel for the petitioner seeks some time to file a rejoinder. Let the same be filed within a period of four weeks from today. List on 23.03.2018. Interim order to continue                                                                                                                                                                                                                                                                                                                                              |
| 23.03.2018  | 1. There is no representation on behalf of the parties. Adverse orders are deferred.<br>2. Renotify the matter on 25.09.2018                                                                                                                                                                                                                                                                                                                                                                                                           |
| 25.09.2018  | It is already 5.00 p.m. The petition cannot be taken up today due to paucity of time.<br>List on 17.04.2019.<br>Interim order to continue.                                                                                                                                                                                                                                                                                                                                                                                             |
| 22.04.2019  | 1. The learned counsel appearing for the petitioner seeks final opportunity to file a rejoinder affidavit. It is seen more than sufficient time has been granted to the petitioner for doing so. Nonetheless, in the interest of justice, a final opportunity is granted to the petitioner to file a rejoinder affidavit<br>2. In the meanwhile, the petitioner shall also ascertain the status of other matters having a bearing on the controversy in the present petition.<br>3. List on 31.10.2019<br>4. Interim order to continue |
| 31.10.2019  | At the request of the learned counsel for the petitioners, relist on 27 <sup>th</sup> April, 2020.                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 25.03.2020  | Court on its own motion "..... such interim orders issued were subsisting as on 16.03.2020 and expired or will expire thereafter, the same shall stand automatically extended till 15.05.2020 or until further orders ...."                                                                                                                                                                                                                                                                                                            |
| 15.05.2020  | Court on its own motion "..... wherein the interim orders issued, as mentioned in our order dated 25 <sup>th</sup> March, 2020, were subsisting as on 15.05.2020 and expired or will expire thereafter, the same shall stand automatically extended till 15.06.2020 or until further orders ...."                                                                                                                                                                                                                                      |
| 15.06.2020  | Court on its own motion "..... we hereby further extend the implementation of the directions contained in our order dated 25 <sup>th</sup> March, 2020 and 15 <sup>th</sup> May, 2020 till 15 <sup>th</sup> July, 2020 with the same terms and conditions"                                                                                                                                                                                                                                                                             |
| 13.07.2020  | Court on its own motion ".....we hereby further extend the implementation of the directions contained in our order dated 25 <sup>th</sup> March, 2020 and 15 <sup>th</sup> May, 2020 and 15 <sup>th</sup> June 2020, till 31 <sup>st</sup> August, 2020 with the same terms and conditions"                                                                                                                                                                                                                                            |
| 24.08.2020  | Court on its own motion ".....we hereby further extend the implementation of the directions contained in our orders dated 25 <sup>th</sup> March, 2020, 15 <sup>th</sup> May, 2020, 15 <sup>th</sup> June, 2020 and 13 <sup>th</sup> July, 2020, till 31 <sup>st</sup> October, 2020 with the same terms and conditions."                                                                                                                                                                                                              |



Tel: 2854322/285904  
Fax: 2851152/281264  
E-mail: [spcb@spcb.oda.org](mailto:spcb@spcb.oda.org)  
Website: [www.spcb.oda.org](http://www.spcb.oda.org)

# OFFICE OF THE STATE POLLUTION CONTROL BOARD, ODISHA

Postbag Bhawan, A/11B, Makana Nagar, Unit VII  
Bhubaneswar - 751 012

By Speed Post/through online

No. 1629 /

IND-E-NOC- 6101

Date 01-10-2019 /

## OFFICE MEMORANDUM

In consideration of the online application no. 2855832 for Consent to Establish for Dhankanal Steel Plant of M/s Rungta Mines Ltd., for establishment of Integrated Steel Plant of capacity 2.85 MTPA in two phases of 1.45 MTPA and 1.4 MTPA, the State Pollution Control Board is pleased to convey its Consent to Establish under section 25 of Water (Prevention & Control of Pollution) Act, 1974 and section 21 of Air (Prevention & Control of Pollution) Act, 1981 for following plant facilities:

| Sl. No. | Plant facilities                                                      | Units | Phase 1                  | Phase 2                   | Total                     |
|---------|-----------------------------------------------------------------------|-------|--------------------------|---------------------------|---------------------------|
| 1       | Raw Material Plant Configuration                                      | MTP   | 2.7                      | 2.7                       | 5.4                       |
| 2       | Polishing Plant Configuration                                         | MTP   | 2.63                     | 1.268                     | 3.898                     |
| 3       | Configuration with additional 10% extra capacity utilization          | MTP   | 1.12                     | 1.12                      | 2.24                      |
| 4       | Gas Washery                                                           | MTP   | 2.516                    | 1.624                     | 4.14                      |
| 5       | Configuration                                                         |       | 1X400 TPH                | 1X235 TPH                 | 1X400TPH+1X235 TPH        |
| 6       | HR Plant Configuration with additional 30% extra capacity utilization | MTP   | 1.301                    | 1.548                     | 2.849                     |
| 7       | HR Plant Configuration                                                | MTP   | 2X500+2X300 TPD          | 2X500 TPD                 | 2X500+2X300 TPD           |
| 8       | HR Plant Configuration                                                | MTP   | 0.987                    | 0.962                     | 1.949                     |
| 9       | Configuration                                                         |       | 1X800 CUM                | 1X1080 CUM                | 1X800CUM+1X1080 CUM       |
| 10      | Slab Plant Configuration                                              | MTP   | 0.812                    | 1.027                     | 1.839                     |
| 11      | Configuration                                                         |       | 1X84 sq.m                | 1X110 sq.m                | 1X84+1X110 sq.m           |
| 12      | Coke Oven Plant Configuration                                         | MTP   | 0.650                    | 0.700                     | 1.35                      |
| 13      | Configuration                                                         |       | 6 batteries X 70,000 TPA | 10 batteries X 70,000 TPA | 16 batteries X 70,000 TPA |
| 14      | Steel Melting Shop                                                    | MTP   | 1.232                    | 1.232                     | 2.464                     |
| 15      | Steel Melting via Induction Furnace Route                             | MTP   | 0.539                    | -                         | 0.539                     |
| 16      | Configuration                                                         |       | 7X20 T.F + 4X20 T.LRF    | -                         | 7X20 T.F + 4X20 T.LRF     |



| Sl. No. | Plant facilities                                                                           | Units                         | Phase 1                     | Phase 2                     | Total                       |
|---------|--------------------------------------------------------------------------------------------|-------------------------------|-----------------------------|-----------------------------|-----------------------------|
| 17      | Steel Melting via Electric Arc Furnace vacuum Degassing-Argon Oxygen Decarburization Route | MTP                           | 0.695                       | 1.232                       | 1.927                       |
| 18      | Configuration                                                                              |                               | 1X20 T.F + 1X20 T.LRF       | 1X160 T.F + 1X160 T.LRF     | 1X20 T.F + 1X160 T.LRF      |
| 19      | Continuous Casting Machine (Oilers/Bloom Casting Sills)                                    | MTP                           | 1.207                       | 1.207                       | 2.414                       |
| 20      | Configuration                                                                              |                               | 1 nos. X 3 strands          | 2 nos. X 2 strands          | 3 nos. X 3 strands          |
| 21      | Finished Product Facilities                                                                | MTP                           | 1.460                       | 1.400                       | 2.860                       |
| 22      | Rolling Mill (TMT/Flat/Round/Wire Rod/Structural Mills etc.) Configuration                 | MTP                           | 0.800                       | 0.800                       | 1.600                       |
| 23      | Configuration                                                                              |                               | 4X0.2 MTPA                  | 1X0.2 + 2X0.3 MTPA          | 5X0.2+2X0.3 MTPA            |
| 24      | Strip Mill Sheet/Coil Wire & Bar Mill Wire Rope                                            | MTP                           | 0.450                       | 0.400                       | 0.850                       |
| 25      | Configuration                                                                              |                               | 1X0.45 MTPA                 | 1X0.4 MTPA                  | 1X0.45+1X0.4 MTPA           |
| 26      | On-site Raw Plant Configuration                                                            | MTP                           | 0.200                       | 0.200                       | 0.400                       |
| 27      | Configuration                                                                              |                               | 1X0.2 MTPA                  | 1X0.2 MTPA                  | 2X0.2 MTPA                  |
| 28      | Recovery Gas Plant                                                                         | Volume Nm <sup>3</sup> /Annum | 240                         | 240                         | 480                         |
| 29      | Configuration                                                                              |                               | 10X3000 Nm <sup>3</sup> /hr | 10X3000 Nm <sup>3</sup> /hr | 20X3000 Nm <sup>3</sup> /hr |
| 30      | Oxygen Plant Configuration                                                                 | MTP                           | 0.325                       | 0.361                       | 0.686                       |
| 31      | Configuration                                                                              |                               | 1X180 TPD                   | 1X180 TPD                   | 1X180+1X180 TPD             |
| 32      | Configuration                                                                              | MTP                           | 0.105                       | 0.186                       | 0.291                       |
| 33      | Configuration                                                                              |                               | 1X300 TPD                   | 1X370 TPD                   | 1X300 + 1X370 TPD           |
| 34      | Cement Plant Configuration                                                                 | MTP                           | 0.584                       | 0.812                       | 1.396                       |
| 35      | Configuration                                                                              |                               | 1X280 TPD                   | 1X230 TPD                   | 1X280+1X230 TPD             |
| 36      | Captive Power Plant                                                                        | MW                            | 217                         | 165                         | 382                         |
| 37      | Waste Water Recovery Water (WTRB) based Captive Power Plant (CPP)                          | MW                            | 57                          | 60                          | 117                         |



| Sl. No. | Plant facilities     | Unit | Phase 1            | Phase 2     | Total                |
|---------|----------------------|------|--------------------|-------------|----------------------|
| a       | DR/Kin ext gas based | MW   | 44                 | 24          | 68                   |
|         | Configuration        |      | 2X 50 + 2X 60 TPH  | 2X 80 TPH   | 2X 50 + 4X 50 TPH    |
| b       | MS Gas based         | MW   | 11                 | 20          | 31                   |
|         | Configuration        |      | 1 X 50 TPH         | 1 X 60 TPH  | 1 X 50 + 1 X 70 TPH  |
| c       | Coke Oven Gas based  | MW   | 12                 | 24          | 36                   |
|         | Configuration        |      | 1 X 50 TPH         | 1 X 100 TPH | 1 X 50 + 1 X 100 TPH |
| 147     | AFBC/CFBC based CPP  | MW   | 150                | 100         | 250                  |
|         | Configuration        |      | 2X 75 + 2X 250 TPH | 2X 250 TPH  | 2X 125 + 4X 250 TPH  |

with project cost of ₹ 7898.90 Crores (₹ 3888.63 Crores for phase-I and ₹ 3948.27 Crores for phase-II) over an area of 674.65 acres. At - villages Jharbandh, Galpada and Tarkabeda in Patna district shall not be commenced as per application form) in the district of Odisha with the following conditions. This Consent to Establish order supersedes earlier Consent to Establish order issued vide Office Memorandum No. 5224, dated 21.01.2012, OM No. 13853, dated 20.08.2013 and OM No. 2649, dated 13.03.2019.

#### GENERAL CONDITIONS

- The Consent to establish is valid for the raw materials, product, manufacturing process and capacity mentioned in the application form. This order is valid for five years. The proponent shall commence construction of the project within a period of five years from the date of issue of this order. If the proponent fails to do substantial physical progress of the project within five years then a renewal of the consent to establish shall be sought by the proponent.
- The industry shall comply to the provisions of Environment Protection Act, 1986 and the rules made there under with the amendments from time to time such as the Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016 as amended from time to time, Hazardous Chemical Rules, Manufacture, Storage and Import of Hazardous Chemical Rules, 1988 etc. and amendments there under. The industry shall also comply to the provisions of Public Liability Insurance Act, 1991 if applicable.
- The industry is to apply for grant of Consent to Operate under Section 25(2) of Water (Prevention & Control of Pollution) Act, 1974 & under Section 21 of Air (Prevention & Control of Pollution) Act, 1986 at least 3 (three) months before the commercial production and obtain Consent to Operate from this Board.
- This consent to establish is subject to statutory and other clearances from Govt. of Odisha and/or Govt. of India, as and when applicable.



#### SPECIAL CONDITIONS:

##### A. GENERAL CONDITIONS

- The proponent shall carryout construction activity of the Integrated Steel Plant as per Environmental Clearance granted by MoEF&CC, Govt. of India vide no. J-14011.008/2018-A-II (I), dated 11.08.2019.
- The unit shall abide by policy/guide lines for establishment/expansion of sponge iron plant in the State issued by Steel & Mines Department, Govt. of Odisha vide letter no. S, R, O.No.157/2015, dated 02.05.2015.
- This Consent to Establish is granted for the capacity as mentioned above and any extension in the capacity, change or modification in the process, additional sub-unit, any future has to be undertaken with prior approval of the Board. For any change in the site or area, fresh Consent to Establish has to be obtained from the Board. The proponent shall carry out construction activity as per approved revised layout map (enclosed). If the proponent wants to change the approved plant layout map, they can submit a modified plant layout map with adequate justification for such modification.
- The proponent shall implement the Pollution Control Measures and safeguards as proposed in the Environment Management Plan (EMP) of Environment Impact Assessment (EIA) report.
- The proponent shall obtain permission from concerned authorities for drawal of surface water/ground water.
- Under no circumstances the unit shall use ground water for industrial purpose. An undertaking to this effect shall be submitted. Ground water level in the plant be monitored every six months (once each in December, January and July + August) on an as to keep track of the depletion of the ground water table.
- The proponent shall not over any other purpose for the area earmarked for solid waste disposal (25.2 acres) and green belt development (222.78 acres).
- Good housekeeping practices shall be followed to improve the work environment. All roads and shop floors shall be cleaned regularly.
- The industry shall develop hazardous waste disposal site as per guideline of Central Pollution Control Board, Delhi for disposal of Hazardous Waste.
- The construction and demolition wastes to be generated from the proposed project shall be disposed off in accordance with the provision under "Construction & Demolition Wastes Management Rules 2015".
- The proponent shall comply to the provisions of E-Waste (Management) Rules, 2016 and shall instruct e-waste to authorized collection center/register/demonstrated recyclers for proper disposal of e-waste.
- All the plastic waste generated from industry during construction and commissioning shall be collected and sent for recycling in a cement kiln.
- Monitoring of stack emissions, fugitive emissions, stack effluent and noise level shall be done as per CPCB regulations.
- A green belt of adequate width and density conforming with local species along the periphery of the unit shall be raised so as to provide protection against particulates and noise. It may be ensured that at least 33% (222.67 acres) of the total land area shall be under permanent



green cover in such a manner that, atleast plantation shall be taken up at least 1/20th of the total green belt area and progressively achieve 100% in a span of five years and under no circumstances this land use marked for green belt shall be used for any other purpose.

15. A 10m wide green belt consisting of atleast 3 trees around boundary shall be developed as green belt and green cover as per CPCB guidelines.
16. The civil construction shall be carried out with the fly ash bricks. If the fly ash bricks are not available locally the civil construction may carried out with other bricks with prior permission to the concerned Regional Office of SPC Board. A statement indicating use of fly ash bricks during construction period shall be submitted to the Board quarterly for records.
17. The proponent shall provide full-fledged environmental management cell and the head of environmental management cell should report directly to the unit Chief Administrator (say MD). A detailed proposal to this effect is to be submitted.
18. The unit shall open a new E unit or seek one existing ETL for imparting training to local youth so that they can be employed in the proposed plant as skilled man power.
19. The land on which the unit is proposed to be established shall be converted to industry status/claim by the competent authority. The copy of said land conversion document shall be submitted to the Board along with consent to operate application.
20. The Board may impose further conditions or modify the conditions stipulated in the order during installation and for all the time of obtaining consent to operate and may revoke this clearance in case the stipulated conditions are not implemented and for any information suppressed in the application form.
21. The industry shall apply for grant of Consent to operate under section 26(6) of Water (Prevention & Control of Pollution) Act, 1974 & Air (Prevention & Control of Pollution) Act, 1986 at least 6 (three) months before the commercial production and obtain Consent to Operate from the Board. No production activity shall commence prior to installation of all pollution control measures.
22. Depending on the environmental condition, stricter standards may be imposed for the effluent or restriction for discharge may be made for which adequate facilities from the beginning shall be made to meet such situation in future.

#### B. WATER POLLUTION:

23. The unit shall install online Continuous Effluent Quality Monitoring System (CEQMS) at the outlet of Effluent Treatment Plant (ETP) for online real time data transmission through GPRS system to SPCB HPCMS server and also upload data for use by CPCB.
24. Under no circumstances the industry shall use ground water for construction as well as operational activities. An undertaking to this effect shall be submitted. Ground water level in the plant be monitored every six months (once each in December/January and July/August) so as to keep track of the depletion of the ground water table.
25. The total water consumption including domestic use shall not be more than 6 m<sup>3</sup>/ton of steel for cng products and 8 m<sup>3</sup>/ton steel for flat products.
26. The consumption of water in the coal washery shall not exceed 1.5 m<sup>3</sup>/ton of coal in any case.



27. The domestic wastewater generated from the industry shall be treated in sewage treatment plant to meet the following standards as notified by the MoEF&CC, Govt. of India vide G.O. No. 1255 (S), dated 13.10.2017. The treated water shall be reused for gardening and sanitation. Under no circumstances there shall be any discharge of treated waste water to violate the factory premises.

| S/L No. | Parameters                 | Standards |
|---------|----------------------------|-----------|
| 1.      | pH                         | 6.5-9.0   |
| 2.      | BOD (mg/l)                 | 30        |
| 3.      | SS (mg/l)                  | <100      |
| 4.      | Total Coliform (MPN/100ml) | <1000     |

28. Waste water generated from Storage Iron Plant, Iron Ore Beneficiation Plant, Coal Washery, SMS, Rolling Mill, Coke Oven Plant etc. shall be completely recycled after treatment. The proponent shall construct a full-fledged CTP for treatment of waste water generated from other plant facilities and shall be completely reused.
29. The proponent shall adopt Zero Liquid Discharge (ZLD) concept and under no circumstances the waste water shall be discharged outside the factory premises.
30. The waste water stream of the Blast down, CV plant, Coke oven, Sinter plant, Blast furnace SMS and Rolling Mills shall be treated separately to conform to the standards stipulated in this order. The treated waste water shall be reused to the maximum possible extent and the balance will be treated via Control Effluent Treatment Plant (CETP).
31. The wastewater generated from leakages, dust suppressors, Blow down and MHPs shall be treated individually to meet the following prescribed standard of effluent discharge to intern surface water and stored in a concrete sump for utilization for plantation and green belt purposes inside the factory premises.

| Parameters              | Boiler Blow down | Cooling Tower Blow down | DM plant   |
|-------------------------|------------------|-------------------------|------------|
| pH                      | ---              | ---                     | 6.5 to 8.5 |
| Suspended solids        | 100              | ---                     | 100        |
| Oil and grease          | 20               | ---                     | 10         |
| Copper (ppm)            | 10               | ---                     | ---        |
| Iron (ppm)              | 10               | ---                     | ---        |
| Free available Chlorine | ---              | 0.5                     | ---        |
| Zinc                    | ---              | 10                      | ---        |
| Chromium (Total)        | ---              | 0.2                     | ---        |
| Mercury                 | ---              | 0.0                     | ---        |

NA: Limiting concentration (mg/l) except for pH.

32. The wastewater generated from various sections like coke oven, sintering plant, steel furnace, steel melting shop, rolling mill etc. shall conform to the following prescribed standards.

| Parameters         | Coke oven  | Sintering plant | Blast Furnace | Steel melting Shop | Rolling Mill |
|--------------------|------------|-----------------|---------------|--------------------|--------------|
| pH                 | 6.0 to 8.5 | 6.0 to 8.5      | 5.0 to 8.5    | 6.0 to 8.5         | 6.0 to 8.0   |
| Suspended Solids   | 100        | 100             | 100           | 100                | 100          |
| BOD (mg/l at 20°C) | 30         | ---             | 10            | ---                | ---          |
| COD (mg/l)         | 250        | ---             | ---           | ---                | ---          |
| Oil and Grease     | 10         | 10              | ---           | 10                 | 10           |





| Parameters    | Coke oven | Sintering plant | Cast Furnace | Steel making Shop | Rolling Mill |
|---------------|-----------|-----------------|--------------|-------------------|--------------|
| Ammonia       | 50        | ---             | 50           | ---               | ---          |
| Nitrogen as N | ---       | ---             | ---          | ---               | ---          |
| Cyanide as CN | 0.2       | ---             | 0.2          | ---               | ---          |
| Phos          | 1.0       | ---             | ---          | ---               | ---          |

NB: Limiting concentration in mg/l except for pH.

33. The treated effluent shall be recycled and reused in the industry and/or used for water spraying or green belt development. The house waste water shall be collected in Central Effluent Treatment Plant (CETP).
34. The treated waste water from the CETP shall be utilized after meeting the following standard:

| Parameters                   | Limiting concentration in mg/l except for pH |
|------------------------------|----------------------------------------------|
| pH                           | 6.5 to 8.5                                   |
| Suspended solids             | 100                                          |
| ECO <sub>2</sub> Sludge 25°C | 30                                           |
| CO <sub>2</sub>              | 250                                          |
| Oil & Grease                 | 10                                           |
| Ammonia                      | 50                                           |
| Nitrogen as N                | ---                                          |
| Cyanide as CN                | 0.2                                          |
| Chromate compound            | 1.0                                          |
| Copper (as)                  | 3.0                                          |
| Iron (Total)                 | 3.0                                          |
| Free available chlorine      | 0.3                                          |
| Zinc                         | 5.0                                          |
| Chromium Total               | 0.2                                          |
| Phosphate                    | 5.0                                          |

35. Storm water shall not be allowed to mix with effluent, scrubber water and/or floor washing and shall be channelized through adequate drains as per natural gradient, pass no through High Density Polyethylene (HDPE) lined pits, each having holding capacity of 10 minutes (hourly average) at full flow.
36. Rain water harvesting structure shall be developed inside the plant premises and maximum effort shall be made to make harvested rain water with a definite plan and programme to reduce the need of fresh water from water body.
37. Wastewater generated from the unit is, likely to contain toxic waste should not go to ST. The unit shall adequately treat the waste water so that it meets the following standard:
- pH = 5.0 - 6.0  
SS = 100 mg/l  
Chromate = 1.0 mg/l  
Cyanide = 0.2 mg/l
38. Coke Dry Quenching (CDQ) shall be provided for coke quenching for both recovery and non-recovery type coke oven.
39. The premises shall adopt dry quenching of coke in coke oven plant.



40. Appropriate structures shall be built within the premises so that the runoff during monsoon does not enter into nearby water bodies directly.
41. The premises shall provide garden drains around coke storage area and all the stock pits area, followed by series of settling tanks to retain the solids if any, in order to prevent damage to the surrounding land and water bodies.
42. There shall not be any discharge of effluent or wastewater from the catchment pit.

#### C. AIR POLLUTION:

43. The proposed shall comply to the emission standards for Integrated Iron & Steel plant notified by the MoEF&CC, Govt. of India vide Gazette Notification No. S.S.R. 27(L) of 31.03.2012.
44. The emission standards notified by the MoEF&CC, Govt. of India vide G.S.R. No. 612 (P) dated 25th August, 2014 and subsequent amendment dated 9th May, 2018 and 10th May, 2018 regarding control plants with respect to particulate matter, SO<sub>2</sub> and NO<sub>x</sub> shall be followed as hot gases from HES will be vented through cement mill main stack.
45. Necessary preventive measures shall be taken during construction phase so that the ambient air quality including noise shall conform to National ambient air quality standards and standards for noise in industrial area as per Annexure-4. Ambient air quality at the boundary of the plant premises shall meet the prescribed standards of the Board as per Annexure - 4. The ambient air quality monitoring report shall be submitted to the Board every month.
46. The unit shall install online Continuous Stack Emission Monitoring Systems (CSEMS) at all the stacks of the plant for online real time monitoring for PM, SO<sub>2</sub> and NO<sub>x</sub> and data transmission through GPRS system to SPCC RTDAS server and also upload data for use by CPCB.
47. The unit shall install online Continuous Ambient Air Quality Monitoring Systems (CAQMS) within and outside the plant premises atleast at four locations covering upwind and downwind directions at an angle of 120° each for online real time monitoring and data transmission through GPRS system to SPCC RTDAS server and also upload data for use by CPCB.
48. Ambient Air Quality shall be maintained as per National Ambient Air Quality standard prescribed for industrial and mixed use area under EIP Act 1986.
49. Waste heat recovery systems shall be provided in all units where the flue gas temperature goes exceeds 300°C.
50. The minimum stack height of the boilers, furnaces, kilns etc., shall be according to the following formula:
- $$H = 1.4 (Q)^{0.18} \text{ meters}$$
- $$1-1 = \text{Height of the stack in meter and}$$
- $$Q = \text{Quantity of SO}_2 \text{ emission in t/yr}$$
51. Air compressor and DG set should be acoustically designed and should be housed in appropriate acoustic enclosures so that the noise level outside it shall conform to the prescribed norms.



53. The height of the stack attached to the D.G. set shall be as follows:

$$H = 1 + 0.2 \sqrt{KW} \quad (\text{Where, } H = \text{Height of the building where it is installed in meter, } KW = \text{Capacity of D.G. Set and } H = \text{Height of the stack in meter above ground level})$$

54. The sinter plant shall install a Sinter Plant dust collecting Furnace to control emission so as to meet the following standards:

- (i) Sintering plant: 100 mg/Nm<sup>3</sup>
- (ii) Inducting furnace: 50 mg/Nm<sup>3</sup>

55. The sinter plant shall install dust handling system in Electro Static Precipitator (ESP) and Bag Filter. Manual cleaned system for timely collection and removal of the dust generated in air pollution control device shall be installed.

56. The unit shall provide adequate dust extraction system such as bag filter in the feed and fan exhaust unit, sintering unit and dust dedusting unit of Sinter plant so that particulate matter emission shall not exceed 50 mg/Nm<sup>3</sup>.

57. Adequate air pollution control equipments shall be installed at all sources of emissions so as to meet the prescribed norms under the Environment Protection Act, 1986 particularly with respect to Blast Furnace, Sintering plant, material handling section, coke oven, steel making shop, rolling mill etc. Depending on the environmental conditions after operation of the plant or otherwise, stricter standards than prescribed under Environment Protection Act may be imposed. As such the project proponent shall have to select the suitable pollution control equipment to achieve such limits as prescribed from time to time.

58. The prescribed emission standards for coke oven plant are as follows:

| Emission standards                                                                                                                                               |                                                                                   |                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------|
| New standards<br>(at Green field site)                                                                                                                           | Fugitive visible emission                                                         | Parameter                            |
|                                                                                                                                                                  | Leakage from cover                                                                | 5 (T.O)                              |
|                                                                                                                                                                  | Leakage from charging facilities                                                  | 4 (P.U.)                             |
|                                                                                                                                                                  | Leakage from AP covers                                                            | 4 (P.O)                              |
|                                                                                                                                                                  | Charging emission (Second Charge)                                                 | 15 (with H.P.U)                      |
| LE = Percent leaking losses, TL = Percent leaking loss, P.O = Percent leaking of losses and P.U = Aspiration through high pressure in coke oven in pressure tank |                                                                                   |                                      |
| Stack emission standards                                                                                                                                         | SO <sub>2</sub> (mg/Nm <sup>3</sup> )                                             | 200                                  |
|                                                                                                                                                                  | NO <sub>x</sub> (mg/Nm <sup>3</sup> )                                             | 200                                  |
|                                                                                                                                                                  | Particulate matter (mg/Nm <sup>3</sup> )                                          | 50                                   |
|                                                                                                                                                                  | Particulate matter during charging of sump charging balance (mg/Nm <sup>3</sup> ) | 25                                   |
|                                                                                                                                                                  | Effluent in coke oven gas used for heating (mg/Nm <sup>3</sup> )                  | 800                                  |
| Fugitive emission<br>(From dry Quenching Pit)                                                                                                                    | Any gas leakage of the battery (µgm/m <sup>3</sup> )                              | 5                                    |
|                                                                                                                                                                  | Effluent in coke oven dust (µgm/m <sup>3</sup> )                                  | 2                                    |
|                                                                                                                                                                  | Carbon Monoxide in coke oven                                                      | 5 kg/m <sup>3</sup> of coke produced |
|                                                                                                                                                                  | Particulate matter during coke pushing in coke oven                               | 5 kg/m <sup>3</sup> of coke produced |
|                                                                                                                                                                  | Particulate matter for quenching operation in coke oven                           | 4 kg/m <sup>3</sup> of coke produced |

59. The prescribed emission standards for Sintering, Blast Furnace, Steel Making Shop, Rolling mill and Laminating are as follows:

| Source                           | Pollutant                                                          | Emission Standard             |
|----------------------------------|--------------------------------------------------------------------|-------------------------------|
| Sintering plant<br>Blast Furnace | Particulate matter (mg/Nm <sup>3</sup> )                           | 150                           |
|                                  | Stack emission                                                     |                               |
|                                  | Particulate matter (mg/Nm <sup>3</sup> )                           | 30                            |
|                                  | SO <sub>2</sub> (mg/Nm <sup>3</sup> )                              | 200                           |
|                                  | NO <sub>x</sub> (mg/Nm <sup>3</sup> )                              | 150                           |
|                                  | CO (mg/Nm <sup>3</sup> )                                           | 1% maximum                    |
|                                  | Before dedusting (after stacks of BF area)                         |                               |
|                                  | Particulate matter (mg/Nm <sup>3</sup> )                           | 50                            |
|                                  | Fugitive emission                                                  |                               |
|                                  | Particulate matter size less than 10 microns (µgm/m <sup>3</sup> ) | 1000                          |
| Steel Making Shop (SKS)          | SO <sub>2</sub> (µgm/m <sup>3</sup> )                              | 150                           |
|                                  | NO <sub>x</sub> (µgm/m <sup>3</sup> )                              | 120                           |
|                                  | CO (µgm/m <sup>3</sup> )                                           | 8 hours 3000<br>1 hour 10,000 |
|                                  | Lead as Pb in fugitive dust (µgm/m <sup>3</sup> ) at exit house    | 2                             |
|                                  | Stack emission                                                     |                               |
|                                  | Particulate matter (mg/Nm <sup>3</sup> )                           | 30                            |
|                                  | Particulate matter during operation (mg/Nm <sup>3</sup> )          | Should be with gas recovery   |
|                                  | Particulate matter during normal operation (mg/Nm <sup>3</sup> )   | Should be with gas recovery   |
|                                  | Fugitive emission                                                  |                               |
|                                  | Particulate matter size less than 10 microns (µgm/m <sup>3</sup> ) | 3000                          |
| Junk bin                         | SO <sub>2</sub> (µgm/m <sup>3</sup> )                              | 150                           |
|                                  | NO <sub>x</sub> (µgm/m <sup>3</sup> )                              | 150                           |
|                                  | CO (µgm/m <sup>3</sup> )                                           | 8 hours 3000<br>1 hour 10,000 |
| Junk bin                         | Lead as Pb in fugitive dust (µgm/m <sup>3</sup> ) at exit house    | 2                             |
|                                  | Loss on standard (percentage above 40 ton per day)                 |                               |
|                                  | Particulate matter (mg/Nm <sup>3</sup> )                           | 50                            |

60. The unit shall provide dust extraction and gas cleaning facilities to extract fumes and gas cleaning system comprises of water cooled duct, gas cooler, bag house, Drier and stack in the blast furnace so that particulate matter emission shall not exceed 100 mg/Nm<sup>3</sup>.

61. The unit shall provide adequate dust extraction system such as bag filter in the stack attached to Laddle Refining furnace so that particulate matter emission shall not exceed 100 mg/Nm<sup>3</sup>.

62. Working area including the roads surrounding the plant shall be equipped or covered & water sprinkling system shall be installed to suppress the fugitive dust emission.

63. Both dust suppression (dry fog) and extractor (bag filter) system shall be provided at all dust generating source such as mixing, screening & material transfer points etc. to control fugitive emission.



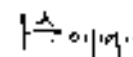
64. Cement from the cement grinding section shall be transported to the storage silo through air slides and bucket elevator and every slide, belt or elevator type unit is connected to the dust extraction system.
65. The unit shall adopt adequate safety measures such as exposure to high temperature surfaces, exposure to CO emissions, and prevention (and control) of explosions and fires.
66. The unit shall accept technology for zero gas generation as proposed. Gas (or generated if any from producer gas plant) shall be stored in an impervious pit and disposed off through authorized operators.
67. Leakage proof doors shall be provided to control fugitive dust emission during the operation of cement plant.
68. Air pollution control devices shall be maintained properly. Fabric bags and cages in bag house shall be checked regularly and repaired or replaced as required. Adequate availability of spares shall be ensured for immediate replacement.
69. Bagging plant shall be equipped with induction furnace for lime extraction and stack washer followed by bag filter shall be installed as air pollution control measure at the stack exit from the induction furnace.
70. Stack washer followed by bag filter shall be installed as air pollution control measure at the stack exit from the Induction Furnace.
71. All Pollution Control equipment may be provided with separate electric motor and fan for continuous recording of power consumption. The amperage of the fan may also be recorded continuously. Non-functioning of Pollution Control equipment should be recorded in the same logbook along with reasons for not running the Pollution Control Equipment.
72. The unit shall provide pathway and platform at suitable location with safe approach to construction work under taking at the stacks.
73. Desulfurization of flue gas from different sources (any) when used by the unit shall be adopted by the industry. Therefore adequate space shall be earmarked at the site for storage for establishment of desulfurization plant (frequency in future).

#### D. SOLID & HAZARDOUS WASTE:

74. Ash generated from the Bag Air Cook (BAG) and (BAG) shall be used in the Cement Unit.
75. The proposed and available Wastebed Waste Converter having polystyrene method and other similar method for processing of Municipal Solid Waste generated from the unit, under covered shed to produce valuable products (e.g. oil, water, gas, coal oil, mud, glass etc.).
76. The iron ore fines, lime, coke, return fines and gas waste shall be used in manufacture of cement. BIF slag shall be used in road making. BIF slag shall not be dumped anywhere except used for making cement and road etc. Manganese shall be reused in the steel plant. Other best firm as per available local norms shall be used properly as per the local norms for generation of steam and pumping of water shall be minimized.
77. Raw materials and products shall be stored in covered sheds and adequate dust suppression measures shall be taken to control fugitive emissions from handling of raw materials and products.

78. The Kih accretions are heavy soft lumps and can be used as sub-base material for road construction or landfill after ascertaining the composition for its suitability and ensuring that it should not have any adverse environmental impact. The industry can explore other reuse & recycling techniques for Kih Accretions.
79. Maximum recovery of iron ore fines/micro fines need to be encouraged by adoption of hydro cyclones, slow speed classifiers in the wet beneficiation circuit in order to increase the float tailing dam.
80. Fine dust is generated from air pollution control system installed with kiln, secondary flue dust generated from air pollution control equipment installed with Raw Material Handling, Coal Crusher, Cooler Discharge and Product house unit shall be reused/ recycled to the maximum possible extent.
81. The solid waste generated as BIF sludge and from other sources shall be suitably disposed off without causing any public nuisance or environmental contamination.
82. Detailed long term planning for at least 20 years for solid waste disposal including SH, SME slag shall be submitted to the Board within 5 months from the date of issue of this order. While management of complete utilization of BF slag shall be made, various options of utilization of SME slag shall be explored to develop a fine action plan for its disposal.
83. A Solid waste management Cell shall be created under Environmental management cell and complete utilization of all solid waste shall be envisaged and implemented in a sustained manner. All the available research and development options shall be explored in this regard. The exact utilization of solid waste shall be finalized in consultation with the State Pollution Control Board.
84. The industry shall submit a definite ash utilization plan to the Board. In case it is proposed to be used in cement plant, they should enter into an agreement with the cement plants. A copy of the agreement shall be submitted to the Board. Ash generated shall be used in a phased manner as per provisions of the notification on fly ash utilization issued by the Ministry of Environment and Forest Govt. of India in 03.11.2009.
85. The industry should obtain authorization for management of Hazardous Waste as per provisions of Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016 as amended from time to time.
86. Municipal solid waste generated from the unit shall be disposed off as per the Solid Waste Management Rules, 2016 and amendment thereafter.

Ends: Approved Layout Map and Annexure - I & II

  
MEMBER SECRETARY

To:  
The Joint Vice President,  
Dherukana Steel Plant of  
M/s Rungta Mines Limited,  
Kunjam By Pass,  
A/Po - Koran, Tehsil - Hindol,  
District - Dhamkani, Odisha.



The Environment (Protection) Rules, 1986

THE GAZETTE OF INDIA : EXTRAORDINARY

[Part II—Sec. 3(1)]

| (1) | (2)                               | (3)       | (4)  | (5)  | (6)                                                                                                             |
|-----|-----------------------------------|-----------|------|------|-----------------------------------------------------------------------------------------------------------------|
| 5   | Ozone ( $O_3$ )<br>$\mu g/m^3$    | 1 hour**  | 100  | 100  | - UV photometer<br>- Chemical methods<br>- Chemical methods                                                     |
| 6   | Lead (Pb)<br>$\mu g/m^3$          | Annual*   | 0.50 | 0.50 | - AAS/ICP method after<br>sampling on EPA 2000<br>or equivalent filter paper<br>- ED-XRF using Teflon<br>filter |
| 7   | Carbon<br>Monoxide (CO)<br>$ppm$  | 8 hours** | 0.5  | 0.5  | - Non-Dispersive Infra<br>Red (NDIR)<br>spectrometry                                                            |
| 8   | Arsenic (As)<br>$\mu g/m^3$       | Annual*   | 0.05 | 0.05 | - Cold vapour method<br>- Inductively coupled<br>plasma atomic<br>fluorescence                                  |
| 9   | Mercury ( $Hg$ )<br>$\mu g/m^3$   | Annual*   | 0.05 | 0.05 | - Cold vapour method<br>- Cold vapour<br>oxidation<br>- Cold vapour<br>oxidation<br>- Cold vapour<br>oxidation  |
| 10  | Benzene (Benzene)<br>$\mu g/m^3$  | Annual*   | 0.1  | 0.1  | - Cold vapour method<br>- Cold vapour<br>oxidation<br>- Cold vapour<br>oxidation                                |
| 11  | Arsenic (As)<br>$\mu g/m^3$       | Annual*   | 0.05 | 0.05 | - Cold vapour method after<br>sampling on EPA 2000<br>or equivalent filter paper                                |
| 12  | Nitrate ( $NO_3$ )<br>$\mu g/m^3$ | Annual*   | 20   | 20   | - AAS/ICP method after<br>sampling on EPA 2000<br>or equivalent filter paper                                    |

\* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

\*\* 24 hourly or 01 hourly or 01 hourly monitored values, as applicable, shall be compared with 95% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note.— Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason for multiple regular or continuous monitoring and further investigation.

[F No. Q 1501/9802/2014-CPW]

RATNEESH DUTTA, J. Secy.

Note.— The principal rules were published in the Gazette of India, Extraordinary vide number S.O. 844(E), dated the 19th November, 1986; and subsequently amended vide numbers S.O. 433(E), dated the 18th April, 1987; G.S.R. 176(E), dated the 2nd April, 1996; and were recently amended vide number G.S.R. 97(E), dated the 10th February, 2009; G.S.R. 149(E), dated the 4th March, 2009; G.S.R. 112(E), dated the 9th July, 2009; G.S.R. 543(E), dated the 22nd July, 2009; G.S.R. 393(E), dated the 24th August, 2009, and G.S.R. 794(E), dated the 4th November, 2009.

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and Published by the Controller of Publications, Delhi-110024.

## [SCHEDULE III]

(See rule 3)

## AMBIENT AIR QUALITY STANDARDS IN RESPECT OF NOISE

| Area Code | Category of Area | Limits in dB(A) Leq. |            |
|-----------|------------------|----------------------|------------|
|           |                  | Day Time             | Night Time |
| (A)       | Industrial area  | 75                   | 70         |
| (B)       | Commercial area  | 65                   | 55         |
| (C)       | Residential area | 55                   | 45         |
| (D)       | Silence Zone     | 50                   | 40         |

## Note

1. Day time is reckoned in between 6 a.m. and 9 p.m.
2. Night time is reckoned in between 9 p.m. and 6 a.m.
3. Silence zone is defined as areas upto 100 meters around such premises as hospitals, educational institutions and courts. The Silence Zones are to be declared by the Competent Authority.
4. Mixed categories of areas should be declared as one of the four above mentioned categories by the Competent Authority and the corresponding standards shall apply.



CGM/SLNA/RML – 225 / 20

Date: 02.07.2020

To

The Chief General Manager (Land)

IDCO, Janpath

Bhubaneswar

Sub: Allotment of land in favour of M/s Rungta Mines Ltd for expansion to 2.85 MTPA Integrated Steel Plant at Jharbandh, Dist - Dhenkanal  
Sir,

In inviting reference to the above subject, I am directed to inform you that the High Level Clearance Authority (HLCA) in its 23rd meeting held on 20.04.2020 had approved "In principle" the proposal of M/s. Rungta Mines Ltd for expansion to 2.85 MTPA Integrated Steel Plant at Jharbandh, Dist – Dhenkanal with an investment of Rs. 7836.90 crore.

The total land requirement for the project was assessed by the Sub- Committee of SLFC as Ac.1769.00 including earlier land allotment of Ac.608.495 by IDCO. The above assessment includes Iron Ore Beneficiation, Pelletisation and Cement Plant apart from the facilities of Integrated Steel Plant. The company had requested for total land of Ac. 2069.00 for the entire plant. The 184<sup>th</sup> SLFC held on 26.06.2020 accepted the Sub-Committee recommendation of additional land requirement for 1160.505 acres for 2.85 MTPA Steel Plant including Beneficiation, Pelletisation and Cement Plant.

In view of the above, It is now recommended for allotment of Ac. 1160.505 of land in addition to the earlier allotment of Ac. 608.495 in favour of M/s Rungta Mines Ltd for expansion of its Integrated Steel Plant to 2.85 MTPA capacity at Jharbandh, Dist – Dhenkanal.

All the required documents for processing the above proposal are available in the GO-SWIFT portal. However the company may be asked to submit any additional documents if the same are not available in the GO-SWIFT site but essentially

**Industrial Promotion & Investment Corporation of Odisha Limited (IPICOL)**

(A Government of Odisha Undertaking)

IPICOL House, Janpath, Bhubaneswar-751022, Odisha, India

☎ +91-674-2542601-03, 254605-06 ☎ +91-674-2543766

✉ cmr.d@investodisha.org, info@investodisha.org, 🌐 www.investodisha.org

CIN: U65993OR1973SGC000585, Toll Free No.: 18003457111



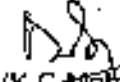
**ODISHA**  
NEW OPPORTUNITIES

required for IDCO. The recommendation is subject to the following special terms and conditions in addition to the conditions of IDCO.

1. The company will clear arrear dues if any, of any Government Department before allotment of land for the project.
2. If construction work is not started within nine months from the date of possession, the lease shall be deemed to have been cancelled at the end of nine months period by IDCO. Further, if the land or any part of it is not utilized fully for the purpose for which it is sanctioned within two years, the same shall be reverted to Govt / IDCO free from all encumbrances.
3. The acquisition / alienation / allotment of land should be made as per relevant Act / rules of Government.
4. The company has to obtain all statutory clearances/approvals for the 32G2B services under the GO-SWIFT portal as mentioned in the HLCA approval letter dated 04.05.2020.
5. The company should strictly adhere to the terms and conditions as laid down in the HLCA approval letter dated 04.05.2020.

Thanking you.

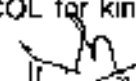
Yours faithfully

  
(K. C. Mohapatra)  
CGM (SLNA)

Memo No. 1889<sup>(2)</sup> dt. 02.07.2020

Copy forwarded to

- I) The Director, M/s Rungta Mines Ltd, Rungta House, Chaibasa - 833201, Jharkhand for information with a request to provide required details to IDCO immediately for facilitating the allotment of land for the project. Action taken in the matter may please be intimated to IPICOL immediately.
- II) The Land Officer (IDCO) & Member (SLFC), IPICOL for kind information and necessary action.

  
CGM (SLNA)

**Industrial Promotion & Investment Corporation of Odisha Limited (IPICOL)**

(A Government of Odisha Undertaking)

IPICOL House, Janpath, Bhubaneswar-751022, Odisha, India

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✉ cmd@investodisha.org, info@investodisha.org, www.investodisha.org

CIN: U65993OR1973SGC000585, Toll Free No.: 18003457111



# Rungta Mines Limited

MAIN ROAD, BARBIL - 758 035, DIST. - KENDUJHAR, ODISHA, INDIA

Telefax : 06767 - 276651. E-mail : bbloffice@rungtamines.com

## CORPORATE ENVIRONMENTAL POLICY

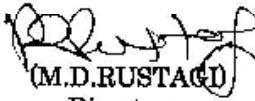
The Board of Directors of the Company in their meeting held on 10.12.2018 deliberated on the agenda regarding Corporate Environmental Policy of Dhenkanal Steel Plant of the Company in Odisha and passed the resolution that M/s Rungta Mines Limited shall strive to ensure that all aspects of the business could have the least harmful effect on the Environment by implementing an effective Environmental Management System to:

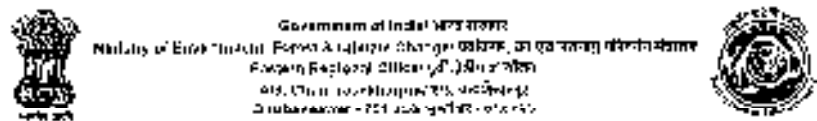
- Have full awareness of all Environmental and Factory legislation in India and to ensure that regulatory requirements are duly met with including the conditions/ stipulations/ norms of Environment Clearance.
- Monitor the implementation of the Policy by carrying our periodic audit of compliance with full reporting to the Board of Directors and to suggest necessary remedial measures, if required, thereto.
- Ensure that all Employees in the course of their duties act in accordance with the Environmental Policy. To encourage supplies, Contractors and vendors to act in accordance with Company's Environmental Standards.
- Maintain transparency in matters of Environmental compliance.
- Selections of non polluting technology, waste minimization, reuse/recycling and the reduction of energy consumption will be particular areas of attention of the business man.
- The Company will also make a positive environmental contribution in the local community by encouraging open communication, general Environmental awareness and the promotion of CSR activities.

Place: BARBIL

Dated:10.12.2018

For Rungta Mines Limited

  
(M.D. RUSTAGI)  
Director  
(DIN - 01219014)



संख्या: J01-1059/19/UPP/11/2020

प्रति: श्री. अ. अ. अ.

दिनांक: 11.06.2020

श्री. अ. अ. अ.

श्री. अ. अ. अ.

निदेशक, उद्योग-1,

पर्यावरण, वन और जलवायु परिवर्तन विभाग,

प्रदेशीय पर्यावरण भवन, लखनऊ-226 002.

उपस्थित: श्री. अ. अ. अ. (11.06.2020)

ई-मेल: [director.moef@moef.gov.in](mailto:director.moef@moef.gov.in), [regionaloffice@moef.gov.in](mailto:regionaloffice@moef.gov.in),  
[regionaloffice@moef.gov.in](mailto:regionaloffice@moef.gov.in)विषय: संयुक्त उद्योग, एनएस सीएस माइंस लिमिटेड, एनएस सीएस, चण्डीबासा, पॉइन्ट  
नं. 1 के संबंध में।आ.प्र. संख्या: J 11011/309/2018-1A 500 दिनांक 11.06.2019 and  
13.01.2020.

महोदय,

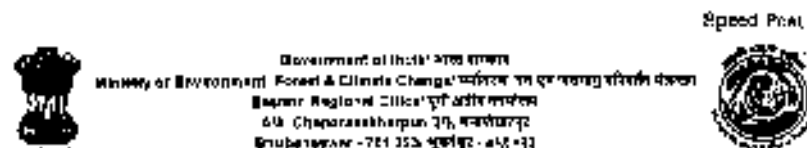
मुझे यह ज्ञात करने का निर्देश हुआ है कि इस संबंध में आप दिनांक  
24.05.2020 को उपरोक्त परियोजना की निरीक्षण की गई। इस संदर्भ में अनुपालन वन  
की परामर्श वन आर के आवश्यक सारांश हेतु संलग्न है।

संलग्नक: उपरोक्त

भवदीय

(श्री. सुनील कुमार पट्टनायक)  
निदेशक-सीपरिशिष्ट: संयुक्त उद्योग, एनएस सीएस माइंस लिमिटेड, एनएस सीएस, चण्डीबासा, पॉइन्ट  
नं. 1, झारखंड - 833201. ई-मेल: [regionaloffice@moef.gov.in](mailto:regionaloffice@moef.gov.in),  
[regionaloffice@moef.gov.in](mailto:regionaloffice@moef.gov.in) इस तरह की जानकारी के लिए और आवश्यक कार्रवाई के लिए।

निदेशक-सी



File No. 101-1059/19/UPP/11/2020

Date: 11.06.2020

To:

Shri Arvind K. Agarwal

Director, Industry-I,

Ministry of Environment, Forest and Climate Change,

Indira Baryasana Bazar, Joribagh Road, Aligarh,

New Delhi - 110 003

E-mail: [arvind-agarwal@moef.gov.in](mailto:arvind-agarwal@moef.gov.in), [sundar2003@gmail.com](mailto:sundar2003@gmail.com),  
[sundar2003@gmail.com](mailto:sundar2003@gmail.com)Sub: Issue of Certified Compliance Report in respect of Integrated Steel  
Plant (2.85 MTPA Steel) of M/s Rungta Mines Limited located at  
Villages Charsandh, Balpura and Terkabura, District Chhikara,  
Odisha-751 002.Re: Ministry's Environmental Clearance Letter No. J 11011/309/2018-1A  
500 dated 11.06.2019 and dated 13.04.2020 (surrounding).

Sir,

I am directed to draw your kind attention to the subject and  
reference letter cited above and to state that the above project has been  
monitored by Shri Sunil Kumar Pattanayak, Deputy Divisional Officer of Forests  
(Central) and Dr. Sunil Kumar Pattanayak, Scientist-C on 24.05.2020 for  
issue of Certified Compliance Report. Based on the observations made while  
monitoring of project, the detailed Certified Compliance Report has been  
prepared and enclosed for kind information and further needful action.

Yours faithfully,

Encl. as above

(श्री. सुनील कुमार पट्टनायक)  
(Dr. Sunil Kumar Pattanayak)  
वैज्ञानिक-सी / Scientist-CCopy to: Joint Vice President, M/s. Rungta Mines Limited, Rungta House,  
Chandrasekhar, West Singhbhum, Jharkhand - 833201. E-mail:  
[regionaloffice@moef.gov.in](mailto:regionaloffice@moef.gov.in), [regionaloffice@moef.gov.in](mailto:regionaloffice@moef.gov.in) for kind information  
and further necessary action.

वैज्ञानिक-सी / Scientist-C





Government of India भारत सरकार  
Ministry of Environment, Forest and Climate Change/पर्यावरण, वन एवं जलवायु संरक्षण विभाग  
Kolkata Regional Office/कोलकाता क्षेत्रीय कार्यालय  
40, Strand Road/कोलकाता-700015  
Chhatrapati - TSI 833/कोलकाता-800043



Website: <http://www.mefcc.gov.in>, 2001/201, 2002/202, 2003/203, 2004/204, 2005/205, 2006/206, 2007/207, 2008/208, 2009/209, 2010/210, 2011/211, 2012/212, 2013/213, 2014/214, 2015/215, 2016/216, 2017/217, 2018/218, 2019/219, 2020/220, 2021/221, 2022/222, 2023/223, 2024/224, 2025/225, 2026/226, 2027/227, 2028/228, 2029/229, 2030/230, 2031/231, 2032/232, 2033/233, 2034/234, 2035/235, 2036/236, 2037/237, 2038/238, 2039/239, 2040/240, 2041/241, 2042/242, 2043/243, 2044/244, 2045/245, 2046/246, 2047/247, 2048/248, 2049/249, 2050/250, 2051/251, 2052/252, 2053/253, 2054/254, 2055/255, 2056/256, 2057/257, 2058/258, 2059/259, 2060/260, 2061/261, 2062/262, 2063/263, 2064/264, 2065/265, 2066/266, 2067/267, 2068/268, 2069/269, 2070/270, 2071/271, 2072/272, 2073/273, 2074/274, 2075/275, 2076/276, 2077/277, 2078/278, 2079/279, 2080/280, 2081/281, 2082/282, 2083/283, 2084/284, 2085/285, 2086/286, 2087/287, 2088/288, 2089/289, 2090/290, 2091/291, 2092/292, 2093/293, 2094/294, 2095/295, 2096/296, 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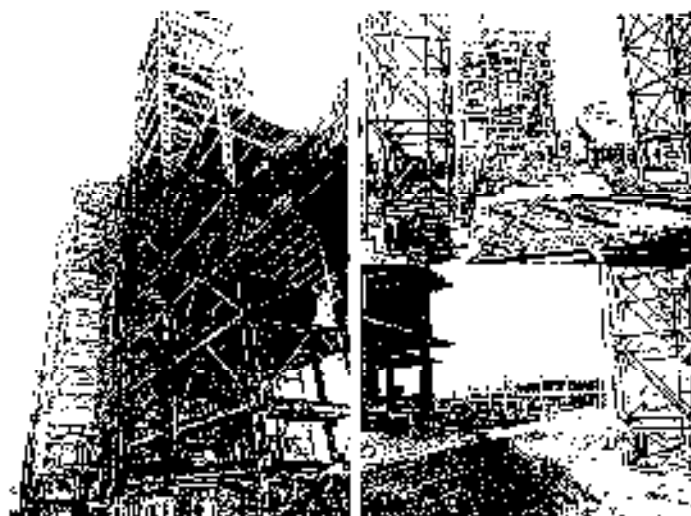
- Acquired Ghat road 75.000 mms through IDDO, Odisha
- Balance land is under acquisition

### III. Present Construction Status:

- As per the discussions held during monitoring and information provided by PAs, the present construction status of the components are as follows.

| Sl. | Part of a                              | Construction | Production         |
|-----|----------------------------------------|--------------|--------------------|
| 1   | Storage location                       | 2 x 300 TPI  | Under construction |
| 2   | Food Milling Shop (Industrial Furnace) | 4 x 20 TPI   | Under construction |
| 3   | Co-fired power plant                   |              | Under construction |
|     | WHRU                                   | 25 MW        |                    |
|     | APRC/AFRC                              | 25 MW        |                    |

Photographs regarding construction are as follows.



Dr. Jyoti Prakash Mishra  
 Director, Odisha Sahitya Akademi  
 Odisha Sahitya Akademi  
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 Odisha Sahitya Akademi



### IV. Green Belt Development

- As per the discussions held during monitoring and information provided by PAs, it has been stated that around 75,000 saplings were planted for the year 2019-20. The photograph of the sapling under green belt development is as follows:



- It has been observed that, PAs have planted fruit bearing plants in the project premises. It is required to follow CPCB guidelines for selection of species in green belt development programme.

### V. Rainwater harvesting system

- It has been observed that the PAs are in process of developing rainwater harvesting system at North-West side of the project area.

Dr. Jyoti Prakash Mishra  
 Director, Odisha Sahitya Akademi  
 Odisha Sahitya Akademi  
 Odisha Sahitya Akademi  
 Odisha Sahitya Akademi

within the prescribed limits

- It is recommended that all environmental parameters to be monitored at least once in two months by ISO/IEC 17025 accredited laboratory and the monitoring reports to be submitted along with six months compliance reports on regular basis.



- It is required to install Continuous Ambient Air Quality monitoring for common/criterion parameters relevant to the main pollutants released (e.g.  $PM_{10}$  and  $PM_{2.5}$  in reference to PM emission), and  $SO_2$  and  $NO_x$  in reference to  $SO_2$  and  $NO_x$  emissions) within and outside the plant area at least at four locations (one within and three outside the plant area at an angle of  $120^\circ$  each), covering upwind and downwind directions.

VIII: CER & CSR:

- PAs have formulated Corporate Environment Policy and has been approved by the Board of Directors vide agenda item no. 6 in Minutes of Meeting / resolution dated 10.12.2018.

- As per the information provided, an amount of Rs. 1,96,94,565/- was incurred under CSR activities for the period of October, 2019 to March, 2020 and the details are as follows:

| Sr.No. | Activity                                            | Amount      |
|--------|-----------------------------------------------------|-------------|
| 01     | Drinking water/Health/Boatlifting Agency            | 17,70,953   |
| 02     | Education, vocational training, livelihood projects | 14,64,552   |
| 03     | Environment/Ecoogy/CRM                              | 00          |
| 04     | Culture & Tradition/Heritages                       | 4,24,250    |
| 05     | Contribution to PMDRF & Welfare of SC, ST, EBC etc. | 00          |
| 06     | <u>Rural Development Projects</u>                   | 1,59,50,428 |
|        | <u>Total</u>                                        | 1,36,94,883 |

| Parameter                                      | Atankhola Village | Chakrabarti Village | Kudajala Village | Tarkhorha Village |
|------------------------------------------------|-------------------|---------------------|------------------|-------------------|
| PM <sub>10</sub> ( $\mu\text{g}/\text{m}^3$ )  | 70.9              | 49.8                | 53.2             | 56.2              |
| PM <sub>2.5</sub> ( $\mu\text{g}/\text{m}^3$ ) | 39.6              | 24.8                | 29.2             | 41.7              |
| SO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )   | 9.3               | 8.5                 | 7                | 8.5               |
| NO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )   | 11.8              | 10.6                | 10.2             | 12.6              |
| CO ( $\text{mg}/\text{m}^3$ )                  | 0.21              | 0.11                | 0.13             | 0.15              |
| O <sub>3</sub> ( $\mu\text{g}/\text{m}^3$ )    | BDL               | BDL                 | BDL              | BDL               |
| NH <sub>3</sub> ( $\mu\text{g}/\text{m}^3$ )   | BDL               | BDL                 | BDL              | BDL               |
| BaP ( $\text{ng}/\text{m}^3$ )                 | N.D               | N.D                 | N.D              | N.D               |
| CaH <sub>6</sub> ( $\mu\text{g}/\text{m}^3$ )  | N.D               | N.D                 | N.D              | N.D               |
| Pb ( $\mu\text{g}/\text{m}^3$ )                | BDL               | BDL                 | BDL              | BDL               |
| As ( $\text{ng}/\text{m}^3$ )                  | BDL               | BDL                 | BDL              | BDL               |
| N <sub>2</sub> ( $\text{ng}/\text{m}^3$ )      | BDL               | BDL                 | BDL              | BDL               |

- It is required to implement the Corporate Environment Responsibility (CER) and Corporate Social Responsibility (CSR) as per activities and time line mentioned in the Environmental Clearances. It requires immediate action.

LE: Other

- It is required to prepare GHG emissions inventory for the plant and shall submit the programme for reduction of the same including carbon sequestration including plantation. It involves

- It has been observed that the Water parameters and Noise levels are

31/08/2019 11:09:2019-14 07/09/2019 11:09:2019 and 11/09/2019 (arrangement) Page 5 of 9

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Dr. SUBASH BABU PANGNIA ET AL

2019 年 12 月 31 日

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डा. राजेंद्र कुमार/राष्ट्रीय आपदाओं के  
प्रमाणित प्रशिक्षण, 15/02/21

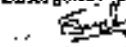
immediate action.

- It is required to submit the copies of Emergency preparedness plan, Hazard identification and Risk Assessment (HIRA) report and Disaster Management Plan to Regional Office, Bhubaneswar.
- It is required to implement the issues raised during Public Hearing as per activities and time line mentioned in the Environmental Clearance. It requires immediate action.
- It is required to display the emission levels of pollutants at a convenient location for disclosure to the public and put on the website of the company. It is required immediate action.
- It is required to provide all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, creche etc. to the construction laborers.
- It has been observed that the details regarding grant of RI was published in two newspapers viz., Samaksha (English), Samaksha (Odia) dated 15.06.2019.

#### 10. Observations:

The PAs have complied or are in process of complying the conditions stipulated by the Ministry. In this context, information/action plans have been sought on following points.

1. It has been observed that PAs have planted tree bearing plants in the project premises. It is required to follow CPCB guidelines for selection of species in green belt development programme.
2. It is recommended that all environmental parameters to be monitored at least once in two months by MoEFCC/NABL accredited laboratory and the monitoring reports to be submitted along with six monthly compliance reports on regular basis.
3. It is required to install Continuous Ambient Air Quality monitoring for common/criterion parameters relevant to the main pollutants released (e.g. PM<sub>10</sub> and PM<sub>2.5</sub> in reference to PM emission, and SO<sub>x</sub> and NO<sub>x</sub> in reference to SO<sub>2</sub> and NO<sub>x</sub> emissions) within and outside the plant area at least at four locations (one within and three outside the plant area at an angle of 120° each), covering upwind and downwind directions.
4. It is required to implement the Corporate Environment Responsibility (CER) and Corporate Social Responsibility (CSR) as per activities and time line mentioned in the Environmental Clearance. It requires immediate action.
5. It is required to prepare GHG emissions inventory for the plant and shall submit the programme for reduction of the same including carbon sequestration including plantation. It requires immediate action.
6. It is required to submit the copies of Emergency preparedness plan, Hazard

  
(Dr. Suresh Babu Paragumleti)  
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Scientist - C / Scientist - C  
Ministry of Environment, Forest and Climate Change  
Government of India  
New Delhi, India

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Identification and Risk Assessment (HIRA) report and Disaster Management Plan to Regional Office, Bhubaneswar.

7. It is required to implement the issues raised during Public Hearing as per activities and time line mentioned in the Environmental Clearance. It requires immediate action.
8. It is required to display the emission levels of pollutants at a convenient location for disclosure to the public and put on the website of the company. It is required immediate action.
9. It is required to provide all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, creche etc. to the construction laborers.

#### 11. Recommendations:

This project can be put up as the following tick-marked category of compliance status.

- Compliance status could not be judged as the project was shut down / not in operational during the site visit.
- No non-compliances detected. No any further action is required.
- ✓ **Minor non-compliances detected (not of immediate danger to health & safety of the people). Letter issued to project authorities for taking corrective measures.**
- Serious non-compliances detected. Requested that the Ministry may appraise the issue of coal separator.

  
(Dr. Suresh Babu Paragumleti)  
Scientist - C / Scientist - C  
Ministry of Environment, Forest and Climate Change  
Government of India  
New Delhi, India

(Dr. Suresh Babu Paragumleti)  
Dr. SURESH BABU PARAGUMLETI  
Scientist - C / Scientist - C  
Ministry of Environment, Forest and Climate Change  
Government of India  
New Delhi, India

J-11031/309/2018-IA III dated 11.09.2019 and dated 13.04.2020 (amendment) Page 8 of 8



## ANNEXURE : XXVII

### TEST REPORT

| NAME AND ADDRESS OF CUSTOMER                                                                                                                                                                        | SAMPLE PARTICULARS                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Rungta Mines Ltd.,<br>Dhenkanal Steel Plant<br>Village : Jharbandh<br>PO.- Nimbhali, Via- Meramandali<br>Dist. – Dhenkanal – 759121<br><br>Contact Person : Mr. G.P. Sharma<br>Phone : 06582-255261 | Type of Sample : Soil                                             |
|                                                                                                                                                                                                     | Work Order No. : RML/DSP/EMP/19-20/502(A)                         |
|                                                                                                                                                                                                     | Sampling Location : In and near Dhenkanal Steel Plant, Jharkhand. |
|                                                                                                                                                                                                     | Sampling Procedure : IS 2720 (Part -1)                            |
|                                                                                                                                                                                                     | Sample Volume/ Quantity : 1.2 Kg                                  |
|                                                                                                                                                                                                     | Sampling Team : MMRDL (Mahesh Dutt)                               |
|                                                                                                                                                                                                     | Sample Reg. No. : MMS/05-19/2.1-2.9                               |
|                                                                                                                                                                                                     | Date of Monitoring : 29/05/2019                                   |
|                                                                                                                                                                                                     | Date of Receipt : 30/05/2019                                      |
|                                                                                                                                                                                                     | Date of Testing : 30/05/2019 to 10/06/2019                        |
|                                                                                                                                                                                                     | Date of Report : 12/06/2019                                       |
|                                                                                                                                                                                                     | Test Report No. : MMS/06-19/10                                    |
|                                                                                                                                                                                                     | ULR No. : TC633719000000090P                                      |
|                                                                                                                                                                                                     | Page : 1 of 2                                                     |

| Parameters                                            | Protocol                    | Proposed Core Zone  | Kadala Village      | Beruanpal Village   | Jharbandh Village   | Benipathar Village  |
|-------------------------------------------------------|-----------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Textural Classification <sup>#</sup>                  | IS 1498:1970                | Medium grained sand | Medium grained sand | Medium grained sand | Medium grained sand | Medium grained sand |
| Grain size analysis <sup>#</sup>                      | IS 2720 (P 4)               | % retain % finer    | % retain % finer    | % retain % finer    | % retain % finer    | % retain % finer    |
| 2.0 mm                                                |                             | 10.2 89.8           | 12.03 87.97         | 26.8 26.8           | 12.99 87.01         | 16.19 83.81         |
| 425 µm                                                |                             | 49.23 40.57         | 42.47 45.5          | 41.18 67.98         | 49.36 37.65         | 48.62 35.19         |
| 75 µm                                                 |                             | 31.36 9.21          | 35.17 10.33         | 24.56 92.54         | 26.64 11.01         | 25.93 9.26          |
| <75 µm                                                |                             | 9.21 -              | 10.33 -             | 7.46 -              | 11.01 -             | 9.26 -              |
| Colour <sup>#</sup>                                   | -                           | Brown               | Blackish            | Blackish            | Brown               | Blackish            |
| pH                                                    | IS 2720 (P26)               | 6.6                 | 7.8                 | 7.3                 | 7.8                 | 7.5                 |
| E.C. (mS/cm)                                          | IS 14767:2000               | 0.07                | 0.507               | 0.1575              | 0.1234              | 0.22                |
| CaCO <sub>3</sub> (%by mass)                          | IS 2720 (P23)               | 2.5                 | 4.0                 | 3.5                 | 4.5                 | 2.0                 |
| Specific Gravity                                      | IS : 2720 (P 3/Sec 1) -1980 | 2.45                | 2.40                | 2.18                | 2.40                | 2.09                |
| Moisture (%by mass)                                   | IS 2720 (P 2)               | 22.217              | 16.722              | 25.668              | 22.236              | 14.609              |
| Organic Carbon (%by mass) <sup>#</sup>                | Method no. 9*               | 0.33                | 0.66                | 0.63                | 0.08                | 0.66                |
| Organic Matter (%by mass) <sup>#</sup>                | Method no. 9*               | 0.74                | 1.48                | 1.42                | 0.19                | 1.48                |
| Phosphorous (mg/kg) <sup>#</sup>                      | Method no. 13*              | 0.31                | 4.17                | 0.04                | 0.08                | 0.11                |
| Nitrate-Nitrogen (mg/kg) <sup>#</sup>                 | Method no. 12*              | 0.58                | 67.18               | 0.77                | 0.39                | 0.39                |
| Sodium (Kg/ha)                                        | Method no. 14*              | 69.44               | 339.36              | 87.36               | 88.48               | 164.64              |
| Potassium (Kg/ha)                                     | Method no. 14*              | 157.0               | 953.0               | 213.0               | 82.0                | 351.0               |
| Calcium <sup>2+</sup> me/100 gram Soil <sup>#</sup>   | Method no. 16.a*            | 13.8                | 13.9                | 29.6                | 18.2                | 14.5                |
| Magnesium <sup>2+</sup> me/100 gram Soil <sup>#</sup> | Method no. 16.b*            | 4.4                 | 2.7                 | 1.7                 | 5.1                 | 1.2                 |

#### NOTES:

- ♦ The results indicated only refer to the tested samples and listed parameters and do not endorse any product
- ♦ Total liability of the laboratory is limited to the invoice amount
- ♦ This certificate shall not be reproduced wholly or in part without prior written consent of the laboratory
- ♦ Unused balance of samples received shall be destroyed after one month from the date of issue of test report, unless other wise specified
- ♦ This report shall not be used in any advertising media or as evidence in the court of law without prior written consent of the laboratory
- ♦ Complaint register is available with the laboratory, in case required



Test Report No. : MMS/06-19/10  
Page : 2 of 2

## ANNEXURE : XXVII Contd..

| Parameters                                            | Protocol                    | Proposed Expansion Area North Side (Core zone) |         | Existing Plant area (core zone) |         | Proposed Water reservoir Area |         | Proposed Staff Colony Area |         |
|-------------------------------------------------------|-----------------------------|------------------------------------------------|---------|---------------------------------|---------|-------------------------------|---------|----------------------------|---------|
| Textural Classification <sup>#</sup>                  | IS 1498:1970                | Medium grained sand                            |         | Medium grained sand             |         | Medium grained sand           |         | Medium grained sand        |         |
| Grain size analysis <sup>#</sup>                      | IS 2720 (P 4)               | % retain                                       | % finer | % retain                        | % finer | % retain                      | % finer | % retain                   | % finer |
| 2.0 mm                                                |                             | 12.21                                          | 87.79   | 14.03                           | 85.97   | 18.26                         | 81.74   | 11.08                      | 88.92   |
| 425 µm                                                |                             | 53.23                                          | 34.56   | 42.71                           | 43.26   | 56.42                         | 25.32   | 43.13                      | 45.79   |
| 75 µm                                                 |                             | 25.33                                          | 9.23    | 37.06                           | 6.2     | 18.2                          | 7.12    | 36.25                      | 9.54    |
| <75 µm                                                |                             | 9.23                                           | -       | 6.2                             | -       | 7.12                          | -       | 9.54                       | -       |
| Colour <sup>#</sup>                                   | -                           | Brown                                          |         | Brown                           |         | Blackish                      |         | Brown                      |         |
| pH                                                    | IS 2720 (P26)               | 6.9                                            |         | 6.8                             |         | 7.1                           |         | 7.3                        |         |
| E.C. (mS/cm)                                          | IS 14767:2000               | 0.0811                                         |         | 0.0642                          |         | 0.1108                        |         | 0.1119                     |         |
| CaCO <sub>3</sub> (%by mass)                          | IS 2720 (P23)               | 2.0                                            |         | 1.5                             |         | 2.5                           |         | 2.0                        |         |
| Specific Gravity                                      | IS : 2720 (P 3/Sec 1) -1980 | 2.29                                           |         | 2.34                            |         | 2.24                          |         | 2.35                       |         |
| Moisture (%by mass)                                   | IS 2720 (P 2)               | 22.096                                         |         | 16.708                          |         | 22.047                        |         | 15.936                     |         |
| Organic Carbon (%by mass) <sup>#</sup>                | Method no. 9*               | 0.36                                           |         | 0.44                            |         | 0.33                          |         | 0.39                       |         |
| Organic Matter (%by mass) <sup>#</sup>                | Method no. 9*               | 0.80                                           |         | 0.99                            |         | 0.74                          |         | 0.86                       |         |
| Phosphorous (mg/kg) <sup>#</sup>                      | Method no. 13*              | 0.34                                           |         | 0.15                            |         | 0.19                          |         | 0.31                       |         |
| Nitrate-Nitrogen (mg/kg) <sup>#</sup>                 | Method no. 12*              | 0.58                                           |         | 0.77                            |         | 0.39                          |         | 0.58                       |         |
| Sodium (Kg/ha)                                        | Method no. 14*              | 76.16                                          |         | 90.72                           |         | 98.56                         |         | 42.56                      |         |
| Potassium (Kg/ha)                                     | Method no. 14*              | 179.0                                          |         | 92.0                            |         | 141.0                         |         | 155.0                      |         |
| Calcium <sup>2+</sup> me/100 gram Soil <sup>#</sup>   | Method no. 16.a*            | 13.9                                           |         | 7.4                             |         | 21.6                          |         | 9.6                        |         |
| Magnesium <sup>2+</sup> me/100 gram Soil <sup>#</sup> | Method no. 16.b*            | 2.7                                            |         | 2.3                             |         | 4.8                           |         | 1.1                        |         |

Note: – \*Methods Manual, Soil Testing in India, Department of Agriculture & Cooperation, Ministry of Agriculture (MOA), Government of India  
# Parameter not in NABL Scope.

Prepared by

*Rashmi*

Rashmi Gupta  
Administrative Manager

Checked by

*Marisha*

Dr. Marisha Sharma  
Authorised Signatory

-end of report-

### NOTES:

- ♦ The results indicated only refer to the tested samples and listed parameters and do not endorse any product
- ♦ Total liability of the laboratory is limited to the invoice amount
- ♦ This certificate shall not be reproduced wholly or in part without prior written consent of the laboratory
- ♦ Unused balance of samples received shall be destroyed after one month from the date of issue of test report, unless other wise specified
- ♦ This report shall not be used in any advertising media or as evidence in the court of law without prior written consent of the laboratory
- ♦ Complaint register is available with the laboratory, in case required

**Form No. 31-A**  
**Health Record**  
 (Pre-Employment / Periodical)  
 (Prescribed under Rule 62-J)

Rungta mines

 Ref. No. : 623/R  
15/4/19

1. Name of the factory : Rungta Mines Limited Jharkhand Steel Plant
2. Name of the Employee : LINEER KUMAR NAYAK
3. Employee Distinguishing Number : \_\_\_\_\_
4. Age of the Employee : 47 yrs
- Identification Mark : Black mole on Left eye brow
- Nature of Job : Commercial SR MANAGER
6. Date of employment : 10.10.2018
8. Length of service in years : 20 yrs 7
7. General Survey :
  - Health : Good / Fair / Poor
  - Height : 174 Cms.
  - Weight : 75 Kgs.
8. Blood Group : \_\_\_\_\_
9. Eye Vision : 01 +ve Bringing 7  
 Normal / Abnormal  
 Use of Glass : Yes / No
10. Hearing : \_\_\_\_\_  
 Normal / Abnormal
11. Respiratory system and Chest Measurement : \_\_\_\_\_  
 Inspiration 96 cm  
 Expiration 92 cm  
 Respiration rate / min. 16  
 Remark, if any \_\_\_\_\_
12. Cardiovascular system : \_\_\_\_\_  
 Pulse Rate 76 / min  
 B.P. 120/80 mmHg  
 Heart Sound S1 S2 (R)  
 Remark, if any \_\_\_\_\_
13. Abdomen Tenderness : \_\_\_\_\_  
 Yes / No
14. Nervous system  
 History of Fits : \_\_\_\_\_  
 Epilepsy : \_\_\_\_\_  
 Remarks on Mental Health : \_\_\_\_\_
15. Locomotor system : \_\_\_\_\_  
 Normal / Abnormal
16. Skin Condition : \_\_\_\_\_  
 Normal / Abnormal  
 Remarks on any skin Disease Noticed : NO
17. Haemias : \_\_\_\_\_  
 Present / Absent
18. Hydrocele : \_\_\_\_\_  
 Present / Absent
19. Present Complain if any : NO
20. Summary of Findings :  
 Heart Disease  
 Hypertension  
 Diabetes  
 T.B.  
 Epilepsy  
 Poisoning  
 Others  
 Occupational Disease if any : NO



Form 30  
[Prescribed under Rule 86]  
**CERTIFICATE OF FITNESS**

10/1/2019  
Rangga  
Date: 15/11/2019  
633/R

I certified that I have personally examined (Name): Dinath Kumar Nayak  
son of (Father's Name): Late - Dadasaheb Nayak  
Residing at (Address): At Post No. 15/60 DC, Village, B...  
..... who is desirous of being employed as  
CR MANAGER (CH) in (process, department and factory) S.M.R. (Lam.)  
..... And that his age, as nearly as can be ascertained  
from my examination is 47 years, and that he is in my opinion Fit / Unfit for employment in the  
above mentioned factory as mentioned above.

He may be produced for further examination after a period of 1 year

- The serial no of the previous certificate is .....
- Signature / Left hand thumb Impression of the person examined

[Signature]  
Signature of Employee



Dr. Anant Kumar  
M.B.B.S.  
Regd. No-243672018  
Signature of Certifying Surgeon



## HEALTH CHECK-UP RECORD, DHENKANAL STEEL PLANT

DATE : 15/11/2019

CONTRACTOR : RUNGTA MINES LIMITED (EMPLOYEE)

| SL. NO | E.CODE   | NAME                     | SEX | AGE | BLOOD GROUP | DESIGNATION            | WEIGHT/ HEIGHT | BMI  | BLOOD PRESSURE | PULSE (Min) | VISION | RESULT |
|--------|----------|--------------------------|-----|-----|-------------|------------------------|----------------|------|----------------|-------------|--------|--------|
| 623    |          | DINESH KUMAR NAYAK       | M   | 47  | O+          | Sr. Manager            | 75/174         | 24.7 | 130/80         | 76          | Normal | Fit    |
| 624    |          | NARAHARI SAHOO           | M   | 38  | O+          | HR Assistant           | 45/170         | 15.5 | 104/64         | 76          | Normal | Fit    |
| 625    |          | GOVIND CHANDRA NAYAK     | M   | 44  | A+          | Asst. Manager          | 75/168         | 26.5 | 110/80         | 78          | Normal | Fit    |
| 626    |          | AJAYA KUMAR DASH         | M   | 50  | A+          | AGM-HR                 | 80/162         | 30.4 | 140/90         | 86          | Normal | Fit    |
| 627    |          | PRAVAT RANJAN AICH       | M   | 38  | B+          | Asst. Mgr (HR)         | 82/184         | 24.2 | 144/84         | 84          | Normal | Fit    |
| 628    |          | MADAL LAL SHARMA         | M   | 43  | B+          | Asst. Mgr (Store)      | 78/173         | 26.0 | 130/90         | 84          | Normal | Fit    |
| 629    |          | ARUN KUMAR SINGH         | M   | 39  | O+          | Dy. Manager (Purch)    | 90/182         | 27.1 | 130/90         | 84          | Normal | Fit    |
| 630    |          | VIVEK KRISHNA            | M   | 45  | O+          | Manager (HR& Admin)    | 70/161         | 27.0 | 114/76         | 82          | Normal | Fit    |
| 631    |          | LAXMIDHAR POI            | M   | 44  | O+          | Security Supervisor    | 76/175         | 24.8 | 120/80         | 84          | Normal | Fit    |
| 632    | 11110053 | DUSMANTA KUMAR ROUT      | M   | 36  | O+          | Peon                   | 50/168         | 17.7 | 130/80         | 76          | Normal | Fit    |
| 633    | 1118050  | SAROJ KUMAR ROUT         | M   | 41  | A+          | Asst. Mgr (Electrical) | 65/163         | 24.4 | 120/80         | 76          | Normal | Fit    |
| 634    | 5106005  | RABINARAYAN MISHRA       | M   | 53  | A+          | Sr. Manager            | 58/169         | 20.3 | 140/90         | 84          | Normal | Fit    |
| 635    | 11180081 | NIRAKAR ROUL             | M   | 45  | O+          | AGM - SMS              | 69/169         | 24.1 | 110/70         | 84          | Normal | Fit    |
| 636    | 11060057 | MANAS RANJAN JENA        | M   | 48  | O+          | Manager (Survey)       | 75/171         | 25.6 | 120/80         | 82          | Normal | Fit    |
| 637    | 11180258 | DEBABRATA MISRA          | M   | 53  | O+          | Sr. G.M. (Project)     | 100/180        | 30.0 | 140/90         | 84          | Normal | Fit    |
| 638    | 11170067 | DEBANATH PADHI           | M   | 47  | B+          | Manager (Purchase)     | 75/178         | 24.6 | 140/90         | 84          | Normal | Fit    |
| 639    | 11040076 | MANAS RANJAN TRIPATHY    | M   | 49  | O+          | DGM -Civil             | 66/168         | 23.9 | 120/80         | 84          | Normal | Fit    |
| 640    |          | PRATIK PATTANAYAK        | M   | 23  | O+          | GET                    | 85/180         | 26.0 | 130/80         | 96          | Normal | Fit    |
| 641    | 11190089 | DEBABRATA MOHANTY        | M   | 47  | O+          | Manager (Mechanical)   | 65/178         | 20.5 | 126/88         | 78          | Normal | Fit    |
| 642    | 11190088 | ANADI BEHERA             | M   | 42  | A+          | Dy. Manager            | 64/164         | 23.7 | 130/80         | 78          | Normal | Fit    |
| 643    |          | SHIVJEE THAKUR           | M   | 59  | O+          | Supervisor             | 50/159         | 19.7 | 128/88         | 80          | Normal | Fit    |
| 644    |          | DEBASIS NAYAK            | M   | 27  | B+          | Engineer               | 67/169         | 23.4 | 130/80         | 84          | Normal | Fit    |
| 645    |          | DILLIP KUMAR MISHRA      | M   | 48  | B+          | DGM(Mechanical)        | 85/173         | 28.4 | 130/90         | 76          | Normal | Fit    |
| 646    |          | DEBABRATA DHAL           | M   | 48  | AB+         | Sr. Manager (Safety)   | 84/182         | 25.3 | 120/80         | 84          | Normal | Fit    |
| 653    |          | PRADEEP KUMAR CHATURVEDI | M   | 61  | B+          | Jt. V.P (Project)      | 98/185         | 28.6 | 140/90         | 84          | Normal | Fit    |

OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS (WILDLIFE)  
 & CHIEF WILDLIFE WARDEN, ODISHA, BDA APARTMENT, 5<sup>TH</sup> FLOOR,  
 PRAKRUTI BHAWAN, NILAKANTHA NAGAR, BHUBANESWAR  
 Ph. No.0674-2564587, FAX No.0674-2565062  
 (Website:odishawildlife.org, E. mail: odishawildlife@gmail.com)

Memo No. **3188** /1 WL-SSP-10/2015 Dated, Bhubaneswar, the **12** Apr, 2015

To

The Principal Chief Conservator of Forests, Odisha,  
 Bhubaneswar

Sub:

**Site specific Wildlife Conservation Plan in respect of Integrated Steel Plant & Captive Power Plant at village Jharbandh, Tarkabeda under Hindol Tahsil in Dhenkanal Forest Division of Dhenkanal district by M/s Rungta Mines Ltd.**

It is to inform you that M/s Rungta Mines Ltd. has to implement a site specific wildlife conservation plan for its proposed Integrated Steel Plant and Captive Power Plant at village Jharbandh, Tarkabeda under Hindol Tahsil in Dhenkanal district in compliance to the condition No.15 of the Stage-I forest clearance granted by Govt. of India, MoEF, ERO vide their letter No.S-ORB207/2014-BHU dt 26.5.2014.

2. The Site Specific Wildlife Conservation Plan in respect of the above project in Dhenkanal Forest Division has been approved by the undersigned with financial forecast of **₹586.53 lakh** (Rupees five crore eighty-six lakh fifty-three thousand) only for the following activities.

- |                                                                                       |              |
|---------------------------------------------------------------------------------------|--------------|
| a. For activities to be implemented by the user agency in project area                | ₹188.63 lakh |
| b. For activities to be implemented by DFO, Dhenkanal Division in project impact area | ₹284.78 lakh |
| c. For activities to be implemented by DFO, Angul Division in project impact area     | ₹113.12 lakh |

**Grand Total:**

**₹586.53 lakh**

3. Various activities in the lease hold area will be executed by the Project proponent under the guidance of the Divisional Forest Officer, Dhenkanal Division. A sum of **₹397.90 lakh** only may be deposited in the CAMPA fund meant for the purpose for implementation of various activities within the project impact area by the Forest Deptt. as envisaged in the plan.

4. The User Agency may be advised to note the following conditions for future compliance.

- This Plan may be revisited after 5 years and the User Agency will give undertaking to contribute towards the revised cost of the conservation plan till the project period, if any.

P.T.O.

-2-

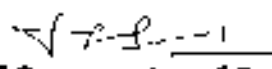
- The project proponent has to prepare and submit the Conservation Plan for the next 10 years of their lease period (balance period for which forest land remains diverted) at least one year before the expiry of the present Conservation Plan and deposit the outlay amount upon its approval. In case of delay, the project operation will be automatically stopped.

**Encl: 2 copies of approved  
site specific WL Conservation Plan**

  
Principal Chief Conservator of Forests (WL)  
& Chief Wildlife Warden, Odisha

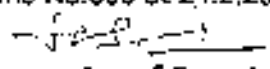
Memo No. 3189 /date 09.04.2015

Copy forwarded to the Special Secretary to Government of Odisha, F&E Deptt., Bhubaneswar for favour of information with reference to Dep'tt. memo No.10F(Con)114/2014-9871/F&E dt 30.5.2014. The user agency has prepared a separate scheme for "Fly Ash Management Plan" in compliance to condition No.13 of the Stage-I forest clearance granted by Govt. of India, MoEF, ERO vide their letter No.S-ORB207/2014 BHU dt 26.5.2014.

  
Principal Chief Conservator of Forests (WL)  
& Chief Wildlife Warden, Odisha

Memo No. 3190 /date 09.04.2015

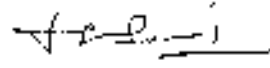
Copy forwarded to the Regional Chief Conservator of Forests, Angul Circle for information and necessary action with reference to his memo No.806 dt 24.2.2015.

  
Principal Chief Conservator of Forests (WL)  
& Chief Wildlife Warden, Odisha

Memo No. 3191 /date 09.04.2015

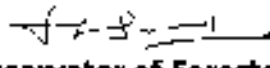
Copy forwarded to the Divisional Forest Officer, Dhenkanal Division for information and necessary action with reference to memo No.807 dt 24.2.2015 of the RCCF, Angul Circle.

**Encl: 1 copy of approved  
site specific WL Conservation Plan**

  
Principal Chief Conservator of Forests (WL)  
& Chief Wildlife Warden, Odisha

Memo No. 3192 /date 09.04.2015

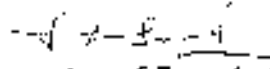
Copy forwarded to the Divisional Forest Officer, Angul Division for information and necessary action.

  
Principal Chief Conservator of Forests (WL)  
& Chief Wildlife Warden, Odisha

Memo No. 3193 /date 09.04.2015

Copy forwarded to Dr. Saran Kumar Sahoo, Chief General Manager, Corporate Affairs, Rungta Mines Ltd., 52-Saheed Nagar, Bhubaneswar-751007 for information and necessary action.

**Encl: 1 copy of approved  
site specific WL Conservation Plan**

  
Principal Chief Conservator of Forests (WL)  
& Chief Wildlife Warden, Odisha

## **SITE SPECIFIC WILDLIFE CONSERVATION PLAN**

**For**

**PROPOSED 1.9 MTPA INTEGRATED STEEL PALNT OF  
M/S RUNGTA MINES LIMITED LOCATED IN VILLAGE  
JHARBANDH OF DHENKANAL DISTRICT, ODISHA**

**&**

**MEASURES TO MITIGATE ADVERSE IMPACTS  
OF FLY ASH POLLUTION**

***Prepared by***

*Sri Kailash Chandra Pati, Dy. C.F. (Rtd.)*

*Sri Harisankar Mohanty, Dy. C.F. (Rtd.)*

**SSP CONSULTANCY SERVICES**

**(March, 2015)**

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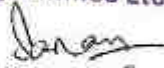


**8.2 Activities within the buffer zone (10 Km. impact zone) of Steel Plant in Dhenkanal Forest Division.**

| Sl. No. | Particulars                                                                                                                                                                      | Unit      | Cost (₹ in lakh) |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------|
| 1       | Assisted Natural Regeneration (ANR) with 200 Plants/Ha. in Hitinda RF of Hindol Range @ ₹ 32,466/- per ha. with maintenance up to 10 <sup>th</sup> year.                         | 250 ha.   | 81.17            |
| 2       | Soil & Moisture Conservation measures in Hitinda RF.                                                                                                                             |           |                  |
|         | (a) Check dam with loose boulder structure                                                                                                                                       |           |                  |
|         | 4 mtr. span @ ₹ 18,200/-                                                                                                                                                         | 60 Nos.   | 10.92            |
|         | 3 mtr. span @ ₹ 11,200/-                                                                                                                                                         | 40 Nos.   | 4.48             |
|         | 2 mtr. span @ ₹ 5,400/-                                                                                                                                                          | 30 Nos.   | 1.62             |
|         | 1 mtr. span @ ₹ 2,700/-                                                                                                                                                          | 70 Nos.   | 1.89             |
|         | (b) Vegetative Gully plugging < 1 mtr. span @ ₹ 2,000/- (LS)                                                                                                                     | 220 Nos.  | 4.40             |
| 3       | Creation of one water body (Game Tank) in Hitinda RF with its maintenance cost.                                                                                                  | 1         | 10.00            |
| 4       | Forest fire preventive measures inside Buffer Zone including cost of fire fighting equipments, fire line maintenance and awareness programme for 10 years @ ₹ 3.0 lakh per year. | LS        | 30.00            |
| 5       | Maintenance of RF boundary line-cum-fire line in Hitinda RF @ ₹ 5000/- per Km./each year for 10 years.                                                                           | 15.68 Km. | 7.84             |
| 6       | Solar fencing over 10.00 Km. around the villages to be identified by DFO                                                                                                         | 10 Km.    | 15.00            |
| 7       | Awareness programme                                                                                                                                                              | LS        | 5.00             |
| 8       | Monitoring & Evaluation                                                                                                                                                          | LS        | 5.00             |
| 9       | Man-Animal conflict                                                                                                                                                              |           |                  |
|         | Provision of compassionate grant in the zone of influence for 10 year period.                                                                                                    | LS        | 60.00            |
|         | <b>Total</b>                                                                                                                                                                     |           | <b>237.32</b>    |
|         | Escallation of cost @ 20%                                                                                                                                                        |           | 47.46            |
|         | <b>Sub-Total</b>                                                                                                                                                                 |           | <b>284.78</b>    |

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For Rungta Mines Ltd

  
Dr. S.K. SAHOO  
C.G.M.(CA)

  
Divisional Forest Officer  
Dhenkanal Division

### 8.3 Activities within the buffer zone (10 Km. impact zone) of Steel Plant in Angul Forest Division.

| Sl. No. | Particulars                                                                                                                                                                      | Unit     | Cost (₹ in lakh) |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------|
| 1       | Assisted Natural Regeneration (ANR) with 200 Plants/Ha. in Kandhal RF of Talcher Range @ ₹ 32,466/- per ha. with maintenance up to 10 <sup>th</sup> year.                        | 10 ha.   | 3.25             |
| 2       | Soil & Moisture Conservation measures in Kandhal RF.                                                                                                                             |          |                  |
|         | (a) Check dam with loose boulder structure                                                                                                                                       |          |                  |
|         | 3 mtr. span @ ₹ 11,200/-                                                                                                                                                         | 7 Nos.   | 0.78             |
|         | 2 mtr. span @ ₹ 5,400/-                                                                                                                                                          | 10 Nos.  | 0.54             |
|         | 1 mtr. span @ ₹ 2,700/-                                                                                                                                                          | 15 Nos.  | 0.41             |
|         | (b) Vegetative Gully plugging < 1 mtr. span @ ₹ 2,000/- (LS)                                                                                                                     | 30 Nos.  | 0.60             |
| 3       | Renovation of water body (Game Tank) in Kandhal RF (Routra Khol) with its maintenance.                                                                                           | 1        | 5.00             |
| 4       | Forest fire preventive measures inside Buffer Zone including cost of fire fighting equipments, fire line maintenance and awareness programme for 10 years @ ₹ 3.0 lakh per year. | LS       | 30.00            |
| 5       | Maintenance of RF boundary line-cum-fire line in Kandhal RF @ ₹ 5000/- per Km./each year for 10 years.                                                                           | 7.39 Km. | 3.69             |
| 6       | Man-Animal conflict                                                                                                                                                              |          |                  |
|         | Provision of compassionate grant in the zone of influence                                                                                                                        | LS       | 25.00            |
| 7       | Solar fencing over 10.00 Km. around the villages to be identified by DFO                                                                                                         | 10 Km.   | 15.00            |
| 8       | Awareness programme                                                                                                                                                              | LS       | 5.00             |
| 9       | Monitoring & Evaluation                                                                                                                                                          | LS       | 5.00             |
|         | <b>Total</b>                                                                                                                                                                     |          | <b>94.27</b>     |
|         | Escalation of cost @ 20%                                                                                                                                                         |          | 18.85            |
|         | <b>Sub-Total</b>                                                                                                                                                                 |          | <b>113.12</b>    |

**Grand Total:** ₹ 188.63 lakhs + ₹ 284.78 (Dhenkanal Division) +  
₹ 113.12 lakhs (Angul Division) = ₹ **586.53 lakhs**

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For Rungta Mines Ltd

*S.K. Sahoo*  
Dr. S.K. SAHOO  
S.G.M.(CA)

*[Signature]*  
Divisional Forest Officer  
Dhenkanal Division