

RUNGTA MINES LIMITED

DRAFT
ENVIRONMENTAL IMPACT ASSESSMENT
AND
ENVIRONMENTAL MANAGEMENT PLAN
OF
DHENKANAL STEEL PLANT
AT
VILLAGES: JHARBANDH, GALPADA &
TARKABEDA,
DISTRICT: DHENKANAL IN ODISHA
(2.85 MTPA STEEL, 674.765 ACRES)

DECEMBER, 2018

Prepared by:



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An ISO 9001:2015
approved company

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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 ²	Square meter
m ³	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 PROJECT

Rungta Mines Ltd. (RML) is proposing to install a 2.85 million tonnes per annum (MTPA) steel plant at villages Jharbandh, Galpada and Tarkabeda, district Dhenkanal in Odisha. It will be established in two phases of 1.45 million tonnes per annum followed by 1.4 million tonnes per annum.

Background

Within the same land parcel, the company had already received an environmental clearance from Ministry of Environment & Forests vide letter No. J-11011/241/2009-IA.II(I) dated 02.08.2010 (copy given in **Annexure I**). The environmental clearance was for a capacity of 1.9 MTPA steel. Amendments in the environmental clearance were granted by the Ministry vide letter dated 25.01.2011 to add lime plant, dolo plant, oxygen plant and vacuum degassing. Company could not start the project and applied for validity extension (i.e. within 5 years) but due to MOEF's Notification dated 29.04.2015, the validity was extended by default to 7 years. Nearing 7 years from date of environmental clearance, Company again applied for extension of validity and received the validity extension letter on 07.07.2017 vide which the validity was upto extended upto 31.03.2020. On 19.07.2018, Company applied for an amendment in configuration and technology of power plant as well as a request to extend the validity of environmental clearance till 01.08.2020, both of which were granted by MOEF&CC vide their letter no. 20.09.2018.

The 1.9 MTPA steel plant construction was started in 2017 only with one DRI kiln of 1X500 TPD, 2X20 T IF with CCM and a 25 MW CPP. The extension of validity of the above mentioned environmental clearance was extended upto 01.08.2020. Since the under construction plant shall not get completed within the validity period of the environmental clearance, the Company decided to apply to Ministry of Environment, Forest and Climate Change and obtained fresh Terms of Reference for a larger production of 2.85 MTPA steel. The plant configuration for 2.85 MTPA steel has been planned in such a way that it includes the under construction units.

Thus, fresh application i.e. 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/80884/2018 dated 30th September 2018. It was duly submitted in our covering letter no. RML/DSP/MoEF/18-19/316 dated 29.09.2018 as well as the proposed TOR annexed with the application that data has been generated from March to May 2018. Thereafter, the

presentation was held before the Expert Appraisal Committee (EAC) for Industry-1 during its meeting held on 26th November 2018. The fact that data has been generated during 01.03.2018 to 30.05.2018 was also submitted in the presentation. Terms of References (TOR) were issued by MoEF&CC, New Delhi vide letter no. J-11011/309/2018-IA.II(I) dated 10.12.2018 (copy given in **Annexure II**). This EIA/EMP has been prepared in line with the Terms of Reference to conduct Public Consultation and then seek environmental clearance from MoEF&CC.

The progress of the project is as follows:

1. Total land required for the plant is 674.765 acres. Out of this, 540.705 acres is private land and 67.790 acres government land. Both these lands have been acquired through IDCO and changed to industrial use. Balance 66.270 acres land is pending with Tehsildar-cum-LAO, Hindol.
2. Additionally, 9.85 acres of private land in village Jharband 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. 7.8 acres (3.156 ha) of forest land is present within the project area. Stage II forest clearance has been obtained from MOEF&C vide letter no. 5-ORB207/2014-BHU dated 02.07.2015. Letter is enclosed as **Annexure III**.
4. 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.
5. Odisha State Pollution Control Board accorded Consent to Establish (CTE) for 1.9 MTPA steel plant on 21.01.2012 and extended validity for CTE till 03.01.2021.
6. Technical consultant has been appointed for commissioning of project.
7. Presently 1X500 TPD DRI, 2X20 T IF and 25 MW power plant are under construction.

Need for study

Environmental clearance is a statutory requirement as per EIA notification dated 14th September 2006 and its amendments. The nature of the project

is ferrous metallurgical industries, which fall under the Schedule of 1(d), 2(a), 2(b), 3(a), 3(b) and 4(b) under category “A” of EIA Notification, 2006. To obtain the environmental clearance for the proposed (2.85 MTPA) steel plant, environmental studies have been carried out and Environmental Impact Assessment (EIA)/ Environment Management Plan (EMP) has been prepared in line with Terms of References (TOR) issued by Ministry of Environment, Forest and Climate Change (MOEF&CC), New Delhi.

1.2 IDENTIFICATION OF THE PROJECT

Manufacturing facilities in proposed plant includes beneficiation, pelletization, coal washery, DRI kilns, mini blast furnace, sinter, coke oven and steel melting shop, producer gas plant and cement plant. The capacities of the various units within the plant are shown in **Table 1.1**.

TABLE 1.1
MANUFACTURING FACILITIES OF THE PROPOSED PROJECT

Sl. No.	Plant facilities	Units	Phase 1	Phase 2	Total
1	Beneficiation Plant	MTPA	2.7	2.7	5.4
2	Pelletisation Plant	MTPA	1.47	1.47	2.948
3	Coal Washery	MTPA	2.616	1.524	4.141
4	DRI Plant	MTPA	1.001	0.546	1.547
5	Mini Blast Furnace	MTPA	0.567	0.992	1.559
6	Sinter Plant	MTPA	0.612	1.051	1.663
7	Coke Oven Plant	MTPA	0.420	0.70	1.12
8	Steel Melting Shop	MTPA	1.232	1.232	2.464
8.1	Steel Melting via Induction Furnace Route	MTPA	0.539	-	0.539
8.2	Steel Melting via Electric Arc Furnace-Vacuum Degassing-Argon Oxygen Decarburization Route	MTPA	0.693	1.232	1.925
8.3	Continuous Casting Machine (Billets/ Bloom Caster/Slab)	MTPA	1.207	1.207	2.415
9	Finished Product Facilities	MTPA	1.450	1.400	2.850
9.1	Rolling Mill (TMT/ Flat/ Round/ Wire Rod/ Structural Mill/ others)	MTPA	0.800	0.800	1.600
9.2	Strip Mill/Sheet/Coil/ Wire & Bar Mill/Wire Rope	MTPA	0.450	0.400	0.8500

Sl. No.	Plant facilities	Units	Phase 1	Phase 2	Total
9.3	Ductile Pipe Plant	MTPA	0.200	0.200	0.400
10	Producer Gas Plant	Million Nm ³ /Annum	240	240	480
11	Oxygen Plant	MTPA	0.035	0.063	0.098
12	Lime Plant	MTPA	0.105	0.1995	0.3045
13	Cement Plant	MTPA	0.884	0.802	1.686
14	Captive Power Plant	MW	217	168	385
14.1	Waste Heat Recovery Boiler (WHRB) based Captive Power Plant (CPP)	MW	67	68	135
a	DRI Kiln exit gas based	MW	44	24	68
b	MBF Gas based	MW	11	20	31
c	Coke Oven Gas based	MW	12	24	36
14.2	Circulating Fluidised Bed Combustion (CFBC) based CPP	MW	150	100	250

A comparative statement of the two configurations of steel plant- 1.9 MTPA (for which EC was granted on 02.08.2010) and 2.85 MTPA (for which TOR has been granted on 10.12.2018) are given in **Table 1.2**. There is no change in the total area requirement for the project.

TABLE 1.2
COMPARATIVE STATEMENT OF PLANT FACILITIES OF 1.9 & 2.85 MTPA

Production facility	1.9 MTPA (Existing EC)	2.85 MTPA (proposed plant)
Beneficiation plant	4.2	5.4
Pelletization Plant	2.4	2.948
Sponge Iron Plant	1.50 (10X500 TPD)	1.547 (2X500 + 4X600 TPD)
Sinter plant	0.650 (2x42 m ²)	1.663 (1X64+1X110 m ²)
Blast Furnace	0.60 (2x350 m ³)	1.559 (1X600+1X1050 m ³)
Steel Melt shop	1.90	2.464
Induction furnace	1.152 (18x20 T)	0.539 (7X20T)
Ladle Refining Furnace for IF	1.152 (2x40 T)	0.539 (4X20T)

Production facility	1.9 MTPA (Existing EC)	2.85 MTPA (proposed plant)
Electric Arc Furnace	0.896 (2x70 T)	1.925 (1X90+1X160 T)
Ladle Refining Furnace for EAF	0.896 (2x70 T)	1.925 (1X90+1X160 T)
Billet caster, Blooms, slab caster	1.9 (6/11 m radius)	2.415(6/11 m radius)
TMT, Flats, Rod, Structural, strip, sheet, coil, wire, bar, wire rope, ductile pipe, others	1.9	2.85
Coal washery	4.2	4.141
Captive Power plant		
WHRB	100 MW (5x45 TPH)	135 MW (3X50+5X60+1X90+1X100 TPH)
CFBC	200 MW (1x375 TPH)	250 MW (2X125+4X250 TPH)
Coke Oven Plant	0.350	1.12
Lime Plant	1X300 TPD	1X300 + 1X570 TPD
Dolo Plant	1X300 TPD	-
Oxygen plant	1X200 TPD	1X100 + 1X180 TPD
Vacuum degassing unit	1X70 TPD	1X90 + 1X160 T
Producer Gas Plant	-	480X10 ⁶ Nm ³
Cement Plant with clinker plant	-	1.686

The under construction units are a part of the revised proposal. Facilities under implementation are given in **Table 1.3**.

TABLE 1.3
STATUS OF FACILITIES UNDER IMPLEMENTATION AS ON 28.12.2018

Sl. No.	Facilities	Configuration	Production	Status
1	Sponge Iron plant	1x500 TPD	0.150 MTPA	Under construction
		1x500 TPD	0.150 MTPA	Ordering stage
2	Steel Melting Shop comprising IF along with CCM	2X 20 T	0.128 MTPA	Under construction
		2X 20 T	0.128 MTPA	Ordering stage

Sl. No.	Facilities	Configuration	Production	Status
3	Captive power plant			
	WHRB	1x45 TPH	25 MW	Under construction
		1x45 TPH		Ordering stage
	CFCB	1 X 115 TPH	25 MW	Under construction
	TOTAL		50 MW	

Salient features of the proposed project is given in **Table 1.4**.

TABLE 1.4
SALIENT FEATURES OF THE PROPOSED PROJECT

Location	Villages Jharbandh, Galpada and Tarkabeda, District Dhenkanal, Odisha
Total Area	674.765 acres
Product	Steel & Cement and any excess unutilised intermediate like washed coal, pellet and coke
Rated capacity	2.85 MTPA Steel (Phase I- 1.45 MTPA ; Phase II- 1.4 MTPA)
Working days	350 days
Manpower	2600 persons (Phase I- 1300 ; Phase II -1300)
Completion Schedule	84 Months from date of fresh environmental clearance (Phase I-48 Months; Phase II- 36 Months)
Cost of the project	Rs. 7837.9 crores (Phase I- Rs.3888.63 Crores; Phase II- Rs. 3948.27 Crores)
Water requirement	2950 KLH (Phase I - 1500 KLH; Phase II- 1450 KLH)
Waste water generation	545 KLH Total
Source of water	Brahmani River
Power generation	385 MW (Phase I- 217 MW; Phase II-168 MW)
Power requirement	376 MW (Phase I- 200 MW; Phase II-176 MW)
Power source	Proposed captive power plant
R & R	54 families. Rehabilitated & resettled as per R&R Policy, Govt. of Odisha. Compensation has already been paid through IDCO

1.3 PROJECT PROPONENT

M/s Rungta Mines Limited (RML), is one of the leading and the oldest mining groups of the mineral rich belt of Odisha and Jharkhand. The group is engaged in these activities for the past six decades, which made the group a pioneer house of mineral Industry. The group owns Iron Ore and Manganese Ore mines in Odisha and Jharkhand and is successfully operating these mines.

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 2.85 million TPA (Phase I- 1.45 MTPA; Phase II- 1.40 MTPA). Details of manufacturing facilities has been given in **Table 1.1**.

1.4.2 Size

The proposed steel plant shall be constructed in a plot of land measuring 674.765 Acres. Details of manufacturing facilities is given in **Table 1.1**.

1.4.3 Location

The proposed site for plant is located in villages Jharbandh, Galpada and Tarkabeda, 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. Plant will be established at following coordinates as measured from Google Earth Pro:

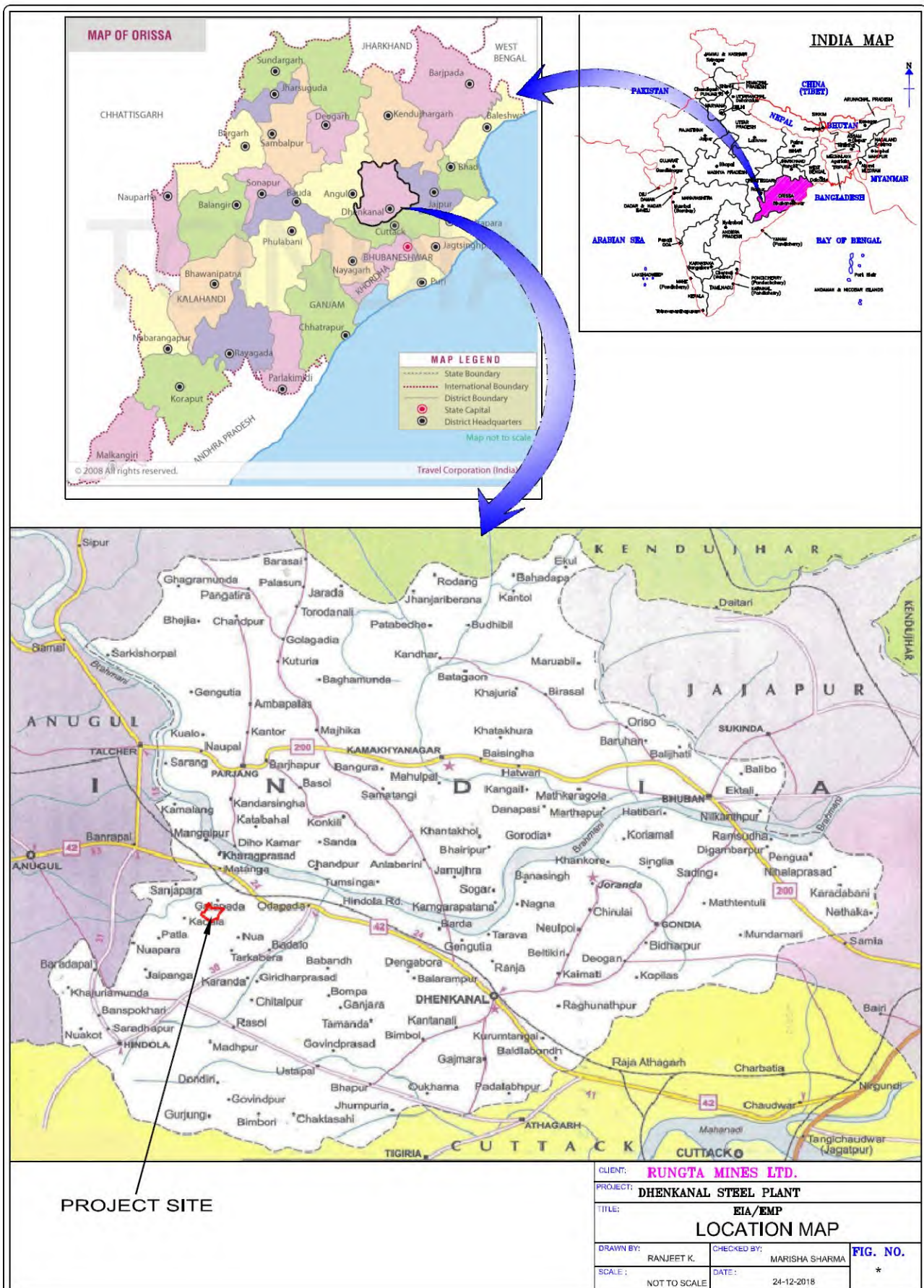
Latitude : - 20° 45' 14" to 20° 46' 24" N

Longitude : - 85° 17' 12" to 85° 18' 45" E

1.4.4 Communication

The proposed plant is accessible by all weather road from the district headquarter Dhenkanal (36 km) and town Angul (22 km). The site is located on NH-55 (2.4 km aerially), which connects Bhubaneswar to Angul. The nearest railway station is Meramandali at a distance of 3.6 km. The nearest airport is at Bhubaneswar, which is approximately 150 km from the site.

FIG 1.1: LOCATION MAP



1.4.5 Importance to country & region

National Scenario

- Steel industry was de-licensed and de-controlled in 1991 & 1992 respectively.
- Today, India is the 3rd largest producer of crude steel in the world.
- In 2014-15, production for sale of total finished steel (alloy + non alloy) was 91.46 mt, a growth of 4.3% over 2013-14.
- Production for sale of Pig Iron in 2014-15 was 9.7 mt, a growth of 22% over 2013-14.
- India is the largest producer of sponge iron in the world with the coal based route accounting for 90% of total sponge iron production in the country.
- Data on production for sale of pig iron, sponge iron and total finished steel (alloy + non-alloy) are given in **Table 1.5** for last five years.

TABLE 1.5
INDIAN STEEL INDUSTRY: PRODUCTION FOR SALE
(IN MILLION TONNES)

Category	2010-11	2011-12	2012-13	2013-14	2014-15
Pig Iron	5.68	5.371	6.870	7.950	9.694
Sponge Iron	25.08	19.63	14.33	18.20	20.38
Total Finished Steel (alloy + non alloy)	68.62	75.70	81.68	87.67	91.46

Source: <http://steel.nic.in/overview.htm> (accessed on 13.02.2017)

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

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. (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))

1.5 LEGAL ASPECTS

As it is a new plant, the 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 amended 1987
4. Water (Prevention and Control of Pollution) Act, 1974 amended 1988
5. Water (Prevention and Control of Pollution) Rules, 1975
6. The Environment (Protection) Act, 1986, amended 1991
7. Environmental (Protection) Rules, 1986 (and its Amendments till date)
8. Hazardous Waste Management Rules, 2016
9. Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016
10. Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996
11. Ozone Depleting Substances (Regulation and Control) Rules, 2000
12. EIA Notification, 2006
13. Batteries (Management and Handling) Rules, 2001
14. Public Liability Insurance Act, 1991 and amendments till date
15. Public Liability Insurance Rules, 1991 and amendments till date
16. The Motor Vehicle Act, 1988
17. The Central Motor Vehicle Rules, 1989
18. The Water (Prevention and Control of Pollution) Cess Act, 1977

Compliance to State Rules and Notifications will also being ensured.

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 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 are briefly summarized below:

- 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 suggest a monitoring programme to evaluate the effectiveness of mitigative 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 CSR.

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.

In line with the TOR, baseline environmental data was generated by Min Mec R&D Laboratory (NABL accredited) as given in **Table 1.6**.

TABLE 1.6
BASELINE DATA GENERATED

Description	No. of locations	Total No of samples
Air Ambient air monitoring (24 hourly samples), twice a week for 3 months for one season Parameters : PM 10, PM 2.5, SO ₂ , NO _x , CO	8 (one in core zone and 7 in buffer zone)	192
Meteorological parameters measured at hourly duration simultaneously at one air monitoring station for 3 months for Wind speed, direction, Relative humidity, Temperature, etc	1 (Core Zone)	90 days
Water Water sample from various surface and ground water sources in core and buffer zone (10 km radius) and tested for physical, chemical & biological parameters	21	21
Soil	2	2
Noise Hourly readings taken for 24 hours (Leq)	10	10 sets
Traffic density	1	1 set

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

- ❖ Long Term Climatic data from Indian Meteorological Department (IMD) for available previous decade
- ❖ Geo-hydrological aspects based on available data from various sources
- ❖ Identification of water bodies, hills, roads etc. within 10 km radius
- ❖ 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 sanctuaries 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**

covering 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 29.12.2018.

1.8 COMPLIANCE OF TERMS OF REFERENCE (TOR)

MoEF&CC issued the Terms of Reference vide letter no. J-11011/309/2018-IA.II(I) dated 10.12.2018. **Table 1.7** gives the compliance of Terms of Reference (TOR) for proposed project.

TABLE 1.7
COMPLIANCE TO TERMS OF REFERENCE ISSUED BY MOEF&CC

ToR No.	ToR Point	Compliance
Generic ToRs in respect of Industry Sector		
1.	Executive Summary	Executive Summary of the project is given in chapter 11 of the EIA/EMP report.
2	Introduction	
i)	Details of the EIA Consultant including NABET accreditation.	Please refer chapter 12 and Annexure XXVIII .
ii)	Information about the project proponent	Information about the project proponent is given in para 1.3 of Chapter 1.
iii)	Importance and benefits of the project	For importance of the project refer para 1.4.5 of Chapter 1. Benefits of project is given in Chapter 8
3.	Project Description	
i)	Cost of project and time of completion.	Cost of the project is Rs. 7836.9 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 para 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	Please refer para 2.9, of Chapter 2
v)	Other chemicals and materials required with quantities and storage capacities	Please refer para 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 para 4.4.1 for emissions; para 4.6.2 for effluents; para 4.7 for solid waste
vii)	Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)	Details of water requirement is given in para 2.12 of chapter 2, water balance diagram is given in Fig 2.15 of Chapter 2. Power requirement and source is given in para 2.11 and manpower requirement is given in para 2.13 of

ToR No.	ToR Point	Compliance
		Chapter 2
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 electricity.	Water allocation committee has recommended the drawl of surface water from Brahmani River as per decision of 54 th Water Allocation Committee, Office of The Engineer In chief, Water Resources, Bhubaneswar, Odisha, Power shall be taken from Captive Power Plant.
ix)	Process description along with major equipment and machineries, process flow sheet (quantitative) from raw material to products to be provided	Please refer para 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	Expansion/modernization proposals	
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. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30 th 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.	MoEF granted Environment Clearance for the project vide letter No. J-11011/241/2009-IA.II(I) dated 02.08.2010.(copy given in Annexure I) A certified report of the monitoring of the Regional office Bhubaneswar is enclosed as Annexure XXIX .
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)	MoEF granted Environment Clearance for the project vide letter No. J-11011/241/2009-IA.II(I) dated 02.08.2010.(copy given in Annexure I)

ToR No.	ToR Point	Compliance															
	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.	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.	<table> <tr> <th></th><th>Latitude</th><th>Longitude</th></tr> <tr> <td>A</td><td>20° 45' 12"N</td><td>85° 17' 47"E</td></tr> <tr> <td>B</td><td>22° 45' 40"N</td><td>85° 17' 04"E</td></tr> <tr> <td>C</td><td>22° 46' 16"N</td><td>85° 17' 36"E</td></tr> <tr> <td>D</td><td>20° 46' 01"N</td><td>85° 18' 40"E</td></tr> </table>		Latitude	Longitude	A	20° 45' 12"N	85° 17' 47"E	B	22° 45' 40"N	85° 17' 04"E	C	22° 46' 16"N	85° 17' 36"E	D	20° 46' 01"N	85° 18' 40"E
	Latitude	Longitude															
A	20° 45' 12"N	85° 17' 47"E															
B	22° 45' 40"N	85° 17' 04"E															
C	22° 46' 16"N	85° 17' 36"E															
D	20° 46' 01"N	85° 18' 40"E															
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 para 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 3.29 and shown in fig. 3.10 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 para 3.6.2 of Chapter 3.															

ToR No.	ToR Point	Compliance
x)	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 of Chapter 3
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 para 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.
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)	Stage II forest clearance has been obtained from MOEF&C vide letter no. 5-ORB207/2014-BHU dated 02.07.2015 Letter is enclosed as Annexure III
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 3.8 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 been obtained from MOEF&C vide letter no. 5-ORB207/2014-BHU dated 02.07.2015 Letter is enclosed as Annexure III
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	No National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animal is present within 10 km radius of plant

ToR No.	ToR Point	Compliance
	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.	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 th April, 2015 Copy of the letter is enclosed as Annexure XVI .
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.
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.	The site specific micro-meteorological data has been collected from the site during March to May 2018. Micrometeorology data is given in Annexure VI and is summarized in para 3.4 of Chapter 3
ii)	AAQ data (except monsoon) at 8 locations for PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , 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 2018. AAQ data is given in Annexure VII 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 Annexure VII and is summarized in Table 3.6 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 Annexure IX 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.

ToR No.	ToR Point	Compliance
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 Annexure IX and summarized results is given in Table 3.13 and 3.14 of Chapter 3. Locations of sampling stations are given in Table 3.12 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 Annexure XI
viii)	Soil Characteristics as per CPCB guidelines.	Soil Characteristics as per CPCB guidelines is given in Table 3.22 of Chapter -3.
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 Annexure XIV .
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 para 3.11 of Chapter 3. List of flora and fauna is given in Annexure XVII . 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 th April, 2015 Copy of the letter is enclosed as Annexure XVI .
xi)	Socio-economic status of the study area.	Socio-economic status of the study area as per census 2011 is given in Annexure XVIII and summarized in para 3.12 of Chapter 3.
7.	Impact Assessment 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 hilly terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation)	The prediction modeling for Ground Level Concentration of pollutants from the stack emissions is given in para 4.4.1.1 of Chapter 4 and the detailed study is given in Annexure XXI .

ToR No.	ToR Point	Compliance
	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 para 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 para 4.6.2 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 para 4.4.1.1 of Chapter 4 and the detailed study is given in Annexure XXI .
vi)	Measures for fugitive emission control	Measures for fugitive emission control is given in para 4.4.1.2 of chapter 4
vii)	Details of hazardous waste generation,	Refer Table 4.11 of Chapter 4.

ToR No.	ToR Point	Compliance
	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	
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 para 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 para 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 para 6.4 of Chapter 6.
xii)	Action plan for post-project environmental monitoring shall be submitted.	Refer para 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 linked with District Disaster Management Plan	Please refer Chapter 7

ToR No.	ToR Point	Compliance
8.	Occupational health:	
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 para 4.12 of Chapter 4. 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 ³ for 8 hours) and iron oxide fumes (<5 mg/m ³ 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 para 4.12 of Chapter 4.
iii)	Annual report of health status of workers with special reference to Occupational Health and Safety.	It is a new plant, data shall be collected on commencement of operation. Proposed plan plan of OHS management is given in para 4.12 of Chapter 4. Format for monitoring is given in Annexure XXV .
iv)	Plan and fund allocation to ensure the occupational health and safety of all contract and casual workers.	Refer para 10.3 of Chapter 10
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.	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 XXVI).
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 /	Refer para 6.5 of Chapter 6

ToR No.	ToR Point	Compliance
	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.	Refer para 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 para 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 para 2.13 of Chapter 2.
11	Enterprise Environment Responsibility (CER)	
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 st 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 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	The maximum capital expenditure on CER will be commensurate with the investment and has been calculated as a maximum of Rs. 39.18 crores in 10 years. Item wise details along with time bound action plan shall be prepared after public hearing.

ToR No.	ToR Point	Compliance
	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.	The current compliance table is the point wise compliance of TORs is given in Table 1.7 of Chapter 1.
14	The TORs prescribed shall be valid for a period of three years for submission of the EIA-EMP reports along with Public Hearing Proceedings (wherever stipulated).	The data is within the validity period
	The following general points shall be noted:	
i	All documents shall be properly indexed, page numbered	Yes, index has been prepared
ii	Period/date of data collection shall be clearly indicated	Agreed and complied. The monitoring period is March-May 2018.
iii	Authenticated English translation of all material in Regional languages shall be provide	-
iv	The letter/application for Environmental Clearance shall quote the MoEF&CC File No. and also attach a copy of the letter.	MoEF&CC File No. IA-J-11011/309/2018-IA.II(I) and enclosed as Annexure II.
v	The copy of the letter received from The Ministry shall be also attached as an Annexure to the final EIA-EMP Report	MoEF&CC File No. IA-J-11011/309/2018-IA.II(I) dated 10.12.2018 and enclosed as Annexure II.
vi	The index of the final EIA-EMP report must indicate the specific chapter and page no. of the EIA-EMP Report	Agreed and complied
vii	While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MOEF vide O.M. No. J-	It has been followed.

ToR No.	ToR Point	Compliance
	11013/41/2006- IA.II (I) dated 4th August, 2009, which are available on the website of this Ministry shall also be followed	
viii	The consultants involved in the preparation of EIA-EMP report after accreditation with Quality Council of India (QCI) /National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA-EMP reports prepared by them and data provided by other organization/ Laboratories including their status of approvals etc. Name of the Consultant and the Accreditation details shall be posted on the EIA-EMP Report as well as on the cover of the Hard Copy of the Presentation material for EC presentation.	Min Mec is preparing and presenting reports as per the High Court of Delhi orders dated 03.02.2014 & subsequent in LPA 110/2014 and CM No.2175/2014 (stay) and orders dated 03.05.2016 & subsequent in W.P.(C) 3665/2016. Copy is enclosed in Annexure XXVIII.
ix	TORs' prescribed by the Expert Appraisal Committee (Industry) shall be considered for preparation of EIA-EMP report for the project in addition to all the relevant Information as per the 'Generic Structure of EIA' given in Appendix III and IIIA in the EIA Notification, 2006. Where the documents provided are in a language other than English, an English translation shall be Provided. The draft EIA-EMP report shall be submitted to the State Pollution Control Board of the concerned State for conduct of Public Hearing. The SPCB shall conduct the Public Hearing/public consultation, district-wise, as per the provisions of EIA notification, 2006. The Public Hearing shall be chaired by an Officer not below the rank of Additional District Magistrate. The issues raised in the Public Hearing and during the consultation process and the commitments made by the project proponent on the same shall be included separately in EIA-EMP Report in a separate chapter and summarized	The public hearing is yet to be held.

ToR No.	ToR Point	Compliance
	in a tabular chart with financial budget (capital and revenue) along with time-schedule of implementation for complying with the commitments made. The final EIA report shall be submitted to the Ministry for obtaining environmental clearance	
	Additional TORs for Integrated Steel Plant	
1	Iron ore/ coal linkage documents along with the status of environmental clearance for limestone and coal mines	Iron ore: Iron ore will be sourced from own Mines in Odisha. Environmental clearance for Jajang Iron Mines was received vide MoEF letter no. J-11015/96/2012-IA II(M) dated 13.03.2015 (copy given in Annexure IV). As the present mining leases of M/s Rungta Mines Limited will expire on 31.03.2020. Iron ore will be sourced from Open market or from M/s OMC Limited or from New Mines that may be granted to M/s Rungta Mines Limited in forthcoming Bindings of Iron ore Mines. Coal: Coal will be procured through e-auction and linkage to be allotted by Government of India. South African coal is also proposed to be used. Coking coal requirement 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.
2	Quantum of generation of coal and limestone from coal & limestone mines and the projects they cater to.	Refer section 2.9 of Chapter 2
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 3.3 of Chapter 3.
4	Recent land use based on satellite imagery. High resolution satellite image data having 1m-5m spatial resolution	The Satellite Imagery is given in Fig 3.8 of Chapter 3.

ToR No.	ToR Point	Compliance
	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	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 ₁₀ to be carried out.	Please refer Table 3.9, of chapter 3 for trace elements of PM 10.
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 para 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.
8	Plan for slag utilization	Plan for slag utilization from various unit of plant is given in para 4.7.2 B 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	WHRB has been proposed to utilise coke oven flue gas for power generation. However, adoption of dry coke quenching shall be explored by Rungta Mines Limited; as of now for such small size coke plant, dry coke quenching is not feasible.
11	Trace metals Mercury, arsenic and fluoride emissions in the raw material	Raw material analysis has been done by IMMT (CSIR), Bhubaneswar and is given in Table 3.17, of Chapter 3.
12	Trace metals in waste material especially slag.	Slag analysis has been done by IMMT (CSIR), Bhubaneswar and is given in Table 3.17 of Chapter 3.
13	Trace metals in water	Water quality analysis including trace metals for ground and surface water has been conducted. Results are given in Annexure IX .
14	Details of proposed layout clearly demarcating various units within the	Please refer para 2.2 of chapter 2

ToR No.	ToR Point	Compliance
	plant	
15	Complete process flow diagram describing each unit, its processes and operations, along with material and energy inputs and outputs (Material and energy balance)	Please refer para 2.3 of chapter 2
16	Details on design and manufacturing process for all the units	Please refer para 2.3 of chapter 2
17	Details on environmentally sound technologies for recycling of hazardous materials, as per CPCB guidelines may be mentioned in case of handling scrap and other recycled materials	Refer para 4.7.2 of chapter 4
18	Details on requirement of energy and water along with its source and authorization from the concerned department. Location of water intake and outfall points (with coordinates).	Please refer para 2.13, for water requirement. Water is drawn from Bramhani river, the intake shall lie between coordinates : Latitude: 20°48'0.46" Longitude: 85°20'13.79" The exact location will be finalised at time of project execution, as per sanction of the Water Resources Department.
19	Details on toxic metal content in the waste material and its composition and end use (particularly of slag).	Please refer para 3.5.4, of chapter 3.
20	Details on toxic content (TCLP), composition and end use of chrome slag. Details on the recovery of the Ferro chrome from the slag and its proper disposal.	Please refer para 3.5.4, of chapter 3.

CHAPTER 2

PROJECT DESCRIPTION

2.1 PRODUCTS AND CAPACITY

The project proposal pertains to installation of units as listed in **Table 2.1** with installation of beneficiation, pelletization, coal washery, DRI kilns, mini blast furnace, sinter, coke oven and steel melting shop, producer gas plant and cement plant.

TABLE 2.1
PROPOSED UNITS TO BE INSTALLED

Sl. No.	Plant facilities	Units	Phase 1	Phase 2	Total
1	Beneficiation Plant	MTPA	2.7	2.7	5.4
	Configuration		1 X2.69 MTPA	1X2.69 MTPA	2X2.69 MTPA
2	Pelletisation Plant	MTPA	1.47	1.47	2.948
	Configuration (with additional 10% extra capacity utilisation)		1X1.2 MTPA	1X1.2 MTPA	2X1.2 MTPA
3	Coal Washery	MTPA	2.616	1.524	4.141
	Configuration		1X400 TPH	1X235 TPH	1X400 TPH + 1X235 TPH
4	DRI Plant	MTPA	1.001	0.546	1.547
	Configuration (with additional 30% extra capacity utilisation)		2X500 + 2X600 TPD	2 X 600 TPD	2X500 + 4X600 TPD
5	Mini Blast Furnace	MTPA	0.567	0.992	1.559
	Configuration		1X600 CUM	1X1050 CUM	1X600 + 1X1050 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	0.70	1.12
	Configuration		6 batteries X 70,000 TPA	10 batteries X 70,000 TPA	16 batteriesX 70,000 TPA
8	Steel Melting Shop	MTPA	1.232	1.232	2.464
8.1	Steel Melting via Induction Furnace Route	MTPA	0.539	-	0.539
	Configuration		7X 20 T IF + 4X20 T LRF	-	7X 20 T IF + 4X20 T LRF
8.2	Steel Melting via Electric Arc Furnace-Vacuum	MTPA	0.693	1.232	1.925

Sl. No.	Plant facilities	Units	Phase 1	Phase 2	Total
	Degassing-Argon Oxygen Decarburization Route				
	Configuration		1X90 T + 1X160 T EAF and 1X90 T + 1X160 T LRF	1X90 T + 1X160 T EAF and 1X90 T + 1X160 T LRF	1X90 T + 1X160 T EAF and 1X90 T + 1X160 T LRF
8.3	Continuous Casting Machine (Billets/ Bloom Caster/ Slab)	MTPA	1.207	1.207	2.415
	Configuration		2 nos. X 3 strands	2 nos. X 3 strands	4 nos. X 3 strands
9	Finished Product Facilities	MTPA	1.450	1.400	2.850
9.1	Rolling Mill (TMT/ Flat/ Round/ Wire Rod/ Structural Mill/ others)	MTPA	0.800	0.800	1.600
	Configuration		4X0.2 MTPA	1X0.2 + 2X0.3 MTPA	5X0.2 + 2X0.3 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	Ductile Pipe Plant	MTPA	0.200	0.200	0.400
	Configuration		1X0.2 MTPA	1X0.2 MTPA	2X0.2 MTPA
10	Producer Gas Plant	Million Nm ³ / Annum	240	240	480
	Configuration		10X3000 Nm ³ /h	10X3000 Nm ³ /h	20X3000 Nm ³ /h
11	Oxygen Plant	MTPA	0.035	0.063	0.098
	Configuration		1 X 100 TPD	1 X 180 TPD	1 X 100 + 1 X 180 TPD
12	Lime Plant	MTPA	0.105	0.1995	0.3045
	Configuration		1 X 300 TPD	1 X 180 TPD	1 X 100 + 1 X 180 TPD
13	Cement Plant	MTPA	0.884	0.802	1.686
	Configuration		1 X 2600 TPD	1 X 2300 TPD	1 X 2600 + 1 X 2300 TPD
14	Captive Power Plant	MW	217	168	385
14.1	Waste Heat Recovery Boiler (WHRB) based Captive Power Plant (CPP)	MW	67	68	135
a	DRI Kiln exit gas based	MW	44	24	68

Sl. No.	Plant facilities	Units	Phase 1	Phase 2	Total
	Configuration		2 X 50 + 2X 60 TPH	2X 60 TPH	2 X 50 + 2X 60 TPH
b	MBF Gas based	MW	11	20	31
	Configuration		1 X 50 TPH	1 X 90 TPH	1 X 60 + 1 X 90 TPH
c	Coke Oven Gas based	MW	12	24	36
	Configuration		1 X 60 TPH	1 X 100 TPH	1 X 60 + 1 X 100 TPH
14.2	Circulating Fluidised Bed Combustion (CFBC) based CPP	MW	150	100	250
	Configuration		2X125 + 2X250 TPH	2X250 TPH	2X125 + 4X250 TPH

2.2 PLANT LAYOUT

Total land required for the project is 674.765 acres. Company has acquired 608.495 acres (comprising 540.705 acres private land + 67.790 acres Government land). Balance 66.270 acres land is pending with Tehsildar, Hindol under acquisition through IDCO. 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	Area (Acres)	Percent
1.	Plants, facilities & tailing pond	273.685	40.56
2.	Stock yards & railway siding	51.81	7.68
3.	Area for solid waste	55.2	8.18
4.	Green belt & plantation	222.67	33.00
5.	Administration & other buildings	1.4	0.21
6.	Water reservoir	30	4.44
7.	Roads	40	5.93
	Total	674.765	100

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

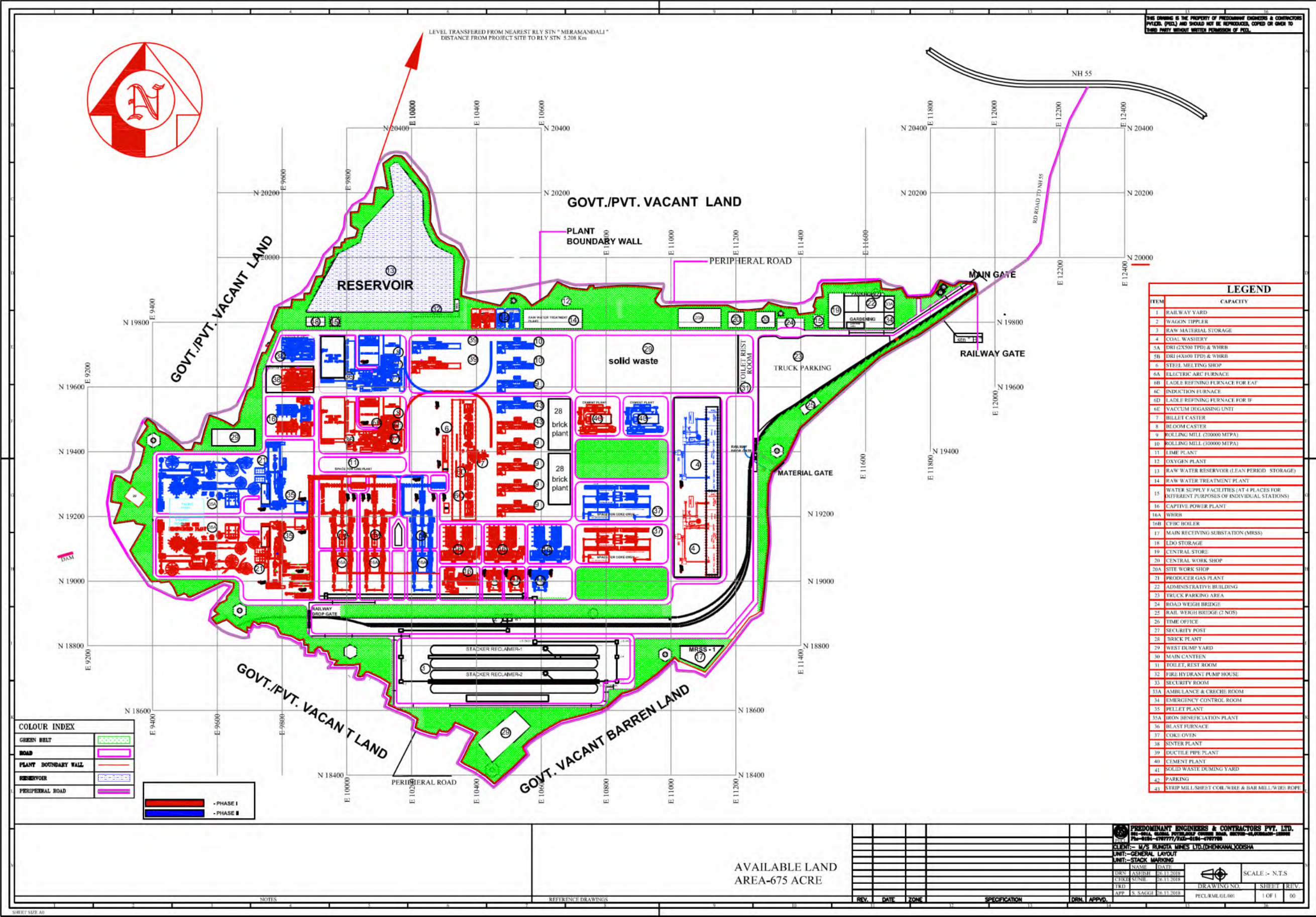
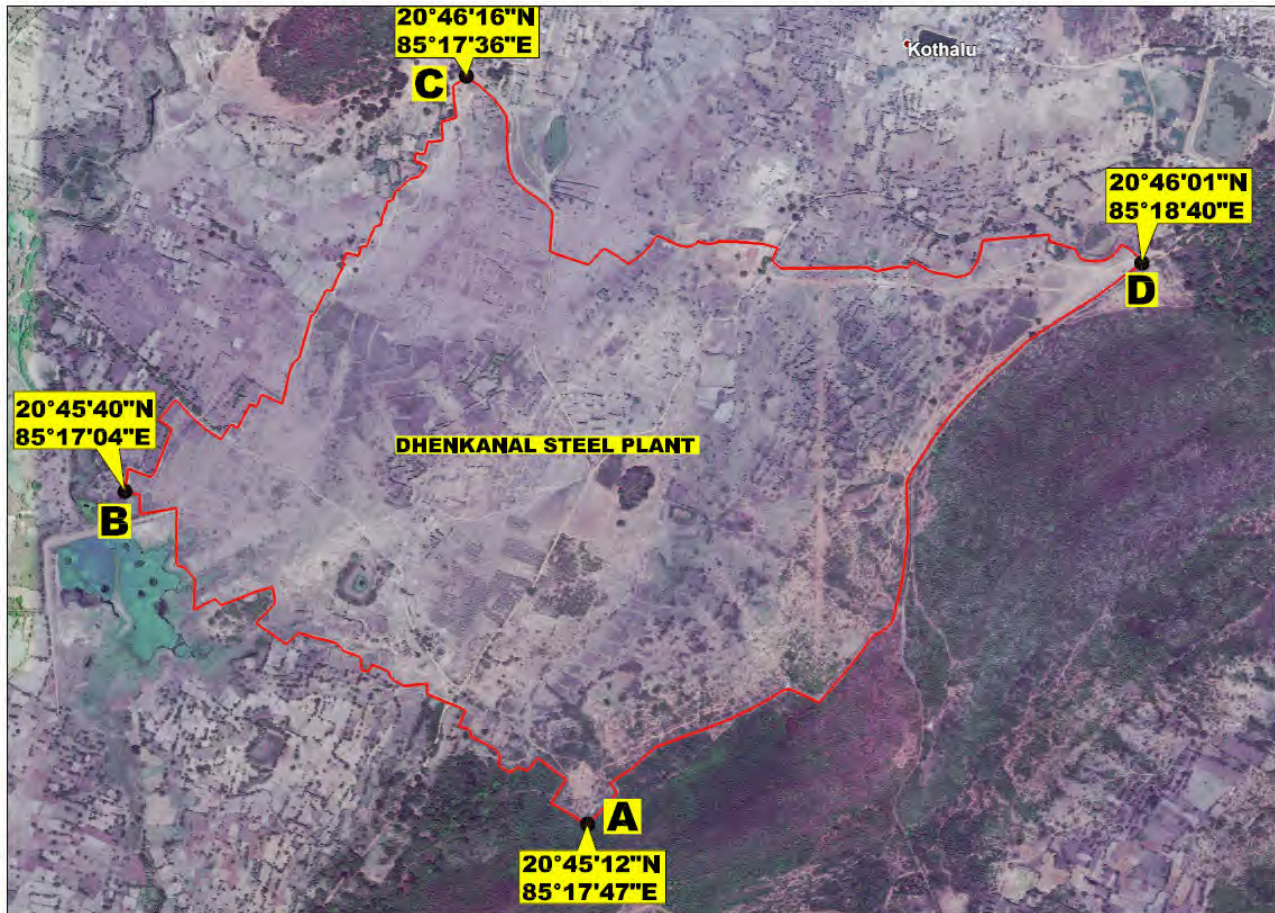


FIG 2.2: PLANT SITE PHOTOGRAPHS

	
Construction of MCC Building	Construction of DRI day bin
	
I BIN	Construction of belt conveyor from transfer tower-6 to daybin building
	
Undeveloped part of plant area	

FIG 2.3: GOOGLE IMAGE OF PROJECT SITE



2.3 PROCESS DESCRIPTION

After obtaining the environmental clearance no. J-11011/241/2009-IA.II(I) dated 02.08.2010 and its subsequent amendments & validity extensions for 1.9 MTPA steel, the plant construction was started in 2017 only with one DRI kiln of 1X500 TPD, 2X20 T IF with CCM and a 25 MW CPP.

Since the under construction plant shall not get completed within the validity period of the environmental clearance (within 01.08.2020), the Company applied to Ministry of Environment, Forest and Climate Change and obtained fresh Terms of Reference for a larger production of 2.85 MTPA steel.

The plant configuration for 2.85 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 are processes are described in subsequent sections.

2.3.1 Iron Ore Beneficiation Plant

The proposed configuration of beneficiation plant is given in **Table 2.3**.

TABLE 2.3
CONFIGURATION OF BENEFICIATION PLANT

Description	Phase-I	Phase-II	Total
Nos.	1	1	2
Capacity, MTPA	2.69	2.69	2.69
No. of working days/ anum	330	330	330
No. of working hours/ day	24	24	24
Production, TPA	2694963	2694963	5389927

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 IRON ORE BENEFICIATION PLANT

Raw Material Inputs	Specific Consumption or generation T/T of Product	Phase-I Quantity (TPA)	Phase-I %	Phase-II Quantity (TPA)	Phase-II %	Total Quantity (TPA)	Total %
Low Grade Iron Ore Fines (0 to 5 mm)	1.00	2694963	99.995%	2694963	99.995%	5389927	99.995%
Flocculant	0.00005	135	0.005%	135	0.005%	269	0.005%
Total	1.00005	2695098	100%	2695098	100%	5390196	100%
Outputs							
Beneficiated Iron Ore (product)	0.60000	1616978	60%	1616978	60%	3233956	60%
Tailing (0.4) & emission losses (0.00005)	0.40005	1078120	40%	1078120	40%	2156240	40%
Total	1.00005	2695098	100%	2695098	100%	5390196	100%

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 ₂ O ₃	-	2.5 - 3% max
SiO ₂	-	2.5 - 3% max
L.O.I.	-	2% max

2.3.2 Pelletisation Plant

The proposed pellet plant is designed to produce iron oxide pellets suitable for use in DRI and Blast Furnace. The configuration of the pellet plant is given in **Table 2.5**.

TABLE 2.5
CONFIGURATION OF PELLETISATION PLANT

Description	Phase I	Phase II
No. of Units	1 No.	1 No.
Unit Capacity (Based on output)	1,200,000 TPA	1,200,000 TPA
Production capacity per day @300 days/annum	4000 Tonnes	4000 Tonnes
10% productivity improved by using high grade iron-ore fines	4000 + (4000 X 10%)	4000 + (4000 X 10%)
Actual number of days per year likely to be operated	335	335
No. of working hours/day	24	24
Total Capacity (Based on output)	1,474,000 TPA	1,474,000 TPA

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 in duration.
- 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.

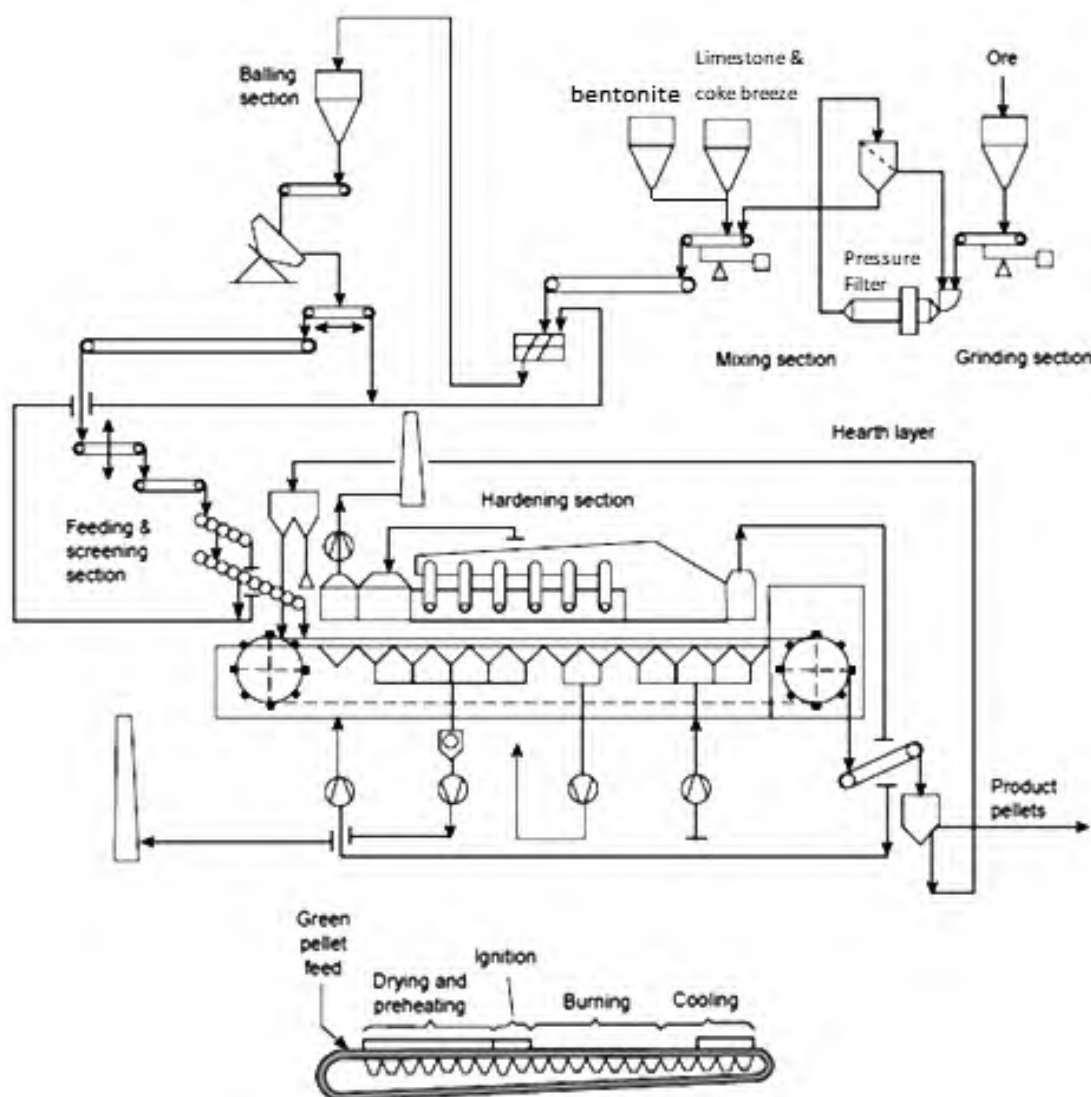
Material balance of the pelletisation plant is given in **Table 2.6**. Process flow sheet is given in **Fig 2.4**.

TABLE 2.6
MATERIAL BALANCE OF PELLETTISATION PLANT

Raw Material & Fuel Inputs	Specific Consumption or generation T/T of Product	Phase-I Quantity (TPA)	Phase-I %	Phase-II Quantity (TPA)	Phase-II %	Total Quantity (TPA)	Total %
Iron Ore/ Fines/ concentrate	1.097	1616978	93.25%	1616978	93.25%	3233956	93.25%
Dolomite (Flux)	0.014	20636	1.19%	20636	1.19%	41272	1.19%
Bentonite	0.015	22110	1.28%	22110	1.28%	44220	1.28%
Coke Breeze	0.017	25058	1.45%	25058	1.45%	50116	1.45%
Coal >= 5500 Kcal /kg (emergency use)	0.033	49232	2.84%	49232	2.84%	98463	2.84%
Sub-Total (solids)	1.176	1734014	100.00%	1734014	1.00	3468027	100.00%
Producer Gas (Nm ³)	162.5	239525000		239525000		479050000	
Sub-Total (gas)	162.500	239525000		239525000		479050000	
Outputs							
Pellets	1.000	1474000	85.01%	1474000	85.01%	2948000	85.01%
Dust (Iron Ore, Coke, Coal Fines)	0.082	120386	6.94%	120386	6.94%	240772	6.94%
Losses	0.095	139628	8.05%	139628	8.05%	279255	8.05%
Sub-Total (Solids)	1.176	1734014	100.00%	1734014	100.00%	3468027	100.00%
Combustion Gases (Nm ³)	162.5	239525000		239525000		479050000	
Sub-Total (gas)	162.500	239525000		239525000		479050000	

The pellets generated in first phase will not be sufficient to meet the demand for the DRI kilns. Of the total demand of 1,501,500 TPA of iron oxide in DRI kilns in phase I, pellet plant will be able to meet 1,474,000 TPA. There will be a shortfall of 27,500 TPA which will be brought from company's own plant at Kamanda Steel Plant or Dudhaposi Pelletisation Plant. Both these plants are located in Odisha. In second phase, against a requirement of 819,000 TPA, the pellets generated will be 1,474,000 TPA. After compensating for the deficit of Phase-I, there will be 6,27,500 TPA excess pellets available which will be sold in the open market.

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 ₂ + Al ₂ O ₃	3.10% max	P	0.04% max
Na ₂ O	0.05% max	S	0.02% max
K ₂ O	0.05% max	V	----
TiO ₂	0.10% max	Basicity (CaO/SiO ₂)	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 configuration of the units will be in **Table 2.8** and material balance is given in **Table 2.9**.

TABLE 2.8
CONFIGURATION OF COAL WASHERY (BASED ON INPUT ROM COAL)

Description	Unit	Phase-I	Phase-II	Total
Coal Washery	Nos.	1	1	2
Capacity	TPH	400	235	400 & 235
No. of working days	per/ annum	327.06	324.36	325.71
No. of working hours	hours/ day	20	20	20
Plant	Unit	Production	Production	Production
1X400 + 1X235 TPH	TPA	2,616,480	1,524,480	4,140,960

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

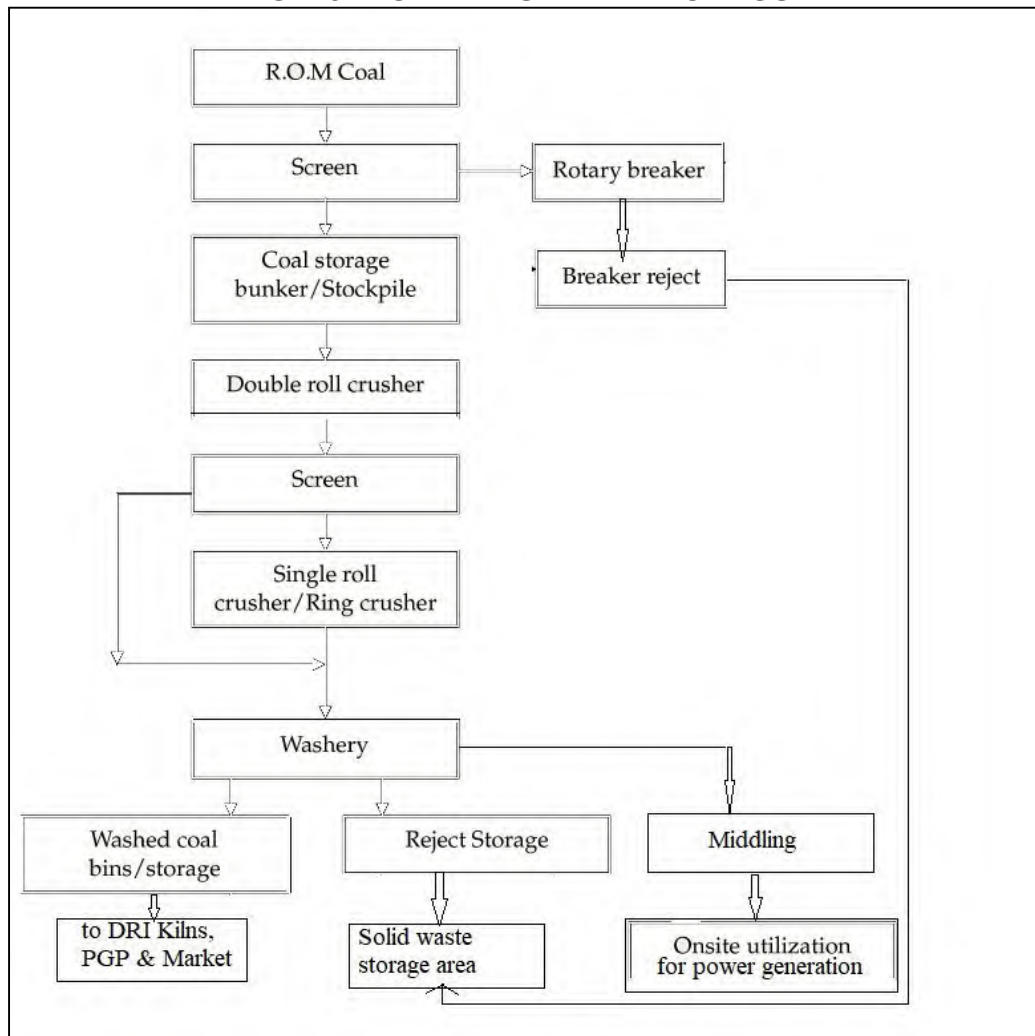


TABLE 2.9
MATERIAL BALANCE FOR COAL WASHERY

Raw Material Inputs	Specific Consumption or generation T/T of Product	Phase-I Quantity (TPA)	Phase-I %	Phase-II Quantity (TPA)	Phase-II %	Total Quantity (TPA)	Total %
ROM Coal	1.00	2616480	100%	1524480	100%	4140960	100%
Total	1.00	2616480	100%	1524480	100%	4140960	100%
Outputs							
Washed Coal	0.500	1308240	50.00%	762240	50.00%	2070480	50.00%
Middlings	0.425	1112004	42.50%	647904	42.50%	1759908	42.50%
Reject	0.075	196236	7.50%	114336	7.50%	310572	7.50%
Total	1.00	2616480	100%	1524480	100%	4140960	100%

The washed coal will be used for DRI kilns as well as producer gas plant. The utilisation of the washed coal as well as middlings is summarised in **Table 10**.

TABLE 10
UTILISATION OF WASHED COAL & MIDDLINGS

Use of washed coal and middlings	Quantity (TPA)	%	Quantity (TPA)	%	Quantity (TPA)	%
Washed Coal Used in DRI kilns	880880	67.33%	480480	63.04%	1361360	65.18%
Washed Coal Used in Producer Gas Plant	107040	8.18%	107040	14.04%	214080	11.11%
Washed Coal sold in market	320320	24.48%	174719.89	22.92%	495040	23.91%
Middlings in Captive Power Plant	1112004	100.00%	647904	100.00%	1759908	

2.3.4 DRI Plant

The proposed capacity is given in **Table 2.11**.

TABLE 2.11
CONFIGURATION OF DRI PLANT

Description	Unit	Phase-I	Phase-II	Total
DRI Kilns		2 X 500 TPD + 2 X 600 TPD	2 X 600 TPD	2 X 500 TPD + 4 X 600 TPD
No. of working days	Days/Annum	350	350	350
No. of working hours	Hours /Day	24	24	24
% Production increase	%	30%	30%	30%
Total Production	TPA	1001000	546000	1547000

With respect to the 30% production increase mentioned in the above table, the following may be noted:

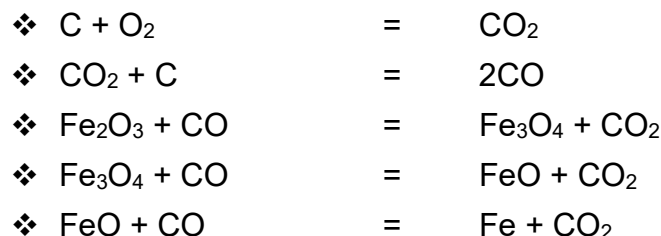
- Increased production will be achieved by using superior quality of Non-Coking Coal.
- When the input coal quality is improved by washing or by using South African coal, the specific consumption of coal reduces to 0.80 T/T of DRI as compared to 1.5 T/T in conventional kilns under operation in the country.
- This will result in increase of production of DRI because of increase in feed rate of Iron Ore with the same fill factor.
- Although specific iron ore consumption will remain 1.5 T/T of DRI, but the feed rate will increase.
- Due to using superior quality of coal, accretion is minimized and number of working days increased.
- With use of superior quality of coal, the char generation will also decrease from conventionally 25% to 18%.

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

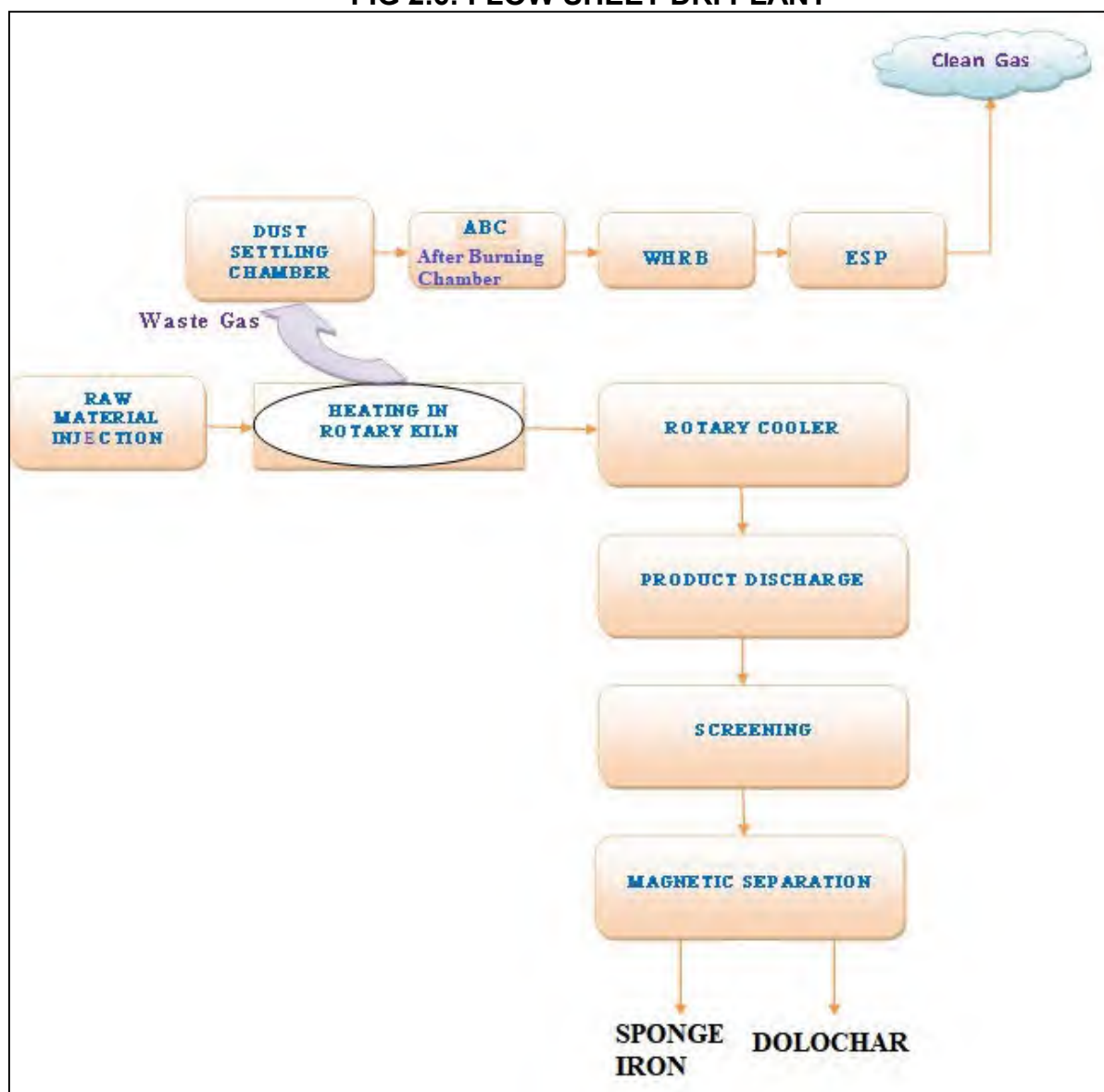
carried out by belt conveyers to the stock house, having 5 days storage bins. Crushers for coal & limestone, will be provisioned.

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 2.12**.

TABLE 2.12
MATERIAL BALANCE OF DRI PLANT

Raw Material & Fuel Inputs	Specific Consumption or generation T/T of Product	Phase-I Quantity (TPA)	Phase-I %	Phase-II Quantity (TPA)	Phase-II %	Total Quantity (TPA)	Total %
Iron Ore	1.500	1501500	62.01%	819000	62.01%	2320500	62.01%
Coal	0.879	879879	36.34%	479934	36.34%	1359813	36.34%
Dolomite	0.040	40040	1.65%	21840	1.65%	61880	1.65%
Total	2.419	2421419	100%	1320774	100%	3742193	100%
Outputs							
Sponge Iron (DRI)	1.000	1001000	41.34%	546000	41.34%	1547000	41.34%
Char	0.184	184572	7.62%	100676	7.62%	285248	7.62%
ESP dust	0.045	45006	1.86%	24549	1.86%	69554	1.86%
Bag Filter Dust, scrapper etc.	0.018	18002	0.74%	9819	0.74%	27822	0.74%
Kiln Accretion	0.018	18002	0.74%	9819	0.74%	27822	0.74%
Losses	1.154	1154841	47.69%	629913	47.69%	1784754	47.69%
Total	2.419	2421419	100%	1320774	100%	3742193	100%

2.3.5 Mini blast furnace

The proposed configuration of Mini Blast Furnaces will be as shown in **Table 2.13**.

TABLE 2.13
CONFIGURATION OF MINI BLAST FURNACE

Description	Unit	Phase-I	Phase-II	Total
MBF	Nos.	1	1	2
Capacity	CUM	600	1050	600 & 1050
Working days	days/Annum	350	350	350

Description	Unit	Phase-I	Phase-II	Total
Working hours	Hours /Day	24	24	24
Productivity	T/Cum/day	2.7	2.7	2.7
Production	TPA	567,000	992,250	1,559,250

By using superior quality raw material, the blast furnace charge mix will become 70% Sinter along with other inputs & 30% Blast Furnace Grade Iron-Ore. Furthermore, use of coke with low ash content and by using best operation & maintenance practice, the productivity of Blast Furnace will increase from traditionally around 2.1 to 2.7 T/cum/day in the proposed MBF.

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

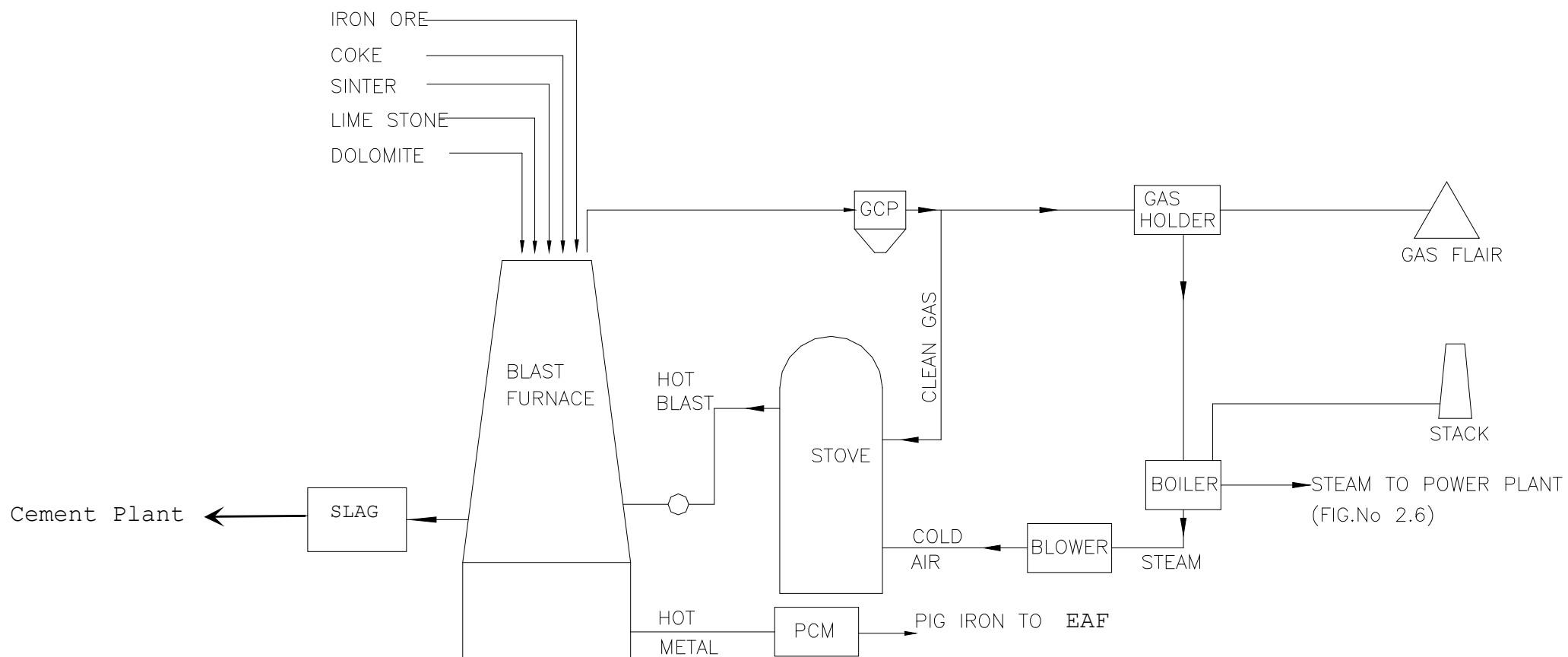
The furnace will have one tap hole. A cast house will be provided for handling the tapping operations and the hot metal/ slag. The main hot metal trough will be fixed type fabricated steel construction. The hot metal runner from each trough will discharge the metal into hot metal ladle kept on cast house 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 2.14**.

TABLE 2.14
MATERIAL BALANCE OF BLAST FURNACE

Raw Material Inputs	Specific Consumption or generation T/T of Product	Phase-I Quantity (TPA)	Phase-I %	Phase-II Quantity (TPA)	Phase-II %	Total Quantity (TPA)	Total %
Iron Ore	0.421	238980	17.92%	418215	18.07%	657195	18.01%
Sinter	1.079	611520	45.86%	1051050	45.41%	1662570	45.57%
Coke	0.610	345870	25.94%	605273	26.15%	951143	26.07%
Coal dust	0.050	28350	2.13%	49613	2.14%	77963	2.14%
Dolomite	0.140	79380	5.95%	138915	6.00%	218295	5.98%
Quartz	0.052	29484	2.21%	51597	2.23%	81081	2.22%
Total	3.411	1333584	100%	2314662	100%	3648246	100%
Outputs							
Hot Metal/ Pig Iron	1	567000	29.31%	992250	29.31%	1559250	29.31%
BF Slag	0.3	170100	8.79%	297675	8.79%	467775	8.79%
Dust (Iron Ore, Coke, Sinter Fines)	0.05	28350	1.47%	49613	1.47%	77963	1.47%
Sludge from GCP	0.005	2835	0.15%	4961	0.15%	7796	0.15%
Losses	2.056	1165899	60.28%	2040323	60.28%	3206223	60.28%
Total	3.411	1934184	100%	3384822	100.00%	5319006	100%

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. Two Sinter machine of about 64 SQM (Phase-I) and 110 SQM (Phase-II) will be installed to produce 1.663 MTPA charge sinter, which will be adequate for feeding the blast furnace. The configuration of sinter plant is as given in **Table 2.15**.

TABLE 2.15
CONFIGURATION OF SINTER PLANT

Description	Unit	Phase-I quantity	Phase-II quantity	Total quantity
Sinter Plant	Nos.	1	1	2
Capacity	SQM	64	110	64 & 110
working days	days/Annum	325	325	325
working hours	Hours /Day	21	21	21
Productivity	Ton/SQM	1.4	1.4	1
Production	TPA	611520	1051050	6125715

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.

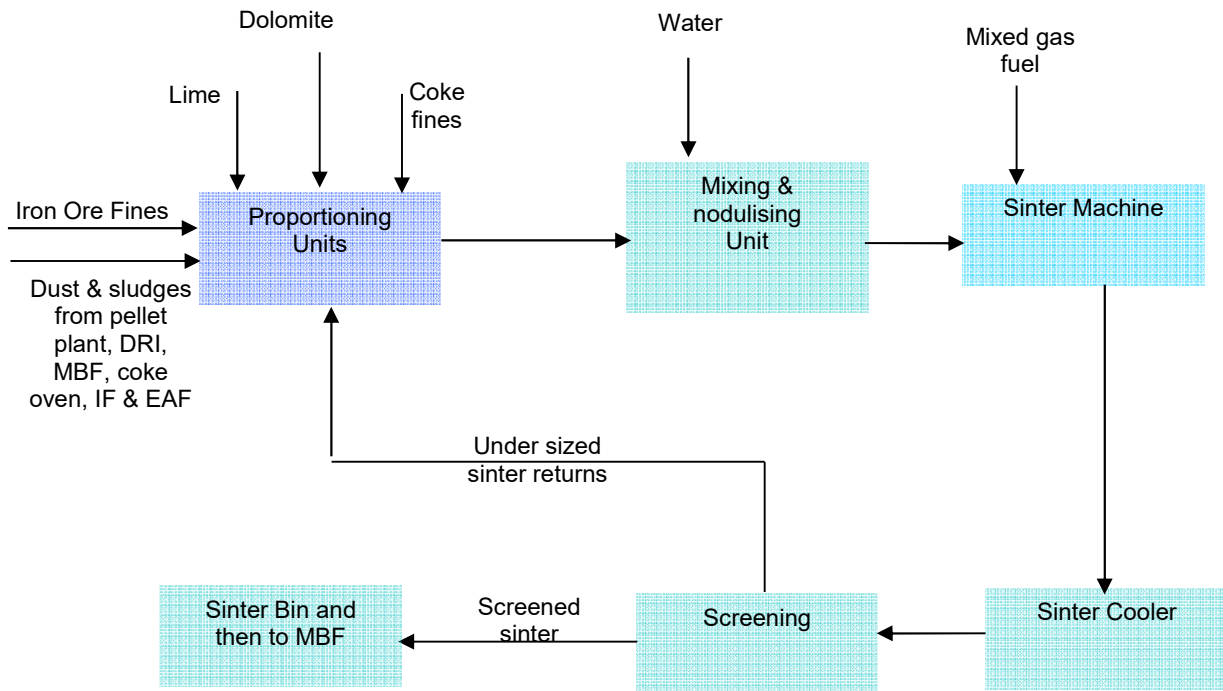
Sinter stabilizing section

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 2.16**.

TABLE 2.16
MATERIAL BALANCE OF SINTER PLANT

Raw Material Inputs	Specific Consumption or generation T/T of Product	Phase I Quantity (TPA)	Phase I%	Phase II Quantity (TPA)	Phase II%	Total Quantity (TPA)	Total %
Iron Ore Fines	0.950	580944	42.52%	998498	46.11%	1579442	44.72%
Coke Fines	0.100	61152	4.48%	105105	4.85%	166257	4.71%
Lime Stone	0.130	79498	5.82%	136637	6.31%	216134	6.12%
Dolomite	0.130	79498	5.82%	136637	6.31%	216134	6.12%
From Pellet plant (iron ore fines)	0.197	120386	8.81%	120386	5.56%	240772	6.82%
ESP, BF dust, etc. from DRI	0.103	63008	4.61%	34368	1.59%	97376	2.76%
Dust (Iron Ore, Coke, Sinter Fines) from MBF	0.046	28350	2.07%	49613	2.29%	77963	2.21%
Sludge from GCP from MBF	0.005	2835	0.21%	4961	0.23%	7796	0.22%
Bag Filter Dust from coke oven plant	0.031	19026	1.39%	31710	1.46%	50736	1.44%
BF dust from IF	0.021	13123	0.96%	0	0.00%	13123	0.37%
BF dust from EAF	0.026	15840	1.16%	27149	1.25%	42989	1.22%
Sinter Return Fines	0.350	214032	15.66%	367868	16.99%	581900	16.48%
Water	0.145	88670	6.49%	152402	7.04%	241073	6.83%
Total	2.234	1366362	100	2165332	100%	3531694	100%
Outputs							
Sinter	1.000	611520	44.76%	1051050	47.86%	1662570	47.86%
Sinter Return Fines	0.350	214032	15.66%	367868	16.75%	581900	16.75%
Water vapour	0.145	88670	6.49%				
LOI & losses	0.739	452140	33.09%	777115	35.39%	1229255	35.39%
Total	2.234	1366362	100%	2196033	100.00%	3473724	100%

FIG 2.8: PROCESS FLOW OF SINTER PLANT

2.3.7 Coke oven plant

The Coke requirements in MBF & Sinter Plant are about 0.610 T/T of hot metal and 0.065 T/T of sinter respectively. Based on the requirement, Rungta Mines Ltd proposes to install 6 batteries of 70,000 TPA in Phase-I & 10 batteries of 70,000 TPA in Phase-II. The configuration of coke oven plant is given in **Table 2.17**.

TABLE 17
CONFIGURATION OF COKE OVEN PLANT

Description	Unit	Phase-I Quantity	Phase-II Quantity	Total Quantity
Coke Oven Batteries	Nos.	6	10	16
Working days	days/Annum	350	350	350
Working hours	Hours /Day	24	24	24
Production	TPA	420000	700000	1120000

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

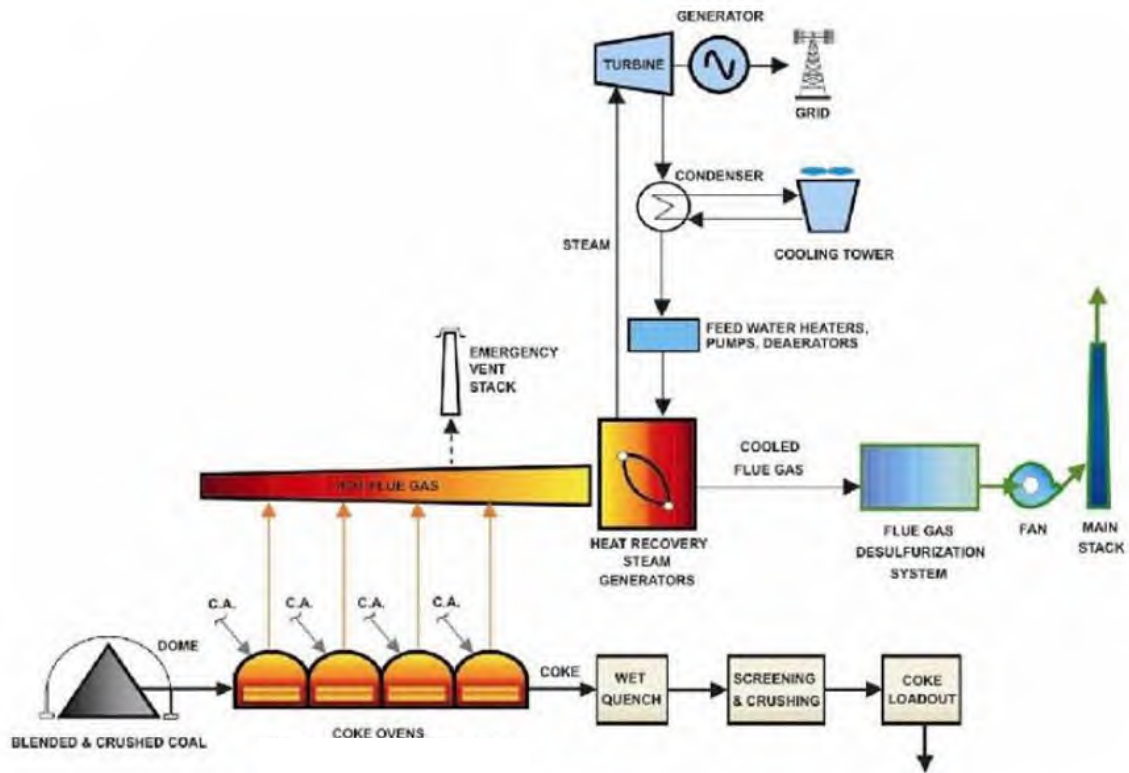
The required quantity of coking coal will be met through import from countries like Australia, China or equivalent from elsewhere. Company also will make efforts to procure from the domestic market to the maximum extent possible. For flexibility in operation, blending provisions in the plant may be incorporated 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 2.18**.

TABLE 2.18
MATERIAL BALANCE OF COKE OVEN

Raw Material Inputs	Specific Consumption or generation T/T of Product	Phase-I Quantity (TPA)	Phase-I %	Phase-II Quantity (TPA)	Phase-II %	Total Quantity (TPA)	Total %
Coking Coal	1.51	634200	100%	1057000	100%	1691200	100%
Total	1.51	634200	100%	1057000	100%	1691200	100%
Outputs							
Coke	1	420000	66.23%	700000	66.23%	1120000	66.23%
Bag Filter Dust	0.0453	19026	3%	31710	3%	50736	3.00%
Losses & COG	0.4647	195174	30.77%	325290	30.77%	520464	30.77%
Total	1.51	634200	100%	1057000	100%	1691200	100%

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

The configuration for various phases is given in **Table 2.19**. A brief description of the manufacturing process is given in subsequent paragraphs.

TABLE 2.19
CONFIGURATION OF SMS VIA IF ROUTE

Description	Unit	Phase-I Quantity
Induction Furnace	Nos.	7
Capacity	Ton	20
Ladle Furnace	Nos.	4
Capacity	Ton	20
CCM	Nos.	1
Strands	Nos.	3
Working days	Days/Annum	350
Working hours	Hours /Day	24
No. of Heats	Heats	11
Production Plant	TPA	539000

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.

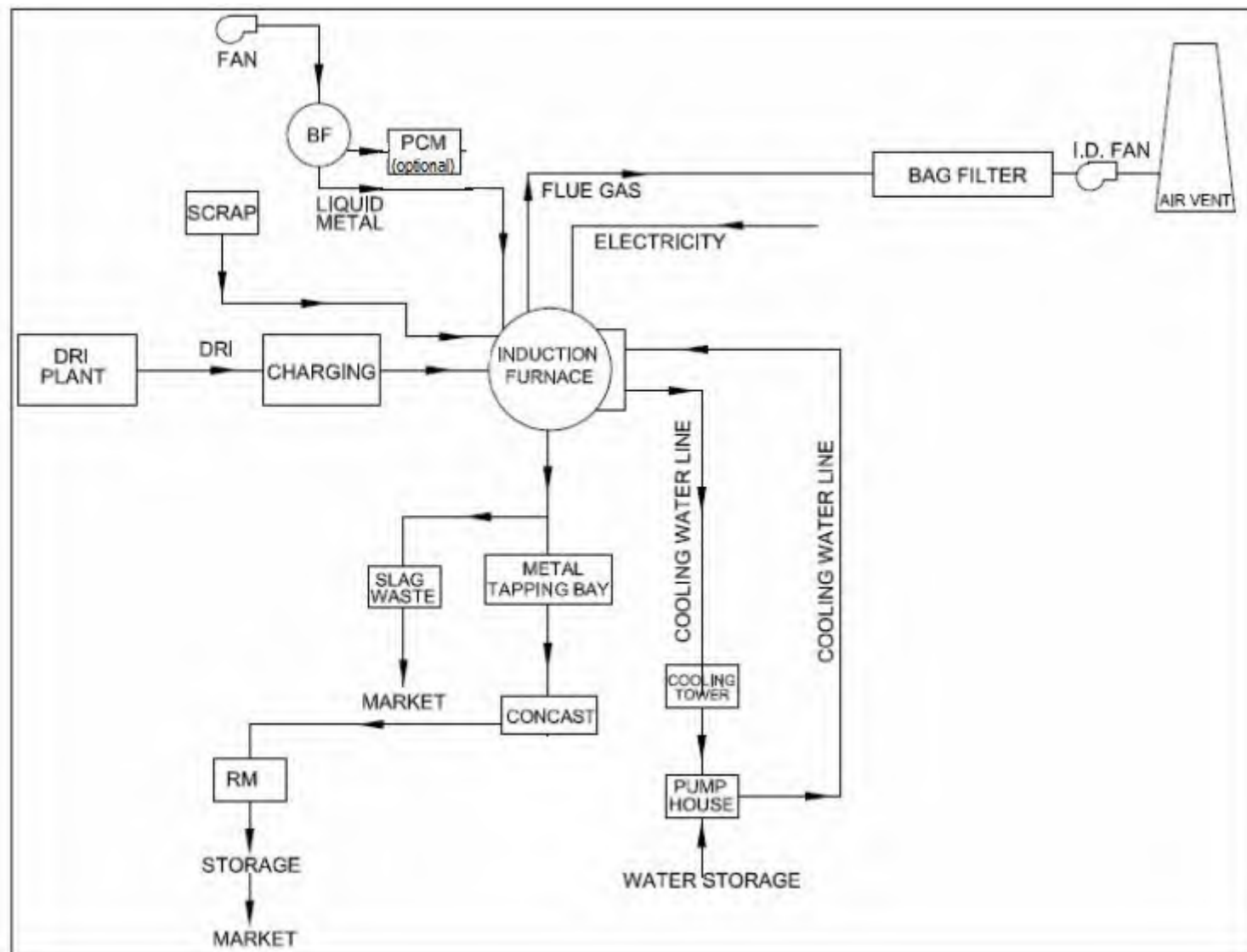
The LF will be complete with the transformer, ladle stirring system, aluminum wire feeder, carbon injecting device, additives storage and addition system, sampling and temperature measuring device. A fume extraction and cleaning system consisting of bag filters, ID fan and chimney with the related duct 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 2.20**.

TABLE 2.20
MATERIAL BALANCE OF SMS VIA IF ROUTE

Raw Material Inputs	Yield	% Charge Mix	Phase-I Quantity (TPA)	Specific Consumption (T/T)
DRI	80%	80%	539000	1.000
Pig Iron / Hot Metal	92%	15%	87880	0.163
Steel Scrap	92%	5%	29293	0.054
Total		100%	656174	1.217
Outputs				
Liquid metal to CCM		82.14%	539000	
Loss (Slag)		17.86%	117174	
Total		100%	656174	

FIG 2.10: PROCESS FLOW SHEET OF INDUCTION FURNACE



2.3.8.2 Electric arc furnace-LRF-CCM Route

The configuration for various phases is given in **Table 2.21**. A brief description of the manufacturing process is given in subsequent paragraphs.

TABLE 2.21
CONFIGURATION OF SMS

Description	Unit	Phase-I	Phase-II	Total
Electric Arc Furnace	Nos.	1	1	2
Capacity	Ton	90	160	90 & 160
Ladle Furnace	Nos.	1	1	2
CCM	Nos.	1	1	2
Strands	Nos.	3	3	3x3
working days	days/Annum	350	350	350
working hours	Hours /Day	24	24	24
No. of Heats	Heats	22	22	22
Production	TPA	693000	1232000	1925000

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 is approximately 53.33% DRI 38.89% hot metal and 7.77% pig iron. Electric Arc Furnaces Process flow sheet of the EAF is given in **Fig 2.11**. The material balance is given in **Table 2.22**.

FIG 2.11: PROCESS FLOW SHEET OF ELECTRIC ARC FURNACE

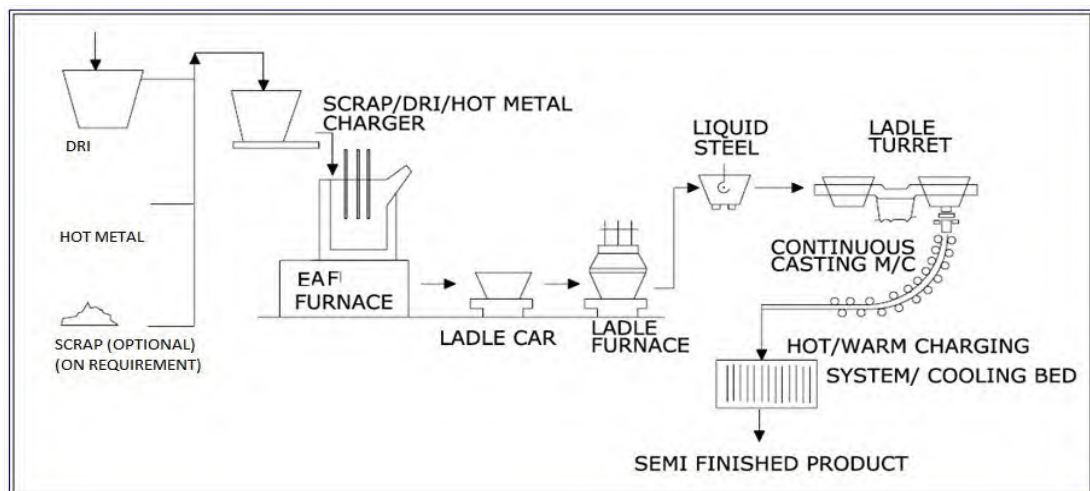


TABLE 2.22
MATERIAL BALANCE SMS (EAF)

Raw Material Inputs	Yield	Phase-I			Phase-II			Total		
		% Charge Mix	Quantity (TPA)	Specific Consumption (T/T)	% Charge Mix	Quantity (TPA)	Specific Consumption (T/T)	% Charge Mix	Quantity (TPA)	Specific Consumption (T/T)
DRI	80%	53.33%	462000	0.667	40.22%	546000	0.729	46.90%	1008000	46.90%
Hot Metal/Pig Iron from MBF	98%	38.89%	275038	0.397	58.06%	788168	0.354	49.46%	1063206	49.46%
Pig Iron from Outside	98%	7.77%	54962	0.079	1.71%	23260	0.071	3.64%	78222	3.64%
Total (Liquid metal to CCM)		100.00%	792000	1.14	100.00%	1357429	1.15	100.00%	2149429	1.00
Outputs			Quantity (TPA)	%		Quantity (TPA)	%		Quantity (TPA)	%
Liquid metal to CCM			693000	87.50%		1232000	88.98%		1925000	88.44%
BF dust			15840	2.00%		27149	2.00%		42989	1.98%
Slag			83160	10.50%		125429	9.06%		208589	9.58%
Total			792000	100.00%		1384577	100.04%		2176577	100.00%

2.3.8.3 Billets / bloom/ slab caster (from IF)

The Caster is complete with ladle stand, mould assembly, Strand guide segments and supports withdrawal and straightening system, mould cooling system, Cut- off equipment incl. length measuring device, marking machine etc. material balance is given in **Table 2.23**.

TABLE 2.23
MATERIAL BALANCE OF BILLETS / BLOOM/ SLAB CASTER (FROM IF)

Raw Material Inputs	Specific Consumption (T/T)	Phase-I quantity TPA	Total quantity in TPA
Liquid Metal from Furnace	1.02	539000	539000
Total	1.02	539000	539000
Outputs		Quantity (TPA)	Quantity (TPA)
Semi-Finished Product from CCM	1.00	528220	528220
Mill Scale	0.02	10780	10780
Total	1.02	539000	539000

2.3.8.4 Billets / Bloom/ Slab Caster VIA EAF Route

The material balance is given in **Table 2.24**.

TABLE 2.24
MATERIAL BALANCE FOR CCM VIA EAF ROUTE

Raw Material Inputs	Phase-I capacity		Phase-II capacity		Total	
	679140		1207360		1886500	
	Quantity (TPA)	Specific Consumption (T/T)	Quantity (TPA)	Specific Consumption (T/T)	Quantity (TPA)	Specific Consumption (T/T)
Liquid Metal from Furnace @ 98.00% yield	693000	1.02	1232000	1.02	1925000	2.04
Total	693000	1.02	1232000	1.02	1925000	2.04
Outputs	Quantity (TPA)	%	Quantity (TPA)	%	Quantity (TPA)	%
Semi-Finished Product from CCM	679140	98%	1207360	98%	1886500	98%
Mill scale	13860	2.00%	24640	2.00%	38500	2%
Total	693000	100%	1232000	100%	1925000	100%

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 proposed Finished Product Facilities configuration is given in **Table 2.25**.

TABLE 2.25
CONFIGURATION OF ROLLING MILL

Description	Unit	Phase-I	Phase-II	Total
Rolling Mill	Nos.	4	1+2	7
working days	days/Annum	350	350	350
working hours	Hours /Day	20	20	20
Production				
5x200000 TPA Rolling Mill	TPA	800000	200000	1000000
2x 300000 TPA Rolling Mill	TPA		600000	600000
Production	TPA	800000	800000	1600000

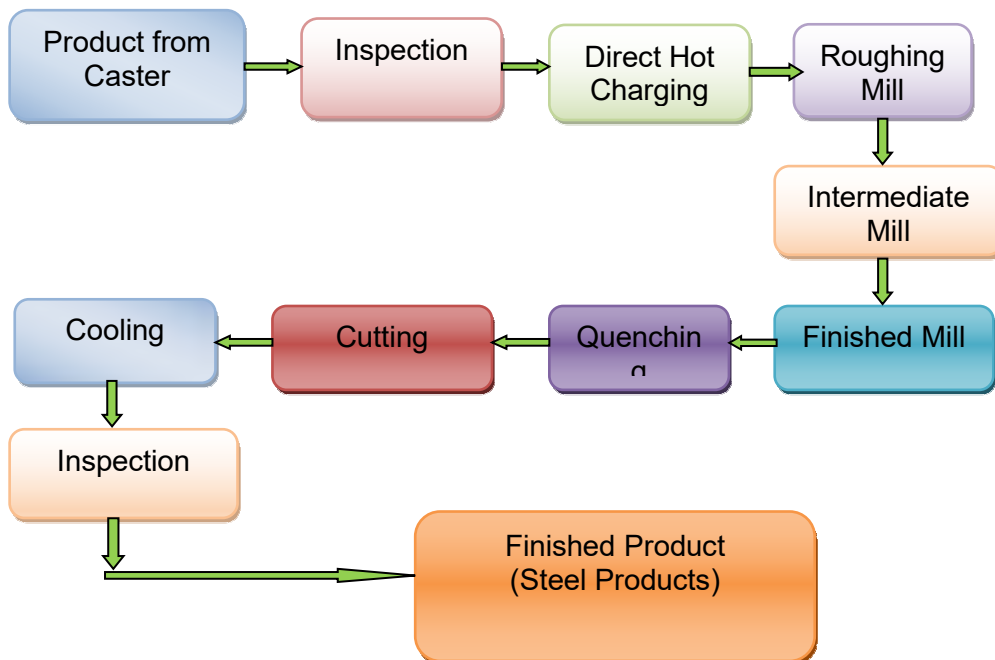
2.3.9.1 Rolling Mill (TMT/ Round / Wire ROD / Structural/ Flat/ Others)

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 2.26**.

TABLE 2.26
MATERIAL BALANCE OF ROLLING MILL

Raw Material Inputs	Yield	Phase-I		Phase-II		Total	
		Unit	Quantity		Quantity		Quantity
		Quantity (TPA)	Specific Consumption (T/T)	Quantity (TPA)	Specific Consumption (T/T)	Quantity (TPA)	Specific Consumption (T/T)
Semi Finished Product from IF-CCM	98%	528220	0.66	0		528220	0.33
Semi Finished Product from EAF-CCM	98%	219956	0.27	799197	1.00	1019153	0.64
Semi finished purchased from outside	98%	68150	0.09	17130	0.02	85280	0.05
Total		816327	1.02	816327	1.02	1632653	1.02
Outputs	Specific Generation (T/T)	Quantity (TPA)	%	Quantity (TPA)	%	Quantity (TPA)	%
Finished Product	1.00	800000	98.0%	800000	98.0%	1600000	98.0%
Reject	0.01	7347	0.9%	7347	0.9%	14694	0.9%
Mill Scale	0.01	8980	1.1%	8980	1.1%	17959	1.1%
Total	1.02	816327	100.0%	816327	100%	1632653	100.0%

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 2.27**.

**TABLE 2.27
CONFIGURATION OF STRIP MILL**

Description	Unit	Phase-I	Phase-II	Total
Strip Mill	Nos.	1	1	2
working days	days/Annum	350	350	350
working hours	Hours /Day	20	20	20
Plant	Unit	Production	Production	Production
Production	TPA	450000	400000	850000

The Material balance for Strip Mill is given in the **Table 2.28**.

**TABLE 2.28
MATERIAL BALANCE OF STRIP MILL**

Raw Material Inputs	Specific Consumption / (T/T)	Phase-I Quantity (TPA)	Phase-II Quantity (TPA)	Total Quantity (TPA)
Semi Finished Product from CCM	1.02	459184	408163	867347
Total	1.02	459184	408163	867347
Outputs	%	Quantity (TPA)	Quantity (TPA)	Quantity (TPA)
Finished Product	98.0%	450000	400000	850000
Reject	0.9%	4133	3673	7806
Mill Scale	1.1%	5051	4490	9541
Total	100%	459184	408163	867347

2.3.9.3 Ductile Pipe Plant

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 2.29**.

**TABLE 29
CONFIGURATION OF DUCTILE PIPE**

Description	Unit	Phase-I Quantity	Phase-II Quantity	Total Quantity
Ductile Pipe Plant	Nos.	1	1	2
working days	Days/Annum	350	350	350
working hours	Hours /Day	20	20	20
Production	TPA	200000	200000	400000

The Material balance for Ductile Pipe Plant is given in the **Table 2.30**.

TABLE 2.30
MATERIAL BALANCE OF DUCTILE PIPE PLANT

Raw Material Inputs	Specific Consumption/ (T/T)	Phase-I Quantity (TPA)	Phase-II Quantity (TPA)	Total Quantity (TPA)
Hot Metal from Blast Furnace	1.02	204082	204082	408163
Total	1.02	204082	204082	408163
Outputs	%			
Finished Product	98.0%	200000	200000	400000
Reject	0.9%	1837	1837	3673
Mill Scale	1.1%	2245	2245	4490
Total	100%	204082	204082	408163

2.4 PRODUCER GAS PLANT

The proposed Producer Gas Plant Facilities configuration is given in **Table 2.31**.

TABLE 2.31
CONFIGURATION OF PRODUCER GAS PLANT FACILITIES

Description	Unit	Parameters	
		Phase I	Phase II
Heat required for one ton of Pellet	KCal/Ton	220,000	220,000
Total Pellet Production	TPA	1,474,000	1,474,000
Total Heat Required	KCal/Year	32.428X 10 ¹⁰	32.428X 10 ¹⁰
CV of Producer Gas	KCal/Nm ³	1250-1375	1250-1375
CV of Producer Gas	KCal/Nm ³	1353.78	1353.78
Producer Gas Requirement	Nm ³ /Year	24.00 X 10 ⁷	24.00 X 10 ⁷
Operational Day per Annum	Days	335	335
Operational Hours per Day	Hours	24	24
Per Hour Requirement	Nm ³ /Hr	29788.55	29788.55
Per Unit Capacity	Nm ³ /Hr	3000	3000
No. of Units	Nos.	9.92	9.92
Say	Nos.	10	10

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 gasification.
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.

On the basis of the plant practice, selection of processes for the proposed Producer Gas Plant is divided into 2X10 units i.e. 3000 Nm³/ Hr. Material balance is given in **Table 2.32**.

TABLE 2.32
MATERIAL BALANCE OF PRODUCER GAS PLANT

Raw Material Inputs	Specific Consumption / or Generation of Gas (Kg/Nm ³ of PG)	Phase-I Quantity (TPA)	Phase-II Quantity (TPA)	Total Quantity (TPA)
Coal	0.000446	107040	107040	214080
Total		107040	107040	214080
Outputs				
Coal Ash	0.000116	27830	27830	55661
Losses on ignition & gas	0.000330	79210	79210	158419
Total	0.000446	107040	107040	214080

2.5 OXYGEN PLANT

The Oxygen Plant for 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. Configuration of oxygen plant is given in **Table 2.33**.

TABLE 2.33
CONFIGURATION OF OXYGEN PLANT

Description	Unit	Phase-I Quantity	Phase-II Quantity	Total Quantity
		24500000	44100000	68600000
Capacity of EAF	TPA	693000	1232000	1925000
Oxygen required for 1 Ton Liquid Steel	CUM/T	35	35	35
Total Oxygen required for EAF	CUM / Annum	24255000	43120000	67375000
Working Days	Days/annum	350	350	350
Working Hours	Hours/day	24	24	24
Daily requirement of Oxygen	CUM / Day	69300	123200	192500
Oxygen Volume	CUM / Ton	700	700	700
Daily requirement of Oxygen in Ton	TPD	99	176	
Plant Capacity	TPD	100	180	

To meet the oxygen and argon requirement of the EAF, tonnage oxygen plants of capacity 100 TPD in Phase-I and 180 TPD in Phase II 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 2.34**.

TABLE 2.34
MATERIAL BALANCE OF OXYGEN PLANT

Raw Material Inputs	Specific Production /Generation Nm3 of Product	Phase-I Quantity (CUM / Annum)	Phase-I %	Phase-II Quantity (CUM / Annum)	Phase-II %	Total Quantity (CUM / Annum)	Total %
Air	4.76	116666667	100%	210000000	100%	326666667	100%
Total	4.76	116666666.7	100%	210000000	100%	326666667	100%
Products Outputs							
Oxygen	1.000	35000	21.00%	63000	21.00%	98000	21.00%
Nitrogen	3.714	130000	78.00%	234000	78.00%	364000	78.00%
Argon	0.048	1667	1.00%	3000	1.00%	4667	1.00%
Total	4.76	166667	100%	300000	100%	466667	100%

2.6 LIME PLANT

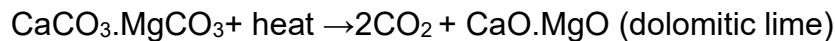
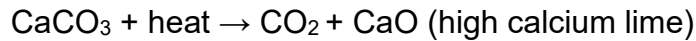
Lime and dolomite are commonly used in converters and electric arc furnaces, where they help to form slag which draws off harmful impurities such as silicon and phosphorus. Lime is also used to improve productivity in the ore agglomeration process. More recently, new products and services have been introduced 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 2.35**.

TABLE 2.35
CONFIGURATION OF LIME PLANT

Description	Unit	Phase-I Quantity	Phase-II Quantity	Total Quantity
Capacity of EAF	TPA	693000	1232000	1932000
Lime required for 1 Ton Liquid Steel	T/T	0.15	0.15	0.15
Working Days	Days/annum	350	350	350
Working Hours	Hours	24	24	24
Daily requirement of Lime	TPD	300	528	828
% of Extra Lime required as of Big Furnace (considering Safe side)	%	0	7.60%	0.076
Plant Capacity	TPD	300	568.13	
Plant Capacity	TPD	300	570	
Annual Capacity	TPA	105000	184800	289800

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 2.36**.

TABLE 2.36
MATERIAL BALANCE OF LIME PLANT

Raw Material Inputs	Specific Consumption T/T of Product	Phase-I Quantity (TPA)	Phase-I %	Phase-II Quantity (TPA)	Phase-II%	Total Quantity (TPA)	Total %
Lime Stone	1.8	189000	90.00%	332640	90.00%	521640	90.00%
Fuel Oil	0.2	21000	10.00%	36960	10.00%	57960	10.00%
Total	2.0	210000	100%	369600	100%	579600	100%
Outputs							
Lime	1.0	105000	50.00%	184800	50.00%	289800	50.00%
LOI & others	1.0	105000	50.00%	184800	50.00%	289800	50.00%
Total	2.0	210000	100%	369600	100%	579600	100%

2.7 CEMENT PLANT

The proposed Cement Plant configuration is given in **Table 2.37**.

TABLE 2.37
CONFIGURATION OF CEMENT PLANT

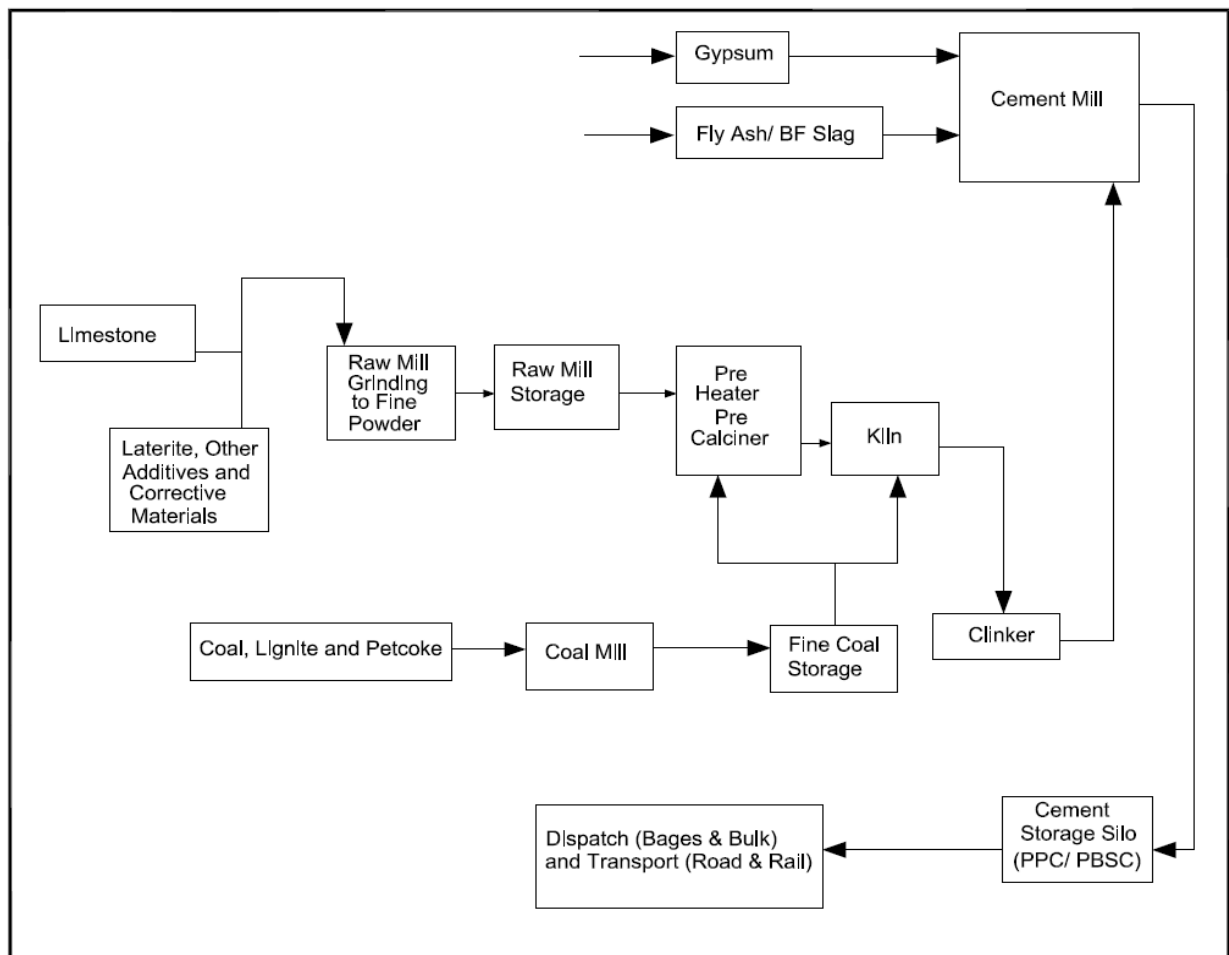
Description	Unit	Phase-I Quantity	Phase-II Quantity	Total Quantity
(1) Cement Plant	Nos.	1	1	2
Capacity	TPD	2600	2300	2600 & 2300
Working days	per/Annum	340	348.5	340
Working hours	Hours /Day	24	24	24
Total	TPA	884000	801550	1685550

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 2.13**.

FIG 2.13: 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 2.38**.

TABLE 2.38
MATERIAL BALANCE CEMENT PLANT

Raw Material Inputs	Specific consumption T/T	Phase-I Quantity (TPA)	Phase-I%	Phase-II Quantity (TPA)	Phase-II%	Total Quantity (TPA)	Total%
(1) Cement Plant							
Portland Blast Furnace Slag Cement							
Slag Generation from Blast Furnace	0.700	95,596	70%	372,179	70%	467,775	70%
Clinker	0.250	34,142	25%	132,921	25%	167,063	25%
Gypsum	0.050	6,828	5%	26,584	5%	33,412	5%
Portland Pozzolana Cement							
Fly Ash from Middlings & Char	0.350	261,602	35%	94,453	35%	356,055	35%
Clinker	0.600	448,460	60%	161,920	60%	610,380	60%
Gypsum	0.050	37,372	5%	13,493	5%	50,865	5%
Total		884,000	200%	801,550	200%	1,685,550	200%
Outputs							
Cement		884,000	100%	801,549.97	100%	1,685,550	100%
Handling Loss & others		-	0%	-	0%	-	0%
Total		884,000	100%	801,550	100%	1,685,550	100%
Raw Material Inputs	Specific consumption T/T	Phase-I Quantity (TPA)	Phase-I%	Phase-II Quantity (TPA)	Phase-II%	Total Quantity (TPA)	Total%
(2) Clinker Plant							
Lime stone	1.500	723,903	83%	442,262	83%	1,166,165	83%
Clay component	0.030	14,478	2%	8,845	2%	23,323	2%
Silica component	0.040	19,304	2%	11,794	2%	31,098	2%
Mill scale (from CCM/RM/SM/DPP)	0.030	14,478	2%	8,845	2%	23,323	2%
Coal	0.200	96,520	11%	58,968	11%	155,489	11%
Others	0.010	4,826	1%	2,948	1%	7,774	1%
Total	1.810	873,510	100%	533,662	100%	1,407,172	100%
Outputs							
Clinker	1.000	482,602	55%	294,841	55%	777,443	55%
Burning & other losses	0.810	390,908	45%	238,821	45%	629,728.83	45%
Total	1.810	873,510	100%	533,662	100%	1,407,172	100%

2.8 CAPTIVE POWER PLANT

2.8.1 WHRB power generation unit

135 MW waste heat recovery boilers based power plant is proposed to utilize the heat from gases exiting DRI kilns, blast furnace and coke oven. 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. For waste heat recovery, boiler and steam turbines to be used are given in **Table 2.39**.

TABLE 2.39
CONFIGURATION OF WHRB

Facilities	Phase-I	Phase II	Total
WHRBs Connected with 2 x 500 TPD DR Kilns	2X50 TPH= 20MW		20MW
WHRBs Connected with 2 x 600 TPD DR Kilns	2X60 TPH= 24 MW	2X60 TPH= 24 MW	48 MW
WHRB Connected with MBFs	1X50 TPH= 11 MW	1X90 TPH= 20 MW	31 MW
WHRB Connected with Coke Oven	1X60 TPH= 12 MW	1X100 TPH= 24 MW	36 MW
Total Power (MW)	67 MW	68 MW	135 MW

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/cm² 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 to below 50 mg/m³.

2.8.2 CFBC Power generation unit

CFBC: 250 MW power plant based on coal fines, middlings from washery and char from DRI kilns has been proposed. Configuration of CFBC based power plant is given in **Table 2.40**.

**TABLE 2.40
CONFIGURATION OF CPP**

Description	Unit	Phase-I Quantity	Phase-II Quantity	Total Quantity
CFBC	Nos.	4	2	2
Capacity and TPH	TPH	2x125 and 2x250	2x250	2x125+2x250
Working days	Per/Annum	340	340	340
Working hours	Hours /Day	24	24	24
Boiler Efficiency	%	80%	80%	80%
Plant	Unit	Production	Production	Production
2X125 TPH AFBC/CFBC	MW	50		50
2X250 TPH AFBC/CFBC	MW	100	100	200
Total Production Capacity	MW	150	100	250

Material and energy balance is given in **Table 2.41**.

**TABLE 2.41
MATERIAL BALANCE OF CPP**

Raw Material Inputs	Specific Consumption T/MWh	Phase-I Quantity (TPA)	Phase-I Generation (MW)	Phase-I %	Phase-II Quantity (TPA)	Phase-II Generation (MW)	Phase-II %	Total Quantity (TPA)	Total Generation (MW)
Char Generation from DR Plant	1.472	184,572	14.60	12.97	100,676	7.96	11.39	285,248	12.36
Middlings from Coal Washery	1.104	1,112,004	117.25	78.14	647,904	68.31	73.29	1,759,908	76.28
Coal Fines from RM handling at DR Plant	0.883	105,585	13.92	7.42	52,416	6.91	5.93	158,001	6.85
Power Generated from above Fuel		1,402,162	145.760	98.53	800,996	83.184	90.61	2,203,157	95.495
Coal required for Balance Power	0.576	20,930	4.240	1.47	83,004	16.816	9.39	103,934	4.50
Limestone (2 T/hr)	0.013	16,320			16,320			32,640	
Total		1,423,091.80	150	100	883,999.98	100		2,307,091.77	100
Outputs									
Material Handling Loss (5%)		71,155	4.97%		44,200	4.80%		115,354.59	4.90%
Material combusted in AFBC/CFBC (FC, VM, etc)		585,724	40.89%		401,035	43.53%		986,759.15	41.92%
Fly Ash from Char (52% Ash)		95,978	6.70%		52,351	5.68%		148,328.95	6.30%
Fly Ash from Middlings (56% Ash)		622,722	43.47%		362,826	39.38%		985,548.43	41.87%
Fly ash from Coal fines (45% Ash)		47,513	3.32%		23,587	2.56%		71,100.67	3.02%
Fly ash from Coal (45% Ash)		9,419	0.66%		37,352	4.05%		46,770	1.99%
Total		1,432,510	100%		921,352	100%		2,353,862	100%

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.

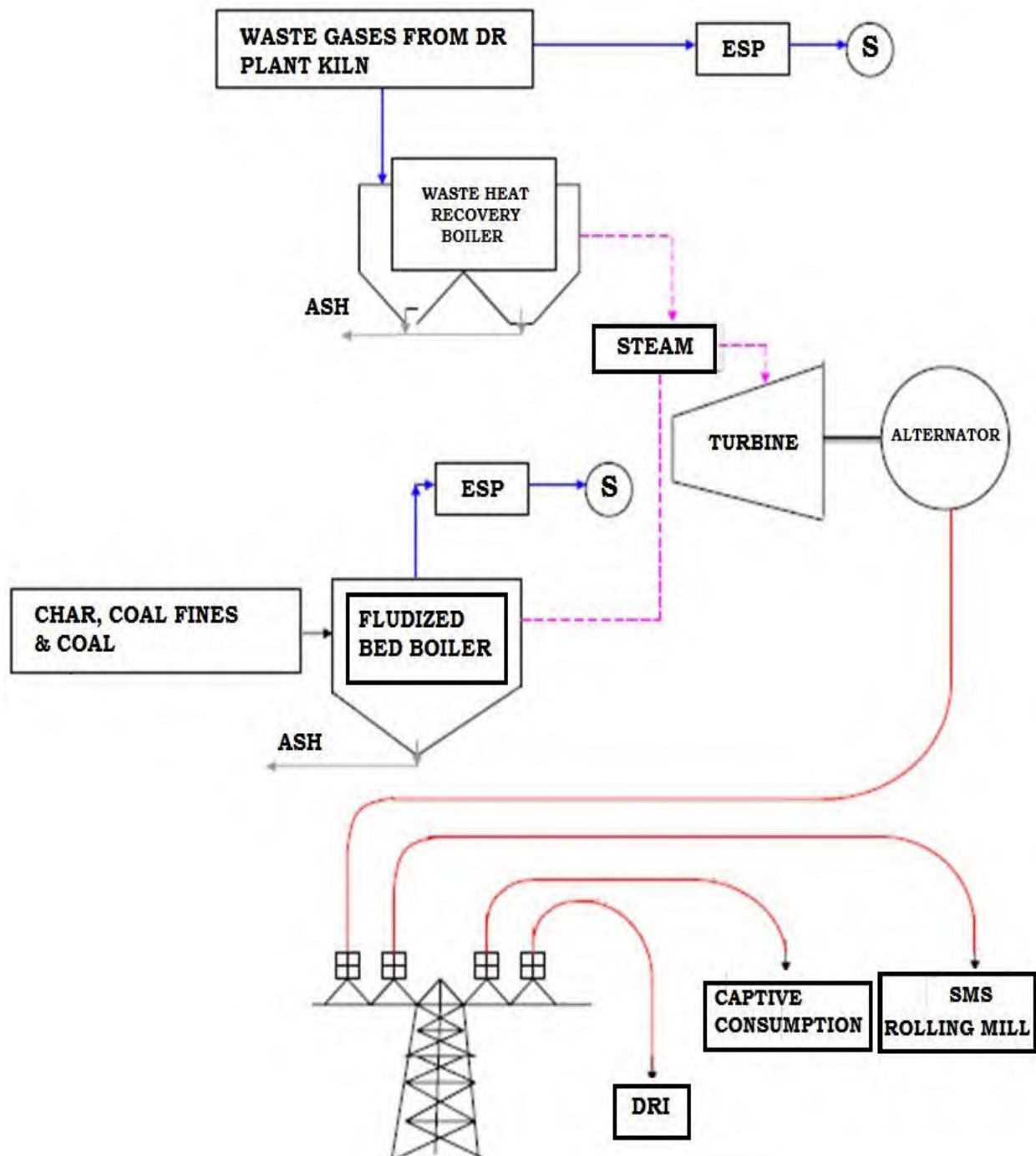
Cooling water system

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. Details of Suitable TG set to be installed are given in **Table 2.42** flow sheet of CPP is given in **Fig 2.14**.

**TABLE 2.42
SUITABLE TG SET TO BE INSTALLED**

Facilities	Units	Generation Capacity (in MW)	Total Power (in MW)	Power Generation (in MW)
Phase I				
TG Sets(WHRB)	3 Nos.	25	75	67
TG Sets (CFBC)	3 Nos.	50	150	150
Total Power			225	217
Phase II				
TG Sets(WHRB)	3 Nos.	25	75	68
TG Sets(CFBC)	2 Nos.	50	100	100
Sub total				168
			Total	385

FIG 2.14: TYPICAL FLOW DIAGRAM OF POWER PLANT



2.9 RAW MATERIAL

The overall requirement of the raw material for the Dhenkanal Steel Plant is given in **Table 2.43**. Mode of transport for raw materials will be by rail & road.

TABLE 2.43
ANNUAL RAW MATERIAL REQUIREMENT, TPA

Sl. No.	Raw materials	Phase 1			Phase 2			Total		
		Required	Own source	From outside (purchased)	Required	Own source	From outside (purchased)	Required	Own source	From outside (purchased)
1	Bentonite & Clay Component	36,588	0	36,588	30,955	0	30,955	67,543	0	67,543
2	Char	184,572	184,572	0	100,676	100,676	0	285,248	285,248	0
3	Clinker	482,602	482,602	0	294,841	294,841	0	777,443	777,443	0
4	Coal (max. when Indian coal used)	3,024,138	1,092,504	2,811,512	1,924,752	639,390	1,765,296	4,844,956	1,731,894	4,576,808
5	Coking Coal	634,200	0	634,200	1,057,000	0	1,057,000	1,691,200	0	1,691,200
6	Coke	345,870	345,870	0	605,273	605,273	0	951,143	951,143	0
7	Coke breeze & fines	86,210	0	86,210	130,163	0	130,163	216,373	0	216,373
8	Dolomite	219,554	0	219,554	318,028	0	318,028	537,581	0	537,581
9	DRI	1,001,000	1,001,000	0	546,000	546,000	0	1,547,000	1,547,000	0
10	Flocculant	135	0	135	135	0	135	270	0	270
11	Fly Ash from Middlings & Char	261,602	261,602	0	94,453	94,453	0	356,055	356,055	0
12	Gypsum	6,828	0	6,828	26,584	0	26,584	33,412	0	33,412
13	Hot metal	567,000	567,000	0	992,250	992,250	0	1,559,250	1,559,250	0
14	Iron ores & fines (all types)	6,394,385	3,090,978	3,303,407	6,129,439	2,435,978	3,693,461	12,523,824	5,526,956	6,996,868
15	Iron Ore BF Grade	238,980	0	238,980	418,215	0	418,215	657,195	0	657,195
16	Limestone	1,006,831	0	1,006,831	927,858	0	927,858	1,902,049	0	1,934,689
17	Liquid Metal from Furnace	1,232,000	1,232,000	0	1,232,000	1,232,000	0	2,464,000	2,464,000	0
18	Middlings from Coal Washery	1,112,004	1,112,004	0	647,904	647,904	0	1,759,908	1,759,908	0
19	Mill scale (from CCM/RM/SM/DPP)	14,478	14,478	0	8,845	8,845	0	23,323	23,323	0
20	Others	4,826	0	4,826	2,948	0	2,948	7,774	0	7,774
21	Pig iron	54,962	0	54,962	23,260	0	23,260	78,222	0	78,222
22	Quartz	29,484	0	29,484	51,597	0	51,597	81,081	0	81,081
23	Semi finished products	1,275,510	1,207,360	68,150	1,224,490	1,207,360	17,130	2,500,000	2,414,720	85,280
24	Sinter	611,520	611,520	0	1,051,050	1,051,050	0	1,662,570	1,662,570	0
25	Steel Scrap	29,293	0	29,293	0	0	0	29,293	0	29,293
26	Slag Generation from MBF	95,596	95,596	0	372,179	372,179	0	467,775	467,775	0
27	Silica component	19,304	0	19,304	11,794	0	11,794	31,098	0	31,098
	Total	18,969,472	11,299,087	8,550,264	18,222,688	10,228,199	8,474,424	37,088,226	21,527,285	17,024,688

Iron ore will be sourced from own Mines in Odisha. Environmental clearance for Jajang Iron Mines was received vide MoEF letter no. J-11015/96/2012-IA II(M) dated 13.03.2015 (copy given in **Annexure IV**).

As the present mining leases of M/s Rungta Mines Limited will expire on 31.03.2020. Iron ore will be sourced from Open market or from M/s OMC Limited or from New Mines that may be granted to M/s Rungta Mines Limited in forthcoming Bindings of Iron ore Mines.

2.10 FUEL REQUIREMENT

The various liquid & gaseous fuel requirements are given in **Table 2.44**.

**TABLE 2.44
FUEL REQUIREMENTS**

Fuel	Used in	Total
LSHS	Rolling Mill	51200 KL/Annum
	Strip Mill	27200 KL/Annum
	Ductile Pipe Plant	12800 KL/Annum

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 power requirement of proposed captive power plant of 385 MW. Now it is envisaged to meet the power requirement for the proposed Captive Power Plant of 385 MW (250 MW AFBC +135 MW WHRB). The fuels consumed in the various sub-units also generates energy for consumption in the process. The power balance of the entire plant can be seen in **Table 2.45**.

**TABLE 2.45
MATERIAL AND ENERGY BALANCE**

Sl. No.	Description	No of Days	No of Hours	KWH Req.	Phase-I			Phase-II		Total	
					Unit	Capacity	Power Required MW	Capacity	Power Required MW	Capacity	Power Required MW
1	Sponge Iron Plant	350	24	80	TPA	1001000	9.53	546000	5.20	1547000	14.73
2	Pellet Plant	335	24	64	TPA	1474000	11.73	1474000	11.73	2948000	23.47
3	Beneficiation plant	330	24	3	TPA	2694963	1.02	2694963	1.02	5389927	2.04
4	Coal Washery	328	20	15	TPH	2616480	5.98	1524480	3.49	4140960	9.47
5	MBF	350	24	150	CUM	567000	10.13	992250	17.72	1559250	27.84
6	Sinter plant	325	21	45	TPA	611520	4.03	1051050	6.93	1662570	10.96
7	Coke Oven Plant	350	24	10	TPA	420000	0.50	700000	0.83	1120000	1.33
8.1	SMS-IF	350	24	750	TPA	539000	48.13	0	0.00	539000	48.13
8.2	SMS-EAF	350	24	400	TPA	693000	33.00	1232000	58.67	1925000	91.67
8.3	SMS-CCM	350	24	100	TPA	1232000	14.67	1232000	14.67	2464000	29.33
9.1	Flat/Round/Wire/Rod/Structural Mill	350	20	140	TPA	800000	16.00	800000	16.00	1600000	32.00
9.2	Strip Mill etc	350	20	140	TPA	450000	9.00	400000	8.00	850000	17.00
9.3	Ductile Pipe Plant	350	20	100	TPA	200000	2.86	200000	2.86	400000	5.71
10	Producer Gas Plant	335	24	0.02	Nm3/Annum	240000000	0.60	240000000	0.60	480000000	1.19
11	Oxygen Plant	350	24	1	Nm3/Annum	24500000	2.92	44100000	5.25	68600000	8.17
12	Lime Plant	350	24	1	TPA	105000	0.01	199500	0.02	304500	0.04
13	Cement Plant	340	24	72	TPA	884000	7.8	801550	7.07	1685550	14.87
14	Power	340	24	0.10	MW	217	21.70	168	16.80	385	38.50
	Total Requirement						199.90		176.45		376.35
	Power generation						217.00		168.00		385.00
	Balance						17.10		-8.45		8.65

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.

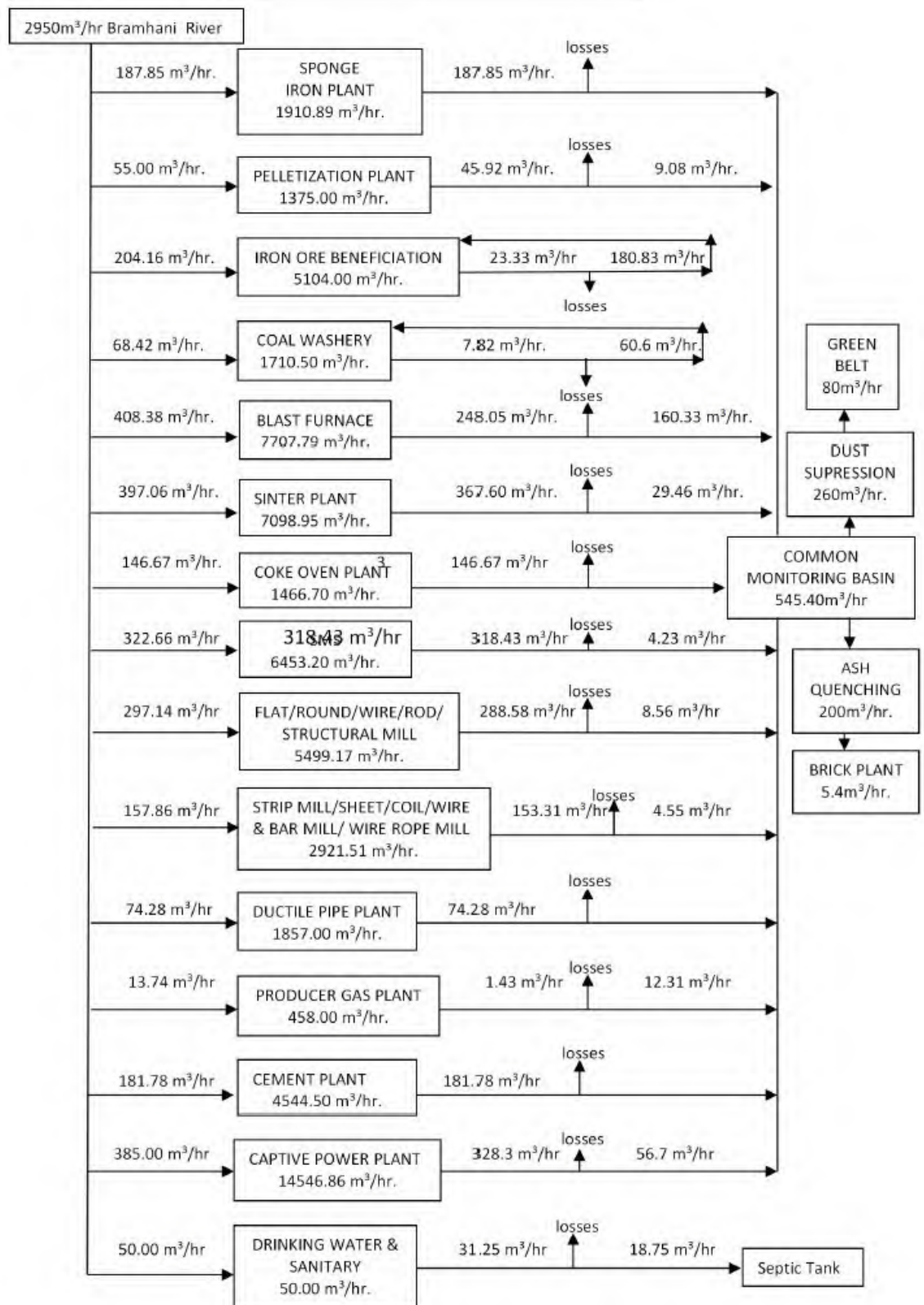
2.12.1 Water requirement for Phase-I & II unit

Total water requirement will be 2950 cum/hr for two phases. Phase I&II water withdrawal is 2950 m³/hr from Bramhani river to meet the plant requirement. Details of water requirement is given in **Table 2.46**. The water balance diagram is given in **Fig 2.15** 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.

TABLE 2.46
WATER REQUIREMENT & DISCHARGE FOR
THE PROJECT CONFIGURATION, KL PER HR (PHASE I&II)

Plant Facilities	Circulating Water (M3/Hr)	Fresh/Make-Up Water (M3/Hr)	Recirculating Water (M3/Hr)	Evaporation/ Consumed water	Discharge/ Waste Water
Sponge Iron Plant	1,910.89	187.85	1,723.04	187.85	0
Pellet Plant	1,375.00	55	1,320.00	45.92	9.08
Iron Ore Beneficiation	5,104.00	204.16	4,899.84	23.33	180.83
Coal Washery	1,710.50	68.42	1,642.08	7.82	60.6
Mini Blast Furnace	7,707.79	408.38	7,299.41	248.05	160.33
Sinter plant	7,098.95	397.06	6,701.88	367.61	29.46
Coke Oven Plant	1,466.70	146.67	1,320.03	146.67	0
Steel Melt Shop	6,453.20	322.66	6,130.54	318.43	4.23
Flat/Round/Wire/Rod/ Structural Mill	5,499.17	297.14	5,202.03	288.58	8.56
Strip Mill/Sheet/Coil/ Wire & Bar Mill/Wire Rope	2,921.51	157.86	2,763.65	153.31	4.55
Ductile Pipe Plant	1,857.00	74.28	1,782.72	74.28	0
Producer Gas Plant	458	13.74	444.26	1.43	12.31
Oxygen Plant	0	0	0	0	0
Lime Plant	0	0	0	0	0
Cement Plant	4,544.50	181.78	4,362.72	181.78	0
Power Plant	14,546.86	385	14,161.86	328.3	56.7
Drinking Water and Sanitary	50	50	0	31.25	18.75
Grand Total	62,704.07	2,950.00	59,754.06	2,404.61	545.40

FIG 2.15: WATER BALANCE DIAGRAM

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.

2.13 MANPOWER

Phase-I&II: The manpower requirement for proposed plant will be 2600 persons. Three shifts working for 350 days of working are planned for different units within the integrated steel plant.

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 tentative project implementation schedule is given in **Table 2.47**.

TABLE 2.47
PROJECT IMPLEMENTATION SCHEDULE (IN MONTHS)

MONTHLY SCHEDULE (ZERO DATE FROM THE DATE OF EC GRANTED)																													
Sl. No.	Production Units	Month of start of project implementation	Month of Completion	Total duration of implementation	Preparation & Issue of Specifications			Tendering & Placement of Orders			Receipt of Certified data from Suppliers			Civil Work			Structural Fabrication, Erection & Sheetting Work			Procurement, Manufacture & Delivery of Plant Equipment at site			Equipment Erection Work			Final Hook up, Cold Test & Commissioning of Plant			Remarks
	Project (Phase-I & II)	0	84	84	0	-	73	3	-	75	5	-	76	4	-	82	5	-	83	4	-	83	8	-	83	13	-	84	
	Phase-I	0	48	48	0	-	37	3	-	39	5	-	40	4	-	46	5	-	47	4	-	47	8	-	56	13	-	48	
1	DRI Plant with WHRBs	0	29	29	0	-	5	3	-	7	5	-	7	4	-	17	6	-	20	5	-	21	9	-	28	27	-	29	
1	500TPD Kiln + WHRB Number-01	0	15	15	0	-	3	3	-	5	5	-	5	4	-	11	6	-	13	5	-	13	9	-	14	14	-	15	Under Implementation
2	500TPD Kiln + WHRB Number-02	2	17	15	2	-	3	3	-	5	5	-	5	4	-	11	6	-	13	5	-	13	11	-	15	15	-	17	Under Implementation
3	600TPD Kiln + WHRB Number-03	10	27	17	10	-	11	11	-	13	13	-	14	12	-	20	14	-	22	13	-	22	19	-	25	25	-	27	
4	600TPD Kiln + WHRB Number-04	12	29	17	12	-	13	13	-	15	15	-	16	14	-	22	16	-	24	15	-	24	21	-	27	27	-	29	
2	Pellet Plant (1X1.434 MTPA)	25	45	20	25	-	28	27	-	30	29	-	31	29	-	43	30	-	40	31	-	41	32	-	43	43	-	45	
3	Iron Ore Beneficiation Plant (2.694 MTPA)	28	48	20	28	-	31	30	-	33	32	-	34	32	-	46	33	-	43	34	-	44	35	-	46	46	-	48	
4	Coal Washery (2.616 MTPA)	35	48	13	35	-	37	36	-	39	40	-	40	40	-	45	40	-	46	42	-	47	46	-	48	48	-	48	
5	Blast Furnace (0.567 MTPA)	15	45	30	15	-	18	17	-	19	18	-	20	19	-	33	22	-	36	27	-	39	28	-	40	41	-	45	
6	Sinter (0.611 MTPA)	15	43	28	15	-	18	17	-	19	18	-	20	19	-	33	22	-	35	26	-	38	27	-	40	41	-	43	
7	Coke Oven (0.42 MTPA)	30	45	15	30	-	31	31	-	31	32	-	32	32	-	39	34	-	41	31	-	40	35	-	44	44	-	45	
8.1	SMS-Complex (IF 7X20T + LRF 4X20T)	0	42	42	0	-	9	7	-	10	8	-	12	9	-	18	12	-	22	12	-	24	15	-	32	33	-	42	
1	20T IF Number-1	0	14	14	0	-	3	3	-	5	5	-	5	4	-	10	5	-	12	4	-	12	8	-	13	13	-	14	Under Implementation
2	20T IF Number-2	0	14	14	0	-	3	3	-	5	5	-	5	4	-	10	5	-	12	4	-	12	8	-	13	13	-	14	

MONTHLY SCHEDULE (ZERO DATE FROM THE DATE OF EC GRANTED)																													
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3	20T IF Number-3	0	14	14	0	-	3	3	-	5	5	-	5	4	-	10	5	-	12	4	-	12	8	-	13	13	-	14	
4	20T IF Number-4	0	15	15	0	-	3	3	-	5	5	-	6	4	-	11	5	-	13	4	-	14	8	-	14	14	-	15	
5	20T IF Number-5	30	48	18	30	-	36	36	-	38	38	-	39	38	-	45	38	-	46	39	-	47	40	-	47	47	-	48	
6	20T IF Number-6	30	48	18	30	-	36	36	-	38	38	-	39	38	-	45	38	-	46	39	-	47	40	-	47	47	-	48	
7	20T IF Number-7	30	48	18	30	-	36	36	-	38	38	-	39	38	-	45	38	-	46	39	-	47	40	-	47	47	-	48	
8.2	SMS–Complex (EAF 1X90T + LRF 1X90T)	33	48	15	33	-	36	36	-	38	38	-	39	38	-	37	38	-	47	38	-	47	42	-	47	47	-	48	
9.1	Flat/ Round/ Wire/ Rod/ Structural/ TMT/ Others Mill (4X40TPH = 0.80 MTPA)	15	48	33	15	-	17	15	-	18	16	-	19	16	-	30	20	-	40	20	-	42	25	-	46	42	-	48	
9.2	Strip Mill (1X0.45 MTPA)	20	40	20	20	-	22	20	-	23	23	-	24	21	-	30	22	-	32	25	-	35	30	-	38	38	-	40	
9.3	Ductile Pipe Mill (1X0.2 MTPA)	15	43	28	15	-	18	17	-	19	18	-	20	19	-	33	22	-	36	27	-	38	28	-	39	41	-	43	
10	Producer Gas Plant (10X3000 NM3/HR)	25	45	20	25	-	28	27	-	30	29	-	31	29	-	43	30	-	40	31	-	41	32	-	43	43	-	45	
11	Oxygen Gas Plant (1X100 TPD)	33	48	15	33	-	36	36	-	38	38	-	39	38	-	37	38	-	47	38	-	47	42	-	47	47	-	48	
12	Lime Plant (1X300TPD)	33	48	15	33	-	36	36	-	38	38	-	39	38	-	37	38	-	47	38	-	47	42	-	47	47	-	48	
13	Cement Plant (1X2600 TPD)	20	47	27	20	-	23	22	-	24	24	-	25	23	-	40	25	-	42	26	-	38	30	-	44	45	-	47	
14.1	Power Plant-150 MW	0	48	48	0	-	15	12	-	16	15	-	20	13	-	30	15	-	40	15	-	42	27	-	56	57	-	48	
1	125TPH FBB-01	0	17	17	0	-	3	3	-	5	5	-	5	4	-	11	6	-	13	5	-	12	8	-	15	15	-	17	Under Implementation
2	125TPH FBB-02	15	35	20	15	-	18	18	-	20	21	-	23	19	-	26	22	-	29	25	-	31	25	-	33	33	-	35	
3	250TPH FBB-03	15	40	25	15	-	18	18	-	20	21	-	23	27	-	34	22	-	30	25	-	32	28	-	38	38	-	40	

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4	250TPH FBB-04	15	48	33	15	-	18	18	-	20	21	-	23	35	-	42	22	-	32	27	-	33	36	-	46	46	-	48	
14.2	BF Gas Based Power Plant (11 MW)	32	47	15	32	-	33	33	-	34	35	-	36	34	-	41	35	-	42	37	-	45	39	-	46	46	-	47	
14.3	Coke Oven Gas Based Power Plant (14 MW)	35	48	13	35	-	36	36	-	37	36	-	37	36	-	41	37	-	44	38	-	46	40	-	47	47	-	48	
	Phase-II	49	84	35	49	-	73	50	-	75	52	-	76	51	-	82	53	-	83	52	-	83	58	-	83	64	-	84	
15	DRI Plant	49	66	17	49	-	50	50	-	52	52	-	53	51	-	59	53	-	61	52	-	61	58	-	64	64	-	66	
1	600TPD Kiln + WHRB Number-05	49	66	17	49	-	50	50	-	52	52	-	53	51	-	59	53	-	61	52	-	61	58	-	64	64	-	66	
2	600TPD Kiln + WHRB Number-06	49	66	17	49	-	50	50	-	52	52	-	53	51	-	59	53	-	61	52	-	61	58	-	64	64	-	66	
16	Pellet Plant (1X1.434 MTPA)	61	81	20	61	-	64	63	-	66	65	-	67	65	-	79	66	-	76	67	-	77	68	-	63	79	-	81	
17	Iron Ore Beneficiation Plant (2.694 MTPA)	64	84	20	64	-	67	66	-	69	68	-	70	68	-	82	69	-	79	70	-	80	71	-	66	82	-	84	
18	Coal Washery (1.524 MTPA)	71	84	13	71	-	73	72	-	75	76	-	76	76	-	81	76	-	82	78	-	83	82	-	72	84	-	84	
19	Blast Furnace (0.992 MTPA)	51	81	30	51	-	54	53	-	55	54	-	56	55	-	69	58	-	72	63	-	75	64	-	52	77	-	81	
20	Sinter (1.051 MTPA)	51	79	28	51	-	54	53	-	55	54	-	56	55	-	69	58	-	71	62	-	74	63	-	53	77	-	79	
21	Coke Oven (0.70 MTPA)	66	81	15	66	-	67	67	-	67	68	-	68	68	-	75	70	-	77	67	-	76	71	-	70	80	-	81	
22	SMS-Complex (EAF 1X160T + LRF 1X160T)	69	84	15	69	-	72	72	-	74	74	-	75	74	-	73	74	-	83	74	-	83	78	-	83	83	-	84	
23	Flat/ Round/ Wire/ ROD/ Structural/ TMT/ Others MILL (3X40TPH = 0.80 MTPA)	51	84	33	51	-	53	51	-	54	52	-	55	52	-	66	56	-	76	56	-	78	61	-	82	78	-	84	
24	Strip Mill (1X0.40 MTPA)	56	76	20	56	-	58	56	-	59	59	-	60	57	-	66	58	-	68	61	-	71	66	-	74	74	-	76	

MONTHLY SCHEDULE (ZERO DATE FROM THE DATE OF EC GRANTED)																													
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25	Ductile Pipe Mill (1X0.2 MTPA)	51	79	28	51	-	54	53	-	55	54	-	56	55	-	69	58	-	72	63	-	74	64	-	75	77	-	79	
26	Producer Gas Plant (10X3000 NM3/HR)	61	81	20	61	-	64	63	-	66	65	-	67	65	-	79	66	-	76	67	-	77	68	-	79	79	-	81	
27	Oxygen Gas Plant (1X180 TPD)	69	84	15	69	-	72	72	-	74	74	-	75	74	-	73	74	-	83	74	-	83	78	-	83	83	-	84	
28	Lime Plant (1X570TPD)	69	84	15	69	-	72	72	-	74	74	-	75	74	-	73	74	-	83	74	-	83	78	-	83	83	-	84	
29	Cement Plant (1X2300 TPD)	56	83	27	56	-	59	58	-	60	60	-	61	59	-	76	61	-	78	62	-	74	66	-	80	81	-	83	
30.1	Power Plant- 2X250TPH FBB	51	84	33	51	-	54	54	-	56	57	-	59	63	-	78	58	-	68	61	-	69	64	-	82	74	-	84	
1	250TPH FBB-05	51	76	25	51	-	54	54	-	56	57	-	59	63	-	70	58	-	66	61	-	68	64	-	74	74	-	76	
2	250TPH FBB-06	51	84	33	51	-	54	54	-	56	57	-	59	71	-	78	58	-	68	63	-	69	72	-	82	82	-	84	
30.2	BF Gas Based Power Plant (20 MW)	68	83	15	68	-	69	69	-	70	71	-	72	70	-	77	71	-	78	73	-	81	75	-	82	82	-	83	
30.3	Coke Oven Gas Based Power Plant (24 MW)	71	84	13	71	-	72	72	-	73	72	-	73	72	-	77	73	-	80	74	-	82	76	-	83	83	-	84	

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/80884/2018 dated 30th September 2018. It was duly submitted in our covering letter no. RML/DSP/MoEF/18-19/316 dated 29.09.2018 as well as the proposed TOR annexed with the application that data has been generated from March to May 2018. Thereafter, the presentation was made to the Expert Appraisal Committee (EAC) for industry projects on 26th November 2018. The fact that data has been generated during 01.03.2018 to 30.05.2018 was also submitted in the presentation. The TOR was issued by MOEF&CC vide letter no. J-11011/309/2018-IA.II(I) on 10.12.2018.

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. T-6337 enclosed in **Annexure XXVII**). 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**.

FIG 3.1: TOPOGRAPHY AND DRAINAGE MAP OF THE STUDY AREA

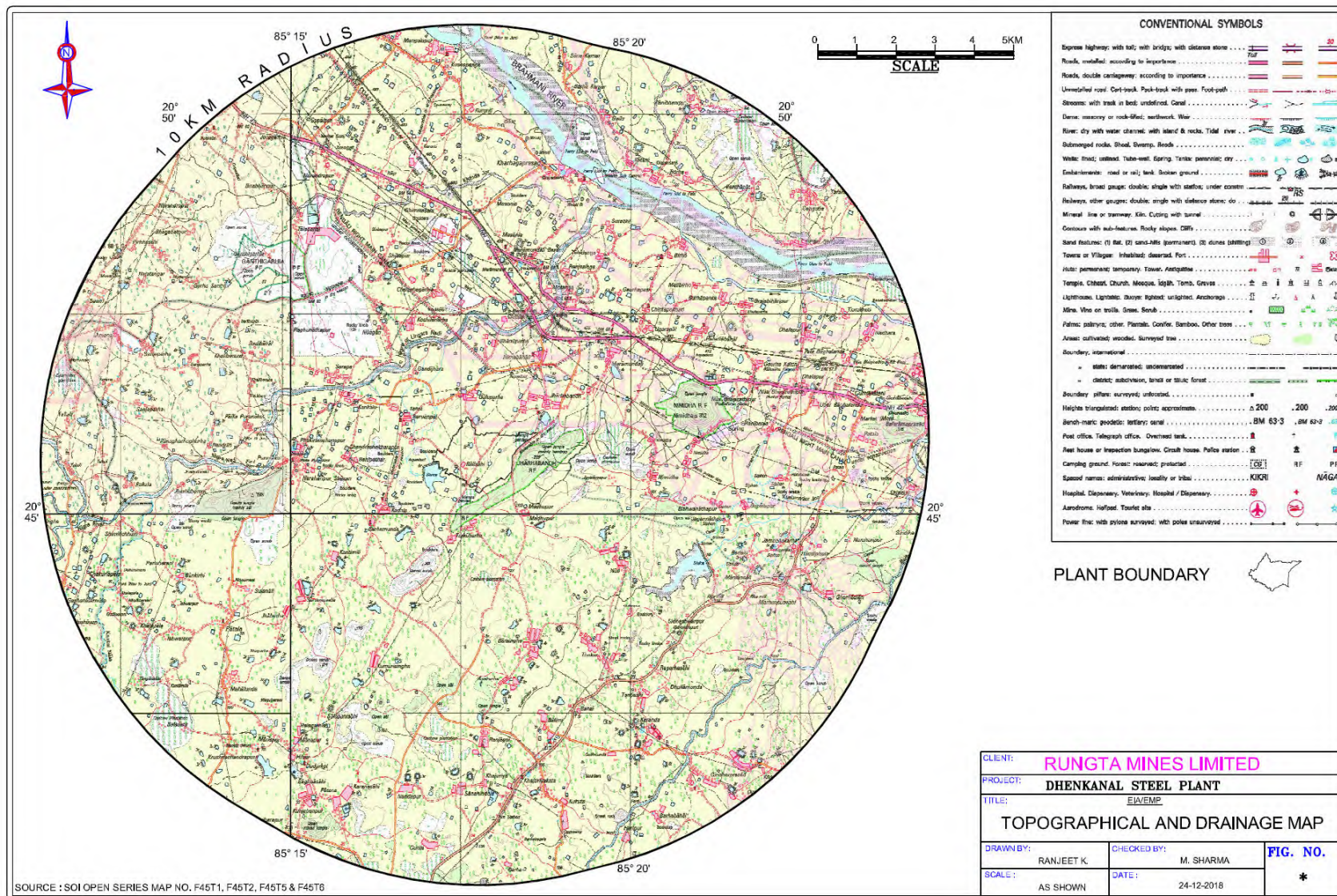
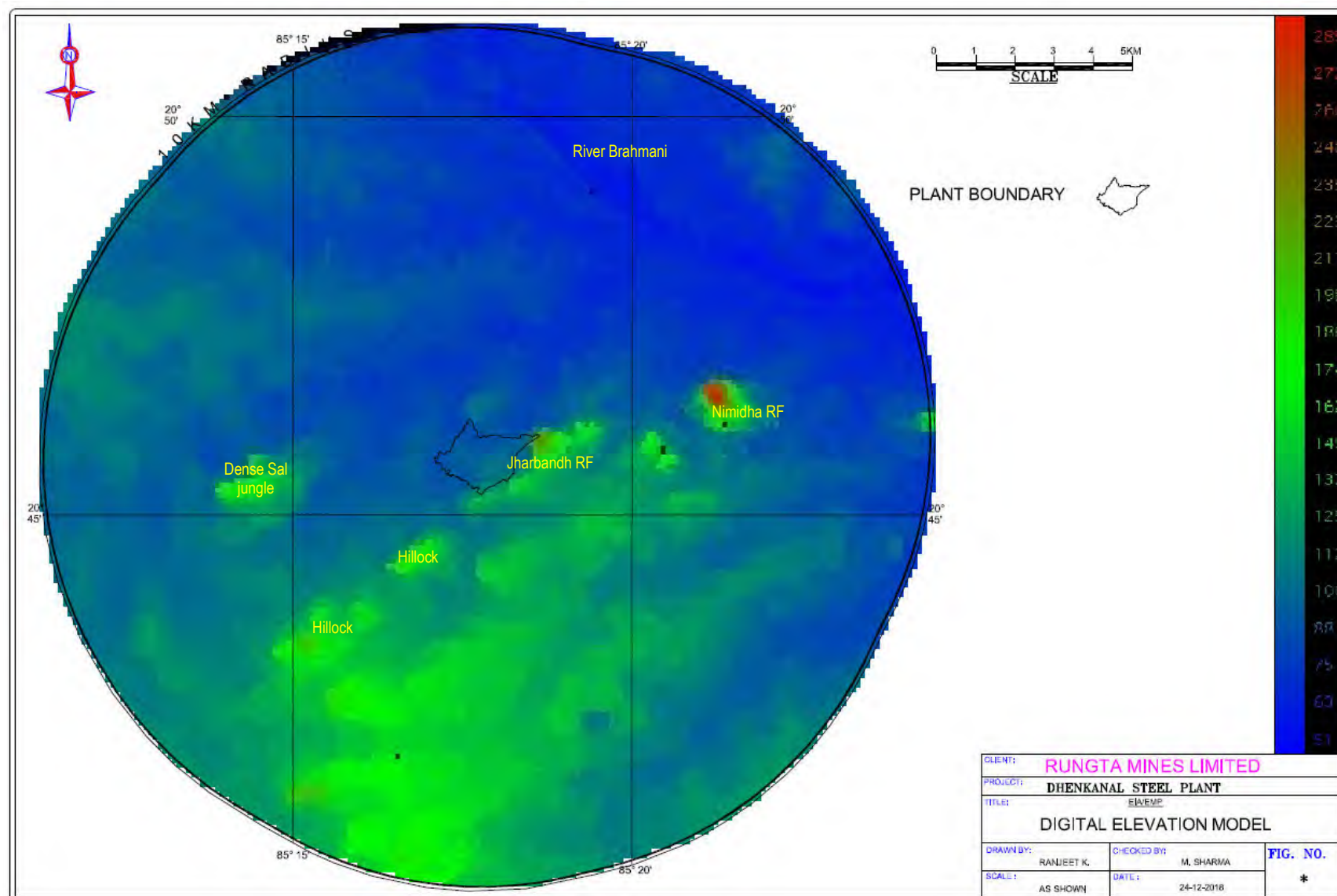


FIG 3.2: DIGITAL ELEVATION MAP OF THE STUDY AREA



3.2.1 Topography

Core zone: The project area is comparatively flat terrain and elevation is approximately 75-95 m AMSL.

Buffer zone: Topographically, the study area represents a flat to gentle, 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 sloping 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 green 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 1.5 km east of Nigra (Lingra) Nala and 7.35 km south of Brahmani River. Two first order seasonal drains originate from within plant boundary and flow out from the north western and northern boundaries. One of the south-north streams is also feeding two seasonal ponds. A total of six ponds exist within the project 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

Name of River/ Nala	Distance with respect to plant	Direction with respect to plant
Brahmani river	7.35 km	N
Nigra or Lingra Nala	1.5 km	NW
Kisinda Jhor	4.7 km	N
Kantei Nala	7.2 km	WSW
Matelia Nadi	9.6 km	WSW

Name of River/ Nala	Distance with respect to plant	Direction with respect to plant
Bauti Nala	9.4 km	W
Bade Jhor	7.4 km	SE
Kusumder Jhor	3.6 km	SE
Agana Nala	1.1 km	ESE

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 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
Average	33.53	19.99	71	61	1185.5

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 average total rainfall for the period 2001-2011 comes to 1185.5 mm. Bulk of the rainfall in the study area is received during the south west monsoon between June to October. Heaviest rainfall was 589.1 mm, recorded 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 1976-86, as supplied by 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

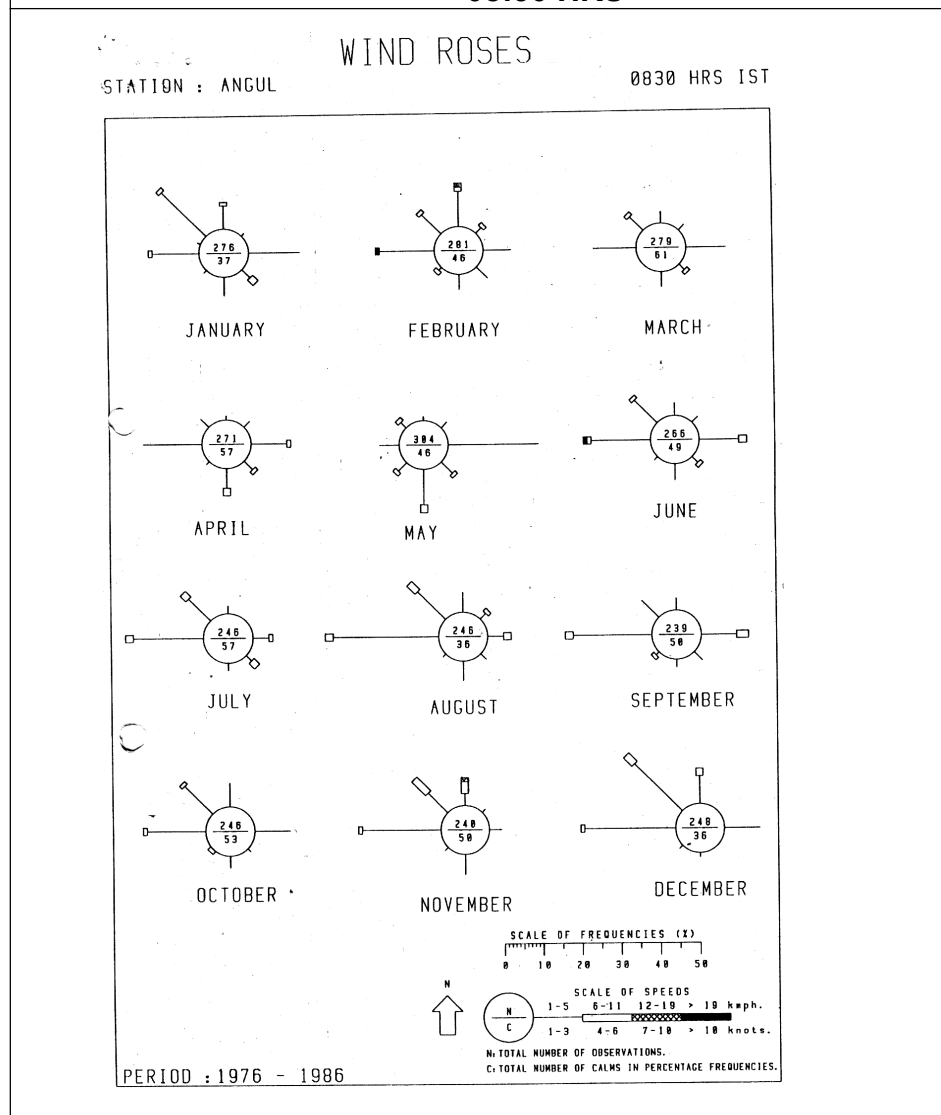
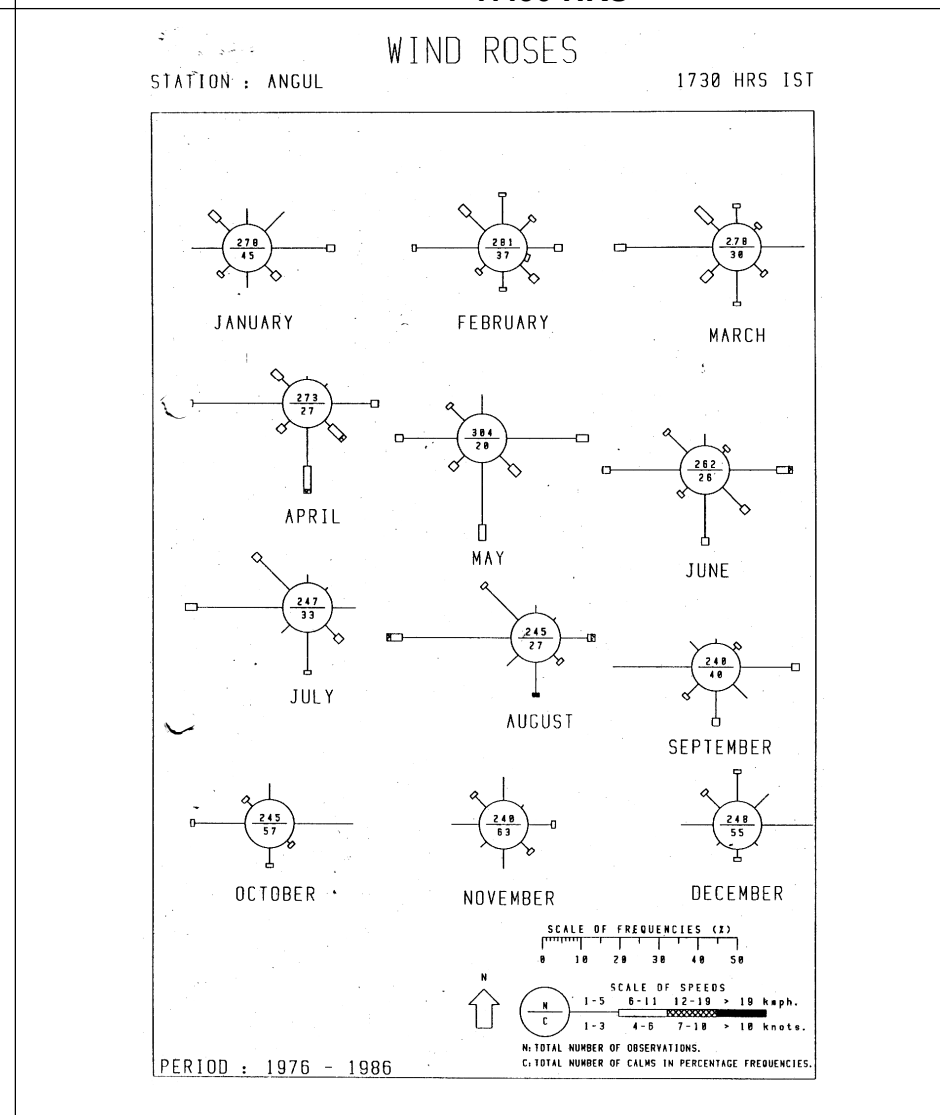


FIG 3.4: WINDROSE DIAGRAM OF IMD DATA OF ANGUL AT 17:30 HRS



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 1st March to 31st May 2018. 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
(1ST MARCH TO 31ST MAY 2018)

Particulars	Maximum	Minimum	Average
Temperature (°C)	41.0	19.8	31.46
Relative humidity (%)	87.7	19.5	49.4
Cloudiness (Octas)	8.0	0.0	0.06
Wind speed (km/h)	38.1	Calm	9.16
Predominant wind direction	S (11.87% Readings)		

Note : Calm is <1.8 km/h

The above table shows that temperature was recorded as a minimum of 19.8 °C and maximum of 41.0°C and relative humidity as a minimum of 19.5% and maximum of 87.7%. 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 38.1 km/h. The predominant wind direction, including calms, was observed from S with 11.87% of occurrences. The wind frequency table is given in **Table 3.5** and the corresponding wind rose diagram is shown in **Fig 3.5**.

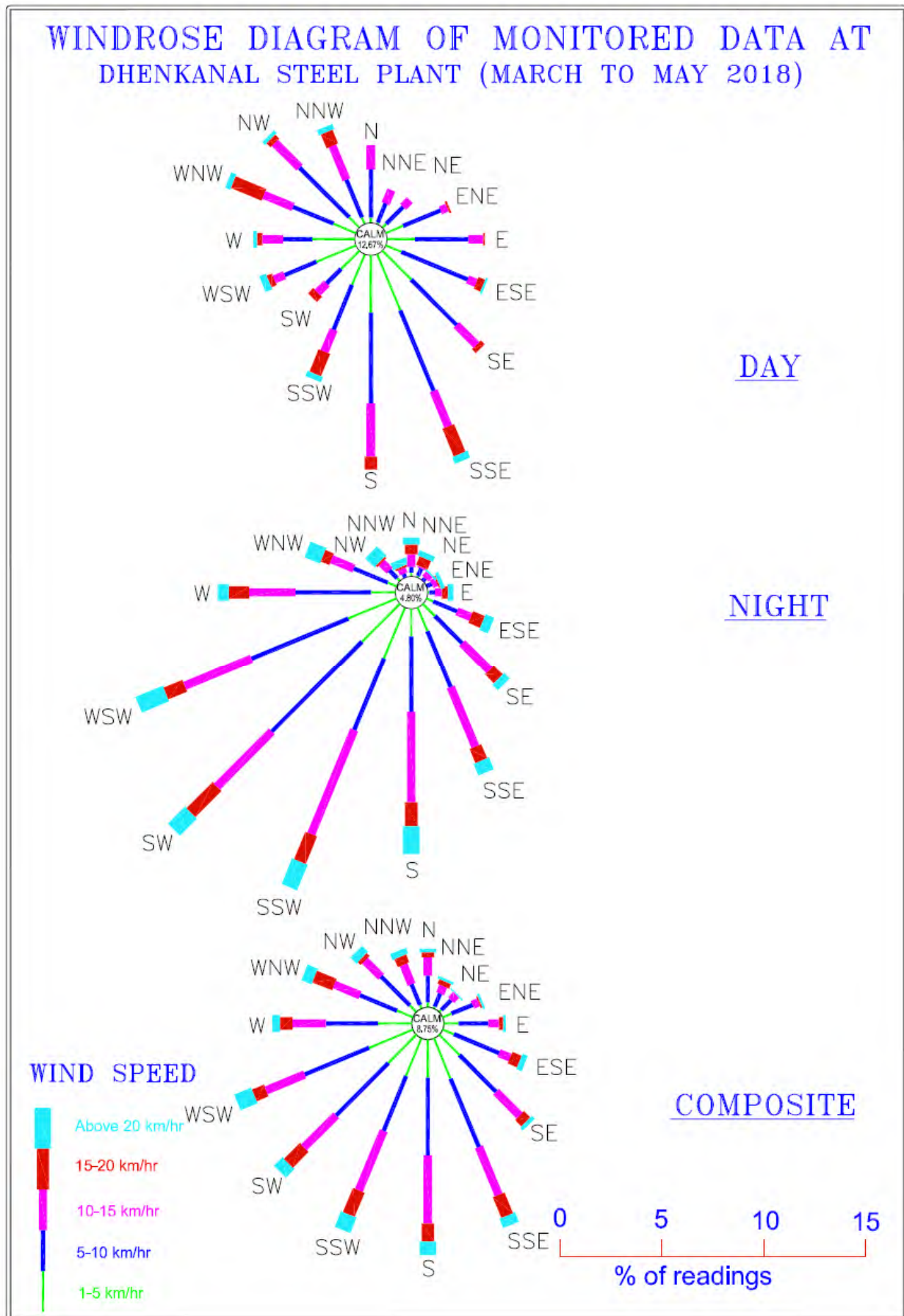
TABLE 3.5
WIND FREQUENCY TABLE OF MONITORED DATA

Direction 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	0.27	1.36	2.63	0.72	0.09	0	5.07	4.8
ENE	0.09	0.91	1.99	0.36	0.09	0	3.44	3.35
NE	0.09	0.27	1.18	0.45	0	0	1.99	1.9
NNE	0	0.09	1	0.72	0	0	1.81	1.81
N	0.18	0.27	2.36	1.18	0	0	3.99	3.81
NNW	0.09	0.36	1.99	1.81	0.72	0.27	5.24	5.15
NW	0.63	0.72	3.44	1.72	0.27	0.18	6.96	6.33
WNW	0.82	1.18	2.17	1.54	1.63	0.27	7.61	6.79
W	1.72	2.08	1.45	1	0.27	0.18	6.7	4.98
WSW	2.54	2.08	1.72	0.54	0.27	0.36	7.51	4.97
SW	1.63	1.27	1	0.63	0.36	0	4.89	3.26
SSW	0.63	1.63	2.36	1.18	1.18	0.27	7.25	6.62
S	0.72	2.81	4.44	2.63	0.63	0	11.23	10.51
SS E	1.45	2.99	4.26	1.9	1.45	0.36	12.41	10.96

Direction from	Percent frequency (wind speed in km/h)							
	Calm	1.8-5	5-10	10-15	15-20	>20	Total	Ex.Calm
SE	1.45	1.99	3.17	1.36	0.27	0	8.24	6.79
ESE	0.36	0.82	3.53	0.45	0.36	0.09	5.61	5.25
TOTAL	12.67	20.83	38.69	18.19	7.59	1.98	99.95	87.28
NIGHT TIME (18 hrs to 05 hrs)								
E	0.09	0.09	0.27	0.36	0.27	0.27	1.35	1.26
E	0	0	0.27	0.27	0.09	0.18	0.81	0.81
ENE	0	0	0.18	0.27	0	0.09	0.54	0.54
NE	0	0.09	0.36	0.09	0.45	0.27	1.26	1.26
NNE	0	0.18	0.27	0.63	0.45	0.36	1.89	1.89
N	0	0	0.18	0.27	0.09	0.36	0.9	0.9
NNW	0.18	0.18	0.54	0.54	0.09	0.63	2.16	1.98
NW	0.27	0.45	1.81	1.18	0.45	0.82	4.98	4.71
WNW	0.91	1.18	3.72	2.36	1	0.54	9.71	8.8
W	1.18	2.54	5.17	3.54	1	1.45	14.88	13.7
WSW	0.82	2.63	6.26	3.81	1.81	1.18	16.51	15.69
SW	0.54	2.36	3.45	5.17	1.36	1.36	14.24	13.7
SSW	0.45	1.36	3.72	4.44	1.18	1.36	12.51	12.06
S	0.18	1.27	2.99	3.17	0.73	0.63	8.97	8.79
SSE	0.18	0.82	1.9	1.9	0.63	0.36	5.79	5.61
SE	0	0.36	1.27	0.73	0.63	0.45	3.44	3.44
ESE	4.8	13.51	32.36	28.73	10.23	10.31	99.94	95.14
Total	0.09	0.09	0.27	0.36	0.27	0.27	1.35	1.26
COMPOSITE (Day + Night)								
E	0.18	0.72	1.45	0.54	0.18	0.14	3.21	3.03
ENE	0.05	0.45	1.13	0.32	0.09	0.09	2.13	2.08
NE	0.05	0.14	0.68	0.36	0	0.05	1.28	1.23
NNE	0	0.09	0.68	0.41	0.23	0.14	1.55	1.55
N	0.09	0.23	1.31	0.91	0.23	0.18	2.95	2.86
NNW	0.05	0.18	1.09	1.04	0.41	0.32	3.09	3.04
NW	0.41	0.45	1.99	1.13	0.18	0.41	4.57	4.16
WNW	0.54	0.82	1.99	1.36	1.04	0.54	6.29	5.75
W	1.31	1.63	2.58	1.68	0.63	0.36	8.19	6.88
WSW	1.86	2.31	3.44	2.04	0.63	0.91	11.19	9.33
SW	1.22	1.95	3.62	2.22	1.09	0.59	10.69	9.47
SSW	0.59	1.99	2.9	3.17	1.27	0.82	10.74	10.15
S	0.59	2.08	4.08	3.53	0.91	0.68	11.87	11.28
SSE	0.82	2.13	3.62	2.54	1.09	0.5	10.7	9.88
SE	0.82	1.4	2.54	1.63	0.45	0.18	7.02	6.2
ESE	0.18	0.59	2.4	0.59	0.5	0.27	4.53	4.35
TOTAL	8.76	17.16	35.5	23.47	8.93	6.18	100	91.24

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 monitoring period. The sampling station locations are given in **Table 3.6** and the same are marked in **Fig 3.6**.

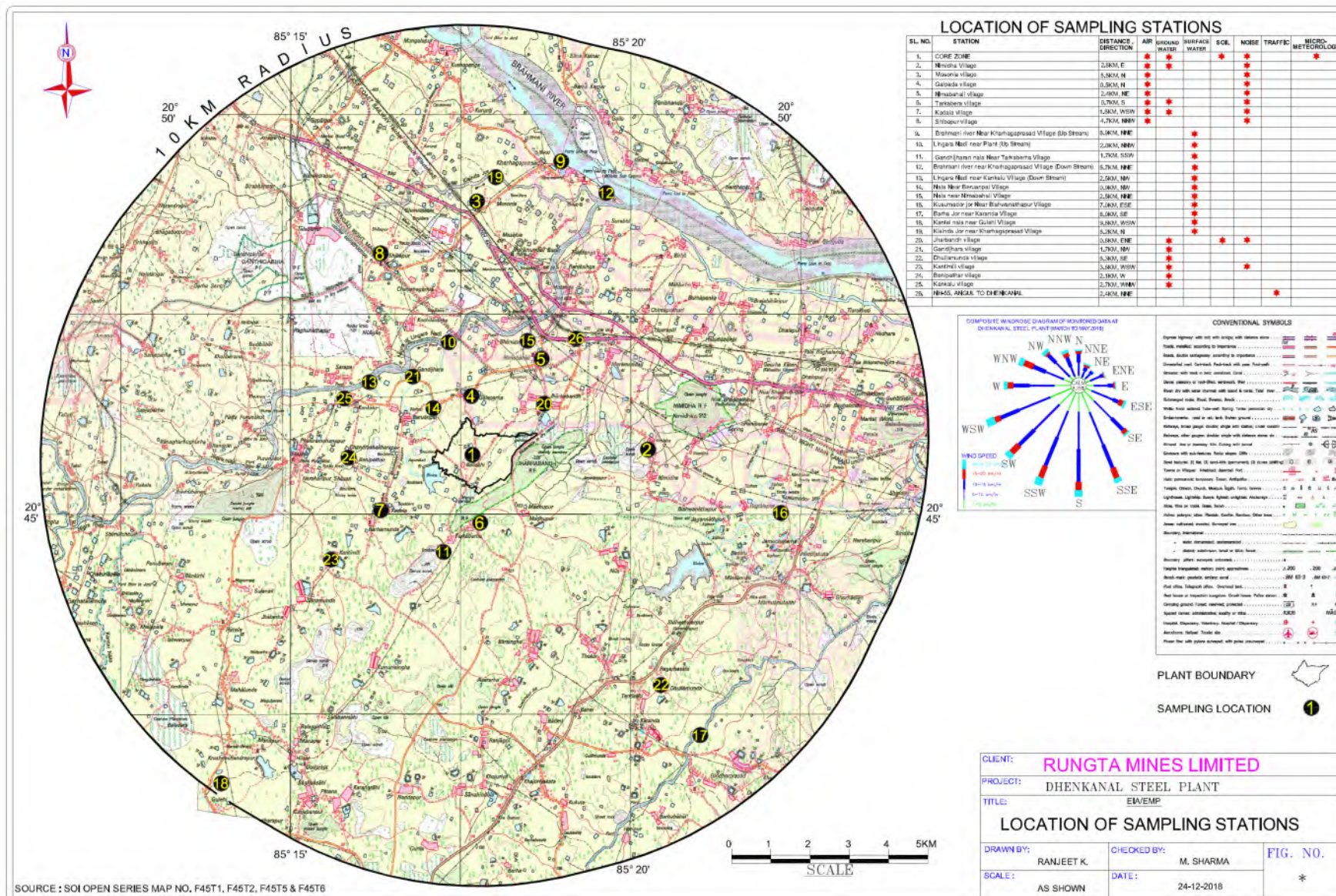
TABLE 3.6
LOCATION OF AIR SAMPLING STATIONS

Station No. (Refer Fig 3.6)	Location	Distance & Direction from Plant boundary	Justification for location
1	Core Zone	Within	Plant site where activities will take place
2	Nimidha village	2.8, E	Cross wind. Likely control location due to hillock barrier
3	Mosonia village	5.5, N	First predominant downwind direction
4	Galpada village	0.5, N	Nearest Village with likely maximum impact due to project & transportation
5	Nimabahali village	2.4, NE	Second predominant downwind direction
6	Tarkabera village	0.7, S	First predominant upwind direction
7	Kadala village	1.8, WSW	Second predominant upwind direction
8	Shibapur village	4.7, NNW	Third predominant downwind direction

3.5.2 Sampling schedule and parameters

The study was for 3 months with frequency of twice a week at each site. Samples were collected for 24 hours from each station for Respirable Particulate Matter (RPM or PM₁₀), Fine particulate matter (PM_{2.5}), Sulphur dioxide (SO₂) and nitrogen dioxide (NO₂). These samples were analysed in laboratory by adopting the methods specified in National Ambient Air Quality Standards. Carbon Monoxide (CO) was monitored at site using portable monitor.

FIG 3.6: LOCATIONS OF SAMPLING STATIONS



3.5.3 Methodology

Respirable particulate matter (PM 10)

Respirable Dust Sampler was used for sampling PM10. It is primarily a High Volume Sampler fitted with a cyclone separator. The cyclone pre-separates 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 cm x 25 cm size (Whatman, EPM-2000 or equivalent). The PM10 concentrations are determined gravimetrically from the average airflow rate, sampling period and the mass of particulate matter collected over the filter sheet surface.

Fine Particulate Matter (PM 2.5)

Fine Particulate Sampler is used 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

SO₂ sampling was carried out with a Multigas Sampler. It uses the vacuum created by the Respirable Dust Sampler to draw air through 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 sulphononic acid is measured and the amount of SO₂ in the sample is computed from graphs prepared with standard solutions. The ambient SO₂ concentrations were computed from the amount of SO₂ collected and the volume of air sampled.

Nitrogen dioxide

Similar to SO₂, the sampling for NO₂ is done with a Multigas Sampler. The difference is in the absorbing solutions. 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 H₂O₂, 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 NO₂ 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 hand held CO indicator Model no. gaZguard Tx of Pollution Protection Systems.

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

TABLE 3.7
PROCEDURE FOR DETERMINING VARIOUS AIR QUALITY PARAMETERS

Parameters	Testing Procedure
PM 10	Gravimetric using Respirable Dust Sampler (RDS)
PM 2.5	Gravimetric using Fine particulate sampler (FPS)
SO ₂	Absorption in Sodium Tetra Chloro-mercurate followed by Colorimetric estimation using P-Rosaniline hydrochloride and Formaldehyde (IS:5182 (Part 2):2001)
NO ₂	Absorption in dil. NaOH and then estimated colorimetrically with sulphanilamide, NEDA and Hydrogen Peroxide (IS:5182 (Part 6): 2006)
CO	Detection by hand held CO indicator with least count 0.1 ppm (125 µg/m ³)

Analysis results with respect to PM_{2.5}, PM₁₀, SO₂, NO₂ and CO are presented in **Annexure VII** and summarized in **Table 3.8**.

TABLE 3.8
SUMMARY OF AMBIENT AIR QUALITY MONITORING RESULTS
24 HOURLY AVERAGE CONCENTRATION IN µG/M³

Location	PM10				PM2.5				SO ₂			
	Min.	Max	Avg	98 th %tile	Min.	Max	Avg	98 th %tile	Min.	Max	Avg	98 th %tile
Core Zone	65.3	70.2	68.3	70.2	36.4	41.7	39.1	41.6	9.8	13.5	11.3	13.2
Nimidha village	54.5	65.7	59.2	64.9	30.8	37.0	33.6	36.9	8.1	10.8	9.6	10.7
Mosania village	65.1	70.1	67.6	70.0	37.0	41.3	39.4	41.3	12.1	15.8	14.2	15.7
Galpada village	55.3	67.5	60.9	67.3	30.7	39.5	34.4	38.7	8.7	11.4	10.4	11.3
Nimabahalī village	57.4	68.6	63.5	68.3	32.8	39.0	35.8	39.0	9.1	13.9	12.1	13.8
Tarkabera village	39.6	57.5	48.9	57.5	22.8	33.5	27.7	33.2	7.5	9.6	8.4	9.4
Kadala village	41.2	61.3	49.7	60.5	24.3	35.8	28.8	35.7	6.3	12.3	9.0	12.1
Shibapur village	64.1	71.0	67.4	71.0	36.9	42.7	39.0	42.2	13.1	16.1	14.6	15.9
NAAQS, 2009		100				60				100		

Location	NO ₂				CO*			
	Min.	Max	Avg	98 th %tile	Min.	Max	Avg	98 th %tile
Core Zone	12.5	11.1	15.4	18.0	375	625	484	625
Nimidha village	11.1	16.3	13.4	16.2	250	500	401	500
Masonia village	15.1	20.3	18.4	20.3	625	875	745	875
Galpada village	11.8	17.2	14.8	17.0	250	500	370	500
Nimabahali village	12.3	20.7	17.8	20.1	500	625	563	625
Tarkabera village	9.0	13.2	11.6	13.1	250	375	333	375
Kadala village	11.1	18.3	14.4	17.9	125	500	333	500
Shibapur village	16.9	21.7	19.8	21.6	625	875	724	875
NAAQS, 2009		80				2000		

Note : *Instant reading, NAAQS : National Ambient Air Quality Standards

Source : Test report no. MMA/06-18/05 dated 05.06.2018 by Min Mec R&D Laboratory, New Delhi

The National Ambient Air Quality Standards (NAAQS) dated 18th November 2009 by CPCB, which give the limits for industrial as well as residential & a rural area, is attached in **Annexure VIII**. Results of monitoring are compared with the NAAQS in **Table 3.9**.

TABLE 3.9
STANDARD OF AMBIENT AIR QUALITY (CONCENTRATIONS IN µg/m³)

Pollutants	NAAQS (18/11/2009)		Maximum values (24 hrs) monitored in study area
	Industrial, Residential, Rural and other area (24 hrs. avg.)	Ecologically Sensitive area (notified by Central Government) (24 hrs. avg.)	
PM10	100	100	71.0
PM2.5	60	60	42.7
SO ₂	80	80	16.1
NO ₂	80	80	20.7

From the above table it can be concluded that the maximum value of ambient air quality monitored during monitoring season in the study area does not exceed the limit laid down by CPCB for all the parameters.

Twenty four hour average PM10 level was found to range from 39.6 to 71.0 µg/m³ against a 100 µg/m³ permissible limit for residential, rural and other areas. PM2.5 was found to vary from 22.8 to 42.7 µg/m³ as against a standard of 60 µg/m³. SO₂ ranged from 6.3 to 16.1 µg/m³ and NO₂ from 9.0 to 21.7 µg/m³ as against a standard of 80 µg/m³ for both. The CO level was observed between 125-875 µg/m³, lower than the standard of 2000 µg/m³.

3.5.4 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.

The result of the Hg, As and Fluoride analysis with respect to Iron ore and scrap is given in **Table 3.10**. The TCLP study result of slag is given in **Table 3.11**.

TABLE 3.10
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 3.11
TCLP TEST RESULTS FOR SLAG

Sl. No.	Component	Concentration in TCLP or WET* Procedure solutions of slag test sample, mg/l	Waste constituents concentration limits based on TCLP or STLC. Gazette of India, Extraordinary, Schedule-II mg/l
1	Hg	0.0011	0.2
2	As	0.0034	5.0
3	Se	<0.001	1.0
4	Sb*	0.002	15.0
5	Ba	0.063	100.0
6	Cd	0.0012	1.0
7	Total Cr	0.004	5.0
8	Cr VI *	0.0003	5.0
9	Pb	0.026	5.0
10	Mn	1.42	10.0
11	Ag	0.004	5.0
12	Co*	0.023	80.0
13	Cu*	0.005	25.0
14	Mo*	<0.001	350
15	Ni*	0.014	20.0
16	V*	0.135	24.0
17	Zn*	0.045	250

Source: Report no. TSP-001/08/2016/308 dated 09.09.2016 of IMMT (CSIR) Laboratory, Bhubaneswar

3.6 WATER ENVIRONMENT

3.6.1 Surface water resources

Core zone: Two first order seasonal drains originate from within plant boundary and flow out from the north western and northern boundaries. There exist six rain fed ponds within the project site, which dry during the

summer months. One of the south-north seasonal streams flowing within 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 its tributaries control the drainage of the area. The Brahmani is perennial in nature with a nominal flow during the summer season. Its important tributaries are Ramiala Nadi, Nigre Nadi, Purajhor Nadi etc. The smaller streams show dendritic pattern while the major river and its 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 western 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 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 2017)” by Rungta Mines Ltd., water level was monitored at 20 observation wells. At Jharbandh it varied from 8.52 m bgl (April) to 2.01 m bgl (October). At Galapad it varied from 8.61 m bgl (April) to 1.42 m bgl (October). In buffer zone it varied from 8.61 mbgl (April) to 0.82 mbgl(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 1997 & 2009).

Ground water resource estimation		Study Area	Project Area
A. Annual ground water recharge by rainfall infiltration method			
Total study area (as per Census 2011)	-	426.12 Sq.km.	273 ha
Area suitable for ground water recharge (as per Census 2011)	-	201.71 Sq.km	90.11 ha (green belt)
Annual Average Rainfall (IMD Angul 2001-2011, Jun. - Sep.)	-	1185.5 mm	1185.5 mm
Rainfall infiltration index (avg) as per GEC recommendation for alluvial area (Sandy Areas)	-	20%	80%
Monsoon groundwater recharge	-	47.82 MCM	0.855 MCM
B. Annual ground water recharge by water table fluctuation method			
Total study area (as per Census 2011)	-	426.12 Sq.km	273 ha
Area suitable for ground water recharge (as per Census 2011)	-	201.71 Sq.km	90.11 ha (green belt)
Average seasonal change of water table (for Granite & granite Gneiss bearing areas in Hindol Block as per CGWB brochure for Dhenkanal District)	-	0.93 m	0.93 m
Specific yield as per GEC recommendation for Sandy alluvial area	-	15%	15%
Monsoon groundwater recharge	-	28.14 MCM	0.125 MCM
Difference between two expressed as a percentage of the rainfall infiltration method	-	-41.15%	-85.3%
Since difference is less than -20%, annual recharge is taken as equal to 0.8 times the value estimated by the rainfall infiltration factor method.	-	38.256 MCM	0.684 MCM

C. Ground Water Use			
C.1.Domestic			
Total population as per Census 2011	-	1,83,621	Present - 0, future - 0*
Decadal growth rate (rural for Odisha)	-	11%	0
Estimated present population (6% till 2018)	-	1,94,637	0
Per capita domestic need (for 365 days)	-	70 L/Day	0
Total annual ground water use	-	4.97 MCM	0
<i>*since no ground water withdrawal is proposed</i>			
C.2. Irrigation			
Total irrigated area	-	2629.48 ha.	90.11 ha (green belt)
Surface water irrigation (canal- 1911.64 ha, tanks/ lakes- 456.294 ha)	-	2367.934 ha	0
Irrigation by others	-	31.87 ha	90.11 ha (supply water)
Ground water irrigation	-	229.68 ha.	0
Ground water withdrawal for irrigation assuming 0.5 m/yr irrigation	-	1.149 MCM	0
Assuming 0.5 m/yr all irrigation & 35% seepage for recharge	-	4.60 MCM	0.158 MCM
Sub-total due to irrigation (Recharge)	-	3.451 MCM	0.158 MCM
C.3. Livestock			
empirically considered as 5% of human consumption	-	0.248 MCM	0
Annual ground water use	-	4.97 - 3.451+0.248 = 1.767 MCM	- 0.158 MCM (recharge)
D. Ground water balance			
Net annual ground water availability (million m3/year)		38.256-1.767= 36.489 MCM	0.684-(-0.158)= 0.842 MCM
Stage of ground water development in %		4.6%	100%
Category as per GEC		Safe	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 3.12** and shown in **Fig 3.6**.

TABLE 3.12
LOCATION OF WATER SAMPLING STATIONS

Station No. (Ref. Fig 3.6)	Source	Location	Distance and direction from Plant
I. Surface Water			
9	River	Brahmani river near Kharhagaprasad village (Up Stream)	6.9 km, NNE
10	River	Lingra Nadi near Plant (Up Stream)	2.0 km, NNW
11	Nala	Gandhijharan nala near Tarkabeda village	1.7 km, SSW
12	River	Brahmani river near Kharhagaprasad village (Down Stream)	6.7 km, NNE
13	River	Lingra nadi near Kankalu village (Down Stream)	2.5 km, NW
14	Nala	Nala Near Berunpal village	0.9 km, NW
15	Nala	Nala near Nimabahali village	2.5 km, NNE
16	Nala	Kusumador jor near Bishwanath village	7.0 km, ESE
17	Nala	Barha jor near Karanda village	8.0 km, SE
18	Nala	Kantel nala near Gulehi village	9.8 km, WSW
19	Nala	Kisinda jor near Kharhagaprasad village	6.2 km, N
II. Ground Water			
1	Hand pump	Core zone	Within
2	Bore well	Nimidha village	2.8 km, E
6	Hand Pump	Tarkabera village	1.3 km, SSW

Station No. (Ref. Fig 3.6)	Source	Location	Distance and direction from Plant
7	Hand Pump	Kadala village	1.8 km, WSW
20	Hand pump	Jharbandh village	0.8 km, ENE
21	Hand Pump	Gandhijhara village	1.7 km, NW
22	Hand Pump	Dhuliamunda village	6.3 km, SE
23	Hand pump	Kantimili village	3.6 km, WSW
24	Hand pump	Benipathar village	2.1 km, W
25	Hand pump	Kankalu village	2.7 km, WNW

Methodology

Grab samples from surface and ground water sources 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 analysed by adopting the relevant parts of IS:3025, "Standard Methods for Water Analysis" and the analysis was carried out for parameters prescribed in IS:10500-2012. For analysis, the samples were brought to Min Mec R&D Laboratory, New Delhi, after requisite preservation.

Analytical Results

The physico-chemical characteristics analysed for ground and surface water samples are given in **Annexure IX**. The Drinking Water-Specification i.e. IS 10500:2012 has been included in the **Annexure X** for ease in reference. Surface water test results have been compared with the drinking water standards and given in **Table 3.13** while ground water test results are given in **Table 3.14**.

TABLE 3.13
SURFACE WATER TEST RESULTS

Sl. No.	Parameters	as per IS 10500:2012		Test Results (range)
		Requirement (Acceptable Limits)	Permissible Limit in the absence of Alternate source	
1.	Odour	Agreeable	Agreeable	Agreeable
2.	Turbidity	1	5	BDL-3.65
3.	pH value	6.5 to 8.5	No Relaxation	7.4-7.9
4.	Specific Conductance, μ mhos	-	-	230-395
5.	Total Dissolved solids, mg/l	500	2000	146-420
6.	Total Suspended Solids, mg/l	-	-	BDL-34
7.	Total hardness (as CaCO_3) mg/l	200	600	79-190

Sl. No.	Parameters	as per IS 10500:2012		Test Results (range)
		Requirement (Acceptable Limits)	Permissible Limit in the absence of Alternate source	
8.	Alkalinity, mg/l	200	600	79-210
9.	Chlorides (as Cl), mg/l	250	1000	23-31
10.	Sodium as Na, mg/l	-	-	6.7-18.9
11.	Potassium as K, mg/l	-	-	1.8-2.4
12.	Magnesium as Mg, mg/l	30	100	7-17
13.	Iron (as Fe), mg/l	0.3	No Relaxation	BDL-0.77
14.	Fluoride (as F), mg/l	1.0	1.5	0.57-0.87
15.	Phosphorus, mg/l	-	-	BDL
16.	Chromium, mg/l	0.05	No Relaxation	BDL-0.011
17.	Sulphate (as SO ₄), mg/l	200	400	9-26
18.	Nitrate (as NO ₃), mg/l	45	No Relaxation	BDL-6.33
19.	Calcium (as Ca), mg/l	75	200	17-38
20.	Magnesium (as Mg), mg/l	30	100	7-17
21.	Copper (as Cu), mg/l	0.05	1.5	BDL-0.028
22.	Manganese (as Mn), mg/l	0.1	0.3	BDL
23.	Selenium (as Se), mg/l	0.01	No Relaxation	BDL
24.	Arsenic (as As), mg/l	0.05	No Relaxation	BDL
25.	Zinc (as Zn), mg/l	5	15	BDL-0.785
26.	Nickel as Ni, mg/l	0.02	No Relaxation	BDL
27.	Boron, mg/l	0.5	1.0	BDL
28.	Silver (as Ag), mg/l	0.1	No Relaxation	BDL
29.	Barium (as Ba), mg/l	0.7	No Relaxation	0.013-0.134
30.	Lead (as Pb), mg/l	0.01	No Relaxation	BDL
31.	Dissolved Oxygen, mg/l	-	-	6.7-6.9
32.	Biochemical Oxygen Demand, mg/l	-	-	5-25
33.	Chemical Oxygen Demand, mg/l	-	-	14-39
34.	Oil & Grease, mg/l	-	-	2-4
35.	Total Coliform (MPN/100ml)	-	-	Absent-24
36.	E. Coli	-	-	Absent

Note: BDL(Below Detection Limit) of Turbidity (NTU) <1, TSS <10, Fe <0.1, P <0.1, Cr <0.01, NO₃ <0.5, Cu <0.01, Mn <0.01, Se <0.01, As <0.01, Zn <0.01, Ag <0.01, Pb <0.1 mg/l, Ni <0.01, B <0.01

Source: Test report no. MMW/03-2018/8A dated 22.03.2018 by Min Mec R&D Laboratory

The analysis of surface water sample shows that all the parameters are within the acceptable limits as per IS 10500:2012 except alkalinity, which is within permissible limits. The alkalinity exceeds at Ghandijharan nala near Tarkabeda village at 210 mg/l and Kanti Nala near Gulihi village at 205 mg/l, which is marginally higher than acceptable limit of 200 mg/l but well below the permissible limit of 600 mg/l.

TABLE 3.14
GROUND WATER TEST RESULTS

Sl. No.	Parameters	As per IS 10500:2012		Test Results (range)
		Requirement (Acceptable Limits)	Permissible Limit in the absence of Alternate source	
1.	Odour	Agreeable	Agreeable	Agreeable
2.	Turbidity	1	5	0-0.52
3.	pH value	6.5 to 8.5	No Relaxation	6.6-7.5
4.	Specific conductance, μ mhos	-	-	726-2298
5.	Total Dissolved solids, mg/l	500	2000	456-1416
6.	Total Suspended Solids, mg/l	-	-	BDL-16
7.	Total hardness (as CaCO_3) mg/l	200	600	249-546
8.	Alkalinity, mg/l	200	600	32-133
9.	Chlorides (as Cl), mg/l	250	1000	27-245
10.	Iron (as Fe), mg/l	0.3	No Relaxation	BDL-0.19
11.	Fluoride (as F), mg/l	1.0	1.5	0.20-0.73
12.	Sulphate (as SO_4), mg/l	200	400	32-133
13.	Phosphorous as P, mg/l	-	-	BDL
14.	Nitrate (as NO_3), mg/l	45	No Relaxation	5.91-28.52
15.	Sodium as Na, mg/l	-	-	3-34
16.	Potassium as K, mg/l	-	-	27.5-324.8
17.	Calcium (as Ca), mg/l	75	200	60-111
18.	Magnesium (as Mg), mg/l	30	100	21-74
19.	Copper (as Cu), mg/l	0.05	1.5	BDL
20.	Manganese (as Mn), mg/l	0.1	0.3	BDL – 0.185
21.	Chromium as Cr, mg/l	0.05	No Relaxation	BDL
22.	Selenium (as Se), mg/l	0.01	No Relaxation	BDL
23.	Nickel as Ni, mg/l	0.02	No Relaxation	BDL
24.	Arsenic (as As), mg/l	0.05	No Relaxation	BDL
25.	Zinc (as Zn), mg/l	5	15	BDL-2.794
26.	Boron (as B), mg/l	0.5	1.0	BDL
27.	Silver (as Ag), mg/l	0.1	No Relaxation	BDL
28.	Barium (as Ba), mg/l	0.7	No Relaxation	0.015-0.368
29.	Cadmium (as Cd), mg/l	0.003	No Relaxation	BDL
30.	Lead (as Pb), mg/l	0.01	No Relaxation	BDL

Note: BDL(Below Detection Limit) of TSS <10, Fe <0.1, P <0.1, Cu <0.01, Mn <0.01, Cr <0.01, Se <0.01, Ni <0.01, As <0.01, Zn <0.01, B <0.01, Ag <0.01, Cd <0.002, Pb <0.1 mg/l Source : Test report no. MMW/03-2018/8 dated 22.03.2018 by Min Mec R&D Laboratory

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 3.15**.

TABLE 3.15
LOCATION OF NOISE MONITORING STATIONS

Station No. (Ref Fig 3.6)	Name of Monitoring Station	Distance (km) and Direction from the Plant
1	Plant area (Core zone)	Within
2	Nimidha Village	2.8 km, E
3	Mosonia village	5.5 km, N
4	Galpada village	0.5 km, N
5	Nimabahali village	2.4 km, NE
6	Tarkabera village	0.7 km, S
7	Kadala Village	1.8 km, WSW
8	Shibapur Village	4.7 km, NNW
20	Jharbandh village	0.8 km, ENE
23	Kantimilli Village	3.6 km, WSW

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 a 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 3.16**. 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 3.16
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 (Core zone)	52.16	42.51	50.39	75	70	I
Nimidha Village	48.12	39.73	46.44	55	45	R
Mosonia village	49.29	39.61	47.52	55	45	R
Galpada village	49.83	40.20	48.06	55	45	R
Nimabahali village	50.69	39.63	48.85	55	45	R
Tarkabera village	50.97	41.63	49.22	55	45	R
Kadala Village	49.89	40.16	48.12	55	45	R
Shibapur Village	53.45	43.24	51.65	55	45	R
Jharbandh village	49.18	40.18	47.51	55	45	R
Kantimilli Village	50.14	39.12	48.30	55	45	R

Abbreviation: I- Industrial, R- Residential

Leq values observed during day time varies from 48.12 to 52.16 dB (A) and at night time varies from 39.12 to 42.51 dB (A). The day and night time Leq values noted from the 9 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 09-10/05/2018 at Nimabahali Chowk (NH-55). The traffic monitoring station is shown in **Fig 3.6**.

3.8.2 Methodology

Traffic volume measurements 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 and cycles. At the end of each hour, fresh counting and recording was undertaken. Thus, total numbers of vehicles per hour under the four categories were determined.

3.8.3 Observations

A summary of the traffic volume monitored during survey period is given in **Table 3.17** and details are given in **Annexure XIV**.

**TABLE 3.17
TRAFFIC VOLUME**

Traffic vehicle	No. of vehicles per day	Factor	Equivalent Passenger Car Unit
H.M.V.	6990	3.0	20970
L.M.V.	2991	1.0	2991
Two/three wheelers	1904	0.5	952
Cycles	640	0.5	320
Grand Total	12525		25233

It was observed that the movement of heavy motor vehicles (trucks) is uniform during the daytime and night times. These are mainly coal carrying trucks from the Talcher coalfield. The road from project site till NH is 5 m wide while the NH is presently 7.5 m. The present traffic load is 84.11% of the maximum capacity 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

Total land required for the project is 674.765 acres. Company has acquired 608.495 acres (comprising 540.705 acres private land + 67.790 acres Government land). Balance 66.270 acres land is pending with Tehsildar, Hindol. This has been changed to industrial use. The pre-project landuse details of project area is given in **Table 3.18**.

**TABLE 3.18
PRE-PROJECT LANDUSE IN PROJECT AREA (IN ACRES)**

Sl. No.	Name of the Village	Private Land	Government Land					Grand Total
			Leasable	Gochar	Communal	Forest	Total	
1	Jharbandh	261.565	44.030	17.390	12.330	7.540	81.290	342.855
2	Tarkabeda	175.870	9.840	0.380	15.170	0.260	25.650	201.520
3	Galapada	103.270	1.800	16.710	8.610	0.000	27.120	130.390
	Grand Total	540.705	55.670	34.480	36.110	7.800	134.060	674.765
	Possession Taken	540.705	40.040	19.950	0.000	7.800	67.790	608.495
	Balance	0.000	15.630	14.530	36.110	0.000	66.270	66.270

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 3.19**.

TABLE 3.19
DISTRICTS/SUB DISTRICT WISE VILLAGES IN STUDY AREA

District	Sub District	No. of villages	Area (ha)
Dhenkanal	Parajung	13	3281
	Motunga	46	9578
	Bhushan Steel Ltd.	23	5292
	Balami	45	11889
	Hindol	4	845
	Rasol	13	6330
Angul	Banarpal	15	4576
	Bhushan Steel Ltd.	2	249
Forest Area			572
Total		161	42612

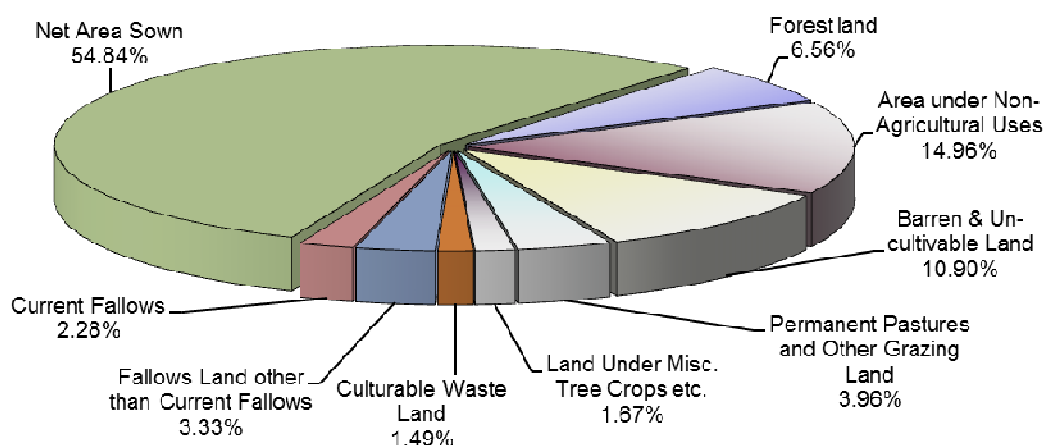
Detailed break up of landuse pattern within study area is given in **Annexure XV** and summarised in **Table 3.20**. The landuse pattern is graphically presented in **Fig 3.7**.

TABLE 3.20
LAND USE DETAILS OF STUDY AREA (AS PER CENSUS 2011)

Land use	Area (Ha.)	% of Total Area
Net area sown	23370.55	54.84
Current fallows	972.81	2.28
Fallows land other than current fallows	1417.21	3.33
Culturable waste	634.75	1.49
Land under misc tree crops	711.54	1.67
Permanent pastures and other grazing land	1689.13	3.96

Land use	Area (Ha.)	% of Total Area
Barren land	4644.51	10.90
Area under non agricultural uses	6374.64	14.96
Forest land	2796.86	6.56
Total	42612.00	100.00

**FIG 7: LAND USE PATTERN IN THE STUDY AREA
(CENSUS 2001)**



A perusal of above table shows that 6.56% of total area is forest land, 14.96% is area under non-agricultural uses, 54.84% is net area sown, 3.96% is permanent pastures and other grazing land, 2.28% is current fallows, 10.90% is barren and un-cultivable land, 3.33% is fallows land, 1.49% is culturable waste land and 1.67% land under miscellaneous tree crops.

3.9.3 Land use based on satellite imagery

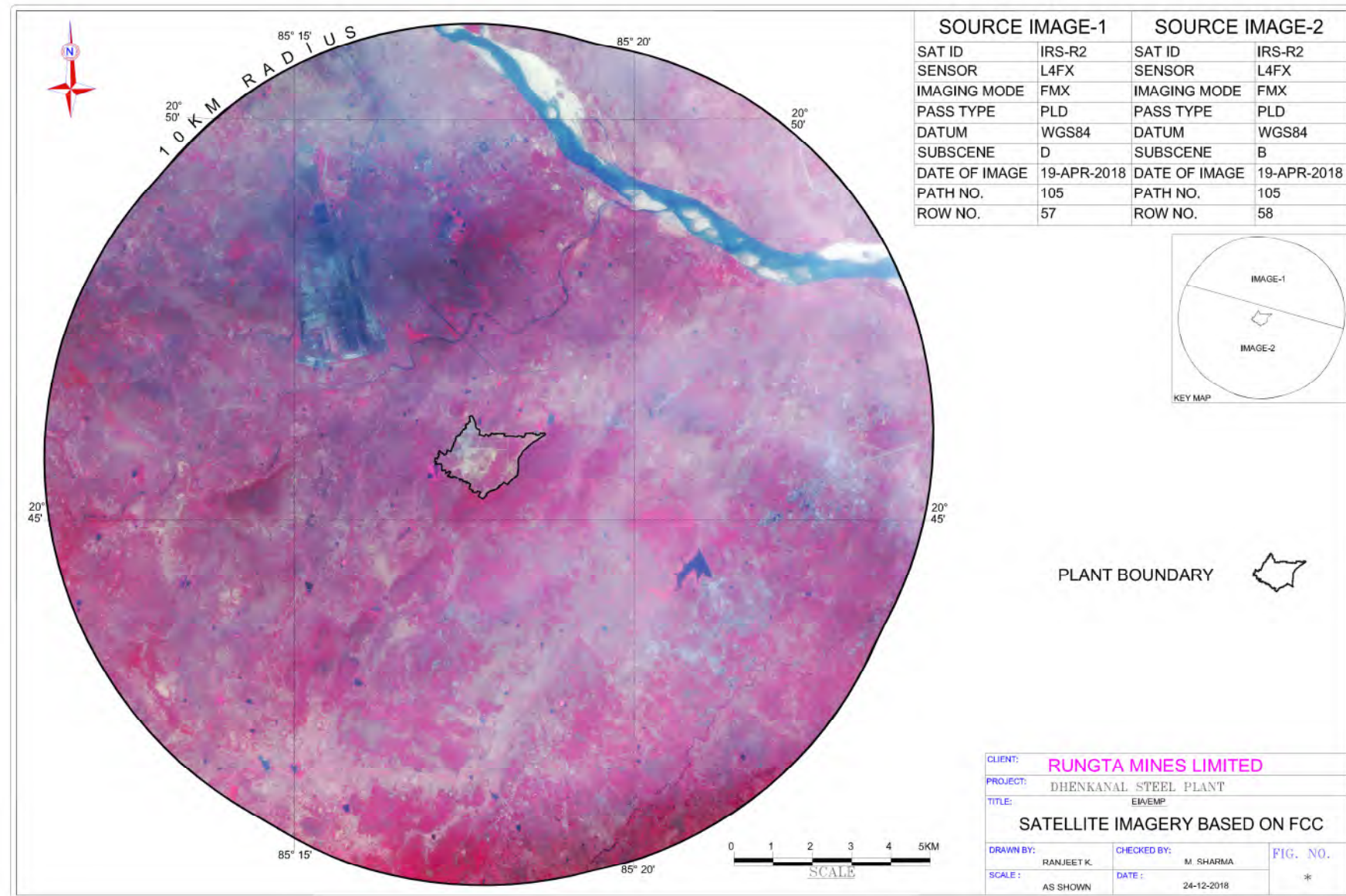
Land use/ land cover information relates to the status, spatial distribution & area extent of different land use categories.

Data Inputs : Satellite-IRS-R2, Sensor- L4FX, path- 105, Row-57&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. Imagery based Land Use / Land Cover Map has been given in **Fig 3.8**.

FIG 3.8: 10 KM RADIUS LAND USE MAP BASED ON SATELLITE IMAGERY



3.10 SOIL QUALITY

Top soil samples were collected from the project site and from one village in the study area. The location of soil sampling stations are given in **Table 3.21**, analysis result is given in **Table 3.22** and shown in **Fig 3.6**.

**TABLE 3.21
SOIL SAMPLING STATIONS**

Station no.	Location	Distance, km & Direction
S1	Project site	Within
S2	Jharbandh village	0.8 km, ENE

**TABLE 3.22
SOIL TEST RESULT**

Parameters	Protocol	Plant Area		Jharbandh Village	
Textural Classification	IS 1498:1970	Fine grained sand		Medium grained sand	
Grain size analysis	IS 2720 (P 4)	% retain	% finer	% retain	% finer
19 mm		-	100	-	100
4.75 mm		-	100	0.65	99.35
2.0 mm		0.46	99.54	5.05	94.3
425 µm		28.1	71.44	50.55	43.75
75 µm		56.79	14.65	36.59	7.16
<75 µm		14.65	-	7.16	-
Colour	-	Reddish		Brown	
pH	IS 2720 (P26)	6.20		7.80	
E.C. (mS/cm)	IS 14767:2000	0.111		0.167	
CaCO ₃ (% by mass)	IS 2720 (P23)	5.0		10.0	
Bulk density (g/cm ³)	IS 15289 (P 2)	1.40		1.40	
Moisture (% by mass)	IS 2720 (P 2)	14.07		18.66	
Organic Carbon (% by mass)	Method no. 9*	0.31		0.26	
Organic Matter (% by mass)	Method no. 9*	0.69		0.58	
Chloride (% by mass)	IARI, Section B/7**	0.03		0.03	
Phosphorous (kg/ha)	Method no. 13*	32.76		81.9	
Nitrate-Nitrogen (kg/ha)	Method no. 12*	5.32		9.52	
Sodium (Kg/ha)	Method no. 14*	97.44		146.72	
Potassium (Kg/ha)	Method no. 14*	332.0		61.0	
Calcium ²⁺ me/100 gram Soil	Method no. 16.a*	10.20		25.60	
Magnesium ²⁺ me/100 gram Soil	Method no. 16.b*	2.20		9.90	

Source: Test report no. MMS/03-18/09 dated 22.03.2018 by Min Mec R&D Laboratory

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

**** Soil and Water Testing Method, Indian Agricultural Research Institute**

Soil analysis results indicate the following:

- Both the soil samples are sandy in nature
- The pH is in the slightly acidic in core zone to mildly alkaline in Jharbandh. Slightly acidic soils are suitable for most crops such as maize, millets, sorghum wheat, barley, oats, field bean, groundnut, soyabean, peas, lentil, gram, sugarcane, cotton, etc. Slightly acidic soil usually has lower availability of macro-nutrients and growth of nitrogen fixing bacteria is adversely affected. Hence, the soil within plant site will have to be treated prior to plantation.
- The EC normal for plant growth and is less than 4, hence it is not a saline/ sodic soil
- Organic carbon and Nitrogen are low in both samples
- Both soil samples are rich in 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 Chandka Dampur WLS at a distance of 26 km in SE direction from the project.

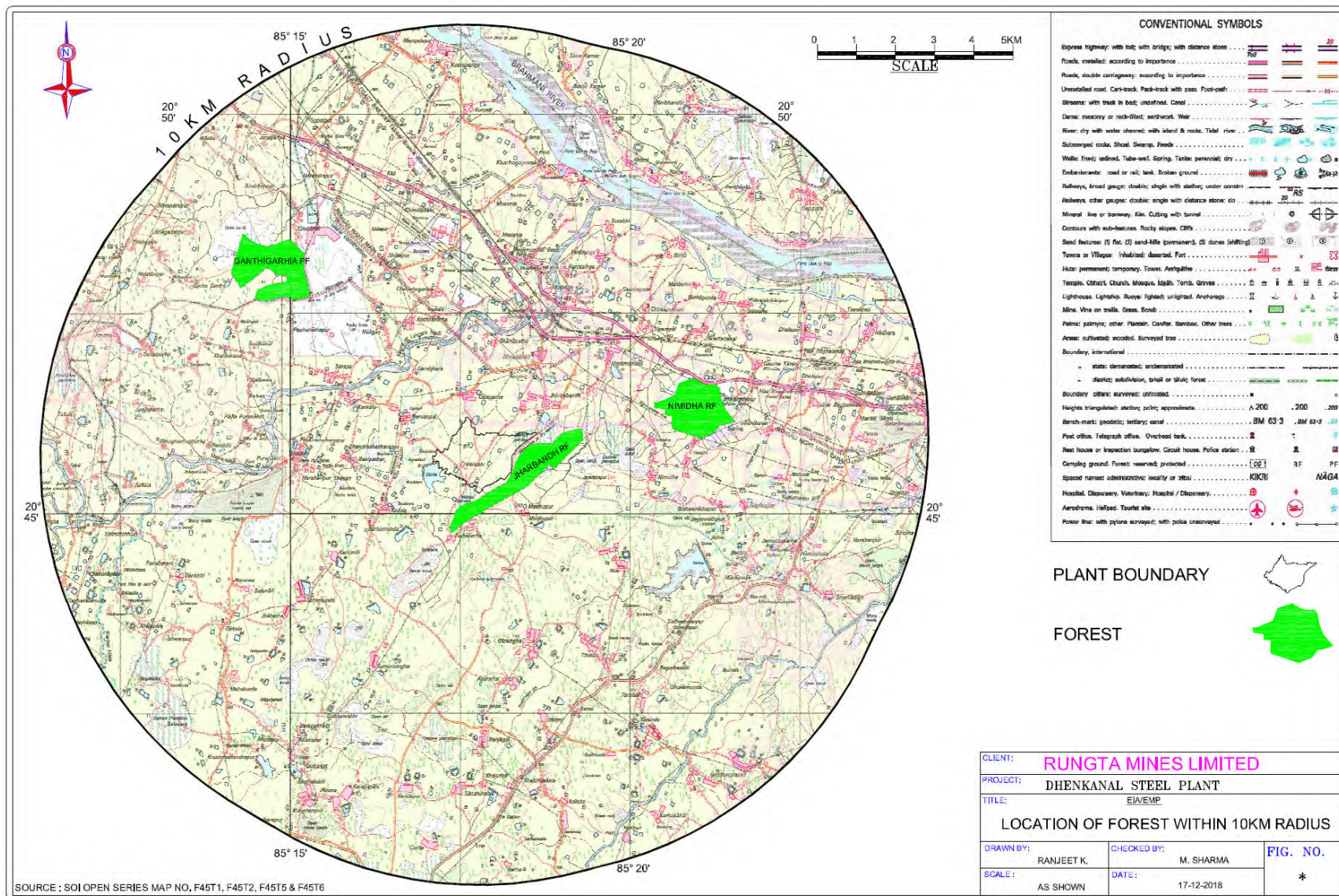
There are three protected and reserve forests present within 10 km radius of the project. They are listed in **Table 3.23** and their location are shown in **Fig 3.9**.

TABLE 3.23
LIST OF FORESTS IN 10 KM RADIUS OF THE PROJECT

Sl. No.	Name of forest	Distance (KM)	Direction
1.	Jharbandh RF	0.5 km	SE
2.	Ganthigarihia PF	5.4 km	NW
3.	Nimidha RF	3.2 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.

FIG 3.9: LOCATION OF FORESTS



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 XVII**. 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 3.9) 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 XVII**. 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 3.9**) 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 3.24**.

TABLE 3.24
AREA UNDER MAJOR FIELD CROP & HORTICULTURE IN
DHENKANAL DISTRICT

Sl. No.	Major Field Crop Cultivated	Total Area (Ha)
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
Horticulture Crops - Fruits		
7.	Mango	8.4
8.	Citrus	0.9
9.	Cashew	1.7
10.	Coconut	1.1
11.	Banana	0.5

Sl. No.	Major Field Crop Cultivated	Total Area (Ha)
Horticulture Crops - Vegetables		
12.	Potato	0.2
13.	Onion	0.8
14.	Sweet Potato	3.4
15.	Vegetables	25.4
Medicinal & Aromatic Crops		
16.	Garlic	0.7
17.	Turmeric	0.4
18.	Ginger	0.3
19.	Corriander	0.8
Plantation Crops		
20.	Eucalyptus	2.0
21.	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 3.9**).

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 XVI**.

The complete list of fauna authenticated by Divisional Forest Officer, Dhenkanal Division found in the plant and study area is given in **Annexure XVII**. 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.

Buffer Zone: There are 161 inhabited villages in the buffer zone of the study area. The total population within the study area is 183621. The district and sub district wise population as per Census 2011 records is given in **Table 3.25**.

TABLE 3.25
DISTRICT & SUB DISTRICT WISE POPULATION (CENSUS 2011)

District	Sub District	No. of villages	No of households	Total population	Males	Females
Dhenkanal	Parajung	13	3,303	12,865	6,494	6,371
	Motunga	46	11,827	50,117	26,118	23,999
	Bhushan Steel Ltd.	23	5,185	22,293	12,025	10,268
	Balami	45	12,057	47,592	24,376	23,216
	Hindol	4	785	3,070	1,580	1,490
	Rasol	13	5,621	23,154	11,920	11,234
Angul	Banarpal	15	5,217	23,432	12,245	11,187
	Bhushan Steel Ltd.	2	272	1,098	558	540
Total		161	44,267	183,621	95,316	88,305

The village wise demographic details including population of males, females, schedule cast, schedule tribe, literacy level are given in **Annexure XVIII** and summarised in **Table 3.26**.

TABLE 3.26
DEMOGRAPHIC DETAILS OF THE STUDY AREA
(AS PER CENSUS 2011)

Sl.	Description	Population	Percentage
1	Total Population	183621	100
1.1	Male Population	95316	51.91
1.2	Female Population	88305	48.09
1.3	Females/1000 males	926	-
2	No. of households	44267	-
2.1	Family size, persons/family	5	-
3	Caste wise break up		
3.1	Schedule caste	43344	23.61
3.2	Schedule Tribe	9502	5.17
4	Literacy		
4.1	Total literates	128585	70.03
4.2	Male literates	73267	39.90
4.3	Female literates	55318	30.13

Mostly the population is rural and the percentage of Scheduled Tribes is 5.17% and Schedule Castes is 23.61% of the total population. The male

population exceeds female population. The average family size is 5 persons per family. The literacy level is approximately 70% and it is lower among females (30.13%). There are 926 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 XIX**. A summary of employment pattern and occupation for the study area is presented in **Table 3.27**.

TABLE 3.27
SUMMARY OF EMPLOYMENT & OCCUPATION IN THE STUDY AREA

Description	Numbers	%
Main workers	44061	24.00
Marginal workers	19096	10.40
Non workers	120464	65.60
Break-up of main workers		
Cultivators (%)	7594	17.24
Agricultural labours (%)	5957	13.52
Household industries (%)	2157	4.90
Other workers (%)	28353	64.35
Total		100
Break-up of marginal workers		
Cultivators (%)	1764	9.24
Agricultural labours (%)	9278	48.59
Household industries (%)	1000	5.24
Other workers (%)	7054	36.94
Total		100

3.12.3 Amenities

Details of amenities available in individual villages are given in **Annexure XX**. A summary of the same in **Table 3.28**.

TABLE 3.28
AMENITIES AS PER CENSUS 2011

Education	Towns	3 Govt. Primary Schools, 2 Govt. Middle Schools, 2 Govt. Secondary School and 12 Govt.-Non formal education
	Villages	5 Pre-Primary Schools, 203 Primary Schools, 103 Middle schools, 53 Secondary schools, 17 Sr. Sec. Schools, 3 Engineering colleges, 2 Medicine Colleges, 2 Management Institute, 3 Polytechnic and 9 Vocational Training School/ITI
Medical and health care	Towns	2 Dispensary/Health Centre, 6 Maternity Home Nearest facility distance (in kms), 1 Nursing home, and 3 Non-Government Medicine Shop
	Villages	19 Primary Health Sub Centre, 8 Maternity and child welfare centre, 1 TB Clinic, 3 Allopathic hospitals, 1 Hospital

		Alternative Medicine, 10 Dispensary, 4 Veterinary hospitals, 3 family welfare centres, 5 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, 56 Non. Govt. Med facilities Medicine shop and 1 Non Govt. Med. Facilities others
Power Supply	Towns	648 Electricity-Domestic Connection, 4 Electricity-Industrial Connection, 25 Electricity-Commercial Connection, 10 Electricity-Road Lighting Connection and 10 Electricity-Others Connection
	Villages	147 Power supply for domestic use, 147 power supply for agricultural use, 49 power supply for all Users
Sanitation	Towns	412 Latrines-Pit, 791 Latrines-Flush/Pour Flush and 9 Latrines-Others
Water supply	Towns	Protected Water Supply Source-0
	Villages	11 Tap with untreated water, 1 covered wells, 151 Uncovered Wells, 159 Hand Pumps, 8 Tube Wells/Borehole, 32 Spring, 68 River/Canals and 150 Tank/Pond/Lakes
Banks and commercial societies	Towns	1 Nationalized Bank and 2 Agricultural Credit Society
	Villages	1 ATM, 1 commercial bank, 2 cooperative bank, 3 Agricultural Credit Societies, 156 Self-Help Group (SHG), 104 Public Distribution System (PDS), 22 Mandis/Regular Market, 32 Weekly Haat, 14 Agricultural Marketing Society, 145 Nutritional Centres-ICDS, 145 Nutritional Centres-Anganwadi Centre), 3 Nutritional Centres-Others, 155 ASHA and 61 Community Centre with/without TV.
Transport	Towns	Pucca Road Length is 8 km and Kutcha Road Length is 10 km
	Villages	25 National Highways, 11 State Highways, 29 Major District Roads, 65 Other District Roads, 102 Black Topped (pucca) Roads, 150 Gravel (kuchha) Roads, 22 Water Bounded Macadams, 109 All Weather Roads, Navigable waterways(Rivers/canals) and 159 Foot Paths. 27 Public Bus Services, 51 Private Bus Services, 13 railway station, 72 Auto/Modified Autos, 45 Taxis, 9 Vans, 78 Tractors, 159 Cycle-pulled Rickshaws (manual driven), 147 Carts Driven by Animals and 26 Sea/River/Ferry Service)
Entertain-ment and commodity	Town	Nil
	Villages	77 Sports Fields, 60 Sports Club/Recreation Centres, 1 cinema/video halls, 13 public library, 13 Daily Newspaper Supply, 120 Assembly Polling Stations and 3 Birth and Death Registration Office.
Fire fighting	Town	4 Fire fighting service (status A(1)/NA(2))

3.13 INDUSTRIES

The list of industries present in the study area is given below in **Table 3.29** and shown in **Fig 3.10**.

TABLE 3.29
LIST OF INDUSTRIES IN STUDY AREA

Sl. No.	List of industries and mines	Distance (km) /direction	Status as in Dec 2018
1	MLR's Tusidiha Ferro-alloys plant	2.7 Km N	Not-operational
2	Bhushan Steel Limited's Steel Plant	2.6 km NW	Operational
3	Bhushan Steel Ltd.'s 200 MW power plant	5.7 km, NW	Operational
4	Hind Metals Pvt. Ltd.'s Ferro Alloys plant	4.1 km, N	Dismantled
5	Navbharat Ventures Ltd.'s Ferro-chrome plant and power plant	4.4 km, N	Operational
6	Ravirum Vinmay Pvt. Ltd.	7.0 km, NNW	Not-operational
7	Bhuvée Profile and Stainless (P) Ltd.	6.0 km, N	Not-operational
8	BRG Irons & Steel Co.'s sponge iron & ingot manufacturing unit	6.2 km, N	Not-operational
9	Lanco's Power Plant	5.9 km, N	Partly constructed & abandoned
10	MGM Steel's sponge iron unit & WHRB	2.6 km, ENE	Operational

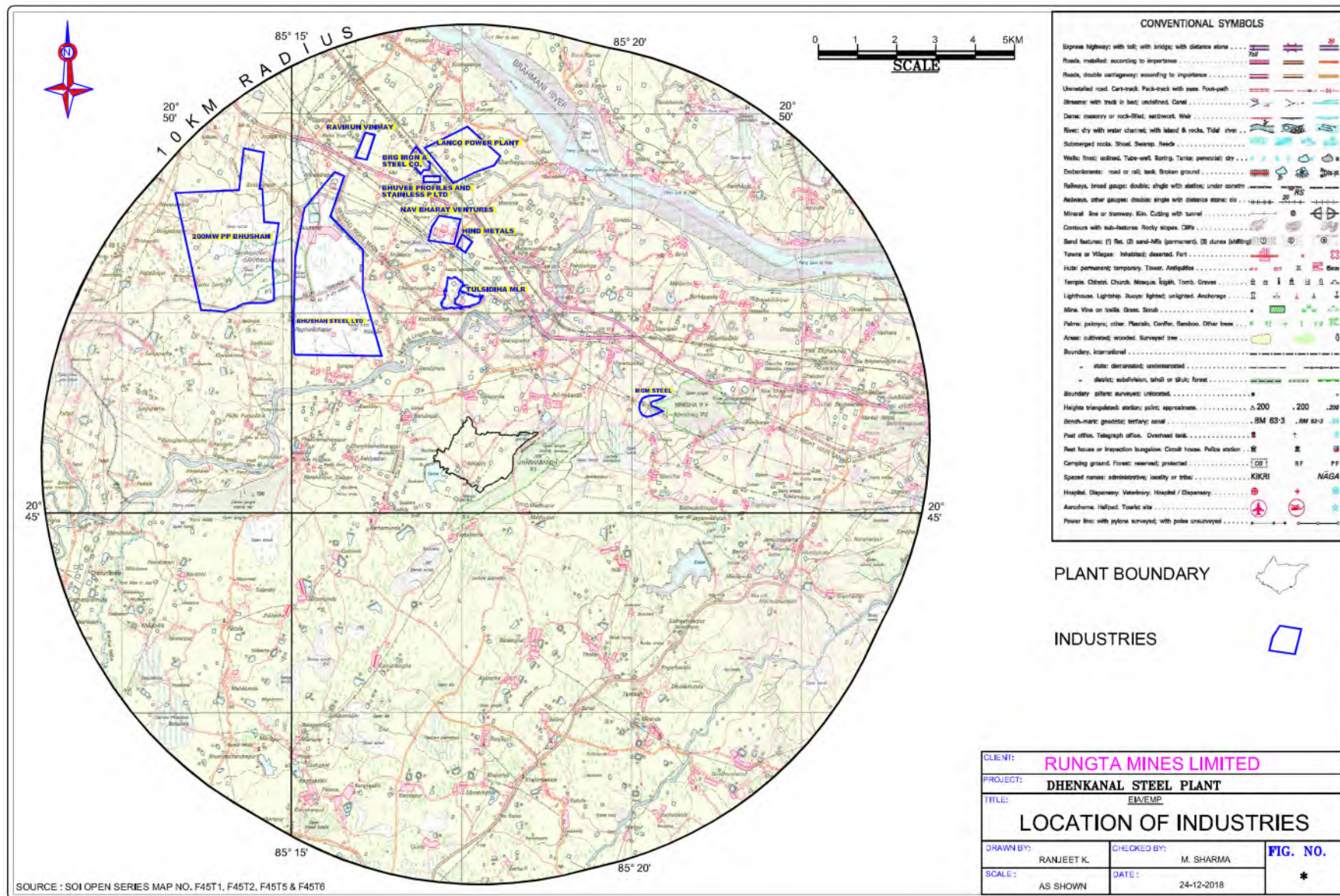
3.14 PLACES OF TOURISM/RELIGIOUS/HISTORICAL INTEREST

No specific place of tourist importance falls within the study area. No places of historical importance are present in the study area.

3.15 SEISMICITY

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

FIG 3.10: LOCATION OF INDUSTRIES



CHAPTER 4

ENVIRONMENTAL IMPACTS & MITIGATION

4.1 GENERAL ASPECTS

Rungta Mines Ltd. (RML) is proposing to install a 2.85 million tonnes per annum (MTPA) steel plant at villages Jharbandh, Galpada and Tarkabeda, district Dhenkanal in Odisha. It will be established in two phases of 1.45 million tonnes per annum followed by 1.4 million tonnes per annum. 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.

4.2 TOPOGRAPHY AND DRAINAGE

4.2.1 Topography

Impact: The core zone represents almost flat land. The elevation of the core zone varies from 75-95 m AMSL. It is devoid of topographical features like hills but has portions of low lying areas. Change in topography will occur in core zone due to digging and filling, construction of the buildings such as walls, buildings, stock yards, etc. and excavation for raw water reservoir and rain water harvesting ponds. The ground will be levelled, where required. One DRI, IF, CCM and CPP is under construction as per environmental clearance dated 02.08.2010. This will be a permanent change in the topography. The construction once achieved will not be reversed. There will be no impact on topography of the buffer zone.

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, it will be fully intentioned 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

Two first order seasonal streams, six 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. The plant area is 674.765 acres (273.18 ha) and rainfall 1185.5 mm. Thus, maximum possible runoff volume getting affected can be 1.94 MCM/ annum of which 89% will occur in July-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 ProServices 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 1.94 MCm, which is 0.013% 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 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 CO₂, 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 CO₂ 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, MTPA	Fixed carbon content %		Quantity of CO ₂ likely to be released, TPA/annum**
Coal*	6,204,769	35.09		7,983,263
Coking coal	1,691,200	40		2,480,427
Coke	951,143	80-86		2,894,645
Coke breeze & fines	216,373	(consider 83)		658,495
		Mol. weight		
		Material	CO₂	
Dolomite [CaMg(CO ₃) ₂]	537,581	184	44	128,552
Limestone [CaCO ₃]	1,414,939	100	44	622,573
Total				14,982,284

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 CO₂ and one CO₂ molecule from limestone & dolomite will be released**

As such, there is no practically applicable technology to sequester this CO₂ 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 SO₂ and NO₂ 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 674.765 acres (273.18 ha) but the construction activity will occur only in a part according to the implementation plan given in Table 2.47 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 2.85 MTPA STEEL PLANT

S.N.	Production Units		Stack Height (m)	Top Dia (m)	Area (m ²)	Volumetric Flow Rate (Nm ³ /Hr)	Volumetric Flow Rate (m ³ /s)	Exit Velocity (m/Sec)	Temp. (°C)	Temp. (°K)	Pollutant emission		
											Rate (mg/Nm ³)		
											SPM	SO ₂	NO ₂
	Phase-I												
1.1	DRI PROCESS STACKS AFTER WHRB ESP (2X500TPD & 2X600TPD DR Plant)												
1	500 TPD Kiln WHRB Stack	K-1	80	2.75	5.94	125,000	53.80	18.13	150	423	100	429	1.284
2	500 TPD Kiln WHRB Stack	K-2				125,000	53.80						
3	600 TPD Kiln WHRB Stack	K-3	80	3.0	7.07	145,000	62.41	17.67	150	423	100	444	1.329
4	600 TPD Kiln WHRB Stack	K-4				145,000	62.41						
1.2	DRI KILNS-DE-DUSTING STACKS												
1	DRI K-1 & K-2 in-plant Dedusting	RMHS	35	1.7	2.27	120,000	39	17.38	50	323	50	--	--
2		CDH	30	1.5	1.77	65,000	25	13.97	100	373	50	--	--
3		PSB	35	1.7	2.27	120,000	39	17.38	50	323	50	--	--
4	DRI K-3 & K-4 in-plant Dedusting	RMHS	35	1.8	2.54	145,000	48	18.74	50	323	50	--	--
5		CDH	30	1.5	1.77	80,000	30	17.19	100	373	50	--	--
6		PSB	35	1.8	2.54	145,000	48	18.74	50	323	50	--	--

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S.N.	Production Units		Stack Height (m)	Top Dia (m)	Area (m ²)	Volumetric Flow Rate (Nm ³ /Hr)	Volumetric Flow Rate (m ³ /s)	Exit Velocity (m/Sec)	Temp. (°C)	Temp. (°K)	Pollutant emission		
											Rate (mg/Nm ³)		
											SPM	SO ₂	NO ₂
2	PELLET PLANT (1X1.434 MTPA)												
1	ESP-Drying & Preheating in Travelling Grate	PEP-01	70	4.0	12.56	470,000	210	16.75	167	440	50	41.78	0.613
2	Raw Material Handling Stack	PEP-02	30	1.5	1.77	65,000	25	13.97	100	373	50	--	
3	Finished Product Handling Stack	PEP-03	30	1.5	1.77	65,000	25	13.97	100	373	25	--	--
3	COAL WASHERY (2.616 MTPA)												
1	Coal Washery in-plant Dedusting	CW-DD	35	1.7	2.27	90,000	30	13.04	50	323	50	--	--
4	BLAST FURNACE (0.567 MTPA)												
1	Stove Stack	BF-01	35	1.8	2.54	80,000	34	13.54	150	423	30	200	150
2	Stock House De-dusting	BF-02	47	1.8	2.54	93,000	30	11.65	40	313	50		--
5	SINTER (0.611 MTPA)												
1	Sinter Plant-Main Stack	SP-MS	55	5	19.63	865,000	372	18.97	150	423	100	15.91	0.093
2	Sinter Plant-De-Dusting	SP-DD	45	2	3.14	160,000	51	16.23	40	313	50	--	--
6	COKE OVEN (0.42 MTPA)												
1	Coke Oven Stack	SP-MS	85	2.5	4.91	175,000	88	17.89	220	493	50	--	--
7.1	SMS-COMPLEX (IF 7X20T + LRF 4X20T)												
1	2x20T IF DES + 20T LRF	IF-04	35	2	3.14	118,000	45	14	100	373	50	--	--
2	2x20T IF DES Stack + 20T LRF	IF-05	35	2	3.14	118,000	45	14	100	373	50	--	--
3	2x20T IF DES Stack + 20T LRF	IF-06	35	2	3.14	118,000	45	14	100	373	50	--	--
4	1x20T IF DES Stack + 20T LRF	IF-07	35	1.8	2.54	59,000	22	9	100	373	50	--	--
7.2	SMS-COMPLEX (EAF 1X90T + LRF 1X90T)												
1	90T EAF Fume Extraction Stack	EAF-01	60	4	12.56	627,000	257	20	130	403	50	--	--
8.1	FLAT/ ROUND/ WIRE/ ROD/ STRUCTURAL/ TMT/ OTHERS MILL (4X40TPH = 0.80 MTPA)												
1	Reheating Furnace Stack	RH-1	60	3	7.07	92,700	60	8.52	365	638	50	255.72	151.02
2	Reheating Furnace Stack	RH-2	60	3	7.07	92,700	60	8.52	365	638	50	255.72	151.02
3	Reheating Furnace Stack	RH-2	60	3	7.07	92,700	60	8.52	365	638	50	255.72	151.02
4	Reheating Furnace Stack	RH-2	60	3	7.07	92,700	60	8.52	365	638	50	255.72	151.02
8.2	STRIP MILL (1X0.45 MTPA)												
1	Reheating Furnace Stack	RH-1	80	4	12.56	209,000	136	10.80	365	638	50	182.29	107.66
8.3	DUCTILE PIPE MILL (1X0.2 MTPA)												
1	Reheating Furnace Stack	RH-1	60	3	7.07	92,700	60	8.52	365	638	50	165.70	107.87
9	PRODUCER GAS PLANT (10X3000 NM³/HR)												
1	Coal Handling System for Producer Gas Plant	PGP-1	30	2	3.14	52,450	20	6.34	100	373	50	--	--
10	CEMENT PLANT (1X2700 TPD)												
1	Crushing Section		30	2	3.14	157,000	50.800	17	45	318	50		
2	Raw Mill / Kiln		80	4	12.56	704,000	281.514	20	120	393	50	4.20	6.72
3	Cement Plant Mill	CP-1	60	4	12.56	950,000	324.786	21	63	336	50		
4	Bag Filling / Packing / Product Area		35	1	0.79	30,000	10.714	16	78	351	50		
11.1	POWER PLANT-2X125TPH + 2X250TPH FBB												
1	125 TPH FBB	FBB-01	90	6.0	28.26	311,000	133.86	9.47	150	423	30	100.00	100.00
2	125 TPH FBB	FBB-02				311,000	133.86						
3	250 TPH FBB	FBB-03	110	7	38.47	622,000	267.71	13.92	150	423	30	100.00	100.00
4	250 TPH FBB	FBB-04				622,000	267.71						
5	Power Plant Raw Material in-plant Dedusting	PP-01	45	5	19.63	377,000	124	6.31	50	323	50	--	--
6	Power Plant Raw Material in-plant Dedusting	PP-02	45	5	19.63	754,000	248	12.63	50	323	50	--	--
11.2	BF GAS BASED POWER PLANT (11 MW)												
1	BF Gas WHR Boiler	PP-03	30	2.5	4.91	135,000	58	11.84	150	423	30	--	7.08
11.3	COKE OVEN GAS BASED POWER PLANT (14 MW)												
1	Coke Oven Based Gas WHR Boiler	PP-04	30	2.5	4.91	159,000	68	13.95	150	423	30	47.48	24.54

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S.N.	Production Units		Stack Height (m)	Top Dia (m)	Area (m ²)	Volumetric Flow Rate (Nm ³ /Hr)	Volumetric Flow Rate (m ³ /s)	Exit Velocity (m/Sec)	Temp. (°C)	Temp. (°K)	Pollutant emission		
											Rate (mg/Nm ³)		
											SPM	SO ₂	NO ₂
	Phase-II												
12.1	DRI PROCESS STACKS AFTER WHRB ESP (2X600TPD DR Plant)												
1	600 TPD Kiln WHRB Stack	K-5	80	3.0	7.07	145,000	62.41	17.67	150	423	100	443.79	1.33
2	600 TPD Kiln WHRB Stack	K-6				145,000	62.41						
12.2	DRI KILNS-DE-DUSTING STACKS												
1	DRI K-5 & K-6 in-plant Dedusting	RMHS	35	1.8	2.54	145,000	48	18.74	50	323	50	--	--
2		CDH	30	1.5	1.77	80,000	30	17.19	100	373	50	--	--
3		PSB	35	1.8	2.54	145,000	48	18.74	50	323	50	--	--
13	PELLET PLANT (1X1.434 MTPA)												
1	ESP-Drying & Preheating in Traveling Grate	PEP-04	70	4.0	12.56	470,000	210	16.75	167	440	50	41.78	0.61
2	Raw Material Handling Stack	PEP-05	30	1.5	1.77	65,000	25	13.97	100	373	50	--	--
3	Finished Product Handling Stack	PEP-03	30	1.5	1.77	65,000	25	13.97	100	373	50	--	--
14	COAL WASHERY (1.524 MTPA)												
1	Coal Washery in-plant Dedusting	CW-DD	35	1.7	2.27	52,294	17	7.58	50	323	50	--	--
15	BLAST FURNACE (0.992 MTPA)												
1	Stove Stack	BF-01	35	2.2	3.80	140,000	60	15.86	150	423	30	200.00	150.00
2	Stock House De-dusting	BF-02	47	2.2	3.80	163,000	52	13.66	40	313	50		--
16	SINTER (1.051 MTPA)												
1	Sinter Plant-Main Stack	SP-MS	80	6.5	33.17	1,484,000	639	19.26	150	423	100	15.94	0.09
2	Sinter Plant-De-Dusting	SP-DD	55	2.5	4.91	273,000	87	17.72	40	313	50		--
17	COKE OVEN (0.70 MTPA)												
1	Coke Oven Stack	SP-MS	100	3.2	8.04	292,000	146	18.22	220	493	50	--	--
18	SMS-COMPLEX (EAF 1X160T + LRF 1X160T)												
1	160T EAF Fume Extraction Stack+1x160TLRF	EAF-01	70	5	19.63	1,115,000	457	23	130	403	50	--	--
19.1	FLAT/ ROUND/ WIRE/ ROD/ STRUCTURAL/ TMT/ OTHERS MILL (3X40TPH = 0.80 MTPA)												
1	Reheating Furnace Stack (0.3 MTPA)	RH-1	60	3.6	10.17	139,000	90	8.87	365	638	50	170.54	100.72
2	Reheating Furnace Stack (0.3 MTPA)	RH-2	60	3.6	10.17	139,000	90	8.87	365	638	50	170.54	100.72
3	Reheating Furnace Stack (0.2 MTPA)	RH-2	60	3	7.07	92,700	60	8.52	365	638	50	255.72	151.02
19.2	STRIP MILL (1X0.40 MTPA)												
1	Reheating Furnace Stack	RH-1	80	4	12.56	186,000	121	9.61	365	638	50	204.83	107.53
19.3	DUCTILE PIPE MILL (1X0.2 MTPA)												
1	Reheating Furnace Stack	RH-1	60	3	7.07	92,700	60	8.52	365	638	50	165.70	107.87
20	PRODUCER GAS PLANT (10X3000 NM³/HR)												
1	Coal Handling System for Producer Gas Plant	PGP-1	30	2	3.14	52,450	20	6.34	100	373	50	--	--
21	CEMENT PLANT (1X2300 TPD)												
1	Crushing Section		30	2	3.14	134,000	43	17	45	318	50		
2	Raw Mill / Kiln		80	4	12.56	600,000	240	20	120	393	50	2.94	4.70
3	Cement Plant Mill	CP-1	60	4	12.56	809,000	277	21	63	336	50		
4	Bag Filling / Packing / Product Area		35	1	0.79	25,000	9	16	78	351	50		
22.1	POWER PLANT- 2X250TPH FBB												
1	250 TPH FBB	FBB-03	110	7.0	38.47	622,000	267.71	13.92	150	423	30	100.00	100.00
2	250 TPH FBB	FBB-04				622,000	267.71						
3	Power Plant Raw Material in-plant Dedusting	PP-01	45	4.5	15.90	252,000	83	5.21	50	323	50	--	--
4	Power Plant Raw Material in-plant Dedusting	PP-02	45	5.0	19.63	503,000	165	8.42	50	323	50	--	--
22.2	BF GAS BASED POWER PLANT (20 MW)												
1	BF Gas WHR Boiler	PP-03	30	3	7.07	245,500	106	14.96	150	423	30	--	19.17
22.3	COKE OVEN GAS BASED POWER PLANT (24 MW)												
1	Coke Oven Based Gas WHR Boiler	PP-04	30	3	7.07	273,000	118	16.63	150	423	30	46.09	23.82

The gases coming out from the units shown above contain pollutants like particulate matter, SO₂ and NO₂. 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, the sources of fugitive emission have been identified as follows:

TABLE 4.2
FUGITIVE EMISSION SOURCES AND EMISSION RATES

Pollution source Unit / location (legend on map in Fig 2.1, Chapter 2)	Loading area m ²	Material loaded TPH	Emission rates µg/m ² -h		
			SPM	PM10	PM2.5
<u>Phase-1</u>					
Brick plant (28)	21200	6.4	0.220	0.083	0.047
Waste Dump (29 & 41)	103100	218.3	1.544	0.579	0.333
Raw Material yard (3)	13900	606.8	31.834	11.938	6.864
Uncrushed Limestone (40)	3600	88.7	59.907	22.465	12.917
Pellet Plant (35)	3200	8.4	1.922	0.721	0.414
Coke Oven Plant (37)	12400	75.5	4.441	1.665	0.957
Washery (4)	18400	370	14.665	5.500	3.162
Total			114.533	42.950	24.696
<u>Phase-I & II Total</u>					
Brick plant (28)	21200	10.24	0.352	0.132	0.076
Waste Dump (29 & 41)	103100	347.9	2.461	0.923	0.531
Raw Material yard (3)	13900	1054.1	55.308	20.740	11.926
Uncrushed Limestone (40)	3600	141.6	95.614	35.855	20.617
Pellet Plant (35)	3200	16.9	3.844	1.442	0.829
Coke Oven Plant (37)	12400	201.3	11.841	4.441	2.553
Washery (4)	18400	585.6	23.210	8.704	5.005
Total			192.631	72.236	41.536

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 =
 $(0.0018 * (S/5) * (U/S) * (h/10)) / (((M/2)^2) * 5)$

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 only from Phase-I stacks & material handling in stock & solid waste yards (Refer **Annexure XXI** for input and output data)
- Stack and fugitive emissions from both Phase-I and II i.e. from the entire project due to stacks & material handling in stock & solid waste yards (Refer **Annexure XXII** for input and output data)
- Stack emissions from only captive power plant and only DG sets. (Refer **Annexure XXIII** for input and output data). The reason for doing these is that the DG sets, in whole or part, will operate when the CPP,

in whole or part, will shut down. The GLC of one will replace the other in the entire integrated steel plant.

The maximum computed concentrations in the entire study area and on the ambient air quality stations is given in **Table 4.3**.

4.4.1.4 *Simulation model for prediction of ground level concentrations due to transportation*

The anticipated traffic volume to and from the plant is expected to be in the range of 2578 trips of the trucks per day during phase-I, considering 60% trucks of 20 T capacity and 40% trucks of 25 T capacity.

For estimating the increase in the air pollutants due to transportation of raw material and finished products CALINE4 model has been used. The assumptions, input data and other details are given in **Annexure XXIV** and the results have been extracted for highest values in the study area as well as the ambient air quality stations and given in **Table 4.3**.

4.4.1.5 *Resultant GLC due to stack emissions, fugitive emissions and transportation*

The predicted ground level concentration obtained due to stack emissions, fugitive emissions and transportation 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**. It is assumed that while transportation will occur through road in phase-I, the railway siding will be developed by the beginning of phase-II, this majority of transportation will shift to rail, thus, the impact of traffic Phase-II will become negligible.

TABLE 4.3
CUMULATIVE IMPACT DUE TO INCREMENTAL GLC FROM STACKS EMISSIONS & STOCK YARDS ON AMBIENT CONCENTRATION ($\mu\text{g}/\text{m}^3$)

Pollutant	Sampling Station	Base line value	Incremental Values Phase-I		Cumulative Incremental Phase-I	Resultant GLC Phase-I	Increment total for Phase-I + II (stack & fugitive only since trucks will be replaced by rail by Ph-II) (from Annexure XXII)	Resultant GLC for Phase I+II
			Stack & fugitive emissions (from Annexure XXI)	Traffic emissions & dust on roads (from Annexure XXIV)				
		(a)	(b)	(c)	(b)+(c)	(a)+(b)+(c)	(d)	(a)+(d)
PM2.5	Highest in study area	42.7	9.85	4.70	14.55	57.25	16.38	59.08
	BA-1-Nr vill. Nimidha	37	2.18	0.00	2.18	39.18	4.04	41.04
	BA-2-Mosonia village	41.3	2.71	1.20	3.91	45.21	4.55	45.85
	BA-3-Galpada village	39.5	5.72	0.00	5.72	45.22	9.00	48.50
	BA-4-Nimabahalil vill.	39	3.45	2.20	5.65	44.65	6.15	45.15
	BA-5-Tarkabera vill.	33.5	5.48	0.00	5.48	38.98	9.86	43.36

Pollutant	Sampling Station	Base line value	Incremental Values Phase-I		Cumulative Incremental Phase-I	Resultant GLC Phase-I	Increment total for Phase-I + II (stack & fugitive only since trucks will be replaced by rail by Ph-II) (from Annexure XXII)	Resultant GLC for Phase I+II
			Stack & fugitive emissions (from Annexure XXI)	Traffic emissions & dust on roads (from Annexure XXIV)				
		(a)	(b)	(c)	(b)+(c)	(a)+(b)+(c)	(d)	(a)+(d)
PM ₁₀	BA-6-Kedala village	35.8	3.29	0.00	3.29	39.09	5.48	41.28
	BA-7-Sibapur village	42.7	2.90	0.00	2.90	45.60	5.27	47.97
	Highest in study area	71.0	17.13	16.70	33.83	104.83	28.49	99.49
	BA-1-Nr vill. Nimidha	65.7	3.79	0.00	3.79	69.49	7.02	72.72
	BA-2-Mosonia village	70.1	4.70	4.20	8.90	79.00	7.92	78.02
	BA-3-Galpada village	67.5	9.96	0.00	9.96	77.46	15.65	83.15
	BA-4-Nimabahali vill.	68.6	5.99	7.80	13.79	82.39	10.71	79.31
	BA-5-Tarkabera vill.	57.5	9.53	0.00	9.53	67.03	17.15	74.65
	BA-6-Kedala village	61.3	5.73	0.00	5.73	67.03	9.53	70.83
SO ₂	BA-7-Sibapur village	71	5.04	0.00	5.04	76.04	9.18	80.18
	Highest in study area	16.1	34.81	57.39	92.20	108.30	54.95	71.05
	BA-1-Nr vill. Nimidha	10.8	8.29	0.00	8.29	19.09	14.39	25.19
	BA-2-Mosonia village	15.8	9.77	14.68	24.45	40.25	16.78	32.58
	BA-3-Galpada village	11.4	22.59	0.00	22.59	33.99	39.78	51.18
	BA-4-Nimabahali vill.	13.9	12.58	26.69	39.27	53.17	16.78	30.68
	BA-5-Tarkabera vill.	9.6	17.69	0.00	17.69	27.29	29.86	39.46
	BA-6-Kedala village	12.3	9.34	0.00	9.34	21.64	16.04	28.34
	BA-7-Sibapur village	16.1	10.76	0.00	10.76	26.86	18.65	34.75
NO ₂	Highest in study area	21.7	14.18	29.47	43.65	65.35	23.18	44.88
	BA-1-Nr vill. Nimidha	16.3	3.26	0.00	3.26	19.56	5.89	22.19
	BA-2-Mosonia village	20.3	3.78	7.26	11.04	31.34	6.92	27.22
	BA-3-Galpada village	17.2	10.65	0.00	10.65	27.85	18.44	35.64
	BA-4-Nimabahali vill.	20.7	4.79	13.67	18.46	39.16	8.46	29.16
	BA-5-Tarkabera vill.	13.2	8.30	0.00	8.30	21.50	14.05	27.25
	BA-6-Kedala village	18.3	3.53	0.00	3.53	21.83	6.77	25.07
	BA-7-Sibapur village	21.7	4.73	0.00	4.73	26.43	8.45	30.15

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 99.49 µg/m³, 59.08 µg/m³, 71.05 µg/m³ and 44.88 µg/m³ for PM₁₀, PM_{2.5}, SO₂ and NO₂ which will be well within the permissible limits for residential and rural areas after adding to the baseline values. (Standards for PM₁₀ is 100 µg/m³, PM_{2.5} is 60 µg/m³, SO₂ 80 µg/m³ and NO₂ 80 µg/m³ as per CPCB).

4.4.1.6 Cumulative impact due industries in study area

Cumulative impact assessment for industries within 2 km has 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

As per AP-42 of US EPA, the recommended measures for various activities during construction phase are summarised in **Table 4.4**.

TABLE 4.4
RECOMMENDED MEASURES FOR CONTROL OF FUGITIVE EMISSIONS DURING CONSTRUCTION

Emission Source	Recommended Control Method(s)
Debris handling	Wind speed reduction, Wet suppression [#]
Truck transport ^{##}	Wet suppression, Paving Chemical stabilization [^]
Bulldozers	Wet suppression ^{^^}
Pan scrapers	Wet suppression of travel routes
Cut/fill material handling	Wind speed reduction, Wet suppression
Cut/fill haulage	Wet suppression, Paving, Chemical stabilization
General construction	Wind speed reduction, Wet suppression 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 99.49 $\mu\text{g}/\text{m}^3$, 59.08 $\mu\text{g}/\text{m}^3$, 71.05 $\mu\text{g}/\text{m}^3$ and 44.88 $\mu\text{g}/\text{m}^3$ for PM₁₀, PM_{2.5}, SO₂ and NO₂. 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 100 mg/Nm^3 will be released from DRI kiln and sinter plant, 30 mg/Nm^3 at BF stove, WHRB exit (based on DRI, MBF & coke oven gases) and in all other sub-units below 50 mg/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 mg/Nm^3 for rolling mills, the emissions are not expected to go beyond 250 mg/Nm^3 in view of the fuels proposed to be used.
- Gas Cleaning Plant will be incorporated in the blast furnace.
- Dust and fume extraction systems will incorporated in the electric arc furnace and the induction furnaces for control of dust and fumes
- The use of dolomite, limestone as additive in the kilns (DRI, clinker, etc) will reduce SO₂ emissions significantly.
- Controlled combustion air supply, controlled combustion temperature and use of low NO_x burners will control NO₂ 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

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 50 mg/Nm³. The clean air will be discharged into the atmosphere.
2. Few raw materials and most finished product will 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 CO₂.
- 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 100 mg/Nm³.

- Control of SO₂ 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. Sulphur from coal is absorbed by the limestone upto 90-95%. For the purpose of air quality prediction modelling, only 75% 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 50 mg/Nm³.

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 wet 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 50 mg/Nm³.

The dirty water from the gas-cleaning unit will be led into a thickener. The clean overflow water from the thickener will be cooled in cooling towers and reused in the gas-cleaning unit.

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 50 mg/Nm³ level. Over all efficiency of ESP will be around 99.50%.
- For control of SO₂, a stack of adequate height shall be provided. Lime dosing at the rated of 2 T/hr shall be done
- Low NO_x burners shall be used to minimise NO_x 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 ³
1. Raw material Handling	Bag Filter	50
2. Coke grinding	Bag Filter	50
3. Flux grinding	Bag Filter	50
4. Proportioning system	Bag filter	50
5. Travelling Grate	ESP	50
6. Finished product Handling	Bag Filter	50

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.

4.4.3.7 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 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 4.5**.

TABLE 4.5
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 & 2 stage wet venturi scrubber	85% & 95%
6.	BF Stock House	Bag Filters	99.6
7.	SMS (EAF)	FES and Bag Filters	Capture efficiency – 96
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.	Pelletisation plant	ESP, Bag filters	99.9, 95
17.	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 674.765 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 4.6**.

TABLE 4.6
BREAK UP OF PLOT AREA

Sl. No.	Description	Area (Acres)	Percent
1.	Plants, facilities & tailing pond	273.685	40.56
2.	Stock yards & railway siding	51.81	7.68
3.	Area for solid waste	55.2	8.18
4.	Green belt & plantation	222.67	33.00
5.	Administration & other buildings	1.4	0.21
6.	Water reservoir	30	4.44
7.	Roads	40	5.93
	Total	674.765	100

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 dumping of solid wastes like char, ESP dust, sludge from DRI/ blast furnace, FES dust, BF slag, fly ash, etc. and permanent 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 2.85 MTPA complex is estimated as 2950 m³/hour for both Phases. 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.

4.6.2 Waste water generation from various sources

The waste water generation from various sources is given in **Table 4.7**.

TABLE 4.7
WASTE WATER GENERATION FROM VARIOUS SOURCES FOR
ENTIRE PLANT (2.85 MTPA)

PLANT FACILITIES	Fresh/Make-Up Water (M3/Hr)	Waste Water generated	Waste water utilisation
Beneficiation	204.16	180.83	Reused in beneficiation plant
Coal Washery	68.42	60.6	Reused in washery
Sponge Iron Plant	187.85	0	Into Common Monitoring basin and thereafter utilised for • Ash quenching • fly ash brick making • Horticulture • Dust suppression
Pellet Plant	55	9.08	
Mini Blast Furnace	408.38	160.33	
Sinter plant	397.06	29.46	
Coke Oven Plant	146.67	0	
Steel Melt Shop	322.66	4.23	
Flat/Round/Wire/Rod/ Structural Mill	297.14	8.56	
Strip Mill/Sheet/Coil/ Wire & Bar Mill/Wire Rope	157.86	4.55	
Ductile Pipe Plant	74.28	0	
Producer Gas Plant	13.74	12.31	
Oxygen Plant	0	0	
Lime Plant	0	0	
Cement Plant	181.78	0	
Power Plant	385	56.7	
Drinking Water and Sanitary	50	18.75	Into decentralised septic tank -soak pit system
Grand Total	2,950.00	545.40	

The water consumption and waste water generation along with its route for reutilisation is given in **Fig 2.15** of Chapter 2.

4.6.3 Waste water sources and treatment

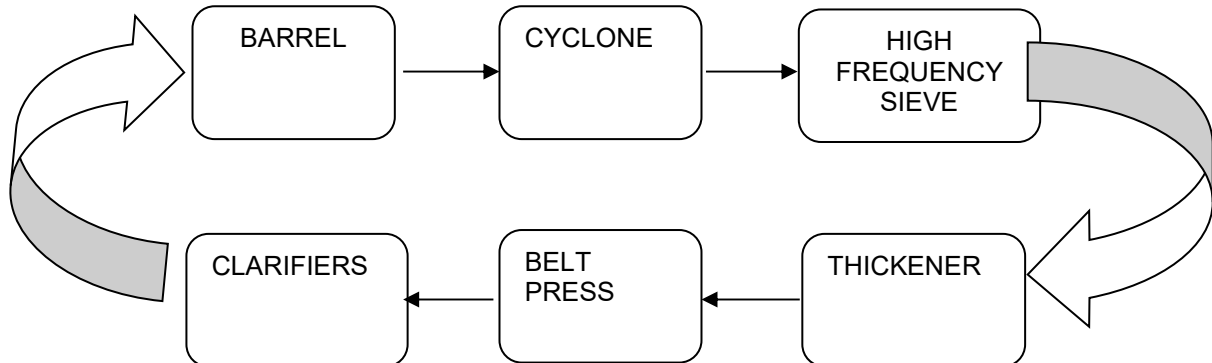
Waste water generation from the operation phases will be on account of the following activities which are described along with the treatment option:

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 buildings-** Sewage from the toilets, washrooms and canteen will be treated in decentralised septic tank - soak pit systems. The sewage and industrial effluent will not be allowed to mix.
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.

4.6.4 Summary of effluent sources and their control systems

The list of water pollution control systems envisaged are summarised in Table 4.8.

TABLE 4.8
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, 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 4.9**.

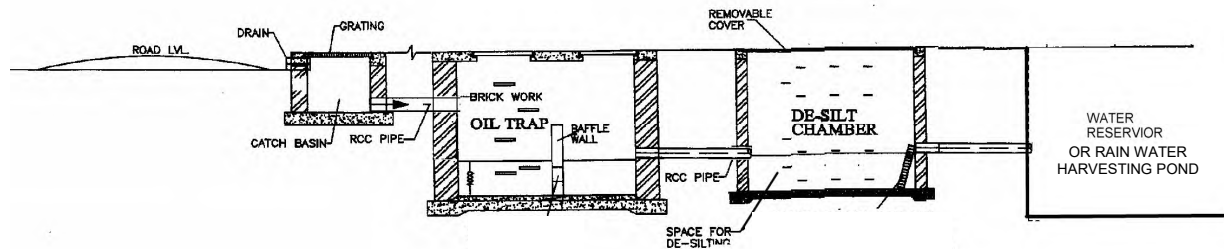
TABLE 4.9
RAIN WATER HARVESTING PROPOSAL FOR PROJECT SITE

	Area, m ²	Runoff co-efficient	Rainfall (June-Sep), mm	Run off harvested, cum/ year	Remark
(1) Plants, facilities & tailing pond, part (20%)	1352551	1	960	1168604	To rain water harvesting pond(s)
(2) Stock yards & railway siding	1280225	1	960	983213	To settling tank & then rain water harvesting pond(s)
(3) Area for solid waste	1363992	1	960	1047546	To settling tank & then common monitoring basin for reuse
(4) Green belt & plantation	5502176	0	960	1584627	To Rain water harvesting trenches
(5) Administration & other buildings	34594	1	960	29889	To Rain water harvesting pits
(6) Water reservoir	741300	1	960	711648	Directly into Raw water reservoir
(7) Roads	988400	1	960	759091	To desilting chambers and the rain water harvesting pits
Total	11263238			6284618	
Reused for plant (1)+(2)+(3)+(6)				3911011	62.23%
Recharged to ground (4)+(5)+(7)				2373607	37.77%

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 4.10**. The likely solid waste generated from entire plant facilities is given in **Table 4.11**.

TABLE 4.10
SOLID WASTE CHARACTERISTICS

Sl. No.	Source	Characteristics
DRI Plant		
1	Char	Ash 60%, C 32%, H ₂ 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%
Blast Furnace		
5	Slag	FeO 25-28%, CaO 50%, MnO 3-5%, Al ₂ O ₃ 4-6%, SiO ₂ 20-22%, MgO 5-7%
6	MBF Flue Dust	Fe 45-55%, CaO 18-20%, SiO ₂ 2-4%, Al ₂ O ₃ 3-4%, Fe ₂ O ₃ 60-70%, SiO ₂ 5-7%, Al ₂ O ₃ 1-2%, CaO 5-7%, MgO 3-4%, C 10-12%
7	GCP Sludge	Fe ₂ O ₃ 60-70%, SiO 5-7%, AlO ₃ 1-2%, CaO 5-7%, MgO 3-4%, C 10-12%
SMS		
8	IF & LRF Slag	CaO 40-60%, SiO 12-18%, MgO 4-7%, Fe ₂ O ₃ 5-7%
Power Plant		
9	Fly Ash	SiO ₂ 55-60%, Al ₂ O ₃ 25-30%, CaO 2-5%
Coal Washery		
10	Middlings	Ash : 45%, Carbon : 24%, and S : 0.5%

TABLE 4.11
LIKELY SOLID WASTE GENERATION (TPA)

Sl.	Facility	Solid Waste	Phase-I	Phase-II	Total
1	Beneficiation Plant	Tailing	1078120	1078120	2156240
2	Pellet Plant	Dust (Iron Ore, Coke, Coal Fines)	120386	120386	240772
3	Coal Washery	Middlings	1112004	647904	1759908
		Reject from washery	196236	114336	310572
4	DRI Kilns	Char	184572	100676	285248
		ESP dust	45006	24549	69554
		Bag Filter Dust, scrapper etc	18002	9819	27822
		Kiln Accretion	18002	9819	27822
5	MBF	BF Slag 74504 TPA shall be sold in Ph-I only	170100	297675	467775
		Dust (Iron Ore, Coke, Sinter Fines)	170100	49613	219713
		Sludge from GCP	28350	4961	33311
6	Sinter Plant	Sinter Return Fines	214032	367868	581900
7	Coke Oven Plant	Bag Filter Dust	19026	31710	50736
8	Induction Furnace	Slag	104050	-	104050
		BF dust	13123	-	13123
	SMS (Caster)	Mill Scale	10780	-	10780
9	Electric Arc Furnace	Slag	83160	125429	208589
		BF dust	15840	27149	42989
	SMS (Caster)	Mill scale	13860	24640	38500
10	Rolling Mill	Reject from RMS/SM/DPP	7347	7347	14694
		Mill Scale	7347	8980	16327
11	Strip Mill	Reject	4133	3673	7806
		Mill Scale	5051	4490	9541
12	Ductile Pipe Plant	Reject	1837	1837	3673
		Mill Scale	2245	2245	4490
13	Producer Gas Plant	Coal Ash	27830	27830	55661
14	Captive Power	Fly Ash from Char (52% Ash)	95978	52351	148329
	Plant	Fly Ash from Middlings (56% Ash)	622722	362826	985548
		Fly ash from Coal fines (45% Ash)	47513	23587	71101
		Fly ash from Coal (45% Ash)	9419	37352	46770
	Total		4446172	3567171	8013343

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, Bag Filter Dust, BF Slag, Char, Kiln Accretion, Slag from SMS, Middlings, Mill Scale, Reject from washery, Reject from RMs/SM/DPP, Sludge from GCP, 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. The waste for disposal shall be bare minimum i.e. only kiln accretion, reject from washery and tailings. They will be stored in such a way that they can be reutilised in future, if technology comes for their reuse.

The quantum of solid waste generation from the different units of proposed plant of 2.85 MTPA along with their reuse and disposal is given in **Table 4.12**.

TABLE 4.12
SOLID WASTE GENERATION & MANAGEMENT FOR 2.85 MTPA ISP

Sl.	Facility	Solid waste	Generated	Reused inhouse	Reused outside	Disposed inhouse	Reuse/ Disposal method
1	Beneficiation Plant	Tailing	2156240			2156240	Disposal in tailing pond within project
2	Pellet Plant	Dust (Iron Ore, Coke, Coal Fines)	240772	240772			Reused in sinter making within project
3	Coal Washery	Middlings	1759908	1759908			Reused in CFBC boiler within project
		Reject from washery	310572			310572	Disposed in solid waste disposal area within project site
4	DRI Kilns	Char	285248	285248			Reused in CFBC boiler within project
		ESP dust	69554	69554			Reused in sinter making within project
		Bag Filter Dust, scrapper etc	27822	27822			Reused in sinter making within project
		Kiln Accretion	27822			27822	Disposed in solid waste disposal area within project sit
5	MBF	BF Slag	467775	467775			* 74504 TPA shall be sold in Ph-I only * By Ph-II, 100% reutilised in making PBS cement within project
		Dust (Iron Ore, Coke, Sinter Fines)	219713	219713			Reused in sinter making within project
		Sludge from GCP	33311	33311			Reused in sinter making within project
6	Sinter Plant	Sinter Return Fines	581900	581900			Reused in sinter making within project
7	Coke Oven Plant	Bag Filter Dust	50736	50736			Reused in sinter making within project
8	Induction Furnace	Slag	104050	104050			Given for metal recovery, converted to aggregates (special balls) and used in road making
		Bag Filter dust	13123	13123			Reused in sinter making within project
	SMS (Caster)	Mill Scale	10780	10780			Reused in cement making within project
9	Electric Arc Furnace	Slag	208589	208589			Given for metal recovery, converted to aggregates (special balls) and used in road making
		Bag Filter dust	42989	42989			Reused in sinter making within project
	SMS (Caster)	Mill scale	38500	12543	25957		Reused in cement making within & outside project

Sl.	Facility	Solid waste	Generated	Reused inhouse	Reused ouside	Disposed inhouse	Reuse/ Disposal method
10	Rolling Mill	Reject from RMS/SM/DPP	14694	14694			Reused in steel making within project
		Mill Scale	16327		16327		Sold to cement other manufacturers
11	Strip Mill	Reject	7806	7806			Reused in steel making within project
		Mill Scale	9541		9541		Sold to cement other manufacturers
12	Ductile Pipe Plant	Reject	3673	3673			Reused in steel making within project
		Mill Scale	4490		4490		Sold to cement other manufacturers
13	Producer Gas Plant	Coal Ash	55661		55661		Sold to brick manufacturers outside project site
14	CPP	Fly Ash from Char, middlings, coal fines & coal	1251749	439613	812135		Utilised outside and within project as shown in Table 4.13 for brick making, road making and cement plant
	Total		8013343	4594599	924110	2494634	

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 SO₂. When water is added, H₂S 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.

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 55.2 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 guidelines is given in Table 4.13.

**TABLE 4.13
ASH UTILISATION PLAN**

<u>Fly ash Generation</u>	Phase I	Phase II	Total
From PGP	27830	27830	55661
From CPP	775632	476117	1251749
Total Generated	803462	503947	1307409
<u>Fly ash utilisation</u>			
Fly ash to own brick plant	52224	31334	83558
Fly ash to other brick plants	261120	313344	574464
Fly ash for road making projects	228517	64815	293332
Utilisation in Cement plant	261602	94453	356055
Total utilised	803463	503947	1307409

The following may be noted in context of fly ash utilisation :

- The company will establish a 2500 bricks/ hour brick plant in Ph-I. As additional 1500 bricks/ hour brick plant will be established in Ph-II
- Based on the current consumption of fly ash by other brick manufacturers in the existing ISP's of the company in Jharkhand and Odisha, it is estimated that fly ash required to manufacture nearly 12,500 bricks/ hour will be lifted in Ph-I and for 15,000 bricks/hour will be lifted in Ph-II
- About 28% of the ash is likely to utilised in road making for highway projects in Ph-I, which will reduce with time to about 13% in Ph-II
- The utilisation in proposed cement plant in the project site will be commensurate with the clinker production facilities

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

$$\text{Sound level dB(A)} = L_w - 20 \log_{10} R - 8$$

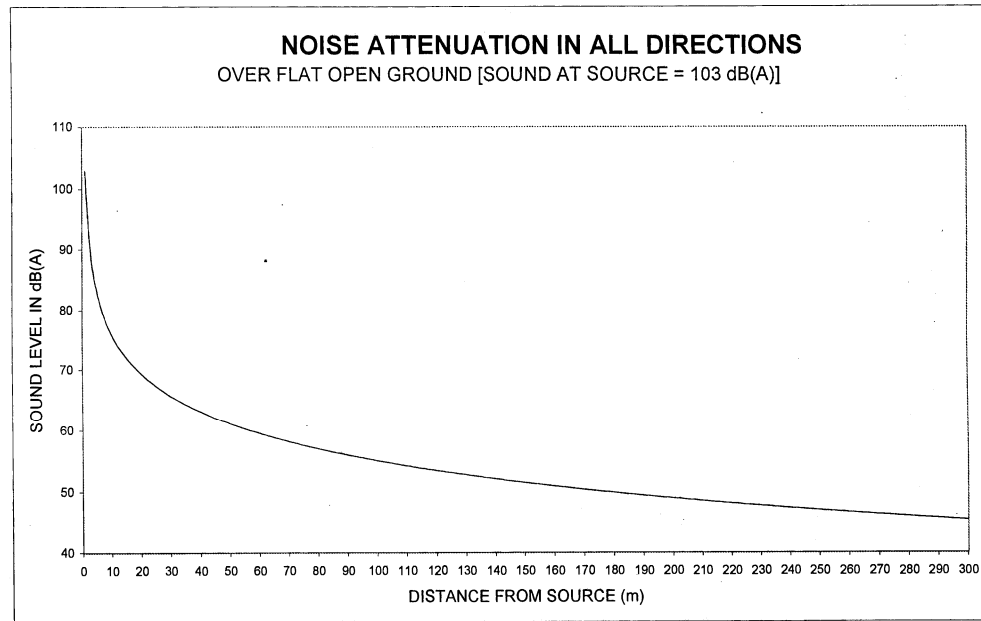
Where :

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 4.14**.

**TABLE 4.14
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. 30th 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 nearest village is Galpada at 0.5 km north.

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 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.

- 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:

Route 1 - From west i.e. Rourkela and Talcher coal field side to plant (Refer **Fig 4.4**, also refer **Annexure XXIV**, where it is “Section 1” in air quality prediction modelling)

Route 2 - From east i.e. Paradeep port or Bhubaneswar side to plant (Refer **Fig 4.4**, also refer **Annexure XXIV**, where it is “Section 3” in air quality prediction modelling)

Both section 1 and 3 come together at Nimabahali on the NH 55 and move southwards towards the plant. This section is referred to as Section 2 in air quality prediction modelling given in **Annexure XXIV**.

According to source of raw material or destination of products, the traffic has been accounted to different routes and given in **Table 4.15**. Traffic through road has been considered for the first phase only since it is expected that the railway siding will become operational by second phase.

FIG 4.4: TRANSPORTATION ROUTE

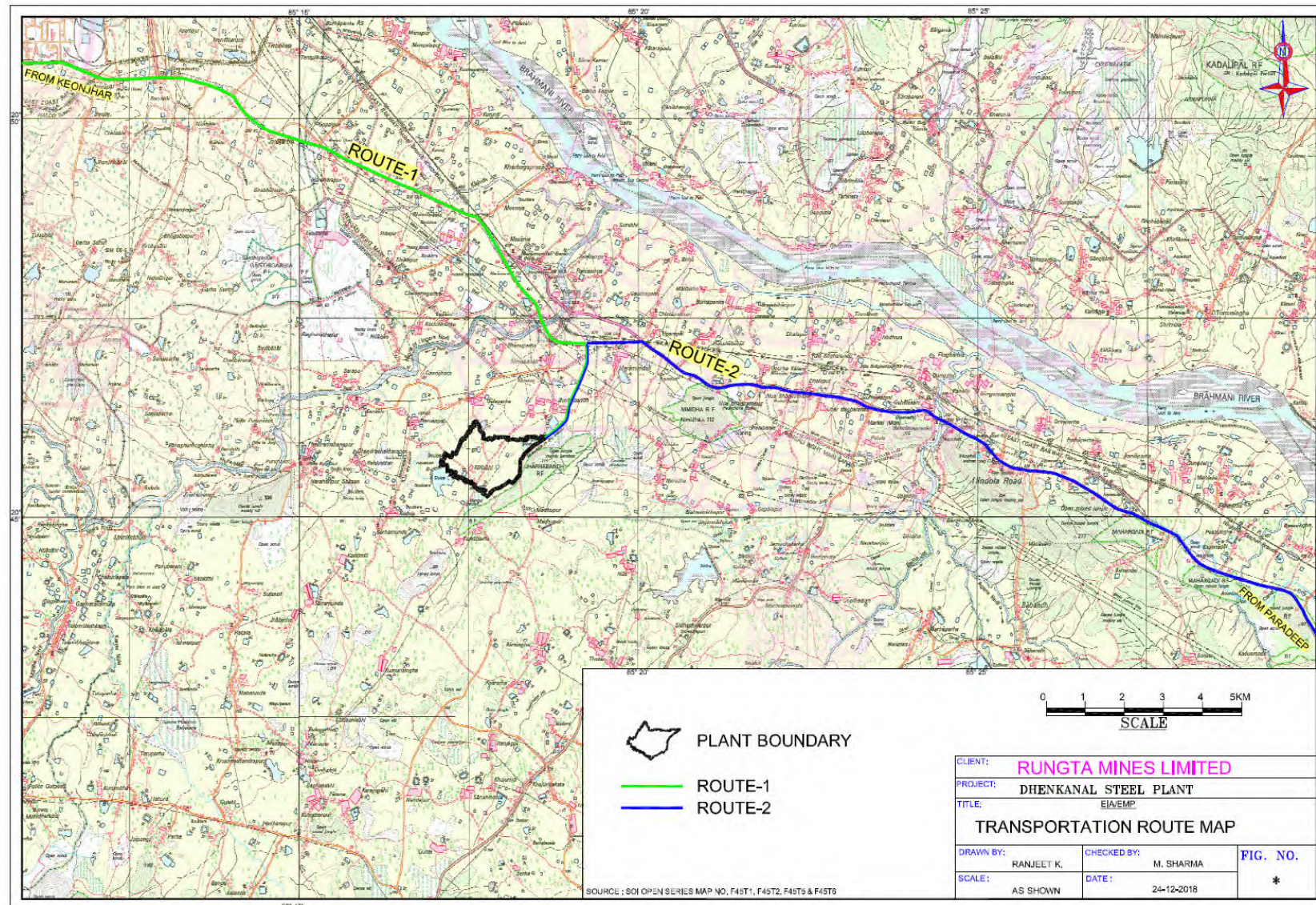


TABLE 4.15
SOURCE OF MATERIAL OR DESTINATION OF PRODUCT/ INTERMEDIATE/ WASTE AND TRUCKS REQUIRED

		Ph-I			Ph-II			Total			Source
		Required	Within plant site	From outside (purchased)	Required	Within plant site	From outside (purchased)	Required	Within plant site	From outside (purchased)	
	Raw Materials										
1	Bentonite & Clay Component	36,588	0	36,588	30,955	0	30,955	67,543	0	67,543	Raurkela, Odisha
2	Char	184,572	184,572	0	100,676	100,676	0	285,248	285,248	0	In-house
3	Clinker	482,602	482,602	0	294,841	294,841	0	777,443	777,443	0	In-house
4	Coal	3,904,017	1,092,504	3,691,391	2,404,686	639,390	2,245,230	6,204,769	1,731,894	5,936,621	South Africa, via Paradeep Port or Talcher Coalfields, Odisha
5	Coking Coal	634,200	0	634,200	1,057,000	0	1,057,000	1,691,200	0	1,691,200	South Africa, via Paradeep Port or Talcher Coalfields, Odisha
6	Coke	345,870	345,870	0	605,273	605,273	0	951,143	951,143	0	In-house
7	Coke breeze & fines	86,210	0	86,210	130,163	0	130,163	216,373	0	216,373	South Africa
8	Dolomite	219,554	0	219,554	318,028	0	318,028	537,581	0	537,581	Raurkela, Odisha
9	DRI	1,001,000	1,001,000	0	546,000	546,000	0	1,547,000	1,547,000	0	In-house
10	Flocculant	135	0	135	135	0	135	270	0	270	Raurkela, Odisha
11	Fly Ash from Middlings & Char	261,602	261,602	0	94,453	94,453	0	356,055	356,055	0	In-house
12	Gypsum	6,828	0	6,828	26,584	0	26,584	33,412	0	33,412	Andra Pradesh
13	Hot metal	567,000	567,000	0	992,250	992,250	0	1,559,250	1,559,250	0	In-house
14	Iron ores & fines (all types)	6,394,385	3,090,978	3,303,407	6,129,439	2,435,978	3,693,461	12,523,824	5,526,956	6,996,868	Own Mines/ OMC/ other private mines in Odisha
15	Iron Ore BF Grade	238,980	0	238,980	418,215	0	418,215	657,195	0	657,195	Own Mines/ OMC/ other private mines in Odisha
16	Limestone	1,006,831	0	1,006,831	927,858	0	927,858	1,934,689	0	1,934,689	Rajgangpur, Odisha
17	Liquid Metal from Furnace	1,232,000	1,232,000	0	1,232,000	1,232,000	0	2,464,000	2,464,000	0	In-house

		Ph-I			Ph-II			Total			Source
		Required	Within plant site	From outside (purchased)	Required	Within plant site	From outside (purchased)	Required	Within plant site	From outside (purchased)	
18	Middlings from Coal Washery	1,112,004	1,112,004	0	647,904	647,904	0	1,759,908	1,759,908	0	In-house
19	Mill scale (from CCM/RM/SM/DPP)	14,478	14,478	0	8,845	8,845	0	23,323	23,323	0	In-house
20	Others	4,826	0	4,826	2,948	0	2,948	7,774	0	7,774	from various suppliers from Odisha and adjoining states
21	Pig iron	54,962	0	54,962	23,260	0	23,260	78,222	0	78,222	Kamanda Steel Plant, District Sundargarh, Odisha
22	Quartz	29,484	0	29,484	51,597	0	51,597	81,081	0	81,081	Raigarh, Chhatisgarh
23	Semi finished products	1,275,510	1,207,360	68,150	1,224,490	1,207,360	17,130	2,500,000	2,414,720	85,280	Open market
24	Sinter	611,520	611,520	0	1,051,050	1,051,050	0	1,662,570	1,662,570	0	In-house
25	Steel Scrap	29,293	0	29,293	0	0	0	29,293	0	29,293	Open market, imports
26	Slag Generation from Blast Furnace	95,596	95,596	0	372,179	372,179	0	467,775	467,775	0	In-house
27	Silica component	19,304	0	19,304	11,794	0	11,794	31,098	0	31,098	Raigarh, Chhatisgarh
	Total Raw Material	19,849,351	11,299,087	9,430,143	18,702,622	10,228,199	8,954,358	38,448,039	21,527,285	18,384,501	
		Ph-I			Ph-II	Total			Ph-I	Ph-I	Total
		Manu- factured for sale	Incoming trucks being used for product evacuation	Balance left for which additional trucks required	Manu- factured for sale				Reused outside project site	Reused outside project site	Reused outside project site
1	Pellets	0		0	627,500	627,500	1	Ash	489637	378159	867796
2	Washed Coal	320,320	320,320	0	174,720	495,040	2	Mill Scale	24805	31509	56314
3	Coke	12,978	12,978	0	-10,377	2,601		Total	514442	409668	924110
4	Finished Product	800,000		800,000	800,000	1,600,000					
5	Finished Product	450,000		450,000	400,000	850,000					

		Ph-I			Ph-II			Total			Source
		Required	Within plant site	From outside (purchased)	Required	Within plant site	From outside (purchased)	Required	Within plant site	From outside (purchased)	
6	Finished Product	200,000		200,000	200,000	400,000					
7	Portland Blast Furnace Slag Cement	136,566	136,566	0	531,684	668,250					
8	Portland Pozzolana Cement	747,434	747,434	0	269,866	1,017,300					
	Total	2,667,298	1,217,298	1,450,000	2,993,393	5,660,691					

The truck movement has been assumed 50% for 20T trucks and 50% for 25T in raw material, 100% as 25 T for product and 100% as 20 T for solid waste. In addition there will be 25KL fuel tankers containing LSHS. The worst case scenario for coal has been considered i.e. Indian coal, wherein higher truck movement will take place on Section 1 of Route 1 compared to import of South African Coal. When South African coal will come, the worst case scenario for Section 3, Route 2 has been considered. The total trucks for Phase-I are calculated and given in **Annexure XXIV**. The impact on air quality of the above scenario has been modelled and given in **Annexure XXIV** and **Section 4.4.1.4** earlier. It may be further be noted that some of the truck bringing in raw material to the plant will not return empty but will pick up finished product also, as shown in **Table 4.15**.

For transportation of the above volume, the maximum increase in traffic is 2578 trucks/day (1289 trips) or 107 trucks/hour. The equivalent passenger car units (PCU's) (1 truck=3 PCU's) are 7,734/ day or 321/hour. The total number of HMT is 6990 per day during monitoring. The Integrated steel plant, therefore, increases the traffic density of HMT by 36.9%, 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 (7.5 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 22% of the design service volume. This is further calculated as 11% of the maximum carrying capacity. The existing traffic volume on the road at its current width is 84% of the maximum carrying capacity. After widening, the existing traffic volume will be 36% of the maximum carrying capacity. Thus, resultant will become 47% of the maximum carrying capacity on commencement of phase-I at 1.45 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-III 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 Nimabahali, 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 674.765 acres. To undertake the construction, 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. 222.67 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, Ganthagaria 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 SO₂ in the study area is envisaged. Concentrations of NO₂ 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: 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 SO₂ stipulates 0.2 ppm (524 µg/m³) level when visible injury to sensitive vegetation in humid regions after 3 hours exposure is observed. In another case, 0.5 ppm SO₂ level (1310 µg/m³) for 1 hour exposure results in visible injury to sensitive vegetation in humid regions. At higher SO₂ concentration of 10 ppm (26214 µg/m³), 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 NO₂ stipulates 2 ppm (3760 µg/m³) level when foliar injury to vegetation at 4 hours exposure is observed. At a lower NO₂ concentration of 0.25 ppm (470 µg/m³) 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, but the development of proposed green belt and plantation will provide food and habitat for fauna. Under the proposed green belt and plantation programme, 222.67 acres (33%) of land within premises (about 33.0 % area) shall be provided with green cover in the form of green belt and plantation.

Operation phase: 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 eco environment, 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 lebbek*), Neem (*Azadirachta indica*), Mango (*Mangifera indica*) and Peepal (*Ficus religiosa*) etc.

4.10.3 Wildlife conservation plan

A "Site Specific Conservation Plan" has been prepared with respect to Jharbandh Steel Plant by SSP Consultancy Services (Sri Kailash Chandra Patti, Dy.C.F Retd. and Sri Harisankar Mohanty, Dy.C.F. Retd) 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 have 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 requirement will be 2600 persons (1300 in each Phase) for various activities like loading, unloading, handling, transportation, general cleaning, horticulture and other miscellaneous works inside the Plant. Three shifts working for 350 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.

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 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. 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. Compensation for fixed assets in land will be paid as per market rates.

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:

Injury Causes:	Prevention:
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
Injury Types	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 officer. Qualified MBBS doctor with assistant shall be hired to run the centre.

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 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 Officer. Job related safety precautionary measures, good safety practices, case studies etc. will be discussed.
- **Site Safety Inspection** – Safety Officer (SO) will be appointed by Rungta Mines Limited & Contracting agencies 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 Officer, 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 SOs 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 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 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 will be administered at site first day of every month where the entire worker gather and safety messages will also delivered them by SOs.
- **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 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.

CHAPTER 5

ANALYSIS OF ALTERNATIVES

5.1 SITE ALTERNATIVES

The proposed Steel Plant shall be located in Jharbandh, Galpada and Tarkabeda 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, the Company plans to establish a higher capacity plant of 2.85 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 land required for the project is already in possession of the company
- Water requirement from Brahmani river is located nearby (7.35 kms)
- 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.
- 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.

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**

	Wet grinding	Dry grinding
Advantages	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
Dis-advantages	“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:-

- 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 Inexpensive Common type - world wide usage	Good separation second most common method	-
Disadvantages	Lower separation than dense-medium	Small capacities	Water 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

Methods	Concentration	Froth flotation	Dry cleaning
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 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.

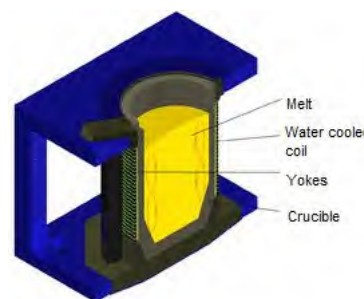
Considering the need of the project, **non recovery type** of coke oven with wet quenching is proposed to be set up. The proposed plant will have a non-recovery type coke oven with following advantages:

- 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 explosion during operation to prevent pollution.

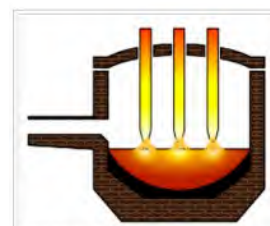
5.2.5 Steel melting

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.

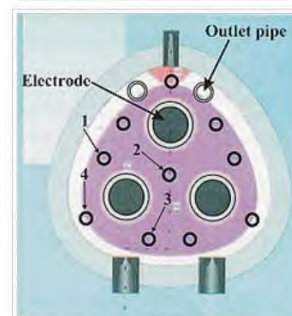


Electric arc furnaces : An electric arc furnace (EAF) is a furnace that heats charged material by means of an electric arc. Industrial electric arc furnace temperatures can be up to 1,800°C. Arc furnaces differ from induction furnaces in that the charge material is directly exposed to an electric arc, 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 existing 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 (SO_2 and NO_x) control and energy conservation.

Fluidized bed combustion (FBC) reduces emissions of SO_2 and 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 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 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 NO_x is formed. In fact, fluidized bed NO_x emissions are about 70 to 80 percent lower than those for conventional pulverized coal boilers. Thus, fluidized bed combustors substantially reduce both SO_2 & 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**.

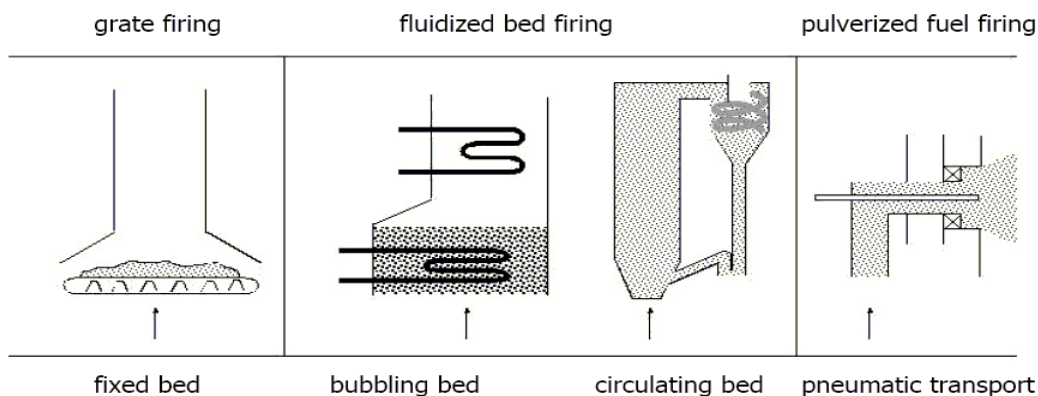


FIG 5.1: COMBUSTION SYSTEMS FOR SOLID FUELS

(source: http://en.wikipedia.org/wiki/Fluidized_bed_combustion)

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 CO₂ released without pre-combustion capture.

Chosen technology: Both AFBC and CFBC have been considered at pre-feasibility stage to generate 250 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 CO₂. 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/m³. 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

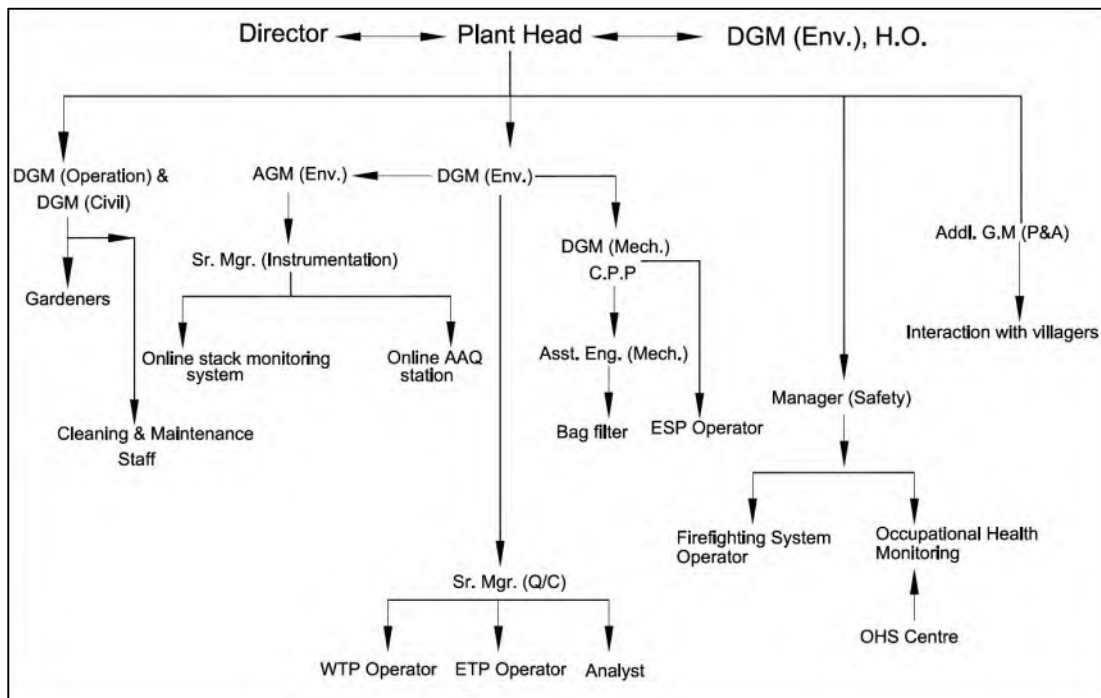
Success of any environmental management programme depends upon the efficiency of the organisational set up responsible for implementation of the programme. Regular monitoring of various environmental parameters is also necessary to evaluate the effectiveness of the management programme so that necessary 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/ registered 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 proper 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: Parameters: PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ , 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: PM, SO ₂ , NO _x	At all major stacks.	Online continuous monitoring system shall be in place as per SPCB directions. In absence of online system, once a month manual monitoring.
3.	Water Quality/effluents Water quality of surface and ground as per IS : 10500-2012 except radioactivity	Ground water- One within plant, one on down gradient and one on up gradient of plant in addition to 5 more samples in 10 km radius Surface water- upstream & downstream at Bramhani River and atleast 6 other nala/ river flowing through nearby villages. ETP- inlet and outlet	Once in every season. ETP- daily/ online
4.	Ambient noise level	One near plant and at four locations around the plant	Prior to every compliance submission
5.	Inventory of flora (Tree plantation, survival etc.)	Green belt	Once in a year within the green belt

Sl. No.	Description of parameters	Location	Schedule and duration of monitoring
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 within 10 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)
PM2.5 sampler	4	1.00	4.00
Respirable dust sampler	4	0.65	2.60
Micro-meteorological station (Auto)	1	1.50	1.50
Laboratory for testing	LS	10.00	10.00
Online stack sampler	13	15.00	195.00
AAQM	4	15.00	60.00
Noise meter	2	0.50	1.00
Total			274.10

TABLE 6.3
RECURRING COST FOR ENVIRONMENTAL MONITORING

Particulars	Recurring cost (Rs. Lakhs)
Testing/Chemicals etc.	2.50
Annual Depreciation	54.15
Power consumption	2.67
Repair & Maintenance including oils, lubricants	11.10
Manpower	8.28
Total	81.7

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. 4.5/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 is envisaged as Rs 2.741 Crores and recurring expenditure during the Steel production is envisaged as Rs. 81.7 lakhs/year.

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 XXVI**).

The Corporate Environment Policy (copy enclosed as **Annexure XXVI**) 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 makes 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 14001, if the company decides to 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 established 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

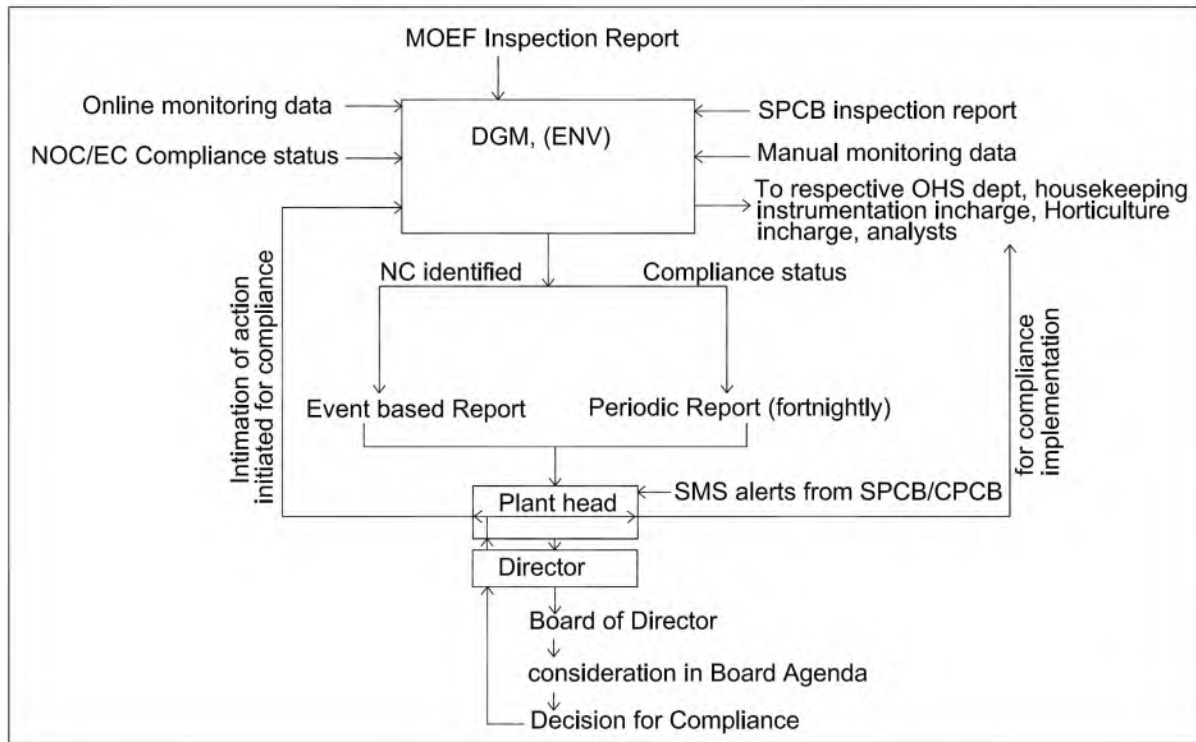
Half yearly Progress Report to the conditions imposed by Ministry of Environment, Forest & Climate Change, Govt. of India, in respect of Environmental Clearance of Steel Plant (1.90 MTPA) dated 02.08.2010 is being uploaded at Company's website regularly. After the receipt of

environmental clearance for the present proposal of 2.85 MTPA steel plant on the same land, the compliances for the same shall be uploaded on the company website. 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	➤ Perusal of data from online monitoring systems attached to stacks ➤ Continuous ambient air quality stations ➤ SMS alerts from SPCB/ CPCB ➤ NOC/ EC conditions compliance status ➤ Periodic manual monitoring data ➤ Inspection report of MOEF&CC ➤ Inspection report of SPCB ➤ Complaints from local people, NGO or any other ➤ Environmental statement (Form V)
Heirarchy of reporting upwards	DGM (Environment) at project --> Plant head --> Director --> Board of Directors
Type of reporting	(1) Periodic written report, every fortnight is submitted even when all conditions are complied (2) Event based written reporting whenever any of the inputs reveals non compliance
Frequency of consideration by Board	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. The Environmental Statement (Form V) is to be considered annually and recorded in the Annual report.
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 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. 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

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) shall be required at proposed 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 auxiliary fuel based on IS 11489 -1985 (Reaffirmed in 2001) has been given in **Table 7.1**.

TABLE 7.1
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
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 personnel 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 Plan follows logically from the analysis that took place to provide the basis for the On Site 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 has been described below. The responsibility for the off site plan will be likely to rest either with the works management or with the local authority.

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.

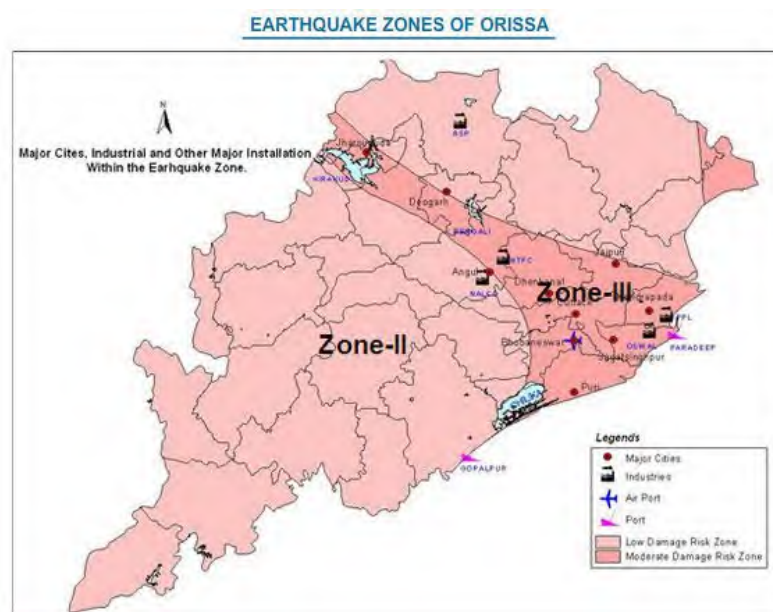
7.2.1 Natural disasters

7.2.1.1 Seismic & Earthquake risk management

According to GSHAP data, the state of Odisha falls in a region of low to moderate seismic hazard. As per the 2002 Bureau of Indian Standards (BIS) map, the plant area falls in Seismic Zone II. Historically Odisha has experienced very few moderate to large earthquakes. Some events with magnitudes in excess of 5.0 have originated in the Bay of Bengal off the coast of the state.

The earthquake hazard map from National Disaster Management Agency is given in **Fig 7.1**.

FIG 7.1: EARTHQUAKE HAZARD MAP



(Source: <http://www.ndma.gov.in/images/odisha-3.jpg> accessed 28.12.2018)

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 28.12.2018):

Date	Description
08 April 1982	Bay of Bengal, Mw 5.2 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 20.390 N, 84.420 E, OT=12:56:09 UTC
01 July 1985	Bay of Bengal, Mw 5.4 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 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 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 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 28.12.2018) 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, 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. will be formed in the area and preparedness drills 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.

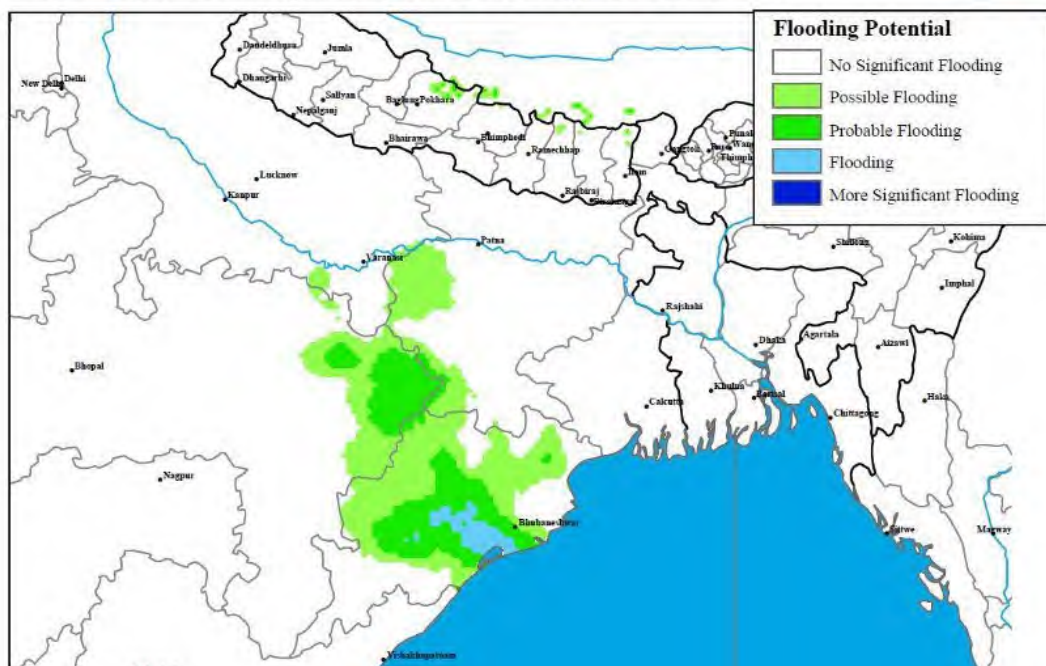
7.2.1.2 Flood Hazard

A perusal of the flood potential 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 POTENTIAL MAP

India: Flood Potential Map for 20131012

Source: Satellite Derived Precipitation and NOAA GFS Precipitation forecast



Source : <http://floodlist.com/wp-content/uploads/2013/10/Phailin-India-flood-map-121.jpg>
accessed 29.12.2018

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
- Electrocution
- 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 7.2**.

TABLE 7.2
HAZARD IDENTIFICATION OF THE PROPOSED STEEL PLANT

Group	Item	Nature of Hazard	Hazard Potential	Remarks
Raw materials handling	Coal for coking	Fire	Moderate	Fire hazard
	Water treatment Chemicals like acids/alkalis	Toxic	Major	Bio-corrosive
	Lube oils/greases	Fire	Moderate	Flammable
Production units				
- 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
Utilities				
- 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 7.2** 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 PREVENTION MEASURES

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.
- 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 shall be manned by experienced engineers and other supporting staff who shall bring safety consciousness amongst the work force of plant.

The safety department will conduct regular safety awareness courses by organizing seminars and training of personnel among the various working levels.

7.5 CONTINGENCY PLAN FOR MANAGEMENT OF EMERGENCY

To tackle the situation, a disaster control room will be set up having 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 its 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

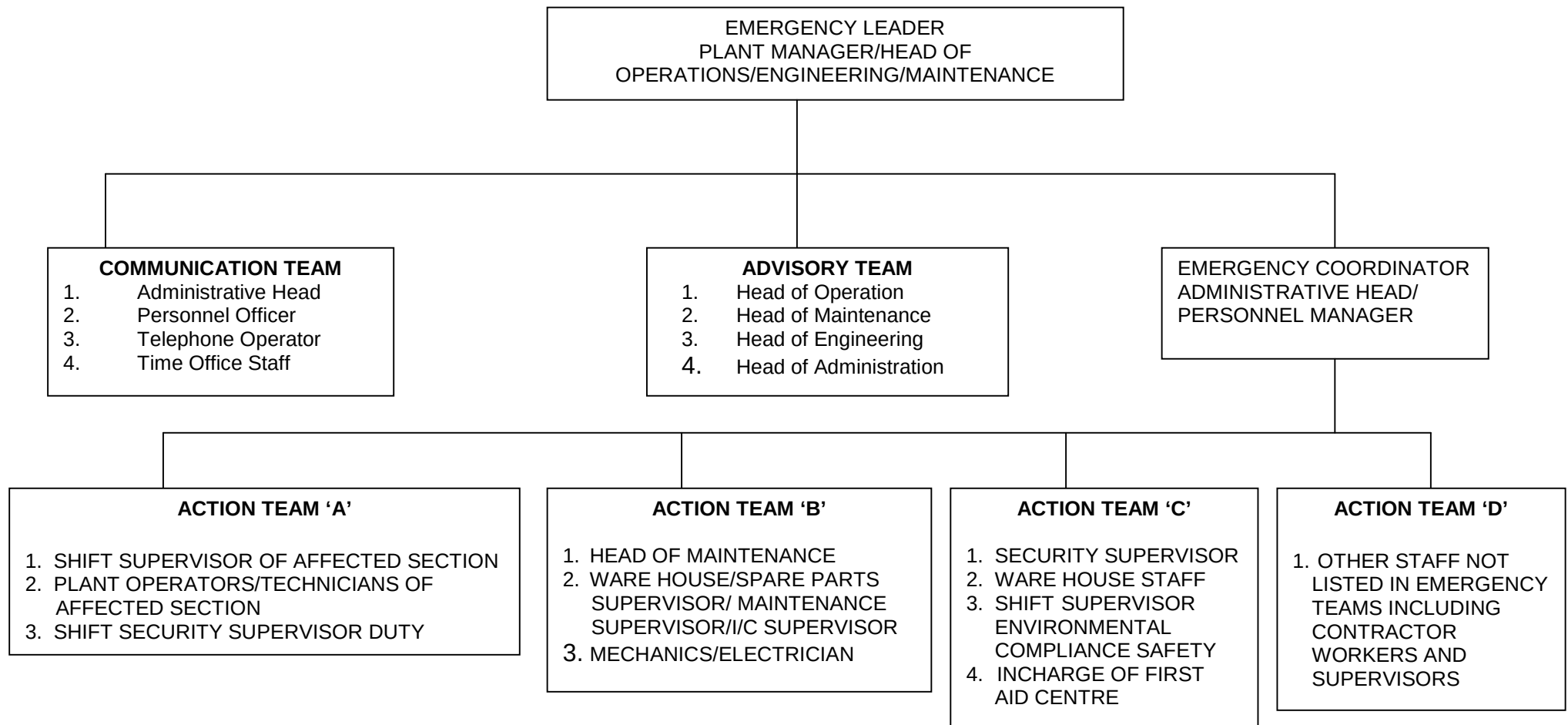
In the event of massive spillage of fuel oil or occurrence of fire, population inside and outside plant boundaries, vegetation and animal etc. may be affected. In such circumstances secondary fire may also take place. In such an event help shall be taken from outside agencies also.

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 equipments 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 have been proposed at strategic locations in the plant and given in **Table 7.3**.

TABLE 7.3
DIFFERENT FIRE EXTINGUISHERS AT DIFFERENT SITES

Name of Site	Type of Fire Extinguishers
Generator area	CO ₂ & Foam Type, Dry Chemical Powder
Cable galleries	CO ₂ & Foam type, Dry chemical powder
High voltage panel	CO ₂ & Foam type, Dry chemical powder
Control rooms	CO ₂ & Foam type, Dry chemical powder
MCC rooms	CO ₂ & Foam type, Dry chemical powder
Pump Houses	CO ₂ & Foam type, Dry chemical powder
Fuel storage	CO ₂ & Foam type, Dry chemical powder sand basket
Guest houses and offices	Dry chemical powder, foam type
Godowns, store	CO ₂ & 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 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 have been planned for the proposed plant. 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 7.4**.

TABLE 7.4
PERSONAL PROTECTIVE EQUIPMENTS

Sl. No.	Unit	Hazard	Injury	Use of PPE
1.	Material handling and storage	Dust pollution Hands going between running parts of conveyors Machine's sound	Eye Injury, Dust inhalation Physical injury Hearing system damage	a) Safety Goggles Eye wash taps b) Safety boot, Hand leather gloves c) Ear muffles Fire fighting equipments
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 b) Safety boot, Hand leather gloves, leather aprons c) Ear muffles Fire fighting equipments

7.7 SOCIAL IMPACT ASSESSMENT MATRIX

Parameter	Present Status	Future impact	Action plan for impact mitigation/ target fulfillment
I. Lifestyle			
Loss of land and homestead	540.705 acres private land has been acquired through IDCO after paying requisite compensation. Also 54 families have been compensated and resettled from the project area, also through IDCO. A monthly livelihood allowance is also paid by the company to the resettled families. Currently 90% of the land is with the company and remaining 10% land is government land, which is under process at Tehsildar level	Land losers and homestead losers will be entitled to job. The company has already started giving employment to some of them since construction under EC dated 02.08.2010 began in 2017.	Preference will be given, for employment and contracts
Employment in plant and related activities	There are limited economic opportunities available to the people since they are mostly into agriculture (rain fed) and animal husbandry.	Proposed plant will generate employment for 2600 people. Other economic opportunities are also expected to rise due to the plant.	To Increase employability of local villagers, their capacity building through ITI training at Karanda at company cost shall be undertaken
Additional employment opportunities outside plant	There are no opportunities in transportation or construction activities or any colony, at present.	Opportunities in transportation, contractual jobs and construction activities will arise. When a colony shall be built to accommodate the non-natives. The villagers will help in providing various services such as cleaning, washing, cooking, driving, security, etc. and also generate additional income for	Seamless amalgamation of the culture of the natives and non natives to be ensured by sensitising the outsiders to local culture.

Parameter	Present Status	Future impact	Action plan for impact mitigation/ target fulfillment
		themselves.	
II. Cultural impacts			
Religious beliefs	There are various religious temples which have been repaired/ renovated and several more which need renovation or maintenance	Galpada temple requires boundary wall, which will be constructed by the Company. If any additional requirement arises from local people, the same shall be addressed.	Financial support is to be provided by the company for construction of boundary wall
Customs & heritage	Company constructed socio- cultural mandap at Jharbandh village	Company shall continue to have a positive impact with their contributions by giving donations for religious and national festivals and contributes to the marriage of girl child by giving utensils, clothes, food etc.	Fulfill the targets of CSR plan as outlined in Chapter 8, and as per budget allotted annually according to The Companies Act
III. Community impacts			
Change in land use	The land under the steel plant has been converted to industrial use. There are no major visible major changes in land use in surrounding areas.	67.790 acres government land is under acquisition which will be changed to industrial use	Company will be remain aware of its surroundings regarding any land use changes
Infrastructure	- Places of worship have been renovated - Assistance for books, uniforms, furniture, etc had been given in the schools	Company shall continue to have a positive impact with their contributions etc.	The physical infrastructure is proposed as a part of CER (Corporate Environmental Responsibility) as given in Section 8.5, Chapter 8.
Services	The management has installed deep	The company intends to improve	The installation of these

Parameter	Present Status	Future impact	Action plan for impact mitigation/ target fulfillment
	bore-wells in all the villages – Jharbandh, Tarkabeda, Galapada. Company also supplies drinking water through water tankers in acute summer, during May and June. Drinking water supply through pipe lines and overhead tanks has also been provided in village Jharbandh.	infrastructure such as roads, sanitation, drinking water, solar lights etc in the the villages in 2 km radius	infrastructure is proposed as a part of CER (Corporate Environmental Responsibility) as given in Section 8.5, Chapter 8 and the cost of its operation and maintenance shall be covered under CSR (Section 8.4, Chapter 8).
NGOs/ SHGs, activity networks and cohesion	The activities are continued in the village but company has not participated in value addition of such activities till now.	This aspect will be looked and requisite support provided to the women for increasing output, creating multiple forward sales linkages and give training for additional products	Fulfill the targets of “Sustainable Livelihood Options” under CSR plan as outlined in Section 8.3.2, Chapter 8.
Education and training	Local people were given financial and social support in education and training in sustainable livelihood opportunities to increase their source of income 102 educated unemployed youths from among the affected families have already been trained in local Industrial Training Centres (ITC) for up-gradation of their skills and employability. Some of them have successfully passed in All Odisha Trade Test (AITT). 30 other candidates presently are under training in two batches in the local Industrial Training Centres (ITC) who	The management is also establishing its own ITC in the locality for providing training on skill development and employability.	Fulfill the targets of “Sustainable Livelihood Options” under CSR plan as outlined in Section 8.3.2, Chapter 8.

Parameter	Present Status	Future impact	Action plan for impact mitigation/ target fulfillment
	would pass out shortly in two years.		
IV. Quality of life			
Security	There has been no change in the availability of government security mechanism. Nearest police station is at Balmi, at 20km from project site	The security system shall come up and be maintained for the plant and shall remain available to the villagers, on demand for special occasions	-
Livability	The livability index is equivalent to that existing in rural areas	The livability will increase marginally due to availability of more money to the villagers. Considering various parameters such as (i) housing, (ii) Neighbourhood, (iii) Transportation, (iv) Environment, (v) Health, (vi) Engagement and (vii) Opportunity, the major improvement can be there in the case of Opportunity	There will be an improvement in opportunities for job and in the income level of the local people.
Aspirations for the future	There are limited sources of income and people are expecting employment only.	People may now aspire to have their children well educated, have higher education, have vocational training, good health facilities, good services such as drinking water, piped supply and infrastructure such as pucca roads and eventually get employment in the plant	Company will continue to provide financial support under CSR and CER for these activities (described in Chapter 8)
V. Health impacts			
Physical well being	There are only government schemes for health and medical facilities	Medical and health check up camps will be organized in nearby villages Jharband, Galpada and Tarkabeda	The capital cost shall be met as a part of CER (Corporate Environmental Responsibility) as

Parameter	Present Status	Future impact	Action plan for impact mitigation/ target fulfillment
		periodically. Ambulance on call will become available for people to be shifted to Primary Health Centre in Angul. It is proposed to provide mosquito nets to people and awareness shall be given regarding cleanliness so that diseases such as malaria, typhoid etc do not spread	given in Section 8.5, Chapter 8 and the cost of its operation and maintenance shall be covered under CSR (Section 8.4, Chapter 8).
Social well being	There were traditional social activities in which people intermingled and shared their joys and sorrows	Company will support financially as well as participate in various festivals, cultural events etc. organized in villages of surrounding areas. Company will add to the various social events that occur in the area by celebrating occasions like World Environment Day by distributing saplings to villagers, sports competitions, competitions for school children, Safety week, awareness campaigns, etc.	Company provides financial support under CSR for these activities (described in Chapter 8)

7.8 SUMMARY OF THE PROCEEDING OF PUBLIC CONSULTATION

The public hearing will be held on the basis of the prepared 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 both phases, 2600 persons are likely to be under direct employment of the company. 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) being done and to be done by the company. CSR is elaborated in subsequent section.

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 these localities under various thematic areas and specific outcomes as given in **Table 8.1** and expenditure incurred by the company on CSR from 2009-18 is given in **Table 8.2**.

TABLE 8.1
CSR ACTIVITIES PLANNING

Sl.	Thematic Area	Targeted Outcome
1.	Education and communication	- Enhanced literacy rate - Enhanced enrollment ratio in primary education - Enhanced proportion of students starting grade 1 who reach last grade of primary

Sl.	Thematic Area	Targeted Outcome
		- Locally available skilled and trained workforce - Increased teacher student ratio
2.	Health care	- Reduction in occurrences of diseases - 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 - Reduced migration - Increased green vegetation - Increased local agriculture product - Food security ensured
5.	Infrastructure development	- Better communication round the year - Quality education ensured - Better community hygiene and sanitation
6.	Promotion of local culture & sports	- Increased participation of locals in sports at district and state level - Increased constructive participation of people in company activity and govt. programmes

TABLE 8.2
EXPENDITURE ON CSR INITIATIVES UNDERTAKEN FOR
DHENKANAL STEEL PLANT (ALL FIGURES IN INR)

Sl. No.	Financial Year	Health Services	Education & Communication	Infrastructure Development	Sustainable Livelihood	Culture & Sports	Total	
1	2009-2010	3,09,379	3,48,669	13,38,610	624,700	4,67,298	30,88,656	
2	2010-2011	16,59,266	47,22,483	18,23,930	18,22,994	34,19,228	1,34,47,901	
3	2011-2012	4,26,748	30,46,861	12,07,992	16,93,468	12,98,234	76,73,303	
4	2012-2013	1,31,208	20,43,672	9,16,217	19,74,623	10,26,253	60,91,973	
5	2013-2014	33,953	5,83,134	3,49,355	24,65,958	2,55,941	36,88,341	
	Sub-Total (2009-14)	25,60,554	1,07,44,819	56,36,104	85,81,743	64,66,954	3,39,90,174	
Sl. No.	Financial Year	Drinking Water / Health / Eradicating Poverty	Education, Vocational Training, Livelihood Projects	Environment / Ecology /NRM	Culture & Tradition/ Heritage	Contribution to PMNRF & Welfare of SC,ST,OBC etc.	Rural Development Projects	Total
1	2014-2015	5,958,159	2,674,725	1,588,825	1,311,015	0.00	2,698,780	14,231,504
2	2015-2016	1,194,785	4,336,026	1,130,227	1,629,241	0.00	1,634,437	9,924,716
3	2016-2017	897,577	2,286,963	453,096	639,331	10,000	1,879,406	6,166,373
4	2017-2018	1,367,906	1,233,724	1,248,007	294,520	214,033	1,054,530	5,412,720
	Sub-Total (2014-18)	9,418,427	10,531,438	4,420,155	3,874,107	224,033	7,267,153	35,735,313

Photographs of some activities under CSR are shown below:

	
Aganwari centre in village Jharbandh	Aganwari centre in village Galpada
	
RO Plant at village Jharbandh	RO Plant at village Tarkabeda
	
Construction of RCC Road from village Jharbandh to Nimabahal	Aganwari at Village Jharbandh

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 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

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. 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 constituted 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. 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 8.3**.

As per the MOEF&CCs office memorandum dated 01.05.2018, an amount equivalent to 0.5% of the capital cost will be spent on Corporate Environment Responsibility (CER) over ten years of project or as 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. The maximum capital expenditure on CER will be commensurate with the investment and has been calculated as a maximum of Rs. 39.18 crores in 10 years.

TABLE 8.3
PRESENT PHYSICAL & SOCIAL INFRASTRUCTURE NEED ASSESSMENT AND PROPOSED INTERVENTIONS

Sector	Present status	Identified Deficiencies	Proposed intervention
1. Roads	➤ The approach road to only three villages is black topped (pucca) road. These are Gandhijhara, Nimabahal and Galpada ➤ Chandrashekharapur, Beruanpal, Jharbandh, Madhupur, Tarkabera and Kadela have other kinds of roads such as all weather road, WBM or gravel roads. ➤ Apart from the above, internal street roads needs maintenance.	➤ People of Chandrashekharapur, Beruanpal, Jharbandh, Madhupur, Tarkabera and Kadela villages are facing problem due to absence of black topped road ➤ Air borne dust is high due to condition of roads	➤ Construction of approach roads in Chandrashekharapur, Beruanpal, Jharbandh, Madhupur, Tarkabera and Kadela villages ➤ Also maintenance of roads, where required in phased manner in collaboration with local Panchayat and Govt. schemes. ➤ Solar based street lights
2. Drainage	➤ Drainage system is available but not everywhere. ➤ Where drainage is present, they are open drains. ➤ Due to open drainages odour problem is prevalent	➤ Water logging in monsoon, breeding of mosquitoes, odour problem and water borne diseases are prevalent. ➤ Where absent, drainage system is required.	➤ Construction of drainage system in villages in phased manner ➤ Covering of open drains in collaboration with local Panchayat heads and Govt. schemes.
3. Sanitation & solid waste management	➤ Toilets are available in majority of the village homes and where not present, construction under Swachh Bharat Mission shall be initiated. ➤ Dustbins are not there at public places.	➤ Open urination and defecation in public places causes spread of diseases. Completion of toilets in houses is required on priority ➤ 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 these animals. ➤ Attention towards cleanliness and solid waste management would be required in near by villages.	Swachh Bharat Mission has initiated construction of toilets, hence, Rungta Mines Ltd. will focus on improvement of overall hygiene & cleanliness by: ➤ Awareness camps about solid waste segregation and household composting ➤ Purchase of dustbins for garbage collection for solid waste disposal. ➤ Purchase of anti mosquito fumigation machine. ➤ Intensive awareness drive among residents to prevent water logging and mosquito breeding ➤ Provide support for cleaning staff to clean village roads and common areas periodically.

Sector	Present status	Identified Deficiencies	Proposed intervention
		➤ Dustbins shall be put at various public places	
4. Drinking Water	➤ Villages withdraw water from hand pumps and open dug wells for drinking & cooking. Ghats are there on few ponds only. ➤ Pipeline water supply systems are not available in the villages except Jharbandh, where it has been constructed by the company. ➤ Adequate safe drinking water source are not available in villages.	➤ Lack of ghats on all water bodies makes access unsafe to them. ➤ Improvement in existing water supply system is required. ➤ 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.	➤ Construction and maintenance of ghats in commonly used ponds. ➤ Construction of Water storage tanks. ➤ Purchase of water tankers. ➤ Water supply through mobile water tankers during festivals and dry season to local villages. ➤ Construction of pond for Rain Water Harvesting. ➤ Deepening and cleaning of existing ponds ➤ Water supply through pipeline
5. Market access and local livelihood means	➤ Weekly haat/ markets are there at Galpada. ➤ Limited local livelihood means are there due to less industries in the 2 km radius area. ➤ Local people are involved in agricultural activities. Dairy, poultry farming, fishing etc. are being followed for income supplementing.	➤ Other vocations, which are not dependent on industries also need to be taught to local people. ➤ Youth need training in ITIs in different vocations to prepare themselves for recruitment in the upcoming projects. ➤ Women empowerment by making them financially self reliant is necessary	➤ 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)] ➤ The Company is also establishing its own Industrial Training Centre in the locality for providing training on skill development and employment. ➤ Training to people for improvement of agriculture
6. Education	➤ Primary schools are available in all villages except Chandrashekharpur. ➤ Middle schools are not available in villages Chandrashekharpur, Gandhijhara and Madhupur. ➤ Secondary school is available in only 4 villages i.e. Beruanpal, Galpada, Tarkabeda, Kadala	➤ Construction of primary and middle schools ➤ General measures for encouraging students to excel in studies	➤ Maintenance & expansion of existing of schools as per requirement ➤ Construction of schools in consultation with statutory regulatory bodies/ government scheme. ➤ Scholarship to meritorious students as

Sector	Present status	Identified Deficiencies	Proposed intervention
	➤ 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.		- educational assistance ➤ Financial support to needy students ➤ Adult education centre ➤ Mid day meals ➤ Distribution of Bags, Study Material (Slate, Globe, Maps Charts, Exercise Book, Duster, Chalk etc.) as per demand from school.
7. Health Care	➤ Lack of adequate health facilities such as medicine, testing, diagnostic and ambulance facilities in the area. ➤ Primary Health subcentre is available only at Galpada village at a distance of 0.5 km from project site, as per Census 2011. ➤ Under nourishment/ malnourishment in children ➤ Lack of veterinary facilities	➤ Diabetes, hypertension, fever, and dysentery/ diarrhoea are the common diseases prevalent in the area. ➤ General steps required to make medical access easier for local people ➤ Absence of veterinary centre	➤ Purchase of ambulance. ➤ Post the contact number for the ambulance at Panchayat house/ community centre in the villages ➤ Construction of about 10 bedded hospital with facilities in Jharband village. ➤ Provide free consultation and medicines to project affected villagers at proposed hospital of the company. ➤ Conducting mobile health/ awareness camp for protection against prevalent common diseases/ family planning camp (Doctor, para-medical staff and free supply of medicines) ➤ Financial help to critical medical cases ➤ Provision of veterinary doctor and centre.
8. Sports and entertainment	➤ Most of the villages have small or big grounds designated for sports. ➤ Perusal of amenities as reported in Census 2011 shows that Beruanpal, Galpada, Nimabahali, Jharbandh, Tarkabeda and Kadela have sports fields.	➤ Maintenance of existing facilities and motivation to the sports player is required.	➤ Construction of community centre ➤ Sponsorship to Rural Sports events ➤ Sponsorship to local talent to participate at state & national levels ➤ Provide equipment to village level teams in different sports such as crickets, football and badminton etc.

CHAPTER 9

ENVIRONMENTAL COST BENEFIT ANALYSIS

The scope of the EIA/EMP has been prescribed vide the Terms of References (TOR) issued by MoEF&CC, New Delhi vide letter no. J-11011/309/2018-IA.II(I) dated 10.12.2018 (**Annexure II**).

As per SO 1533 dated 14th 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

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 674.765 acres. There shall be levelling of land by filling of soil taken out during construction of buildings.	Civil contractor	Assistant General Manager (Civil)	Measurement of material handling
Drainage	➤ Disturbance to sheet flow ➤ Disturbance to drains	➤ Runoff will be diverted through the man made storm water drainage system within plant to the surface water reservoir and harvesting ponds	Civil Contractor	Assistant General Manager (Civil)	Verification of construction of surface reservoir, rain water harvesting ponds & drains
Water quality	➤ Suspended solids due to soil run-off during heavy precipitation. ➤ Loose soil at	➤ 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.	Civil Contractor	DGM (Environment)	Verification of settling tank & septic tank system installed Water quality from overflow of settlement

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters
			Implementation	Monitoring	
	construction site. ➤ Domestic waste water (sewage) from workers in plant	➤ Domestic waste water shall be treated in septic tank- soak pit system			tank
Air quality	Dust concentration due to construction activities, vehicular movement, excavation and material handling activities	➤ Isolating the construction area with flexible enclosures/ curtains so that the air emissions will not spread in the surroundings. ➤ Sprinkling of water in the construction area and unpaved roads. ➤ Periodic maintenance of vehicles shall be done and ensuring PUC ➤ Trucks shall be covered with tarpaulin. ➤ Vehicles speed shall be restricted on construction roads and vehicles will ply on dedicated construction roads and access points. ➤ Visually monitor particulate emissions from diesel vehicles	➤ Civil contractor	➤ DGM (Environment)	➤ Verifying construction of enclosures ➤ Verification of log of sprinkling & actual site conditions ➤ Verifying cover on trucks and construction of speed breakers ➤ Records of PUC of vehicles
Noise	Increase in noise level due to construction equipment.	➤ Equipment to be kept in maintained condition to keep the noise level within 90 dB(A). ➤ Develop and implement a	➤ Civil contractor ➤ Machine/ equipment incharge	➤ DGM (Environment)	➤ Noise levels at site ➤ Verification of PPE of workers through surprise checks

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters
			Implementation	Monitoring	
		construction noise management plan. ➤ Limit hours of construction where practical. Workers will be provided with necessary protective equipment e.g. earplug, earmuffs.			
Terrestrial ecology	Clearing of vegetation due to soil handling activities	Landscaping and plantation shall be done as per green belt development plan.	➤ Civil contractor ➤ Horticulture staff	➤ DGM (Environment)	Verification by observation Records of plantation
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	➤ Civil contractor ➤ Horticulture staff	➤ DGM (Environment)	Verification by observation and material handling records
During Operation phase					
Air quality	➤ PM, SO ₂ and NO ₂ levels in ambient air due to stack emissions ➤ Fugitive dust emission due to material handling ➤ Emission due to traffic	➤ The list of pollution control equipment for fugitive and stack emission in steel plant are summarised in Chapter 4 ➤ The resultant air quality will conform to the stipulated standards. ➤ Bag Filters will be installed to control Particulates. ➤ Stacks heights as per norms will be provided for the proper dispersion of pollutants.	➤ Engineers & Staff of Maintenance departments of respective units	➤ DGM (Environment)	➤ Third party periodical ambient air quality monitoring for PM2.5, PM10, SO ₂ , NO ₂ , etc ➤ Maintenance record of Bag Filters, ESP, dust extraction systems, etc ➤ Verification of cover of trucks, dust suppression measures &

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters
			Implementation	Monitoring	
		➤ Particulate emission from stacks expected to be below 50 mg/Nm³ except DRI and sinter plant where it will be 100 mg/Nm³ ➤ Product stock yards will be covered ➤ Transport of raw material will be by road through covered trucks ➤ Green belt/ green cover development programs will be undertaken within project site over 33% of the area.			plantation
Terrestrial ecology	➤ Impact on plant species due to emission from stacks ➤ Planting trees within premises ➤ Impact on fauna and flora	➤ Control and disperse emission through APCM and appropriate stack heights. ➤ Extensive tree plantation will be carried out and any tree cut will get compensated manifold ➤ Boundary wall has already been constructed around the plant (after EC dt. 02.08.2010) so that there is no interaction with the fauna of the surrounding except birds and small mammals who make their way into the planted areas of the plant. Air emissions shall also reduce to a level so that negligible impact will be there.	➤ Horticulture staff	➤ DGM (Environment)	➤ Inventory of trees planted with species and survival rate ➤ Area under plantation ➤ Height and girth to be annually measured ➤ Inspection of boundary wall

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters
			Implementation	Monitoring	
Noise	Noise levels in the plant area due to equipment in main plant and auxiliaries.	➤ 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. ➤ 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. ➤ Employees working in high noise areas shall be provided with ear plugs/ear muffs as protective device. ➤ Maintenance of all equipment as per schedule	➤ Engineers & Staff of Maintenance departments of respective units ➤ Manager Safety & Health	➤ DGM (Environment)	➤ Noise level ➤ Vibration level ➤ Tree inventory as in previous point ➤ Verification of PPE
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.	Manager (Safety & Health)	DGM (Environment)	Verification by observation
Demography and socio-economics	During the construction phase, no family will displace from the core zone as there is no	➤ Plant will generate direct employment. Preference will be given to local population for employment in the semi-skilled and	Plant Head	DGM (Environment)	➤ Employment and domicile records ➤ CER compliances

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters
			Implementation	Monitoring	
	habitation now & land 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	unskilled category. ➤ Indirect employment will get generated in transportation, helpers, sweepers, service providers, etc ➤ Additional facilities will be developed by the project proponent in surrounding villages as part of CSR and CER.			
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)	Verification by observation Waste water reuse log books
Fire and Safety	Accidents/ disasters related to fire and safety	➤ Prepare and implement Disaster Management Plan (DMP). ➤ Fire fighting system and fire extinguishers will be installed as per fire safety norms. ➤ Regular fire safety training and mock drills will be conducted.	Sr. GM (Production)	Manager (Safety & Health)	➤ Verification of approvals from factory inspector ➤ Fire fighting approvals ➤ Training and mock drill records
Solid Waste	➤ Pollution of air due to waste handling	➤ Municipal solid waste due to everyday sweeping, canteen and	➤ Manager Safety &	➤ DGM (Environment)	➤ Log of solid waste handling, reuse and

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters
			Implementation	Monitoring	
	➤ Municipal solid waste due to everyday sweeping and canteen ➤ Sludge from water and waste water treatment systems ➤ Miscellaneous wastes from plant	- domestic activities will be used as manure. Non biodegradable waste shall be sold to recyclable vendor. ➤ 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. ➤ Management of other wastes from the steel plant has been discussed in detail in chapter 4	Health Engineers & Staff of Maintenance departments of respective units	➤ Maintenance of respective departments	- disposal ➤ Inspection of solid waste storage site ➤ Log books of STP ➤ Surprise checks ➤ Verification by observation
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.	➤ DM Plant regeneration waste water after passing through neutralization pit shall be used for irrigation of green belt and horticulture. ➤ 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.	➤ Treatment Unit operators	➤ DGM (Environment)	➤ Quality parameters ➤ Log books ➤ Inspection
Health and Safety	Injury	➤ Working as per approved plans. ➤ Periodical Medical Examination. ➤ Extensive publicity and propaganda related to safety.	➤ Manager (Safety & Health) ➤ Doctor(s)	➤ Sr. GM (Production)	➤ Examination format as given in Annexure XXV ➤ Training records

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 General Managers, Deputy General Manager and their subordinates. The responsibilities of various cadre are given below:

Manager (HR) : 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.

Manager (Safety & Health) : 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): He will be 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.	Coke Oven Plants - 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. - To rebuild at least 40% of the coke oven batteries* in next 10 years (by December 2012).	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.	Steel melting shop 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.	Blast Furnace Direct inject of reducing agents 55% by June 2013.	Blast furnace to be installed ensuring that direct injection of reducing agents meets the norms
4.	Solid waste/ Hazardous Waste management Utilisation of Steel Melting Shop (SMS)/ Blast Furnace (BF) Slag as per the following schedule: By 2004 – 70% By 2006 – 80% 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. The BF slag will be ground and used for cement making in the proposed cement plant within the project.
5.	Water conservation/ water pollution To reduce specific water consumption to 5m ³ /t for long products and 8 m ³ /t for flat products by December 2005. To operate CO-BP effluent treatment plant efficiently to achieve the notified effluent discharge standards- by July 2020.	- The specific water requirement for rolling mill output over 350 days will be <5 m³/t considering sponge iron unit, MBF, SMS, rolling mills, strip mill and Ductile pipe plant. - An neutralising pit and effluent collection sump (called common monitoring basin) will be installed for treating & reusing the effluent generated.

Sl. No.	Recommendation	Plan for Implementation
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
	➤ 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.	
	➤ 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 2. Use of by-products gases for power generation 3. Promotion of Energy Optimisation Technology including energy audit	1. The power use will be reduced through energy conservation measures on commencement of operation 2. BF gas and coke oven gas will be use for power generation 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.	Sponge Iron Plants 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. 4.5 (self generation), diesel Rs. 70/ litre, Petrol Rs. 72/ litre
- Number of shifts are three with annual 350 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
Air pollution control	8919.88	2096.51
Water pollution control	277.50	17.13
Noise pollution control	10.00	1.43
Env. Monitoring and management*	274.10	79.54
Occupational health	150.00	75.76
Green belt	225.28	36.88
Others (expert advice, vehicle for environment monitoring & management work)	10.00	7.91
Overheads (3% of dep., energy, R&M & interest)		59.37
Total	9866.76	2374.54

**Already included in Table 6.2 & 6.3, Chapter 6*

The total capital investment on environmental protection work is envisaged as Rs 98.67 Crores and recurring expenditure during the Steel production is envisaged as Rs. 23.75 Crores/year.

CHAPTER 11

EXECUTIVE SUMMARY

11.1 INTRODUCTION

11.1.1 General background

Rungta Mines Ltd. (RML) is proposing to install a 2.85 million tonnes per annum steel plant (MTPA) at villages Jharbandh, Galpada and Tarkabeda, district Dhenkanal in Odisha. It will be established in two phases of 1.45 million tonnes per annum followed by 1.4 million tonnes per annum. Direct reduced iron (DRI) and hot metal by Mini Blast Furnace (MBF) will be manufactured. These will be inputs into steel melting shop. There steel production will be through induction furnace and electric arc furnace routes. Manufacturing facilities in proposed plant includes beneficiation, pelletization, coal washery, DRI kilns, mini blast furnace, sinter, coke oven and steel melting shop, producer gas plant and cement plant. Total cost of the project will be Rupees 7837.9 crores. The first phase will cost Rupees 3888.63 Crores while second phase will cost Rupees 3948.27 Crores. The entire project will be implemented in 84 months from date of receipt of environmental clearance. The first phase in 48 months followed by second phase of 36 months.

Within the same land parcel, the company had already received an environmental clearance no. J-11011/241/2009-IA.II(I) dated 02.08.2010 and its amendment dated 25.01.2011 and 20.09.2018. The environmental clearance was for a capacity of 1.9 MTPA steel. The plant construction was started in 2017 only with one DRI kiln of 1X500 TPD, 2X20 T IF with CCM and a 25 MW CPP. The extension of validity of the above mentioned environmental clearance was granted on 07.07.2017 & 20.09.2018. It was extended upto 01.08.2020. Since the under construction plant shall not get completed within the validity period of the environmental clearance, the Company applied to Ministry of Environment, Forest and Climate Change and obtained fresh Terms of Reference for a larger production of 2.85 MTPA steel. The plant configuration for 2.85 MTPA steel is such that it includes the under construction units.

11.1.2 Location and communication

The proposed plant will be located in villages Jharbandh, Galpada and Tarkabeda of district Dhenkanal in Odisha. The location of plant is given in **Fig 1.1** of Chapter 1. Based on coordinates from Google Earth Pro, the plant boundary lies between latitude 20° 45' 14" to 20° 46' 24" N and longitude 85° 17' 12" to 85° 18' 45" E.

The proposed plant is accessible by all weather road from the district headquarter Dhenkanal (36 km) and town Angul (22 km). The site is located

on NH-55 (2.4 km aially), which connects Bhubaneswar to Angul. The nearest railway station is Meramandali at a distance of 3.6 km. The nearest airport is at Bhubaneswar, which is approximately 150 km from the site.

11.2 PROJECT DESCRIPTION

Manufacturing facilities of the proposed plant with capacities is given in table below:

Sl.	Plant facilities	Units	Phase 1	Phase 2	Total
1	Beneficiation Plant	MTPA	2.7	2.7	5.4
2	Pelletisation Plant	MTPA	1.47	1.47	2.948
3	Coal Washery	MTPA	2.616	1.524	4.141
4	DRI Plant	MTPA	1.001	0.546	1.547
5	Mini Blast Furnace	MTPA	0.567	0.992	1.559
6	Sinter Plant	MTPA	0.612	1.051	1.663
7	Coke Oven Plant	MTPA	0.420	0.70	1.12
8	Steel Melting Shop	MTPA	1.232	1.232	2.464
8.1	Steel Melting via Induction Furnace Route	MTPA	0.539	-	0.539
8.2	Steel Melting via Electric Arc Furnace-Vacuum Degassing-Argon Oxygen Decarburization Route	MTPA	0.693	1.232	1.925
8.3	Continuous Casting Machine (Billets/ Bloom Caster/Slab)	MTPA	1.207	1.207	2.415
9	Finished Product Facilities	MTPA	1.450	1.400	2.850
9.1	Rolling Mill (TMT/ Flat/ Round/ Wire Rod/ Structural Mill/ others)	MTPA	0.800	0.800	1.600
9.2	Strip Mill/Sheet/Coil/ Wire & Bar Mill/Wire Rope	MTPA	0.450	0.400	0.8500
9.3	Ductile Pipe Plant	MTPA	0.200	0.200	0.400
10	Producer Gas Plant	Million Nm ³ / Annum	240	240	480
11	Oxygen Plant	MTPA	0.035	0.063	0.098
12	Lime Plant	MTPA	0.105	0.1995	0.3045
13	Cement Plant	MTPA	0.884	0.802	1.686
14	Captive Power Plant	MW	217	168	385

Sl.	Plant facilities	Units	Phase 1	Phase 2	Total
14.1	Waste Heat Recovery Boiler (WHRB) based Captive Power Plant (CPP)	MW	67	68	135
a	DRI Kiln exit gas based	MW	44	24	68
b	MBF Gas based	MW	11	20	31
c	Coke Oven Gas based	MW	12	24	36
14.2	Circulating Fluidised Bed Combustion (CFBC) based CPP	MW	150	100	250

11.2.1 Plant layout

The proposed steel plant shall be constructed in a plot of land measuring 674.765 acres. Out of this total land, 273.685 acres shall be under plants, facilities & tailing pond, 51.81 acres under stock yards & railway siding, 55.2 acres for solid waste, 222.67 acres for green belt & plantation, 1.4 acres for administration & other buildings, 30 acres for water reservoir and 40 acres for roads. 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 MTPA): 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 Tailing pond.

Pelletization plant (2X1.2 MTPA): The pellet plant will produce oxide pellets suitable for use in 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 (1X400 TPH + 1X235 TPH): 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 fed to the washery. Washed coal recovered will be 50%, middlings will be 42.5% and rejects will be 7.5%.

Direct reduced iron (DRI) plant (2X500 TPD + 4X600 TPD): 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 DRI or Sponge Iron and Char by magnetic separation. In rotary cooler, product is cooled by indirect water spray.

Blast Furnace (1X600 + 1X1050 CUM): 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 for power generation. Thereafter, the gas will be used as fuel in blast furnace stove and elsewhere after cleaning in Gas Cleaning Plant. Unutilised gas will be flared.

Steel melting shop: Steel melting shop will have (1) 7X 20 T induction furnaces (IF) with 4X20 T ladle furnaces (LF) and (2) 1X90 T + 1X160 T electric arc furnaces (EAF) with 1X90 T + 1X160 T ladle furnaces in it. Induction furnace works on the principle of induction melting of scrap/ sponge iron with the help of electric power. The electric arc furnace, the necessary heat is generated by electrical power. 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.

Rolling mill (5X0.2+ 2X0.3 MTPA): Semi-finished product from the CCMs of IF and EAFs 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 (1X0.4 + 1X0.45 MTPA): Semi finished product from the CCMs of EAF 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 (2X0.2 MTPA): Ductile pipe plant will receive hot metal directly from the MBF and manufacture finished product comprising of ductile pipes. However, as a back up measure, provision of reheating furnace has also been made.

Sinter Plant (1X64+1X110 sq.m.): 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 be utilised as raw material for sinter. Thus, utilising maximum solid waste from within the plant. The sinter generated will be 100% utilised in MBF.

Coke oven plant (16 X 70,000 TPA): 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. Balance leftover shall be sold in the market.

Captive Power Plant (CPP): (1) WHRB: 135 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) CFBC:** 250 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 (1X2600 + 1X2300 TPD): 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 (PPC) using fly ash and Portland Blast Furnace Slag Cement (PBFS) 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 are Iron Ore (5.4 MTPA from own mines/other private mines), BF Grade Iron Ore (0.657 MTPA from own mines/other private mines), non coking coal (5.94 MTPA domestic/Import) and Coking Coal (1.69 MTPA from South Africa). Other raw material required is limestone, dolomite, bentonite, clay, silica component, flocculant, gypsum, quartz, silica, pig iron and semi finished products.

Fuels required in various units will be coking and non coking coal, coke breeze & fines, Low Sulphur Heavy Stock (LSHS) oil, coke oven gas and MBF gas.

Total power requirement of the plant for operating different facilities is estimated as 385 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 plant is estimated as 2950 m³/hr. Industrial water shall be sourced from Brahmani River.

11.2.4 Manpower

The manpower requirement is 2600 persons for various activities like plant operation, loading, unloading, handling, transportation, general cleaning, horticulture and other miscellaneous works inside the plant. Three shifts working for 350 days is planned.

11.2.5 Site services

Infrastructure facilities such as administrative office, rest rooms, canteen, first aid centre, etc. will be provided.

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 project area is comparatively flat terrain and elevation is approximately 75-95 m AMSL. The study area represents a flat to gentle, undulating sloping topography with few scattered hillocks. The surface elevation in buffer zone varies from 60 m to about 312 m.

Drainage: The proposed project site is located 1.5 km east of Nigra (Lingra) Nala and 7.35 km south of Brahmani River. Two first order seasonal drains originate from within plant boundary and flow out from the north western and north boundaries. 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.

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, average annual rainfall is 1185.5 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 1st March to 31st May 2018. The temperature ranged between 19.8°C to 41.0°C and relative humidity ranged between 19.5% to 87.7 % during the monitoring period.

The wind speed varied between calm to 38.10 km/hr and the predominant wind direction was observed from South with 11.87% 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. Seven locations in the buffer zone are near village Nimidha, Mosonia, Galpada, Nimabahali, Tarkabeda, Kedala and Sibapur villages. Twenty four hour average PM₁₀ level was found to range from 39.6 to 71 µg/m³, PM 2.5 was found to vary from 22.8 to 42.7 µg/m³, SO₂ from 6.3 to 16.1 µg/m³ and NO₂ from 9.0 to 21.7 µg/m³. The concentration of CO was found between 125-875 µg/m³.

11.3.4 Water resource and quality

The river Brahmani and its tributaries control the drainage of the study area. Brahmani is a perennial river. The drainage pattern is dendritic in nature. Brahmani River (7.3 km), Nigra Nala (1.5 km), Kisinda Jhor (4.7 km), Kantei nala (7.2 km), Metelia nala (9.6 km), Bauti Nala (9.4 km), Bade Jhor (7.4 km), Kusumder Jhor (3.6 km) and Agana nala (1.1 km) are present within study area in addition to various ponds in villages.

Water samples were collected from 10 ground water sources. These are core zone, Jharband, Tarkabeda, Kadala, Gandhijhara, Dhuliamunda, Nimidha, Kantimili, Benipathar and Kankalu villages. 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.

Water samples were collected from 11 surface water sources. These are (1) upstream and (2) downstream samples from Brahmani river near Khadagprasad Village, (3) upstream and (4) downstream samples from Lingra nala near plant & near Kankalu village, (5) Gandhijharan nala near Tarkabeda village, (6) Nala near Berunpal village, (7) Nala near Nimabahali village (8) Kusumjhor nala near Bishwanath village, (9) Barajhor nala near Karanda village, (10) Kanti nala near Gulihi village and (11) Kisinda nala near Khadagprasad Village. The analysis of surface water sample shows that all the parameters are within the desirable limits as per IS 10500:2012 except alkalinity, which is within permissible limits.

11.3.5 Land use pattern and soil quality

Total land required for the project is 674.765 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 is pending with Tehsildar, Hindol. The entire land use has been changed to industrial use.

The study area has 161 villages. Land 6.56% of total area is forest land, 14.96% is area under non-agricultural uses, 54.84 % is net area sown, 3.96% is permanent pastures and other grazing land, 2.28% is current fallows, 10.90% is barren and un-cultivable land, 3.33% is fallows land, 1.49% is culturable waste land and 1.67% land under miscellaneous tree crops.

Top soil samples were collected and analyzed from the proposed plant area and from Jharband village. The results indicate that both the soil samples are medium grained sand and have pH of 6.20 and 7.16, respectively.

11.3.6 Noise and traffic density

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 48.12 to 52.16 dB (A) and at night time varies from 39.12 to 42.51 dB (A). A traffic density survey was conducted round the clock on 09-10/05/2018 at Nimabahali Chowk (NH-55). Total number of vehicles were found as 12525 including cycles.

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 are Jharbandh RF (0.5 km), Ghanthigarhia PF (5.4 km) and Nimidra RF (3.2 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 project area. There were 54 families previously who have been resettled in village Nimabahali and paid compensation. As per Census 2011, total population within the study area is 1,83,621 persons that include 95,316 males and 88,305 females.

The SC population is 23.61% and ST population is 5.17%. The average literacy rate is 70%.

The literacy amongst women is poorer at 30.13%. 24% of the total population are main workers, while 10.4% are marginal workers and the rest 65.60% 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.

11.4 ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION

11.4.1 Topography and drainage

Impact: Change in topography will occur in core zone due to cutting, filling, construction of the buildings such as walls, buildings, stock yards, etc. The ground will be levelled, where required. One DRI, IF, CCM and CPP is under construction as per environmental clearance dated 02.08.2010. The construction once achieved will not be reversed. There will be no impact on topography of the buffer zone.

Two first order seasonal streams, six 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: Storm water drains shall have to be constructed to tackle the rainwater within the plant. The two first order streams will have to be realigned such the the water flows into the storm water water drains along internal roads. All the storm water drains will eventually flow into the reservoir on north western side or any intermediate rainwater harvesting reservoirs.

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 which can lead to secondary impacts on health. 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 will be controlled by sprinkling of water. 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, 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 calculated are 28.48

$\mu\text{g}/\text{m}^3$ for PM₁₀, 16.37 $\mu\text{g}/\text{m}^3$ for PM_{2.5}, 54.96 $\mu\text{g}/\text{m}^3$ for SO₂ and 23.23 $\mu\text{g}/\text{m}^3$ for NO₂.

11.4.3 Noise and traffic density

Impact: The noise level during construction will be due to construction machinery and be temporary and reversible in nature. The noise level at sources like plant machinery are anticipated to go as high as 90 dB(A).

Mitigation: The equipments shall be provided with acoustic shields or enclosures to limit the sound level within the plant boundary. Vibration dampners 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, 545.38 cum/hr waste water will be generated 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.

The withdrawal of water from Bramhani River can also have an impact in absence of mitigation measures.

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 (CMB). From CMB, 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 shall be treated in de-centralised septic tanks.

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 steel plant will be spread over 674.765 acres. The the proposed land use break up for the plant has been given in section 11.2.1 earlier. The storage of solid wastes on land can also impact the soil quality in absence of control measures.

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 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, the labour and other work force will generate garbage (municipal solid waste). During operation phase, solid waste will be generated from ash, Bag Filter Dust, BF slag, char, kiln accretion, slag from SMS, middlings, mill scale, washery rejects, rejects from rolling mill, grinder waste, sludge from GCP, sinter return fines and tailings. Additionally waste from sweepings and other biodegradable wastes from the canteen shall be there.

Mitigation: The tailings from the beneficiation plant will be stored in the tailings pond where recovery of water shall be done for recycling. IF and EAF slag will be given for metal recovery, converted to aggregates (special balls) and used in road making. Mill scales will be reused in the proposed cement plant within the premises, sold to other cement manufacturers and can also be sent to the proposed Ferro Alloys plant of the company at Kamanda, District Sundargarh, Odisha. Dusts from pollution control equipment and generated during handling from units such as Pellet plant, DRI kilns, MBF, Coke oven plant and SMS shall be sent to sintering plant for making sinter and subsequently use it in MBF. Steel scraps and rejects will be recycled by melting in SMS. Grinder waste is recycled to SMS. Solid waste storage area will be required only for kiln accretion and rejects from washery. These storage areas will be provided with stable liner to avoid leaching to ground water. Runoff will be collected in a garland drain around the solid waste storage areas, settled in settling pond and directed to rain water harvesting ponds or raw water reservoir.

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 plant area. Stage II forest clearance has been obtained from MOEF&CC for the same on 02.07.2015. No 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 modelling shows that negligible impact will be caused on the forests of the study area.

Mitigation: Under the proposed green belt and plantation programme, 222.67 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 also. The expenditure for plantation and wildlife conservation plan shall be met through the fund earmarked for Corporate Environment Responsibility (CER).

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.

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, 2600 people will be employed.

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 (CSR) activities of the company.

11.5 ANALYSIS OF ALTERNATIVES

The proposed Steel Plant shall be located in Jharbandh, Galpada and Tarkabeda 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, the Company plans to establish a higher capacity plant of 2.85 MTPA within the same area. The under construction units will be incorporated in the proposed configuration. The site has many advantages such as about 90% land is in possession of the company, water requirement from Brahmani river is located nearby (7.3 kms), source of

power will be captive power plant of the company and railway siding can be constructed. The technology for various processes have been selected based on minimum environment pollution.

11.6 ENVIRONMENTAL CONTROL AND MONITORING ORGANISATION

Rungta Mines Ltd. already has an Environment Management Department (EMD) at the headquarter. They will also be responsible for 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. An environment officer appointed at the plant. He will be responsible for 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. 274.10 Lakhs and recurring expenditure during the Steel production will be Rs. 81.7 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 disaster 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 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 (SMC). The plant manager shall be the SMC.

11.8 PROJECT BENEFIT

During operation phase, around 2600 persons for both phases will be under direct employment of the company. 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.

The budget for such corporate social responsibility (CSR) activities is subject to 2% of average profit of previous three years as per Companies Act 2013. Since this is a proposed plant, for initial years the budget will be based on the discussion with villagers and District administration.

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. It has been preparing EIA/EMPs since the year 1986. Min Mec is ISO 9001:2015 certified under ANZ-JAS. In 1994, Min Mec established a modern R&D Laboratory. In June 2006, the laboratory received accreditation from NABL, which has been renewed as per procedure since. 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 order under 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 on 02.02.2003, Min Mec received ISO 9001 certification under ANZ-JAS and now it has been renewed and updated to ISO 9001:2015. In 1994, Min Mec established a modern R & D laboratory. In June, 2006, the laboratory received certification from NABL, which has been renewed since (current Certificate No. TC-6337). Copy of certificate is given in **Annexure XXVII**.

Services and expertise

Services are provided to the following sectors

- 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.
- Mines-surface and under ground for all minerals and metals

As on 31.12.2018, the following projects have been executed:

Studies	Numbers
EIA, EMP & Environmental Studies	370
RA & DMP	17
EHS	4
Socio Economics	13
Feasibility studies (sponge iron & power plants)	40
Pre Feasibility studies (coal blocks)	43
Market surveys	8
Mine Planning and Detailed Project Report	130
Regional Studies	2

Studies	Numbers
Hydro- geological & hydrological studies	63
Others (due diligence, land acquisition study, forest proposal, compliances, softwares etc.)	25

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 comprising of over twenty specialists in various fields with an average experience of over 30 years.

Team engaged

The team of Min Mec Consultancy Pvt. Ltd. and Min Mec R&D Laboratory involved in EIA preparation was as follows:

Role	Expert Name	Qualifications	Experience
Team leader & EC Core FAE- WP, SE, SHW, SC Supporting FAE- AP, AQ, LU, NV, HG	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. Certified Energy auditor & visiting faculty to School of Planning & Architecture. 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. Guidance in land use analysis, mathematical modelling of air, hydrogeological studies, impact on noise and air.
Core FAE- AP, AQ, HG, RH Supporting FAE- SHW, NV, GEO	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

Role	Expert Name	Qualifications	Experience
			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.
Core FAE- EB, AP, WP Supporting FAE- SHW, NV	Rashmi Gupta	M.Sc. (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.
Core FAE- AP, AQ, NV Supporting FAE- EB	M.S. Yadav	M. Sc. (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.
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.
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.

As per Circular no. F. No. J-11013/77/2004-IA II (I), dated 30th 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 XXVIII**).

Others consultants

1. Environmental monitoring and testing has been done by Min Mec R&D Laboratory, NABL accredited (Certificate No. TC-6337 dt. 03 October 2017)
2. "Site Specific Conservation Plan" has been prepared with respect to Jharbandh Steel Plant by "SSP Consultancy Services (Sri Kailash Chandra Patti, Dy.C.F Retd. and Sri Harisankar Mohanty, Dy.C.F. Retd).

ANNEXURES

F. No. J-11011/241/2009- IA II (I)
Government of India
Ministry of Environment and Forests
(I.A. Division)

Paryavaran Bhawan
CGO Complex, Lodhi Road
New Delhi – 110 003
E-mail: ms.industry-mef@nic.in
Tele/fax: 011 – 2436 3973
Dated: August 2, 2010

To,

M/s Rungta Mines Limited
Rungta House, Chaibasa- 833 201
Jharkhand

Sub: Integrated Steel Plant (1.9 MTPA), WHRB (100MW) and AFBC (200 MW) at Village Jharbandh Galpada and Tarakabeda District Dhenkanal, Orissa by M/s Rungta Mines Limited. – Environmental Clearance reg.

This has reference to your letter no. MOEF/ BHR/10 dated 3rd March, 2010 along with copies of final EIA report and public hearing reports seeking environment clearance under the provisions of EIA Notification, 2006.

2. The Ministry of Environment and Forests has examined your application . It is noted that M/s Rungta Mines Limited have proposed to set up an Integrated Steel Plant (1.9 MTPA) and 100MW WHRB and 200MW AFBC power plant at Village Jharbandh, Galapada and Tarakabeda, District Dhenkanal, Orissa. Out of total land required (667.39 acres) for the proposed project, 600.24 acres is already acquired. Land use at present is agricultural land under private ownership (540.705 acres) and government land (126.685 acres). The proponent informed that there will be displacement of 18 houses (53 families) which will be rehabilitated and resettled as per the R & R policy, Government of Orissa. Jharbandh RF (0.5 km E), Ganthigarihia PF (5.0 km NW), Nimidra RF (4.0 km NW), Hindol RF (8.5 km S), Nandina RF (14.0 km RF S), Patalu RF (9.5 km SE), Barbank RF (14.5 km NNE) and Kankeli RF (14.5 km NE) are located within 15 km radius of the proposed site. Brahmani River flows at a distance of 7.35 km from the proposed site. Application seeking permission for setting up of proposed plant was submitted to DFO Dhenkanal. Total cost of the project will be Rs. 4,150.71 Crores (Rs. 2,083.58 Crores for Phase-I and Rs. 2,067.13 Crores for Phase-II). Rs. 40.0 Crores and Rs. 5.00 Crores will be earmarked towards total capital cost and recurring cost / annum for environmental pollution control measures.

3. Following facilities will be installed in the proposed plant:

S.N.	Facility	Production Capacity		Total Capacity (MTPA)
		Phase-I	Phase-II	
1	Beneficiation Plant	2.1 MTPA	2.1 MTPA	4.2
2	Pelletization 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	0.325 MTPA (1x42 m ²)	0.325 MTPA (1x42 m ²)	0.650
5	Blast Furnace	0.3 MTPA (1x350 m ³)	0.3 MTPA (1x350 m ³)	0.6
	Steel Melt Shop	0.95 MTPA	0.95 MTPA	1.90

6	Induction Furnace	0.576 MTPA (9x20 T)	0.576 MTPA (9x20 T)	1.152
7	Ladle Refining Furnace for IF	0.576 MTPA (1x40 T)	0.576 MTPA (1x40 T)	1.152
8	Electric Arc Furnace	0.448 MTPA (1x70 T)	0.448 MTPA (1x70 T)	0.896
9	Ladle Refining Furnace for EAF	0.448 MTPA (1x70 T)	0.448 MTPA (1x70 T)	0.896
10	Billet Caster, Blooms, Slab caster	0.95 MTPA (6/11 m radius)	0.95 MTPA (6/11 m radius)	1.90
11	Flats, Rod and Structural mill	0.95 MTPA	0.95 MTPA	1.90
12	Coal Washery	2.1 MTPA	2.1 MTPA	4.2
	Captive Power Plant	150 MW	150 MW	
13	WHRB	50 MW (5x45 TPH)	50 MW (5x45 TPH)	100 MW
14	AFBC	100 MW (1x375 TPH)	100 MW (1x375 TPH)	200 MW
15	Coke Oven Plant Dry Quenching, Non-recovery type	0.175 MTPA	0.175 MTPA	0.350 MTPA

4. Following will be the products from the proposed plant:

Product	Phase-I		Phase-II	
	Captive use (TPA)	Outside sale (TPA)	Captive use (TPA)	Outside sale (TPA)
Beneficiation Ore	12,60,000	Nil	12,60,000	Nil
Pellets	11,25,000	23,590	11,25,000	23,590
Sponge Iron	7,50,000	Nil	7,50,000	Nil
Sinter	3,25,000	Nil	3,25,000	Nil
Pig Iron	57,600	8,065	57,600	8,065
Billets, blooms, slabs	9,64,865	Nil	9,64,865	Nil
Rolled products	Nil	9,26,270	Nil	9,26,270
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 Dust Settling Chamber (DSC), after Burning Chamber (ABC), WHRB and cleaned in a ESP before discharging through a chimney of adequate height. Flue 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 Stock house. Bag filters and dust collectors will be provided to Iron ore proportionating, grinding, mixing and blending section of Pelletization Plant. Flue gas and dust extraction system comprising of multi-cyclone, ESPs will be Grate-Kiln-Cooler system of pellet plant. Bag filters will be provided to coke and flux grinding system of Pellet Plant. Dust laden air from Sinter Plant will be sucked through a hood and cleaned in an ESP before discharging through a stack. ESP will be provided to FBC boiler of CPP. Dust suppression will be carried out by water sprinkling on the raw material stock piles. 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 m³/hr for Phase-I and 1,475 m³/hr for Phase-II. Therefore, the total water requirement of 2,950 m³/hr will be

met from the River Brahmani through intake 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 tower blow down will be used for dust suppression. Waste effluents from DM Plant will be neutralized in a neutralization pit. Zero effluent discharge will be practiced. Industrial effluent from the plant will be treated in ETP and the domestic effluent will be separately treated in the STP. The treated water will be re-used 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 tailing dam in the beneficiation plant site and the overflow will be recycled to process. Coal washery effluent will be treated in a thickener. The thickened tailing will be dewatered in a belt press while the clarified water will be recycled back in the process circuit.

7. Regarding solid/hazardous waste management, granulated BF slag will be sold to cement plants. Other waste materials which cannot be reused will be dumped in an area of 155.2 acres. Garland drain will be constructed around the solid waste yard which will be made impervious with lining and leachate collection system. Middlings from coal washery, char from DRI as well as ROM coal will be used as fuel in AFBC boiler. SMS slag will be used for land filling. Fly ash will be disposed off to brick manufacturing plants/cement plants. Sludge from GCP, flue dust from blast furnace will be disposed in a dump yard. Sinter plant dust will be recycled back to sinter plant. Used/spent oil will be sold to the CPCB authorized reprocessors / recyclers. Green belt will be developed in 33% of total plant area. Noise control measures include provision of silencers, vibration isolators to 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 OSEB. Fuel oil (250 KLPA for each phase) will be used for start-up/ stabilization of boiler, DR plant and SMS.

8. All the Integrated steel plants are listed at S.No. 3(a) under Primary Metallurgical Industries under Category 'A' and appraised at the Central level.

9. The proposal was considered by the Expert Appraisal Committee-1 (industry) in its meeting held during 24-26th June, 2010 (p.482-486/c). The Committee recommended the proposal for environmental clearance subject to stipulation of specific conditions along with other environmental conditions. Public hearing/Public consultation meeting was conducted by the Orissa Pollution Control Board on 12th March, 2010.

10. Based on the information submitted by you, presentation made by you and your Consultant, Min Mec Consultancy Pvt. Ltd., Delhi, the Ministry of Environment and Forests hereby accords environmental clearance to the above project under the provisions of EIA Notification dated 14th September 2006 subject to strict compliance of the following Specific and General conditions:

A. SPECIFIC CONDITIONS :

- I. Efforts shall be made to reduce RSPM levels in the ambient air. On-line 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-cyclone, wet scrubber, bag filters etc. shall be provided to keep the emission levels below 50 mg/Nm³ by installing energy efficient technology.
- II. As proposed, Electrostatic precipitator (ESP) shall be provided to sinter plant, WHRB, CFBC, DRI plants; bag house to blast furnace and ESP & bag filters to by-product recovery type of coke oven to control SPM levels within 50 mg/Nm³. Fume extraction system with bag filters shall be provided to electric arc furnace and ladle furnace.
- III. 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 generators shall be ensured and no flue 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-sulphurization section of coke oven plant shall be catalytically cracked to Nitrogen and Hydrogen. BF top gas shall be cleaned in dust catcher and gas cleaning plant (GCP) comprising of bag filters and used in furnace of BF, EAF, sinter plant, lime & dolo plant. Bag filters with adequate stack height shall be provided to lime and dolo plant. Proper and full utilization of coke oven gases in power plant using heat recovery steam generators should be ensured and no flue gases should be discharged into the air.
- V. The National Ambient Air Quality Standards issued by the Ministry vide G.S.R. No. 826(E) dated 16th November, 2009 should be followed.
- VI. Gaseous emission levels including secondary fugitive emissions from all the sources shall be controlled within the latest 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 30th May, 2008 shall be followed.
- VII. The After Burning Chamber in the DRI units, sinter plant, Blast Furnace and coke ovens for burning of CO shall be installed. Hot gases from DRI kiln 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). The gas then shall be cleaned in ESP before leaving out into the atmosphere through ID fan and stack.
- VIII. Vehicular 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 continuous monitoring of stack emissions, online stack monitoring system shall be installed.
- X. Total water requirement from River Brahmani shall not exceed 2,950 m³/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 sprinkling at coal stockyard. Clarifier, sludge pond and filter press shall be provided in raw water treatment plant. DM plant water shall be neutralized in neutralization pit 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 reused in the plant for dust suppression and slag granulation, pig casting machine etc. Provision of separate drains 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 enhanced to meet the maximum water requirement. Only balance water requirement should be met from other sources.
- XIII. Measures shall be taken to prevent impact of particulate emissions / fugitive emissions, if any from the proposed plant on the surrounding reserve forests viz. Jharbandh RF (0.5 km E), Ganthagaria PF (5.0 km NW), Nimidra RF (4.0 km NW), Hindol RF (8.5 km S),

Nandina RF (14.0 km RF S), Patalu RF (9.5 km SE), Barbank RF (14.5 km NNE) and Kankeli RF (14.5 km NE) located within 15 km radius of the project site. A monitoring station to monitor the BAQ at the nearest RF viz Jharkhand 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.

- 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 E(P) Act whichever are more stringent. Leachate study for the effluent generated 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 data submitted to the Ministry's Regional Office at Bhubaneswar, OSPCB and CPCB.
- XV. All the wastewater from the coke oven plant containing cyanide, phenol and COD etc. shall be properly treated in the BOD plant. Continuous monitoring of Total Organic Compounds (TOC) should be done at the outlet of ETP (BOD plant) and recovery of products like tar, ammonia, naphthalene etc. should be ensured.
- XVI. The water consumption shall not exceed 16 m³/Ton of Steel as per prescribed standard.
- XVII. Iron ore fines, process dust, and mill scales shall be recycled to sinter plant to produce sinter. Sludge and slag from electric arc furnace (EAF) shall also be recycled in the sinter plant.
- XVIII. All the coal fines, char from DRI plant and washery rejects shall be utilized in AFBC boiler of power plant and no char should be used for briquette making or disposed off anywhere else. AFBC boiler should be installed simultaneously along with the DRI plant to ensure full utilization of char from the beginning. Scrap shall be used in steel melting shop (SMS). EAF & SMS slag and kiln accretions shall be properly utilized. All the other solid waste including broken refractory mass shall 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.
- XIX. All the slag shall be used for land filling inside the plant or used as building material only after passing through Toxic Chemical Leachability Potential (TCLP) test. Toxic slag should be disposed in secured landfill as per CPCB guidelines. Otherwise, hazardous substances should be recovered from the slag and output waste and be disposed in secured landfill as per CPCB guidelines.
- XX. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 1999 and subsequent amendment in 2003. All the fly ash generated shall be fully utilized in manufacturing of Pozollona Portland Cement (PPC) and BF slag in shall be ensured.
- 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, end use of solid/hazardous waste shall be submitted to the Ministry's Regional Office at Bhubneswar, OSPCB and CPCB.
- XXII. A time bound action plan shall be submitted to reduce solid waste, its proper utilization and disposal.
- 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 Bhopal, OSPCB and CPCB within 3 months of issue of environment clearance letter.

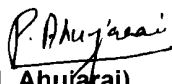
- XXIV. As proposed, green belt shall be developed in 33 % of the plant area as per the CPCB guidelines in consultation with DFO.
- XXV. All the recommendations made in the Charter on Corporate Responsibility for Environment Protection (CREP) for the Steel Plants should be implemented.
- XXVI. All the commitments made to the public during the Public Hearing / Public Consultation meeting held on 12th March, 2010 shall be satisfactorily implemented and a separate budget for implementing the same shall be allocated and information submitted to the Ministry's Regional Office at Bhubaneswar.
- XXVII. At least 5 % of the total cost of the project should be earmarked towards the corporate social responsibility and item-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.
- 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.
- 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, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.

B. GENERAL CONDITIONS:

- i. The project authorities must strictly adhere to the stipulations made by the Orissa State Pollution Control Board and the State Government.
- ii. No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment and Forests.
- iii. The gaseous emissions from various process units shall conform to the load/mass based standards notified by this Ministry on 19th 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 size and location.
- 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, SO₂ and NO_x 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.
- v. Industrial wastewater shall be properly collected, treated so as to conform to the standards prescribed under GSR 422 (E) dated 19th May, 1993 and 31st December, 1993 or as amended from time to time. The treated wastewater shall be utilized for plantation purpose.
- 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, 1989 viz. 75 dBA (daytime) and 70 dBA (nighttime).

- vii. Occupational health surveillance of the workers should be done on a regular basis and records maintained as per the Factories Act.
- viii. 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.
- ix. 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.
- x. 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 implementing all 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.
- xi. A copy of clearance letter shall be sent by the proponent to concerned Panchayat, Zila Parishad/Municipal Corporation, Urban Local Body and the local NGO, 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.
- xii. The project proponent shall upload the status of compliance of the stipulated environment 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; PM₁₀, SO₂, NO_x (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the projects shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.
- xiii. 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 e-mail) to the Regional Office of MOEF, the respective Zonal Office of CPCB and the SPCB. The Regional Office of this Ministry at Bhubaneswar/ CPCB / SPCB shall monitor the stipulated conditions.
- xiv. The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company alongwith 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.
- xv. 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://envfor.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 one 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.

- xvi. Project authorities 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 and the date of commencing the land development 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 in a time 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, 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 Wastes (Management, Handling and Transboundary) Rules, 2008 and the Public (Insurance) Liability Act, 1991 along with their amendments and rules


(Dr. P.L.Ahujara)
Scientist -F

Copy to:-

1. The Secretary, State Department of Environment, Govt. of Orissa, Bhubaneswar, Orissa.
2. Chairman, Central Pollution Control Board, Parivesh Bhavan, CBD-cum-Office Complex, East Arjun Nagar, New Delhi, 110 032.
3. Chairman, Orissa Bengal Pollution Control Board, Parivesh Bhavan, A/118, Neelkanthnagar, Unit-8, Bhubaneswar - 751 012, Orissa.
4. The Chief Conservator of Forests (Eastern), Regional Office (EZ), A/3, Chandrasekharpur, Bhubaneswar - 751 023, Orissa.
5. Monitoring Cell, Ministry of Environment and Forests, Paryavaran Bhavan, CGO Complex, New Delhi.
6. Guard File.
7. Record File.


(Dr. P.L.Ahujara)
Scientist -F

F. No. J-11011/241/2009- IA II (I)
Government of India
Ministry of Environment and Forests
(I.A. Division)

Paryavaran Bhawan
CGO Complex, Lodhi Road
New Delhi – 110 003
E-mail: ms.industry-mef@nic.in
Tele/fax: 011 – 2436 3973
Dated: 25th January, 2010

To,
 M/s Rungta Mines Limited
 Rungta House, Chaibasa- 833 201
 Jharkhand

Ph: 06582 – 256861 Fax: 06582 – 256442
E-mail: rungtas@satyam.net.in

Sub: Integrated Steel Plant at Village Jharbandh Galpade and Tarukabeda District Dhenakal in Orissa by M/s Rungta Mines Limited- regarding Amendment in Environmental Clearance

Sir,

This is in continuation of this Ministry's letter of even no. dated 2.08.2010 and your communication no. RML/MOEF/Jnarbandh/10-11/238 dated 25th September, 2010 requesting the Ministry to amend the environmental clearance accorded vide this Ministry's even no. dated 2.08.2010.

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	Lime plant	1x300 TPD
2	Dolo Plant	1x300 TPD
3	Oxygen Plant	1x200 TPD
4	Vacuum Degassing unit	1x70 TPD

4. The proposal was placed before the Expert Appraisal Committee in its 17th meeting held on 13th - 14th December, 2010. The Committee noted that there is no increase in the pollution load and the proposed additional units would reduce sulphur and phosphorus in the product.

-2-

5. The Committee recommended for amendment in Environmental Clearance dated 02.08.2010 with the following additional Specific Condition:

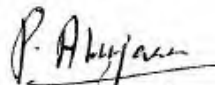
- The existing pollution load shall not increase and the individual components should be environmentally compliant.

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 with in 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, dolo and oxygen plant and vacuum degassing unit.
- v. In case of change of scope of the project, the company shall obtain fresh environmental clearance.

7. This issues with the approval of the Competent Authority.

Yours faithfully,


(Dr. P. L. Ahujarai)
Scientist 'F'

F. No. J-11011/241/2009-IA II (I)
 Government of India
 Ministry of Environment, Forest and Climate Change
 (I.A. Division)

Indira Paryavaran Bhawan
 Jor Bagh Road, Aliganj,
 New Delhi - 110003
 E-mail: satish.garkoti@nic.in
 Tel.: 011-24695316

Dated: 27th August, 2015

To /
M/s Rungta Mines Ltd.
 Jharabandha, P.O-Nimabahal,
 Via-Meramandli, Dhenkanal,
 Odisha-759121

Email: Nil ; Fax No. 91 6762 228361

Subject: Integrated Steel Plant (1.9 MTPA) WHRB (100MW) and AFBC (200MW) at Village Jharbandha, Galapdu and Taraka bedd, District Dhenkanal, Odisha by M/s Rungta Mines Ltd. - Extension of validity of EC regarding.

Sir,

This is with reference to your letter No. NiRML/DSP/14-15/868 dated 10.02.2015 regarding Extension of validity of the Environmental Clearance for the project mentioned above.

2.0 It has been noted that the project was accorded Environmental Clearance by the Ministry vide letter of even number dated 02.08.2010. The above proposal was considered by the Reconstituted Expert Appraisal Committee (Industry) in its 37th EAC meeting held during 30th April-1st May, 2015.

3.0 It may be informed that an amendment in the EIA Notification, 2006 was issued by the Ministry vide Notification No. S.O. 1141(E) dated 29th April, 2015, extending the period of validity of Environment Clearance from 5 years to 7 years. Therefore, the EC accorded to the Project vide letter of even No. 02.08.2010 stands valid upto 01.08.2017. In case of seeking further extension of Environment Clearance beyond 01.08.2017, an application as per the provisions of EIA Notification, 2006 as amended may be submitted afresh by online to the Ministry.

This issues with the approval of the competent Authority.


 (Dr. Satish C. Garkoti)
 Scientist 'F'

Copy to:-

1. The Secretary, Department of Environment, Govt. of Orissa.
2. The Chairman, Central Pollution Control Board, Parivesh Bhavan, CBD-cum-Office Complex, East Arjun Nagar, New Delhi, 110 032.

3. The Additional Principal Chief Conservator of Forests (C) Ministry of Env. And Forests Regional Office (EZ), A/3, Chandrasekharpur, Bhubaneswar-751023. Orissa.
4. The Chairman, Orissa Pollution Control Board, "Paribesh Bhawan, A/118, Nilakantha Nagar, Unit-VIII, Bhubaneswar-751012.
5. Guard File / Record File/Monitoring file.

(Dr. Satish C. Garkoti)
Scientist 'F'

F. No. J-11011/241/2009-IA.II (I)
 Government of India
 Ministry of Environment, Forest and Climate Change
 (Impact Assessment Division)

Indira Paryavaran Bhawan
 Jor Bagh Road, Aliganj,
 New Delhi - 110003
 E-mail: sharath.kr@gov.in
 Tel: 011-24695319

Dated: 7th July 2017

To

**M/s Rungta Mines Limited,
 Rungta House, Chaibasa – 833 201
 Jharkhand**

Subject: Integrated steel plant (1.9 MTPA), WHRB (100 MW) and AFBC (200 MW) at village Jharbandh Galpada and Tarakbeda, District Dhenkanal, Odisha by M/s Rungta Mines Limited. – Extension of validity of environmental clearance regarding.

Sir,

This has reference to your online application No. IA/OR/IND/20891/2010 dated 23.01.2017 and reply to Additional details sought on 28th June, 2017 for extension of validity of environmental clearance granted vide J-11011/241/2009-IA.II (I) dated 02.08.2010 for Integrated Steel Plant (1.9 MTPA), WHRB (100 MW) and AFBC (200 MW) at village Jharbandh Galpada and Tarakbeda, District Dhenkanal, Odisha of **M/s Rungta Mines Limited** and amended on 25.01.2011. The Project Proponent applied for extension of validity on 10.02.2015 vide letter No. NiRML/DSP/14-15/868. The matter was considered in the 37th EAC (Industry-I) meeting held during 30th April – 1st May, 2015 and informed that the EC will be valid for 7 years from the date of issue as per the provisions of SO 1141(E), Dated 29th April 2015.

2.0 Consent to Establishment was granted by State Pollution Control Board, Odisha on 04.01.2011 and amended on 21.01.2012, the validity of which has been extended till 03.01.2021 vide letter no. 13955/Ind-II-NOC-5224 dated 20.08.2015.

3.0 informed that the reasons such as fluctuation in worldwide steel market; cancellation of coal mine allotted for supplying coal to this project by the Hon'ble Supreme Court of India in 2014; uncertainty about the availability of coal required for plant operation; financial issues raised by the bankers due to non-availability of firm coal linkage; rehabilitation of villagers did not occur on time as villagers did not move from the site and same was completed in December 2016; land acquisition through IDCO for approach road is pending for approx. 0.9 km out of 3.5 km; land acquisition for 10% of the total land inside the project area is under process, likely to be completed in April 2017; etc.

4.0 The progress of the various activities of the project informed *inter alia* include 540.705 acres of private land and 59.990 acres of Government land has been acquired (approximately 90% of total plot area); balance is Government land, which is pending with Tahsildar-cum- LAO, Hindol and Tahsildar, Odapada; MECON was appointed as consultant to prepare plant layout, which has been completed; detailed engineering is being carried out by ITC, Raipur for execution; compensated 54 displaced families as per R & R policy, Govt of Orissa, through IDCO & District Administration, Dhenkanal; sponsored 102 educated

unemployed youth from the affected families for training in Industrial Training Centers for upgradation of their skills and employability; In addition, 170 candidates have successfully passed out in all Odisha Trade Test (AITT) and another 30 candidates have also been sponsored for the course period 2014-15 & 2015-16; The management is also establishing its own ITC in the locality for providing training on skill development and employability; and Rs. 83.23 crores have been incurred on the project.

5.0 The proposal was considered in the 16th EAC meeting held during 6th – 7th March 2017 and the committee desired to know the component wise schedule of completion of the project. Accordingly, PP has submitted the implementation schedule for completion of the construction activity, component wise (Bar Chart) vide PP's Lr. No. RML/DSP/MoEF/16-17/477 dated 6th March 2017. It is noted that the project will be completed by July 2020. However, the committee asked the PP to expedite the completion of the project by 31st March 2020.

6.0 After taking into consideration the aforesaid facts, the Committee recommended the extension of validity of Environmental Clearance for further period of three years.

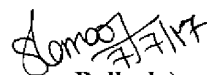
7.0 The Ministry of Environment, Forest and Climate Change has considered the application based on the recommendations of the Expert Appraisal Committee (Industry-I) and hereby decided to grant extension of validity of Environmental Clearance for further period of three years i.e. up to 31st March 2020 subject following Specific condition.

- (i) PP shall provide a time schedule for completion of all the activities related to the project within extended time limit.

8.0 All other conditions stipulated in the environmental clearance granted vide J-11011/241/2009-IA.II (I) dated 02.08.2010 shall remain the same.

9.0 The company shall obtain fresh environmental clearance in case of any change in the scope of the project.

This issues with the approval of the Competent Authority.


(Sharath Kumar Pallerla)
Scientist 'F' / Director

Copy to:

1. The Secretary, Department of Environment, Government of Odisha, Secretariat, Bhubaneswar.
2. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110032.
3. The Additional Principal Chief Conservator of Forests (C), Ministry of Environment, Forest and Climate Change, Regional Office (EZ), A/3, Chandersekharapur, Bhubaneswar – 751023.
4. The Chairman, Odisha State Pollution Control Board, Parivesh Bhawan, A/118 Nilakantha Nagar, Unit-VIII, Bhubaneshwar-751012.
5. The District Collector, Dhenkanal District, State of Odisha.
6. Guard File/Record File/Monitoring File.
7. MoEF&CC Website


(Sharath Kumar Pallerla)
Scientist 'F' / Director

80/60

F. No. J-11011/241/2009-IA-II(I)

Government of India
Ministry of Environment, Forest and Climate Change
(Impact Assessment Division)

Indira Paryavaran Bhawan
Jor Bagh Road, Aliganj,
New Delhi - 110003
E-mail: sharath.kr@gov.in
Tel: 011-24695319

Dated: 20th September, 2018

To

M/s Rungta Mines Limited,
Rungta House, Chaibasa - 833 201
Jharkhand.

Subject: Integrated steel plant (1.9 MTPA), WHRB (100 MW) and AFBC (200 MW) at village Jharbandh, Galpada and Tarakbeda, District Dhenkanal, Odisha by M/s Rungta Mines Limited - Extension of validity of environmental clearance and amendment in Environmental clearance for change in configurations.

Sir,

This has reference to online application vide proposal no. IA/OR/IND/20891/2010 dated 19th 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 Jharbandh Galpada and Tarakbeda, District Dhenkanal, Odisha.

2.0 Environmental clearance for the Integrated steel plant (1.9 MTPA), WHRB (100 MW) and AFBC (200 MW) at village Jharbandh Galpada and Tarakbeda, District Dhenkanal, Odisha was granted vide F. No. J-11011/241/2009-IA.II(I) dated 2nd August, 2010 and subsequently amended for installation of 1X300 TPD Lime Plant; 1X300 TPD Dolo Plant; 1X200 TPD Oxygen Plant; and 1X70 TPD Vacuum De-gassing Plant was granted vide F. No. J-11011/241/2009-IA.II(I) dated 25th January 2011. Extension of validity of the environmental clearance was obtained under clause (9) of EIA Notification, 2006 up to 31st March 2020 vide even letter number dated 7th 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)
Beneficiation plant	2.1	2.1	4.2
Pelletization Plant	1.2	1.2	2.4
Sponge Iron Plant	0.75 (5x500 TPD)	0.75 (5x500 TPD)	1.50
Sinter plant	0.325 (1x42 m ²)	0.325 (1x42 m ²)	0.650

Blast Furnace	0.30 (1x350 m ³)	0.30 (1x350 m ³)	0.60
Steel Melt shop	0.95	0.95	1.90
Induction furnace (IF)	0.576 (9x20 T)	0.576 (9x20 T)	1.152
Ladle Refining Furnace for IF	0.576 (1x40 T)	0.576 (1x40 T)	1.152
Electric Arc Furnace (EAF)	0.448 (1x70 T)	0.448 (1x70 T)	0.896
Ladle Refining Furnace for EAF	0.448 (1x70 T)	0.448 (1x70 T)	0.896
Billet caster, Blooms, Slab caster	0.95 (6/11 m radius)	0.95 (6/11 m radius)	1.9
Flats, Rod and Structural mill	0.95	0.95	1.9
Coal washer	2.1	2.1 M	4.2
Captive Power plant			
WHRB	50 MW (5x45 TPH)	50 MW (5x45 TPH)	100 MW
AFBC	100 MW (1x375 TPH)	100 MW (1x375 TPH)	200 MW
Coke 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 R&R issues and teething problems of 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	1x500 TPD	0.15 MTPA
2	Steel Melting Shop comprising IF along with CCM	2X 20 T	0.128 MTPA
3	Captive power plant		
	WHRB	1x45 TPH	10 MW

4.0 At the time of EC dt. 02.08.2010, an AFBC of 100 MW (1X375 TPH) was proposed based on dolochar & coal fines from DRI kiln and middlings from washery. With one DRI kiln now proposed initially, the boiler will also have to be downsized. Due to de-allocation of coal block, no washery will be established in near future and consequently no middling will be available for boiler. Therefore, the consumption of dolochar 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 25 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 sanctioned in EC dated 02.08.2010) as given below:

AFBC	Phase	As per sanctioned in EC dated 02.08.2010	Proposed change
	Ph-1	100 MW (1X375 TPH)	2 X 25 MW + 1X50 MW, all proposed to be changed to CFBC
	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 CFBC boiler, when compared to AFBC boiler. The combustion temperature is lower and the stage combustion takes place. Consequently, CFBC 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 increase 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 CFBC boiler is much higher. The un-burnt content of CFBC 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 2X25 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/hr which will remain unchanged. There will be no change in effluent treatment systems or solid waste handling systems. The ash from CFBC 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/Nm³, which will now be improved for CFBC to 30 mg/Nm³.

9.0 Certificate of compliance was obtained from Regional Office, Bhubaneswar vide letter No. 101.639/EPE/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 1st 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 Mec Consultancy Pvt. Ltd., New Delhi with permission from High Court of Delhi vide in LPA 110/2014 and CM No.2175/2014 (stay) and W.P.(C) 3665/2016

13.0 The proposal was considered in 34th EAC meeting held during 6th -7th August 2018. After detailed deliberations, the committee recommended the extended the validity of environmental clearance upto 1st August, 2020 with the revised configuration of power plant as below.

Particulars	Existing	Modified /proposed
Captive Power Plant	100 MW, AFBC	2x25MW+1x50MW, CFBC

14.0 The Ministry has considered the recommendation of the EAC and here by decided to extend the validity of environmental clearance vide letter No. F.No.J-11011/241/2009-IAII(I) dated 2nd August,2010, for further period upto 1st 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 F.No.J-11011/241/2009-IAII(I) dated 2nd 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 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.

This issues with the approval of Competent Authority.


(Sharath Kumar Pallerla)
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 (EZ), A/3, Chandersekharapur, 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 Barracks, K.G. Marg, New Delhi-110001.
7. **The District Collector**, Keonjhar District, Odisha.
8. **Guard File / Record file / Monitoring file.**
9. **MOEF&CC Website.**

[Handwritten signature]
20/11/18

(Sharath Kumar Pallerla)
Scientist 'F'/Director

F. No. IA- J-11011/309/2018-IA.II (I)
Government of India
Ministry of Environment, Forest and Climate Change
(Impact Assessment Division)

Indira Paryavaran Bhawan
Jor Bagh Road, Aliganj,
New Delhi – 110003

E-mail: sharath.kr@gov.in
Tel: 011-24695319

Dated: 10th December, 2018

To

Shri P.K.Chaturvedi,
Jt. Vice President,
M/s. Rungta Mines Limited,
Rungta House, Chaibasa,
West Singhbhum,
Jharkhand – 833201.
Tel: 06582- 256321; E-mail: environment@runtamines.com

Subject: Proposed Dhenkanal Steel Plant (2.85 MTPA Steel) of M/s. Rungta Mines Limited at villages Jharbandh, Galpada and Tarkabeda, District Dhenkanal, Odisha – Prescribing of Terms of References (ToRs) – reg.

Sir,

14 This has reference to your online application made vide proposal no. IA/OR/IND/80884/2018 dated 30/09/2018 along with the application in prescribed format (Form-I), copy of pre-feasibility report and proposed ToRs for undertaking detailed EIA study as per the EIA Notification, 2006 for the project mentioned above. The proposed project activity is listed at Sl. No. 3(a) Metallurgical industries (ferrous & nonferrous) under category 'A' of the Schedule of EIA Notification, 2006 and the proposal is appraised at the Central Level.

The proposal cited above was considered during the 1st meeting of Reconstituted Expert Appraisal Committee [REAC] (Industry-I) held on 26-28th November, 2018. The EAC proceedings of the proposal cited above is given as below.

Details submitted by the Project Proponent

2.0 M/s Rungta Mines Limited proposes to install a new manufacturing unit for 2.85 MTPA integrated Steel Plant based on DRI/IF/MBF/EAF technology.

3.0 The project was granted Environment Clearance vide Letter No. J-11011/241/2009-IA.II(I) dated 02.08.2010. The CTE has been obtained from OSPCB vide letter No. 917 dated 21.01.2012 for the proposed plant, but the company was not able to complete installation of

Plant Facilities within validity period of Environment Clearance due to fluctuation in steel market.

4.0 The proposed unit will be located at villages Jharbandh, Galpada and Tarkabeda, District Dhenkanal, Odisha.

5.0 The land required for the proposed plant is 273.07 ha., out of which 218.82 ha. is private fallow land and 27.43 ha is Government waste land. 3.156 ha Forest land is present within project area. Stage II forest clearance has been obtained from MOEF&C vide letter no. 5-ORB207/2014-BHU dated 02.07.2015. The entire land has not been acquired for the project. Out of total area, 246.249 ha (218.815 ha private and 27.434 ha Government Land) has been acquired and balance of 26.82 ha is pending with Tehisldar, Hindol. Out of the total area 90.11 ha (33%) land will be used for green belt development and plantation.

6.0 The Chandka Dampur WLS is located at a distance of 26 km from the site. No 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.

7.0 Total project cost is approx 7836.9 Crore rupees (Phase I-Rs 3888.63 Crores; Phase II-Rs. 3948.27 Crores). Proposed employment generation from proposed project will be 2600 (Phase I-1300; Phase II-1300) direct employment and 2000 indirect employment.

8.0 The targeted production capacity of the Integrated Steel Plant is 2.85 million TPA (Phase I-1.45 MTPA; Phase II-1.40 MTPA). The iron ore for the plant would be procured from company's own mine/OMC/other private mines and coking coal shall be sourced from South Africa. The ore transportation will be done through Rail/Road. The proposed capacity for different products is given below:

Sl. No.	Plant Facilities	Phase-1					Phase-2					Total Capacity
		Production Unit Description			Annual Production/ Generation		Production Unit Description			Annual Production/ Generation		Total Annual Production/ Generation
		No of Units	Unit	Unit Capacity	Unit	Annual Capacity	No of Units	Unit	Unit Capacity	Unit	Annual Capacity	
C1	C2	C3	C4	C5	C6	C7	C13	C14	C15	C16	C17	C18=C7+C12+C17
1	Sponge Iron Plant					1.001					0.546	1.547
	DR Kilns	2	TPD	500	MTPA	0.455						0.455
		2	TPD	600	MTPA	0.546	2	TPD	600	MTPA	0.55	1.092

Sl. No.	Plant Facilities	Phase-1					Phase-2					Total Capacity
		Production Unit Description			Annual Production/ Generation		Production Unit Description			Annual Production/ Generation		Total Annual Production/ Generation
		No of Units	Unit	Unit Capacity	Unit	Annual Capacity	No of Units	Unit	Unit Capacity	Unit	Annual Capacity	
C1	C2	C3	C4	C5	C6	C7	C13	C14	C15	C16	C17	C18=C7+C12+C17
2	Pelletisation Plant	1	MTPA	1.2	MTPA	1.47	1	MTPA	1.2	MTPA	1.47	2.948
3	Beneficiation Plant (Based on input)	1	MTPA	2.69	MTPA	2.7	1	MTPA	2.69	MTPA	2.7	5.4
4	Coal Washery (Based on input ROM Coal)	1	TPH	400	MTPA	2.616	1	TPH	235	MTPA	1.524	4.141
5	Mini Blast Furnace	1	CUM	600	MTPA	0.567	1	CUM	1050	MTPA	0.992	1.559
6	Sinter Plant	1	SQM	64	MTPA	0.612	1	SQM	110	MTPA	1.051	1.663
7	Coke Oven Plant	6	TPA	70000	MTPA	0.420	10	TPA	70000	MTPA	0.70	1.12
8	Steel Melting Shop				MTPA	1.232				MTPA	1.232	2.464
8.1	Steel Melting Via IF-Route				MTPA	0.539						0.539
a	Induction Furnace	7	Ton	20	MTPA	0.539						0.539
b	Ladle Furnace	4	Ton	20								0
8.2	Steel Melting via EAF-VD-AOF Route				MTPA	0.693				MTPA	1.232	1.925

Sl. No.	Plant Facilities	Phase-1					Phase-2					Total Capacity
		Production Unit Description			Annual Production/ Generation		Production Unit Description			Annual Production/ Generation		Total Annual Production/ Generation
		No of Units	Unit	Unit Capacity	Unit	Annual Capacity	No of Units	Unit	Unit Capacity	Unit	Annual Capacity	
C1	C2	C3	C4	C5	C6	C7	C13	C14	C15	C16	C17	C18=C7+C12+C17
a	Electric Arc Furnace	1	Ton	90	MTPA	0.693	1	Ton	160	MTPA	1.232	1.925
b	Ladle Furnace	1	Ton	90			1	Ton	160			0
8.3	Continuous Casting Machine				MTPA	1.207				MTPA	1.207	2.415
a	Billets/ Bloom Caster/Slab Caster	2	Strands	3	MTPA	1.207	1	Strands	3	MTPA	1.207	2.415
9	Finished Product Facilities				MTPA	1.450				MTPA	1.400	2.850
9.1	Rolling Mill (TMT/ Flat/ Round/ Wire Rod/ Structural Mill/ others)				MTPA	0.800					0.800	1.600
a	Rolling Mill-1	4	TPA	200000	MTPA	0.800	2	TPA	300,000.00	MTPA	0.600	1.400
b	Rolling Mill-2						1	TPA	200,000.00	MTPA	0.200	0.200
9.2	Strip Mill/Sheet/ Coil/ Wire & Bar Mill/Wire Rope	1	TPA	450000	MTPA	0.450	1	TPA	400,000.00	MTPA	0.400	0.8500

Sl. No.	Plant Facilities	Phase-1					Phase-2					Total Capacity
		Production Unit Description			Annual Production/ Generation		Production Unit Description			Annual Production/ Generation		Total Annual Production/ Generation
		No of Units	Unit	Unit Capacity	Unit	Annual Capacity	No of Units	Unit	Unit Capacity	Unit	Annual Capacity	
C1	C2	C3	C4	C5	C6	C7	C13	C14	C15	C16	C17	C18=C7+C12+C17
9.3	Ductile Pipe Plant	1	TPA	200000	MTPA	0.200	1	TPA	200,000.00	MTPA	0.200	0.400
10	Producer Gas Plant				Nm ³ /Ann um	240000000				Nm ³ /Ann um	240000000	480000000
	Producer Gas Plant	10	Nm ³ /Hr	3000	Nm ³ /Ann um	240000000	10	Nm ³ /Hr	3000	Nm ³ /Ann um	240000000	480000000
11	Oxygen Plant				MTPA	0.0350				MTPA	0.0630	0.0980
	Oxygen Plant	1	TPD	100	Nm ³ /Ann um	24500000	1	TPD	180.00	Nm ³ /Ann um	44100000	68600000
12	Lime Plant				MTPA	0.105				MTPA	0.1995	0.3045
	Lime Plant	1	TPD	300	TPA	105000	1	TPD	570	TPA	199500	304500
13	Cement Plant				MTPA	0.884				MTPA	0.802	1.686
	Cement Plant along with Clinker Plant	1	TPD	2600	TPA	884000	1	TPD	2300	TPD	801596	1685596
14	Captive Power Plant				MW	217.00				MW	168.00	385.00
14.1	WHRB Based CPP				MW	67.00				MW	68.00	135.00

Sl. No.	Plant Facilities	Phase-1					Phase-2					Total Capacity
		Production Unit Description			Annual Production/ Generation		Production Unit Description			Annual Production/ Generation		Total Annual Production/ Generation
		No of Units	Unit	Unit Capacity	Unit	Annual Capacity	No of Units	Unit	Unit Capacity	Unit	Annual Capacity	
C1	C2	C3	C4	C5	C6	C7	C13	C14	C15	C16	C17	C18=C7+C12+C17
a	WHRB (500 TPD DR Kiln)	2	TPH	50	MW	20.00						20.00
b	WHRB (600 TPD DR Kiln)	2	TPH	60	MW	24.00	2	TPH	60	MW	24.00	48.00
c	WHRB (MBF)	1	TPH	50	MW	11.00	1	TPH	90	MW	20.00	31.00
d	WHRB (Coke Oven)	1	TPH	60	MW	12.00	1	TPH	100	MW	24.00	36.00
14.	AFBC/CFB 2 C based CPP				MW	150.00				MW	100.00	250.00
a	AFBC/CFB C	2	TPH	125	MW	50.00						50.00
b	AFBC/CFB C	2	TPH	250	MW	100.00	2	TPH	250	MW	100.00	200.00

9.0 The Electricity load of 385 MW (Phase I- 217 MW; Phase II- 168 MW) will be procured from Captive Power Plant of the company. Company has also proposed to install 2x1500 KVA and 6x3500 KVA DG Set.

10.0 Proposed raw material and fuel requirement for project are Iron Ore (8.9 MTPA from own mines/OMC/other private mines), BF Grade Iron Ore (0.701 MTPA from own mines/OMC/other Private Mines), non-coking coal (6.39 MTPA domestic/Import) and Coking Coal (1.6 MTPA from South Africa). The requirement would be fulfilled by company's own mines/OMC/Other private mines. Fuel consumption will be mainly Coking and non-coking coal.

11.0 Water Consumption for the proposed project will be 2950 cum/hr and waste water generation will be 545.38 cum/hr. Domestic waste water will be treated Sewage treatment

plant and industrial waste water generated will be treated in Effluent Treatment Plant and reused completely.

12.0 The proponent has mentioned that there is no court case or violation under EIA Notification to the project or related activity.

13.0 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.

14.0 Name of the Consultant: M/s Min Mec Consultancy Pvt. Ltd., New Delhi with permission from High Court of Delhi vide in LPA 110/2014 and CM No.2175/2014 (stay) and W.P.(C) 3665/2016.

Observations of the Committee: -

15.0 The committee observed that the project proponent has obtained the environmental clearance in the August 2010 and got extended the validity up to 2020. However, it was informed that they may not be able to implement within the balance validity period and also would like to optimize the project configurations. Therefore, the PP has made an application for seeking the ToRs, so as to obtain the fresh environmental clearance before the expiry of the earlier EC.

Recommendations of the Committee: -

16.0 After detailed deliberations, the Committee recommended the project proposal for prescribing following specific ToRs for undertaking detailed EIA and EMP study in addition to the generic ToR enclosed at **Annexure I read with additional ToRs at Annexure-2:**

- i. Public Hearing to be conducted by the concerned State Pollution Control Board.
- ii. The issues raised during public hearing and commitment of the project proponent on the same along with time bound action plan to implement the commitment and financial allocation thereto should be clearly provided.
- iii. The project proponent should carry out social impact assessment of the project and submit the Corporate Environment Responsibility as per the Ministry's Office Memorandum vide F.No. 22-65/2017-IA.III dated 1/05/2018.
- iv. The project proponent shall clearly specify the implemented units and proposed units along with configuration and product.

17.0 The undersigned is directed to inform that the Ministry of Environment, Forest and Climate Change (MoEF&CC) after accepting the recommendation of the EAC (Industry-I), hereby decided to accord above-said specific ToRs, in addition to the standard ToRs and Sector Specific ToRs as enclosed at **Annexure I read with additional ToRs at Annexure-2** for carrying out detailed EIA/EMP for the above project.

18.0 It is requested that the draft EIA Report may be prepared in accordance with the above mentioned specific ToRs and enclosed generic ToRs and additional ToRs and thereafter further necessary action including conduct of public consultation may be taken for obtaining

Environment Clearance in accordance with the procedure prescribed under the EIA Notification, 2006 as amended.

19.0 The ToRs are valid for a period of three years from today i.e. 10.12.2018 and will expire on 9.12.2021. However, this period could be further extended by a maximum period of one year provided an application is made by the project proponent at least three months before the expiry of the validity period, together with updated Form-I, based on proper justification.

This issues with the approval of Competent Authority.


(Sharath Kumar Pallerla)
Scientist 'F'/Director

Copy to:-

1. **The Secretary**, Department of Environment, Government of Odisha, Secretariat Bhubaneswar.
2. **The Additional Principal Chief Conservator of Forests(C)**, Ministry of Environment, Forest and Climate Change, Regional Office (EZ), A/3, Chandrasekharpur, Bhubaneswar – 751023.
3. **The Chairman**, Odisha State Pollution Control Board, Parivesh Bhawan, A/118 Nilakantha Nagar, Unit-VIII, Bhubaneswar-751012.
4. **The Member Secretary**, Central Ground Water Authority, A-2, W3, Curzon Road Barracks, K.G. Marg, New Delhi-110001.
5. **The District Collector**, Dhenkanal District, State of Odisha.
6. **Guard File / Record file / Monitoring file.**
7. **MOEF&CC Website.**


(Sharath Kumar Pallerla)
Scientist 'F'/Director

ANNEXURE –I**GENERIC TERMS OF REFERENCE (ToR) IN RESPECT OF INDUSTRY SECTOR**

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. 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 electricity.
 - ix. Process description along with major equipment and machineries, process flow sheet (Quantitative) from raw material to products to be provided
 - x. Hazard identification and details of proposed safety systems.
 - xi. Expansion/modernization proposals:
 - a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MoEF&CC/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment, Forest and Climate Change 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 /existing operation of the project from SPCB/PCC 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 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. Co-ordinates (lat-long) of all four corners of the site.
- iv. Google map-Earth downloaded of the project site.
- v. 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.
- vi. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.
- vii. 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)
- viii. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area
- ix. Geological features and Geo-hydrological status of the study area shall be included.
- x. 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)
- 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.
- xii. 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. 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*).
- 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, PM_{2.5}, SO₂, NO_x, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the predominant 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 (60m upstream and downstream) 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.
- 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.

7. Impact Assessment 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 well 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, if the effluent is proposed to be discharged in to the local drain, then Water Quality Modelling study should be conducted

- for the drain water taking into consideration the upstream and downstream quality of water of the drain.
- 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 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.
 - 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.
 - 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. 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,
- 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 analysed data of abovementioned parameters as per age, sex, duration of exposure and department wise.

- iii. Annual report of health status of workers with special reference to Occupational Health and Safety.
- iv. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers.

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. Corporate Environment Responsibility (CER)

- 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 1st 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 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 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 ToRs.
14. The ToRs prescribed shall be valid for a period of three years for submission of the EIA-EMP reports along with Public Hearing Proceedings (wherever stipulated).

The following general points shall be noted:

- i. All documents shall be properly indexed, page numbered.
- ii. Period/date of data collection shall be clearly indicated.
- iii. Authenticated English translation of all material in Regional languages shall be provided.
- iv. The letter/application for environmental clearance shall quote the MOEF&CC file No. and also attach a copy of the letter.
- v. The copy of the letter received from the Ministry shall be also attached as an annexure to the final EIA-EMP Report.
- vi. The index of the final EIA-EMP report must indicate the specific chapter and page no. of the EIA-EMP Report
- vii. 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 shall also be followed.
- viii. The consultants involved in the preparation of EIA-EMP report after accreditation with Quality Council of India (QCI)/National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA-EMP reports prepared by them and data provided by other organization/Laboratories including their status of approvals etc. Name of the Consultant and the Accreditation details shall be posted on the EIA-EMP Report as well as on the cover of the Hard Copy of the Presentation material for EC presentation.
- ix. ToRs' prescribed by the Expert Appraisal Committee (Industry) shall be considered for preparation of EIA-EMP report for the project in addition to all the relevant information as per the 'Generic Structure of EIA' given in Appendix III and IIIA in the EIA Notification, 2006. Where the documents provided are in a language other than English, an English translation shall be provided. The draft EIA-EMP report shall be submitted to the State Pollution Control Board of the concerned State for conduct of Public Hearing. The SPCB shall conduct the Public Hearing/public consultation, district-wise, as per the provisions of EIA notification, 2006. The Public Hearing shall be chaired by an Officer not below the rank of Additional District Magistrate. The issues raised in the Public Hearing and during the consultation process and the commitments made by the project proponent on the same shall be included separately in EIA-EMP Report in a separate chapter and summarised in a tabular chart with financial budget (capital and revenue) along with time-schedule of implementation for complying with the commitments made. The final EIA report shall be submitted to the Ministry for obtaining environmental clearance.

ANNEXURE-2**ADDITIONAL ToRS 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. PM (PM₁₀ and P_{2.5}) present in the ambient air must be analysed for source analysis – natural dust/RSPM generated from plant operations (trace elements) of PM₁₀ to be carried over.
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.
11. Trace metals Mercury, arsenic and fluoride emissions in the raw material.
12. Trace metals in waste material especially slag.
13. Trace metals in water
14. Details of proposed layout clearly demarcating various units within the plant.
15. Complete process flow diagram describing each unit, its processes and operations, along with material and energy inputs and outputs (material and energy balance).
16. Details on design and manufacturing process for all the units.
17. Details on environmentally sound technologies for recycling of hazardous materials, as per CPCB Guidelines, may be mentioned in case of handling scrap and other recycled materials.
18. Details on requirement of energy and water along with its source and authorization from the concerned department. Location of water intake and outfall points (with coordinates).
19. Details on toxic metal content in the waste material and its composition and end use (particularly of slag).
20. Details on toxic content (TCLP), composition and end use of slag.

Executive Summary

Executive summary of the report in about 8-10 pages incorporating the following:

- i. Project name and location (Village, Dist, State, Industrial Estate (if applicable))
- ii. Products and capacities. If expansion proposal, then existing products with capacities and reference to earlier EC.
- iii. Requirement of land, raw material, water, power, fuel, with source of supply (Quantitative)
- iv. Process description in brief, specifically indicating the gaseousemission, liquid effluent and solid and hazardous wastes. Materials balance shall be presented.
- v. Measures for mitigating the impact on the environment and mode of discharge or disposal.
- vi. Capitalcost of the project, estimated time of completion
- vii. Site selected for the project – Nature of land – Agricultural (single/double crop), barren, Govt/private land, status of is acquisition, nearby (in 2-3 km.) water body, population, with in 10km other industries, forest, eco-sensitive zones, accessibility, (note – in case of industrial estate this information may not be necessary)
- viii. Baseline environmental data – air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population
- ix. Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.
- x. Likely impact of the project on air, water, land, flora-fauna and nearby population
- xi. Emergency preparedness plan in case of natural or in plant emergencies
- xii. Issues raised during public hearing (if applicable) and response given
- xiii. CSR plan with proposed expenditure.
- xiv. Occupational Health Measures
- xv. Post project monitoring plan



Government of India/ भारत सरकार
Ministry of Environment, Forests & Climate Change/ पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
Eastern Regional Office/ पूर्वी क्षेत्रीय कार्यालय
A/3, Chandrasekharpur/ ए/३, चंद्रशेखरपुर
Bhubaneswar-751 023/ भुवनेश्वर - ७५१ ०२३



ଉପରୋକ୍ତ ଶ୍ରୀମତୀ ।
କର୍ମ ଶ୍ରୀ ଉପାସନା ।

Telephone : 0674-2301213, 2301248, 2302452, 2302453, Fax: 0674- 2302432, E-mail: roe2.bse-mef@nic.in

No.5-ORB207/2014-BHU

2nd July, 2015

To

The Principal Secretary,
Forest & Environment Deptt.,
Govt. of Odisha,
Bhubaneswar.

Sub:- Diversion of 3.156 ha of Revenue forest land for construction of Integrated Steel Plant and Captive Power Plant at village Jharbandh, Tarkabeda under Hindol Tehsil in Dhenkanal Forest Division of Dhenkanal district, Odisha by M/s Rungta Mines Ltd.

Sir,

I am directed to refer to State Govt. letter No. 10F(Cons)114/2014-8907/F&E dated 14.05.2014 and No.9016/F&E dated 15.05.2015, wherein prior approval of the Ministry of Environment, Forests & Climate Change for diversion of 3.156 ha of Revenue forest land for construction of Integrated Steel Plant and Captive Power Plant at village Jharbandh, Tarkabeda under Hindol Tehsil in Dhenkanal Forest Division of Dhenkanal district, Odisha by M/s Rungta Mines Ltd., was sought in accordance with Section-2 of the Forest (Conservation) Act, 1980. After due consideration of the proposal by the Ministry of Environment, Forests & Climate Change, the in-principle approval for diversion of the said forest land was accorded by Ministry vide this office letter of even number dated 26.05.2014, subject to fulfillment of certain conditions. The State Government has furnished compliance report in respect of the conditions stipulated in the in-principle approval and has requested to grant final approval of the proposal.

2. In this connection, I am directed to say that on the basis of the compliance report furnished by the State Government of Odisha vide their letter No. 10F(Cons) 114/2014-9304/F&E dated 01.06.2015 and OSD, Ad-hoc CAMPA, New Delhi letter No.1-26/2013-CAMPA dated 09.06.2015, approval of the Ministry of Environment, Forests & Climate Change is hereby granted under Section 2 of the Forest (Conservation) Act, 1980 for diversion of 3.156 ha of Revenue forest land for construction of Integrated Steel Plant and Captive Power Plant at village Jharbandh, Tarkabeda under Hindol Tehsil in Dhenkanal Forest Division of Dhenkanal district, Odisha by M/s Rungta Mines Ltd., subject to the fulfillment of the following conditions:-

- (i) The legal status of the diverted forest land shall remain unchanged.
- (ii) Compensatory Afforestation shall be raised and maintained for 10 years over 3.156 ha of non-forest land identified in Plot No.653/1075, Khata No.128 of village Gurujang under Hindol Tehsil of Dhenkanal district at the cost of user agency by State Forest Department.
- (iii) The non-forest land which has been transferred and mutated in favour of the State Forest Department for the purpose of compensatory afforestation shall be notified by the State Govt. as RF under Section 4 or PF under Section 29 of Indian Forest Act, 1927 or under the relevant section of the local Forest Act. The Nodal Officer shall report compliance within a period of six months and send a copy of the original notification declaring the non-forest land as RF under section 4 or as PF section 29 of India Forest Act, 1927, or under the relevant section of the local Forest Act as the case may, to this office for information and record.

- (iv) Additional amount of NPV of the diverted forest land, if any, becoming due after finalization of the same by the Hon'ble Supreme Court of India, shall be charged by State Govt. from the user agency. An undertaking from the user agency shall be obtained in this regard.
- (v) The boundary of the diverted forest land shall be demarcated on the ground at the project cost, by erecting four feet high reinforced cement concrete pillars, each inscribed with its serial number, DGPS coordinates, forward and back bearing and distance from adjoining pillars etc. Each pillar should be clearly visible from pillars on both sides.
- (vi) The user agency shall implement the scheme prepared for utilizing 92.724 ha land within the project for development of Green Belt in consultation with Forest Department at the project cost.
- (vii) The user agency shall take all measures to prevent pollution by effluent, particulate matters etc. at project cost.
- (viii) The user agency shall implement the R & R Plan as per the R & R Policy of State Govt. in consonance with National R&R Policy, Govt. of India before the commencement of the project work and implementation. The said R & R Plan will be monitored by the State Govt./Regional Office of MoEF along with indicators for monitoring and expected observable milestones.
- (ix) The user agency shall ensure that ash produced due to the unit shall not pollute the air and water of the nearby areas for which, green belt shall be maintained around the proposed unit and necessary plantation in the nearby villages/habitation should be carried out in consultation with the local people. The user agency shall also utilize the ash generated by supplying for construction of road project within the 100 Km radius and also facilitate supply of ash to brick industries as per fly ash notification as amended in 2003 No.S.O.979 dated 27th August, 2003 as per the feasibility.
- (x) The user agency shall implement the mitigative scheme to control pollution of Brahmani River, ensuring zero water discharge to the nearby natural water bodies, streams and river Brahman. The user agency shall also install incinerators, STP in the township area along with their maintenance including regular cleaning of storm water drain at the project cost, carrying out other environmental/forest conservation activities and awareness programmes.
- (xi) The site specific wildlife conservation plan shall be implemented to protect, conserve the wildlife and elephant depredation in the nearby area with the approval of CWLW, Odisha at project cost.
- (xii) No labour camp shall be established on the forest land.
- (xiii) The user agency shall provide fire wood, preferably alternate fuel, to the labourers working at the site to avoid damage/felling trees.
- (xiv) The user agency shall ensure that there shall be no damage caused to the wildlife in the surrounding area of this project.



- (xv) No additional or new path will be constructed inside forest area for any activity related to the project work.
- (xvi) The forest land shall not be used for any purpose other than that specified in the proposal.
- (xvii) The forest land proposed to be diverted shall under no circumstances be transferred to any other agency, department or person without prior approval of the Ministry of Environment, Forests & Climate Change.
- (xviii) The layout plan of the proposed forest land shall not be changed without the prior approval of Ministry of Environment, Forests & Climate Change.
- (xix) The user agency shall submit annual self monitoring report on compliance of stipulated conditions to the Nodal Officer (FCA) of the State and Eastern Regional Office of this Ministry.
- (xx) Any other conditions that the Ministry of Environment, Forests & Climate Change may stipulate from time to time, in the interest of conservation, protection and development of forests and wildlife, shall be complied by the user agency.
- (xxi) The user agency and the State Government shall ensure compliance to provisions of the all Acts, Rules, Regulations and Guidelines, for the time being in force, as applicable to the project.
- (xxii) In case of non-compliance of any of the above conditions, the State Govt. shall report to this office as per procedure laid down in the clause 1.9 of guidelines issued under Forest (Conservation) Act, 1980.

3. As has been mentioned at Para-2 of the Stage-II approval, this approval for diversion of forest land is subject to the fulfillment of stipulated conditions mentioned in this approval letter. Therefore, in the event of non-compliance of any of the conditions laid out in this approval letter, the Eastern Regional Office of MoEFCC may withdraw the said approval for diversion of the forest land and stop the non-forest activity being carried out in the forest land besides initiating the legal action as per provisions of Forest (Conservation) Act, 1980.

Yours faithfully,

(S. Mohapatra)
Conservator of Forests (Central)

Copy to:-

1. The Inspector General of Forests (FC), Ministry of Environment, Forests & Climate Change, Indira Paryavaran Bhawan, Agni Block, Aliganj, Jor Bagh Road, New Delhi – 110 003.
2. The Director, ROHQ, Ministry of Environment, Forests & Climate Change, Indira Paryavaran Bhawan, Agni Block, Aliganj, Jor Bagh Road, New Delhi – 110 003.
3. The Principal Chief Conservator of Forests, Forest Department, Govt. of Odisha, Aranya Bhawan, Chandrasekharpur, Bhubaneswar.
4. The Addl. PCCF & Nodal Officer (FC), Forest Department, Govt. of Odisha, Aranya Bhawan, Chandrasekharpur, Bhubaneswar.
5. The Divisional Forest Officer, Dhenkanal Forest Division, Dhenkanal, Odisha.
- ✓ 6. Dr. Saran Kumar Sahoo, Senior General Manager (CA) M/s Rungta Mines Ltd., Plot No.52, Saheed Nagar, Bhubaneswar, Odisha.
7. Guard file.


Conservator of Forests (Central)

21/3/15

BY SPEED POST

No. J-11015/96/2012-IA.II (M)
Government of India
Ministry of Environment, Forests & Climate Change
Impact Assessment Division

3rd Floor, Vayu Wing,
 Indira Paryavaran Bhawan,
 Jorbagh Road, Aliganj,
 New Delhi-110 003
 Tele: 011-24695304
 E-mail: sridhar-mef@nic.in
 Dated: the 13th March, 2015

To,

✓ **M/s Rungta Mines Limited,**
 Main Road, Barbil
 Distt-Keonjhar
 Odisha-758035
 Email: rungta_bbl@yahoo.co.in
 Fax: 06767-276161

Subject: Jajang Iron and Manganese Mine of M/s Rungta Mines Limited located at Village Jajang, Joribahal, Palsa (Ka) and Bandhubeda, District Keonjhar, Orissa (666.15 ha). Production of Iron Ore from 5.5 million TPA to 16.5 million TPA (total handling including dry processing) and Installation of Wet Beneficiation Plant of 6.0 Million TPA capacity- Environmental Clearance regarding

Sir,

This has reference to your letter No. RM/ED/ENV/2011-12/5659 dated 20.03.2012 on the subject mentioned above and subsequent letters dated 09.07.2012, 22.06.2012, 24.01.2014, 12.03.2014 and 09.09.2014. The proposal was considered by the Expert Appraisal Committee in its meeting held on 20 June, 2012 to determine the Terms of Reference (TOR) for undertaking detailed EIA study. The TORs were issued by MoEF vide letter J-11015/96/2012-IA-II(M), dated 23.07.2012. The proposal was considered in the EAC in the meeting held during March 20-21, 2014 wherein the Committee recommended the proposal for environmental clearance.

2. The proposal is for enhancement of production of Iron ore from 5.5 MTPA to 16.5 MTPA (12.8MTPA ROM by fresh excavation + 3.7 MTPA by collection from old dumps/material stacks), installation of Wet Beneficiation Plant of 6 MTPA throughput and pelletisation plant of 2.4 MTPA capacity over an area of 666.15 ha in Jajang, Bandhuabeda, Palsa (ka) and Joribahal villages of District Keonjhar. The proposal of pelletisation plant of 2.4 MTPA capacity has been withdrawn by the PP. The Latitude and Longitude of the site is 21°54'43.70"N to 21°56'33.50"N and 85°24'49.68"E to 85°26'50.70"E.

3. The Environmental Clearance for the mine was earlier granted by Ministry of Environment and Forests, Govt. of India vide letter no. J-11015/136/2005-IA-II(M) dated 14.06.2005 for production of 5.5 million TPA of Iron Ore. The Certified Compliance Report by MoEF Regional Office, Bhubaneswar, submitted vide letter no. 101-187/05/EPE dated 18.03.2013 was also discussed during the meeting.

4. The scheme of mining for proposed expansion has been approved by IBM; vide letter No. 314(3)/2011/MCCM (CZ)/MS-49 dated 27.03.2012 for the period 2012-13 to 2016-17. The lease area of 666.150 ha consists of 67.965 ha of Khesra forest land 417.62 ha DLC forest land, 180.565 ha of non-forest land. Out of 67.965 ha of KF, 44.70 ha has received Stage-II clearance and safety zone of 23.265 ha has received Stage-I clearance. Similarly out of 417.620 ha of DLC forest, 379.846 ha (including 4.629 ha safety zone) has already received Stage-I clearance on 19.03.2012. Balance 37.774 ha of DLC forest is acquired by DKB rail line.

5. The proposed method of mining operation in Iron Ore Quarry will be opencast fully mechanized with excavation of waste and ROM Iron ore by excavators. Loading will be done by loaders. ROM ore will be processed through screening and crushing Units to get sized and fines of iron ore. Large boulders of Iron Ore will be broken by using rock breakers to avoid blasting. Dozers will be used for road development and dump development. Transportation of iron ore will be mainly through two Railway sidings within the lease, partly through Railway siding outside lease area (together 80%). The balance 20% material will be transported by road.

6. Total ROM Iron ore production of the mine or already stacked low-grade Iron ore of the mine will be processed by dry screening/crushing dry/magnetic separation/wet beneficiation. Various types of dry processing Units are already under operation in the mine. It is proposed to install (4x500TPH) iron ore wet beneficiation plant after statutory clearances, for a feed capacity of 6.0 MTPA, which will provide 4.5 MTPA of saleable ore per annum. At the proposed production capacity, life of the mine is 8 years.

7. The solid waste generation will be 66,29,129 m³ and tailings 17,46,030 m³ during mining scheme period. During life of the mine, waste generation will be 68,50,599 m³ and tailings 39,68,250 m³. Existing 92,43,072 m³ waste is dumped in D1,D2,D3,D4 dumps. Out of 92,43,072 m³ of dump around 16,77,819 m³ (D1 +D2) of iron ore will be produced after processing. The balance quantity shall be dumped/stacked. Out of 66,29,129 m³ waste generated during mining scheme period 3260078 will be dumped in external dump D4, balance will be used for backfilling in Block B & C. Tailings of 17,46,030 m³ will be filter pressed & backfilled near block C, remaining will go to tailing pond. 68,50,599 m³ waste generated during life of mine will be dumped/ backfilled in Block B & C. Tailings of 39,68,250 m³ will be filter pressed & backfilled near block C, remaining will go to tailing pond. 1,42,33,930 m³ of waste & tailing shall be backfilled in an area of 225.751 ha & 12.894 ha of tailing pond will be filled by 12,00,000 m³ of tailings.

8. Total Water requirement is 14,231 m³/day. The quantity of water will be met from Surface water & Ground water. On the basis of the approval by Single Window Clearance Authority (SLSWCA), the Industrial Promotion and Investment Corporation of Orissa Limited (IPICOL) has recommended 480 m³ of surface water/hr (11,520m³/day) for the beneficiation plant which includes the water requirement for dust suppression , greenbelt development and miscellaneous work. The total makeup water requirement/ day for plant operation is

10,421m³/day for which the application is being submitted to Department of Water Resources, Govt. of Odisha for allocation of the said quantity.

9. The present working is from 617 mRL and ultimate working will be up to 467mRL. The water table (Post monsoon) is at 456 mRL. Therefore, mine working will not intersect the water table. The Baitarni river flows adjacent to the mine lease area in East direction. It was reported by PP that no Wild Life Sanctuary/Tiger Reserve/National Park/ Elephant corridor/ Schedule I species occur within 10 km of the mine lease area. For conservation of wildlife in the area, site specific conservation plan is already approved by Principal CCF (Wild Life) & Chief Wild Life Warden, Odisha. However, PP has contributed proportionate amount in preparation of regional Wild Life Management Plan. The proposed fund requirement for implementation of the Plan has already been deposited (Rs. 200 Lakhs) to DFO Keonjhar. All other works within the lease area shall be undertaken by the Company under the guidance of the Monitoring Committee and DFO and a budget of Rs. 100 lakhs has been kept by the Company for implementation of the Plan within lease area.

10. Baseline studies were carried out in October, November, and December, 2012. Public hearing was held on 17.01.2014 at Exhibition ground, near Radhakrishna temple, Jajang village of district Keonjhar, Odisha. Issues raised & the action plan with budgetary allocation is given as: Environmental protection measures (Rs 30 lacs/ annum), Educational facility (Rs.9lacs/annum), Health Care (Rs. 63.5 lacs/ annum), drinking water supply (Rs. 2 lacs/annum), peripheral development (Rs. 6.3 lacs/ annum), dust suppression (Rs. 10 lacs/annum), promotion of culture & sports (Rs. 5 lacs/ annum), support to agriculture (Rs. 5 lacs/annum).

11. The cost of the project is Rs.1400 crores and environmental cost towards EMP already incurred is Rs.1520.93 lakhs & further proposed is Rs. 698.00 lakhs. Proposed recurring cost per year is Rs. 103.08 lakhs. For Peripheral development expenditure already made is Rs. 51.24 crores and proposed recurring expenditure per year is Rs. 2.72 crores. It was informed by PP that there is no court case/litigation pending against the Project and no violation of the rule.

12. The Ministry of Environment and Forests has examined the application in accordance with the EIA Notification, 2006 and hereby accords environmental clearance under the provisions thereof to the above mentioned proposal of Jajang Iron Ore and Manganese Mine of M/s Rungta Mines Limited located at Village Jajang, Palsa (Ka), Joribahal and Bandhubeda, District Keonjhar, Odisha for production of Iron Ore from 5.5 million TPA to 16.5 million TPA (total handling including dry processing) and Installation of Wet Beneficiation Plant of 6.0 Million TPA capacity within mine lease area of 666.15 ha [67.965 ha (forest area for which FC is available) + 379.846 ha of DLC forest for which FC is available + 180.565 ha (non-forest area)] excluding 37.774 ha of forest land acquired by Railways subject to implementation of the following conditions and environmental safeguards.

A. Specific Conditions

- (i) The dump height should be maintained upto 60 meter and overall slope of the dump shall be upto 30°.

- (ii) The project proponent shall obtain Consent to Establish and Consent to Operate from the State Pollution Control Board, Odisha and effectively implement all the conditions stipulated therein.
- (iii) Environmental clearance is subject to obtaining clearance under the Wildlife (Protection) Act, 1972 from the competent authority, as may be applicable to this project.
- (iv) The project proponent shall obtain prior approval of the competent authorities for drawl of requisite quantity of surface water and ground water for the project before commencing the mining activity.
- (v) No mining activities are allowed in forest area for which the FC is not available.
- (vi) The condition 3(iii)b of the the guidelines issued by the Forest Conservation Division in this Ministry vide F. No. 11-362/2012-FC dated 1st February, 2013 is not being prescribed in view of Hon'ble Supreme Court order dated 27.01.2014 and the EC is subject to the final order of the Supreme Court in the matter.
- (vii) Traffic density on the route of mineral transportation shall be regularly monitored and report shall be submitted along with compliance report.
- (viii) As part of ambient air quality monitoring during operational phase of the project, the air samples shall also be analysed for their mineralogical composition and records maintained.
- (ix) Mineral handling plant shall be provided with adequate number of high efficiency dust extraction system. Loading and unloading areas including all the transfer points should also have efficient dust control arrangements. These should be properly maintained and operated.
- (x) Effective safeguard measures such as conditioning of ore with water, regular water sprinkling shall be carried out in critical areas prone to air pollution and having high levels of particulate matter such as around crushing and screening plant, loading and unloading point and transfer points. It should be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central Pollution Control Board in this regard.
- (xi) The project authority shall implement suitable conservation measures to augment ground water resources in the area in consultation with the Regional Director, Central Ground Water Board.
- (xii) Regular monitoring of ground water level and quality shall be carried out in and around the mine lease by establishing a network of existing wells and installing new piezo meters during the mining operation. The periodic monitoring [(at least four times in a year- pre-monsoon (April-May), monsoon (August), post-monsoon (November) and winter (January)); once in each season)] shall be carried out in consultation with the State Ground Water Board/Central Ground Water Authority and the data thus collected may be sent regularly to the Ministry of Environment and Forests and its Regional Office Bhubaneswar, the Central Ground Water Authority and the Regional Director, Central Ground Water Board. If at any stage, it is observed that the groundwater table is getting depleted due to the mining activity; necessary corrective measures shall be carried out.
- (xiii) The project proponent shall regularly monitor the flow rate of the natural water streams Jalpa, Kakrapani Nallah and Baitarni river and the Suna nadi flowing adjacent to the mine lease and maintain the records.
- (xiv) The reclaimed and rehabilitated area shall be afforested. Monitoring and management of rehabilitated areas shall continue until the vegetation

becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment & Forests and its Regional Office located at Bhubaneswar on six monthly basis.

- (xv) Dimension of the retaining wall at the toe of temporary over burden dumps and OB benches within the mine to check run-off and siltation shall be based on the rain fall data.
- (xvi) Plantation shall be raised in an specified area including a 7.5m wide green belt in the safety zone around the mining lease, backfilled and reclaimed area, around the higher benches of excavated void to be converted in to water body, roads etc. by planting the native species in consultation with the local DFO/Agriculture Department. The density of the trees should be around 2500 plants per Ha.
- (xvii) Effective safeguard measures such as regular water sprinkling shall be carried out in critical areas prone to air pollution and having high levels of SPM and RPM such as haul road, loading and unloading point and transfer points. It shall be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central Pollution Control Board in this regard.
- (xviii) Process water discharge and/or any waste water shall be properly treated to meet the prescribed standards before reuse/discharge. The runoff from temporary OB dumps and other surface run off shall be analyzed for iron and in case its concentration is found higher than the permissible limit, the waste water should be treated before discharge/reuse.
- (xix) The decanted water from the beneficiation plant and slime/tailing pond shall be re-circulated within the mine and there shall be zero discharge from the mine.
- (xx) Regular monitoring of the flow rate of the springs and perennial nallahs shall be carried out and records maintained.
- (xxi) Regular monitoring of water quality, upstream and downstream of river shall be carried out and record of monitoring data should be maintained and submitted to Ministry of Environment and Forests, its Regional Office, Bhubaneswar, Central Groundwater Authority, Regional Director, Central Ground Water Board, State Pollution Control Board and Central Pollution Control Board.
- (xxii) Suitable rainwater harvesting measures on long term basis shall be planned and implemented in consultation with Regional Director, Central Ground Water Board.
- (xxiii) Vehicular emissions shall be kept under control and regularly monitored. Measures shall be taken for maintenance of vehicles used in mining operations and in transportation of mineral from mine face to the beneficiation plant. The vehicles shall be covered with a tarpaulin and shall not be overloaded.
- (xxiv) Sewage treatment plant shall be installed for the colony. ETP shall also be provided for workshop and wastewater generated during mining operation.
- (xxv) Digital processing of the entire lease area using remote sensing technique shall be carried out regularly once in three years for monitoring land use pattern and report submitted to Ministry of Environment and Forests and its Regional Office, Bhubaneswar.
- (xxvi) Pre-placement medical examination and periodical medical examination of the workers engaged in the project shall be carried out and records maintained. For the purpose, schedule of health examination of the workers should be drawn and followed accordingly.

- (xxvii) The project proponent shall undertake all the commitments made during the public hearing and effectively address the concerns raised by the locals in the public hearing as well as during consideration of the project, while implementing the project.
- (xxviii) The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered fauna spotted in the study area. Action plan for conservation of flora and fauna shall be prepared and implemented in consultation with the State Forest and Wildlife Department. Necessary allocation of funds for implementation of the conservation plan shall be made and the funds so allocated shall be included in the project cost. All the safeguard measures brought out in the Wildlife Conservation Plan so prepared specific to the project site shall be effectively implemented. A copy of action plan shall be submitted to the Ministry of Environment and Forests and its Regional Office, Bhubaneswar.
- (xxix) A Final Mine Closure Plan along with details of Corpus Fund shall be submitted to the Ministry of Environment & Forests 5 years in advance of final mine closure for approval.

B. General Conditions

- (i) No change in Iron Ore Processing/Beneficiation technology and scope of working should be made without prior approval of the Ministry of Environment & Forests.
- (ii) No change in the calendar plan including Processing/Beneficiation of mineral iron ore and waste should be made.
- (iii) At least four ambient air quality-monitoring stations should be established in the core zone as well as in the buffer zone for RSPM (Particulate matter with size less than 10 micron i.e., PM₁₀) and NO_x monitoring. Location of the 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. The data so recorded should be regularly submitted to the Ministry including its Regional office located at Bhubaneswar and the State Pollution Control Board / Central Pollution Control Board once in six months.
- (iv) 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.
- (v) There will be zero waste water discharge from the plant.
- (vi) 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.
- (vii) Occupational health surveillance program of the workers should be undertaken periodically to observe any contractions due to exposure to dust and take corrective measures, if needed.
- (viii) A separate environmental management cell with suitable qualified personnel should be set-up under the control of a Senior Executive, who will report directly to the Head of the Organization.
- (ix) The funds earmarked for environmental protection measures should be kept in separate account and should not be diverted for other purpose. Year wise expenditure should be reported to the Ministry and its Regional Office located at Bhubaneswar.

- (x) The project authorities should inform to the Regional Office located at Bhubaneswar regarding date of financial closures and final approval of the project by the concerned authorities and the date of start of land development work.
- (xi) The Regional Office of this Ministry located at Bhubaneswar 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.
- (xii) The project proponent shall submit six monthly reports on the status of compliance of the stipulated environmental clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the Ministry of Environment and Forests, its Regional Office Bhubaneswar, the respective Zonal Office of Central Pollution Control Board and the State Pollution Control Board. The proponent shall upload the status of compliance of the 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 Ministry of Environment and Forests, Bhubaneswar, the respective Zonal Officer of Central Pollution Control Board and the State Pollution Control Board.
- (xiii) A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zila Parisad/ Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the Company by the proponent.
- (xiv) The State Pollution Control Board should display a copy of the clearance letter at the Regional office, District Industry Centre and the Collector's office/ Tehsildar's Office for 30 days.
- (xv) The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed 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 clearance conditions and shall also be sent to the respective Regional Office of the Ministry of Environment and Forests, Bhubaneswar by e-mail.
- (xvi) The project authorities should advertise at least in two local newspapers of the District or State in which the project is located and widely circulated, one of which shall be in the vernacular language of the locality concerned, within 7 days of the issue of the clearance letter informing that the project has been accorded environmental clearance and a copy of the clearance letter is available with the State Pollution Control Board and also at web site of the Ministry of Environment and Forests at <http://envfor.nic.in> and a copy of the same should be forwarded to the Regional Office of this Ministry located at Bhubaneswar.

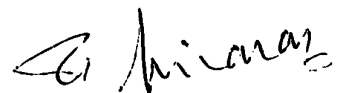
13. The Ministry or any other competent authority may alter/modify the above conditions or stipulate any further condition in the interest of environment protection.

14. 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 attract action under the provisions of Environment (Protection) Act, 1986.

15. 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 Odhisa and any other Court of Law relating to the subject matter.

16. 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 16 of the National Green Tribunal Act, 2010.



(Dr. U. Sridharan)
Scientist 'F'

Copy to:

- (i) The Secretary, Ministry of Mines, Government of India, Shastri Bhawan, New Delhi.
- (ii) The Secretary, Department of Environment, Government of Odhisa, Secretariat, Bhubaneswar.
- (iii) The Secretary, Department of Mines and Geology, Government of Odhisha, Secretariat, Bhubaneswar.
- (iv) The Secretary, Department of Forests, Government of Odhisha, Secretariat, Bhubaneswar.
- (v) The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110032.
- (vi) The Chief Conservator of Forests, Regional Office (EZ), Ministry of Environment and Forests, A-3 Chandrashekharapur, Bhubaneswar-751023.
- (vii) The Chairman, Odhisa State Pollution Control Board, Parivesh Bhawan, A/118 Nilakantha Nagar, Unit-VIII, Bhubaneswar-751012.
- (viii) The Controller General, Indian Bureau of Mines, Indira Bhavan, Civil Lines, Nagpur-440 001.
- (ix) The Member Secretary, Central Ground Water Authority, A2, W3 Curzon Road Barracks, K.G. Marg, New Delhi-110001.
- (x) The District Collector, Keonjhar District, Government of Odhisa.
- (xi) Record File.
- (xii) MoEF Website



(Dr. U. Sridharan)
Scientist 'F'

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

: A-47 :

ANNEXURE : V

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	1185.5

CLIMATOLOGICAL TABLE OF DATA RECORDED AT IMD STATION ANGUL, ORISSA
MONTH WISE MAINLY WIND DIRECTION (AT 0830 HRS)

YEAR	JAN.	FEB.	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
2009	NW	NW	SW	SE	NW	NW	SW	NW	NW	NW	NW	NW
2010	NW	NW	NW	NW	NW	NW	NW	NE	NE	SE		NW
2011	NW	NW	NW	NE	SE	NW	NE	SW	NW	NW	NW	NW

CLIMATOLOGICAL TABLE OF DATA RECORDED AT IMD STATION ANGUL, ORISSA
MONTH WISE MAINLY WIND DIRECTION (AT 1730 HRS)

YEAR	JAN.	FEB.	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
2009	NW	NW	NW	NW	SE	SW	SW	NW	SW	NW	NW	NW
2010	NE	SE	SW	SW	NE	SW	NW	NW	NE	NE		SW
2011	SE	SE	SE	SE	SE	SE	SE	SE	SW	NW	NW	SE

CLIMATOLOGICAL TABLE OF DATA RECORDED AT IMD STATION ANGUL, ORISSA
MONTH WISE MAINLY WIND SPEED (KM/HR) AT 0830 HRS

YEAR	JAN.	FEB.	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
2009	2	2	2	2	2	2	2	2	2	2	2	2
2010	2	2	2	2	2	2	2	2	2	2		2
2011	2	2	2	2	2	2	2	2	2	2	2	2

CLIMATOLOGICAL TABLE OF DATA RECORDED AT IMD STATION ANGUL, ORISSA
MONTH WISE MAINLY WIND SPEED (KM/HR) AT 1730 HRS

YEAR	JAN.	FEB.	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
2009	2	2	2	2	2	2	2	2	2	2	2	2
2010	2	2	2	2	2	2	2	2	2	2		2
2011	2	2	2	2	2	2	2	2	2	2	2	2

DAILY AVERAGE OF MICRO-METEOROLOGICAL DATA MONITORED AT DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.(1 MARCH TO 31 MAY, 2018)

DATE	CALM <1.8kmph	<----- DIRECTION WISE AVERAGE WIND SPEED (km/hr) EXCLUDING CALM ----->																TEMP. (°C)	REL HUM (%)	CLOUD (Octa)
		E	ENE	NE	NNE	N	NNW	NW	WNW	W	WSW	SW	SSW	S	SSE	SE	ESE			
01/03/2018	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.70	8.78	6.79	8.60	8.15	0.00	0.00	0.00	0.00	27.47	39.00	0.00
02/03/2018	0.73	0.00	0.00	0.00	12.70	7.95	0.00	0.00	0.00	7.80	6.00	6.85	4.95	7.75	13.20	0.00	0.00	26.87	46.00	0.00
03/03/2018	1.80	0.00	29.00	0.00	0.00	0.00	37.00	6.40	0.00	6.00	5.15	6.60	11.43	11.90	9.60	9.25	9.60	27.47	51.00	0.00
04/03/2018	0.00	6.70	0.00	0.00	0.00	5.90	8.95	10.35	13.65	0.00	8.90	6.45	4.60	0.00	9.60	14.95	7.93	27.64	53.00	0.00
05/03/2018	0.94	0.00	0.00	0.00	10.10	9.10	9.45	5.75	5.25	13.45	4.93	5.10	5.90	5.30	0.00	0.00	0.00	27.81	52.00	0.00
06/03/2018	1.20	9.40	0.00	7.20	7.90	10.60	0.00	0.00	8.05	5.90	5.90	4.97	10.10	2.70	8.20	0.00	0.00	28.62	49.00	0.00
07/03/2018	1.80	10.90	8.50	6.90	7.10	8.20	0.00	7.00	8.87	4.60	6.35	5.83	8.45	4.15	0.00	6.40	0.00	28.65	49.00	0.00
08/03/2018	1.08	0.00	0.00	11.05	0.00	8.50	7.63	11.40	3.50	7.17	7.34	6.50	0.00	0.00	3.50	0.00	0.00	28.79	45.00	0.00
09/03/2018	0.73	9.47	12.30	0.00	0.00	3.60	7.90	7.80	0.00	4.90	0.00	6.79	7.85	12.30	9.00	0.00	0.00	28.43	40.00	0.00
10/03/2018	0.63	11.25	7.85	0.00	0.00	0.00	0.00	2.30	0.00	7.10	5.50	5.00	9.76	6.60	12.30	7.10	10.00	29.08	49.00	0.00
11/03/2018	0.45	0.00	0.00	0.00	7.10	7.15	4.40	0.00	12.10	0.00	7.83	7.03	0.00	2.80	14.70	8.60	6.10	29.50	49.00	0.00
12/03/2018	0.73	11.10	5.50	0.00	0.00	6.40	0.00	4.75	8.80	12.50	9.30	5.23	2.10	8.38	12.10	6.20	5.40	29.66	54.00	0.00
13/03/2018	1.10	9.05	8.20	7.85	7.40	7.95	1.90	6.95	7.40	6.00	0.00	7.45	6.90	15.17	0.00	1.80	17.10	29.69	54.00	0.00
14/03/2018	0.35	0.00	14.80	0.00	0.00	10.35	12.55	15.20	2.60	6.97	5.64	14.60	4.50	7.30	4.60	6.80	0.00	29.67	50.00	0.00
15/03/2018	1.45	8.80	11.40	9.90	10.25	9.50	0.00	0.00	0.00	7.50	1.80	11.60	11.78	11.90	0.00	3.10	6.90	30.16	38.00	0.00
16/03/2018	1.60	6.50	4.15	0.00	11.05	0.00	9.70	6.05	1.80	12.90	10.10	4.10	8.90	14.10	13.30	7.00	4.40	31.08	40.00	0.00
17/03/2018	0.83	4.30	5.55	0.00	17.70	0.00	0.00	0.00	6.30	9.50	3.20	7.85	8.30	9.45	8.30	6.60	7.25	30.48	53.00	0.00
18/03/2018	0.00	21.80	0.00	7.00	13.27	11.90	10.50	0.00	14.30	0.00	0.00	9.90	0.00	0.00	13.40	13.25	20.88	28.74	57.00	0.00
19/03/2018	0.55	6.20	5.90	0.00	0.00	0.00	19.60	24.70	14.95	4.90	2.55	14.70	11.30	13.70	7.40	11.00	6.80	27.55	44.00	0.00
20/03/2018	0.83	4.00	0.00	6.60	0.00	0.00	8.00	7.10	11.75	13.10	4.55	11.98	6.35	10.80	9.40	0.00	0.00	32.11	46.00	0.00
21/03/2018	0.00	0.00	0.00	0.00	0.00	16.90	0.00	8.17	4.30	5.15	31.20	12.40	16.60	9.80	7.20	9.20	0.00	33.12	48.00	0.00
22/03/2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.25	12.45	9.30	9.98	9.80	13.26	10.97	0.00	9.40	33.05	47.00	0.00
23/03/2018	0.73	7.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.60	8.23	6.50	25.70	8.57	11.55	8.47	31.30	57.00	0.00
24/03/2018	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.88	5.15	14.95	15.12	8.65	13.87	0.00	30.15	65.00	0.00
25/03/2018	0.78	20.60	10.65	0.00	15.90	0.00	0.00	9.20	11.25	12.90	0.00	9.65	0.00	0.00	5.70	3.70	8.70	28.80	70.00	0.00
26/03/2018	1.36	6.50	5.60	0.00	0.00	0.00	0.00	0.00	0.00	4.90	0.00	2.17	13.60	7.18	6.38	9.55	5.70	28.74	64.00	0.00
27/03/2018	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.60	4.30	8.30	7.44	6.40	8.30	3.10	7.10	29.50	62.00	0.00
28/03/2018	1.15	7.90	10.10	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.75	1.80	11.00	11.02	0.00	15.50	10.84	30.05	63.00	0.00
29/03/2018	0.90	9.35	4.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.20	9.43	10.85	9.24	10.42	7.80	31.12	58.00	0.00
30/03/2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	3.80	0.00	10.20	6.25	8.48	11.70	6.30	6.51	31.69	55.00	0.00
31/03/2018	1.53	0.00	0.00	0.00	0.00	0.00	0.00	10.55	12.88	6.70	6.97	5.85	0.00	13.70	13.75	0.00	0.00	32.11	45.00	0.00
01/04/2018	0.00	0.00	0.00	0.00	4.70	12.40	12.23	0.00	11.73	10.30	0.00	9.57	9.35	8.73	8.40	6.90	0.00	32.29	48.00	0.00
02/04/2018	0.90	5.80	0.00	4.70	6.40	0.00	5.30	12.20	9.00	6.45	0.00	7.40	9.70	10.60	11.75	6.30	12.80	32.18	47.00	0.00
03/04/2018	0.70	7.00	0.00	0.00	0.00	9.30	12.10	12.85	17.40	9.40	8.32	7.60	0.00	0.00	0.00	0.00	0.00	32.11	37.00	0.00
04/04/2018	0.92	0.00	0.00	9.80	0.00	0.00	0.00	0.00	3.45	4.90	8.28	9.14	6.40	0.00	0.00	3.65	0.00	31.94	38.00	0.00
05/04/2018	0.87	11.40	8.50	13.80	0.00	0.00	4.50	5.70	5.70	0.00	8.60	4.00	6.87	6.00	11.85	10.85	0.00	32.00	48.00	0.00
06/04/2018	1.06	6.40	0.00	0.00	0.00	0.00	12.50	8.35	0.00	0.00	0.00	7.20	14.20	15.60	9.58	7.25	0.00	31.27	35.00	0.00
07/04/2018	1.20	3.90	0.00	0.00	0.00	0.00	3.00	0.00	9.43	16.95	5.16	7.35	4.55	5.93	11.40	0.00	0.00	31.60	47.00	0.00
08/04/2018	0.90	0.00	0.00	0.00	0.00	0.00	21.50	13.90	17.30	25.60	12.70	13.20	0.00	0.00	0.00	0.00	0.00	28.64	62.00	0.00
09/04/2018	1.10	6.60	6.70	9.10	0.00	0.00	19.00	10.17	11.37	6.15	11.00	8.05	8.17	0.00	0.00	0.00	6.40	31.68	51.00	0.00
10/04/2018	0.83	2.70	8.50	0.00	0.00	9.90	8.40	10.15	10.25	14.00	7.60	6.72	13.70	9.30	9.95	0.00	0.00	31.78	47.00	0.00
11/04/2018	0.60	0.00	0.00	8.40	11.90	0.00	8.60	8.70	8.05	10.17	7.20	11.07	16.90	9.83	0.00	14.00	0.00	30.74	50.00	0.00
12/04/2018	0.00	0.00	0.00	0.00	0.00	11.10	0.00	8.13	6.80	5.90	34.50	14.00	16.60	10.50	7.50	3.90	10.20	33.18	48.00	0.00
13/04/2018	0.23	0.00	0.00	0.00	0.00	10.60	0.00	8.13	0.00	6.70	0.00	18.63	15.62	8.10	6.00	8.50	0.00	33.15	48.00	0.00
14/04/2018	0.00	0.00	6.70	8.50	10.20	16.00	0.00	0.00	0.00	0.00	35.20	13.70	16.03	10.00	11.90	0.00	7.50	31.87	49.00	0.00
15/04/2018	1.40	0.00	0.00	0.00	8.20	9.60	12.13	7.55	14.10	10.50	8.60	9.98	10.43	0.00	0.00	0.00	15.80	31.55	51.00	0.00

DAILY AVERAGE OF MICRO-METEOROLOGICAL DATA MONITORED AT DHENKANAL STEEL PLANT OF RUNGTA MINES LTD.(1 MARCH TO 31 MAY, 2018)

DATE	CALM <1.8kmph	DIRECTION WISE AVERAGE WIND SPEED (km/hr) EXCLUDING CALM															TEMP. (°C)	REL HUM (%)	CLOUD (Octa)
		E	ENE	NE	NNE	N	NNW	NW	WNW	W	WSW	SW	SSW	S	SSE	SE	ESE		
16/04/2018	1.25	0.00	0.00	0.00	0.00	11.20	15.35	25.90	11.08	0.00	9.65	4.20	0.00	0.00	0.00	0.00	0.00	31.32	40.00
17/04/2018	0.93	0.00	0.00	0.00	0.00	9.95	15.94	19.45	8.40	5.30	12.65	7.37	0.00	8.50	0.00	0.00	0.00	30.95	37.00
18/04/2018	1.40	0.00	0.00	13.40	13.10	11.67	12.73	6.45	0.00	5.73	9.45	7.93	0.00	0.00	5.60	0.00	0.00	30.89	35.00
19/04/2018	0.00	0.00	7.70	12.40	0.00	0.00	8.90	7.57	8.77	0.00	5.10	3.50	9.40	10.00	6.18	0.00	10.30	31.13	40.00
20/04/2018	0.88	0.00	0.00	0.00	0.00	7.30	10.90	8.05	8.10	7.40	10.70	7.95	10.70	13.50	0.00	0.00	0.00	31.53	42.00
21/04/2018	0.40	0.00	0.00	7.40	7.80	0.00	0.00	10.25	9.00	9.50	7.50	9.47	6.60	11.63	15.35	7.65	8.50	32.17	47.00
22/04/2018	1.10	4.70	0.00	0.00	6.80	7.40	0.00	0.00	0.00	12.12	6.40	8.30	10.66	0.00	10.33	9.45	0.00	33.03	50.00
23/04/2018	0.55	7.10	5.50	0.00	0.00	0.00	18.80	19.30	10.82	4.50	10.20	5.50	6.55	7.50	8.85	10.00	5.80	34.13	44.00
24/04/2018	0.55	4.30	0.00	7.50	0.00	0.00	10.20	8.40	11.25	16.90	4.90	11.28	3.35	11.15	10.45	0.00	0.00	34.16	46.00
25/04/2018	0.58	0.00	0.00	0.00	0.00	11.80	0.00	7.00	0.00	5.00	33.30	18.40	15.40	11.05	5.60	10.15	0.00	33.25	48.00
26/04/2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.50	15.25	13.63	12.29	10.10	10.30	7.30	33.18	50.00
27/04/2018	0.00	0.00	0.00	0.00	0.00	0.00	28.30	0.00	16.07	0.00	20.00	17.35	9.16	16.54	14.63	13.75	0.00	32.35	50.00
28/04/2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	18.40	2.10	19.00	11.73	12.66	12.63	9.20	0.00	32.56	48.00
29/04/2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.80	0.00	11.23	15.22	6.05	13.65	20.57	0.00	0.00	32.65	49.00
30/04/2018	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.17	4.28	18.18	21.40	1.80	14.35	15.38	0.00	0.00	32.67	48.00
01/05/2018	0.00	20.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.40	12.33	23.50	13.53	10.60	9.60	15.28	20.75	33.02	48.00
02/05/2018	0.00	11.34	10.70	0.00	24.50	0.00	0.00	16.20	16.10	13.63	18.43	17.30	12.90	0.00	15.00	0.00	8.88	32.48	52.00
03/05/2018	1.80	0.00	0.00	21.70	21.40	7.00	0.00	6.00	0.00	6.00	20.10	23.50	17.63	11.20	21.20	0.00	0.00	32.31	48.00
04/05/2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.30	18.10	0.00	11.75	11.75	10.55	9.65	7.15	0.00	33.11	49.00
05/05/2018	1.80	4.20	0.00	0.00	4.25	13.50	0.00	0.00	13.50	7.63	13.46	7.70	13.45	15.50	7.75	0.00	2.50	32.35	43.00
06/05/2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.70	16.48	16.75	14.47	9.37	13.86	0.00	0.00	32.86	38.00
07/05/2018	0.90	0.00	0.00	0.00	0.00	0.00	21.90	0.00	28.35	0.00	0.00	15.30	13.90	23.94	12.22	16.40	0.00	33.15	47.00
08/05/2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.70	11.13	8.80	11.60	10.63	13.48	20.73	16.37	0.00	33.04	54.00
09/05/2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.30	11.35	14.74	10.90	12.25	10.15	12.63	0.00	0.00	32.35	52.00
10/05/2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.95	9.38	16.44	21.03	11.40	19.37	13.15	9.20	0.00	32.32	53.00
11/05/2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.90	0.00	17.15	12.35	13.80	10.32	9.53	17.56	0.00	0.00	32.63	55.00
12/05/2018	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.60	8.83	7.25	5.30	8.35	9.18	10.95	0.00	0.00	32.98	50.00
13/05/2018	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.35	9.70	8.90	0.00	6.75	3.50	3.13	2.85	0.00	32.71	54.00
14/05/2018	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.20	4.90	9.27	12.60	4.17	6.30	5.57	0.00	0.00	32.72	50.00
15/05/2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.70	11.34	11.03	8.65	5.28	5.15	0.00	0.00	33.01	64.00
16/05/2018	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.40	9.07	5.52	5.55	8.80	4.63	2.20	0.00	33.30	69.00
17/05/2018	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.78	7.60	8.13	5.90	7.20	5.15	0.00	0.00	31.65	59.00
18/05/2018	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.60	2.70	6.30	10.20	9.20	9.70	8.90	5.40	33.50	64.00
19/05/2018	1.13	2.57	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	6.00	5.45	34.14	60.00
20/05/2018	1.17	10.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.04	6.94	8.95	34.30	54.00
21/05/2018	1.40	7.95	4.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.11	9.91	0.00	0.00	32.76	44.00
22/05/2018	1.40	0.00	2.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.50	13.05	13.60	9.17	2.48	3.40	9.30	33.03	49.00
23/05/2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.30	8.20	9.80	5.39	5.79	13.53	16.20	31.93	47.00
24/05/2018	1.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.90	5.33	9.67	13.82	32.33	39.00
25/05/2018	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.80	5.03	6.77	4.90	5.80	32.16	40.00
26/05/2018	1.19	0.00	0.00	0.00	0.00	2.15	0.00	7.20	5.13	8.90	6.83	4.55	1.80	0.00	0.00	1.80	0.00	32.15	50.00
27/05/2018	1.45	0.00	0.00	0.00	0.00	0.00	9.23	6.40	3.80	4.06	3.13	0.00	5.87	1.80	0.00	8.97	0.00	32.39	49.00
28/05/2018	0.00	9.22	5.40	0.00	0.00	16.10	10.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.45	8.17	0.00	31.84	48.00
29/05/2018	0.00	4.56	8.92	7.02	18.60	15.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.60	17.40	3.45	31.75	49.00
30/05/2018	1.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	7.17	6.51	6.40	32.95	48.00
31/05/2018	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.10	5.40	6.30	6.27	32.26	45.00

Note : The above daily averages have been arrived after processing the hourly readings monitored by automatic weather station

ANNEXURE : VII

NAME AND ADDRESS OF CUSTOMER	SAMPLE PARTICULARS
Rungta Mines Ltd. Dhenkanal Steel Plant Village – Jharbandh, PO.- Nimabahal, Via – Meramandali Dist. – Dhenkanal – 759121 Contact Person : Mr. G.P. Sharma Phone : 06582-255261	Type of Sample : Air
	Work Order No. : 4800012134
	Sampling Location : As per table given below in and near Dhenkanal Steel Plant, Odisha
	Sampling Procedure : IS 5182 (Part 2) 2001 for SO ₂ , CPCB guidelines NAAQMS 96/2012-13 for PM ₁₀ , NO ₂ , Lab SOP/09 for PM _{2.5} , instant reading CO
	Sample Duration : 24 hours
	Sampling Team : MMRDL (Manoj Kumar)
	Sample Reg. No : MMA/18S3L1, L2, L3, L4, L5, L6, L7 & L8/01-24
	Date of Sampling : 01/03/2018 to 31/05/2018
	Date of Receipt : 15/03/2018 to 03/06/2018
	Date of Report : 05/06/2018
	Test Report No. : MMA/06-18/05
	Page : 1 of 3

TEST REPORT

Sl. No.	Date of sampling	24 hourly concentrations (in µg/m ³)														
		PM ₁₀	PM _{2.5}	SO ₂	NO ₂	CO*	PM ₁₀	PM _{2.5}	SO ₂	NO ₂	CO*	PM ₁₀	PM _{2.5}	SO ₂	NO ₂	CO*
	LOCATION:	Kadala Village (BA6)					Tarkabera Village (BA5)					Shibapur Village (BA7)				
1	1- 02-03-18	61.3	35.5	6.4	17.5	500	41.9	24.5	7.8	12.6	375	70.9	40.1	14.9	20.3	750
2	4- 05-03-18	42.6	25.8	8.5	11.6	500	42.2	22.8	8.5	13.2	375	71.0	41.4	13.4	18.9	875
3	8- 09-03-18	59.3	33.7	9.9	18.3	250	45.9	24.5	9.2	10.1	250	67.4	37.2	14.2	19.6	750
4	12- 13-03-18	42.0	25.5	9.2	15.1	250	55.9	30.7	8.4	12.2	375	70.8	42.7	13.1	18.6	750
5	16- 17-03-18	44.0	25.5	8.5	16.8	250	48.6	27.7	8.4	9.4	250	70.4	39.2	14.8	20.6	750
6	20- 21-03-18	49.9	28.4	6.4	16.1	375	57.5	31.3	8.5	13.0	375	66.7	37.5	15.6	21.4	625
7	24- 25-03-18	44.9	26.0	11.2	17.1	375	45.6	25.8	9.2	12.9	375	67.4	38.0	13.5	21.1	625
8	28- 29-03-18	48.4	26.5	10.6	14.7	375	52.1	29.5	7.5	12.5	375	65.6	39.7	15.5	20.9	750
9	2- 03-04-18	51.5	30.3	8.5	14.5	125	55.6	32.9	9.1	12.4	375	65.8	37.5	15.2	19.8	750
10	5- 06-04-18	55.8	32.9	7.3	11.7	375	56.0	32.0	9.1	11.7	375	65.9	38.4	14.6	20.6	750
11	9- 10-04-18	57.0	33.7	9.1	14.5	125	39.6	22.8	8.5	11.6	250	65.4	39.2	14.6	21.3	625
12	13- 14-04-18	53.6	30.8	12.3	14.8	500	52.6	29.9	7.9	13.1	375	70.6	40.7	16.1	19.7	750
13	17- 18-04-18	43.3	25.1	6.7	11.4	500	48.2	25.8	8.5	10.6	250	65.5	37.3	13.3	21.2	625
14	20- 21-04-18	43.6	24.8	10.9	12.4	250	46.1	26.7	7.9	9.0	375	70.7	40.0	14.0	19.5	625
15	24- 25-04-18	41.2	24.3	7.9	16.7	375	50.2	28.6	9.1	10.6	375	68.8	41.6	13.3	16.9	625
16	27- 28-04-18	51.3	28.7	11.5	13.1	375	46.4	27.3	8.5	13.1	375	65.0	40.3	14.5	17.3	750
17	1- 02-05-18	50.7	30.4	10.4	13.7	375	42.8	23.8	7.8	11.5	250	68.0	38.5	13.7	19.3	875
18	4- 05-05-18	59.5	33.7	6.5	11.1	125	57.4	31.7	8.5	12.3	250	65.0	39.6	15.6	20.0	875
19	8- 09-05-18	45.3	26.3	6.3	14.4	375	48.6	27.8	7.8	10.7	250	70.4	37.5	13.6	18.1	625
20	12- 13-05-18	45.8	25.9	10.4	13.0	500	49.9	28.2	9.6	11.0	375	66.4	38.0	15.5	21.7	750
21	16- 17-05-18	51.6	29.6	7.8	11.5	500	45.8	26.7	8.5	12.6	375	64.1	36.9	15.6	20.3	750
22	20- 21-05-18	46.2	26.0	8.5	17.4	125	42.9	25.2	9.1	9.2	375	64.7	39.3	15.6	17.8	750
23	24- 25-05-18	46.5	26.8	11.7	12.3	125	44.5	25.7	7.8	11.4	375	65.1	37.2	14.9	19.1	750
24	28- 29-05-18	58.5	35.8	10.4	15.9	375	57.4	33.5	7.8	10.7	250	67.1	37.8	15.5	20.3	625
Minimum		41.2	24.3	6.3	11.1	125	39.6	22.8	7.5	9.0	250	64.1	36.9	13.1	16.9	625
Maximum		61.3	35.8	12.3	18.3	500	57.5	33.5	9.6	13.2	375	71.0	42.7	16.1	21.7	875
Average		49.7	28.8	9.0	14.4	333	48.9	27.7	8.4	11.6	333	67.4	39.0	14.6	19.8	724
98 percentile		60.5	35.7	12.1	17.9	500	57.5	33.2	9.4	13.1	375	71.0	42.2	15.9	21.6	875

NOTES:

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Test Report No. : MMA/06-18/05
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ANNEXURE : VII Contd..

Sl. No.	Date of sampling	24 hrly concentrations (in $\mu\text{g}/\text{m}^3$)														
		PM ₁₀	PM _{2.5}	SO ₂	NO ₂	CO*	PM ₁₀	PM _{2.5}	SO ₂	NO ₂	CO*	PM ₁₀	PM _{2.5}	SO ₂	NO ₂	CO*
	LOCATION:	Galpada Village (BA3)					Nr. Village Nimidha (BA1)					Mosonia Village (BA2)				
1	2- 03-03-18	56.3	30.7	10.6	14.0	250	61.5	33.4	9.9	15.1	375	65.3	37.9	13.5	18.2	625
2	5- 06-03-18	58.3	30.8	10.6	16.4	375	55.7	30.9	8.5	16.3	375	68.0	39.5	15.5	16.1	750
3	9- 10-03-18	61.9	35.7	10.6	14.8	250	61.9	36.5	9.8	14.3	500	68.6	40.0	12.8	17.5	750
4	13- 14-03-18	60.3	33.0	10.6	16.8	375	56.8	32.9	9.2	11.6	500	68.7	41.2	15.6	19.3	750
5	17- 18-03-18	62.1	37.8	9.9	14.0	500	55.0	30.8	10.6	14.0	375	67.4	39.1	12.7	17.1	875
6	21- 22-03-18	56.9	31.6	10.6	13.2	375	58.0	32.7	9.1	14.6	500	68.0	39.7	14.1	16.4	625
7	25- 26-03-18	65.8	37.8	10.6	14.4	375	62.8	36.2	9.9	16.1	375	66.2	41.0	14.9	18.2	625
8	29- 30-03-18	66.2	39.5	10.5	16.4	375	61.5	35.4	9.9	11.6	500	69.9	39.2	13.4	18.6	625
9	3- 04-04-18	65.3	36.4	9.7	16.3	375	56.3	32.4	10.3	13.7	250	66.3	39.2	14.6	18.8	750
10	6- 07-04-18	62.8	35.7	11.4	15.2	375	55.5	31.5	9.1	11.7	500	69.2	38.7	15.8	20.3	625
11	10- 11-04-18	67.0	36.6	10.9	14.5	250	60.3	33.1	10.4	15.7	375	66.3	38.0	14.6	19.5	750
12	14- 15-04-18	55.5	31.5	10.9	14.1	250	60.9	34.0	9.1	11.1	375	66.4	37.9	14.0	20.2	875
13	18- 19-04-18	58.9	34.9	10.3	13.8	500	60.3	34.7	10.3	12.4	500	65.1	37.0	14.0	20.2	750
14	21- 22-04-18	63.9	34.3	8.7	15.2	250	65.7	37.0	10.8	14.5	500	68.7	40.1	14.0	19.1	750
15	25- 26-04-18	60.3	34.2	10.3	13.8	375	61.2	32.9	9.1	12.8	500	68.2	40.8	15.1	20.1	750
16	28- 29-04-18	55.3	33.7	9.7	13.8	500	56.8	33.7	8.1	13.7	250	66.1	38.1	14.0	20.3	875
17	2- 03-05-18	66.8	36.6	10.4	16.3	375	58.9	32.8	10.3	15.8	250	65.9	38.2	14.2	19.2	750
18	5- 06-05-18	56.6	32.8	9.7	15.9	250	58.7	33.1	9.1	11.4	375	66.5	39.4	15.5	15.1	625
19	9- 10-05-18	57.9	32.9	11.1	11.8	375	58.8	34.6	9.7	12.2	375	69.3	38.7	14.9	17.4	750
20	13- 14-05-18	56.6	33.0	11.1	16.3	375	57.6	31.3	10.4	13.7	375	69.1	41.0	14.9	18.4	750
21	17- 18-05-18	58.7	31.6	11.0	12.6	500	60.5	34.6	9.1	11.9	375	70.1	41.3	12.1	19.9	875
22	21- 22-05-18	61.2	33.0	9.8	14.1	375	57.0	33.3	10.4	12.2	500	69.9	41.1	13.6	17.7	750
23	25- 26-05-18	59.8	33.8	9.1	17.2	375	54.5	32.0	9.7	13.3	250	67.3	39.0	13.6	18.4	750
24	29- 30-05-18	67.5	36.8	10.4	13.3	500	63.9	36.7	8.4	11.8	375	66.3	40.2	12.4	15.6	875
Minimum		55.3	30.7	8.7	11.8	250	54.5	30.8	8.1	11.1	250	65.1	37.0	12.1	15.1	625
Maximum		67.5	39.5	11.4	17.2	500	65.7	37.0	10.8	16.3	500	70.1	41.3	15.8	20.3	875
Average		60.9	34.4	10.4	14.8	370	59.2	33.6	9.6	13.4	401	67.6	39.4	14.2	18.4	745
98 percentile		67.3	38.7	11.3	17.0	500	64.9	36.9	10.7	16.2	500	70.0	41.3	15.7	20.3	875

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Test Report No. : MMA/06-18/05
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ANNEXURE : VII Contd..

Sl. No.	Date of sampling	24 hrly concentrations (in $\mu\text{g}/\text{m}^3$)									
		PM ₁₀	PM _{2.5}	SO ₂	NO ₂	CO*	PM ₁₀	PM _{2.5}	SO ₂	NO ₂	CO*
	LOCATION:	Core Zone (CA1)					Nimabahali Village (BA4)				
1	3- 04-03-18	69.2	39.1	12.8	12.5	375	63.2	34.2	12.7	17.5	500
2	6- 07-03-18	69.0	39.6	12.7	16.4	625	65.5	39.0	11.3	17.8	500
3	10- 11-03-18	65.4	36.4	9.9	13.7	500	65.7	36.9	12.8	15.1	625
4	14- 15-03-18	65.9	37.1	11.3	17.9	375	65.9	36.0	12.1	18.6	625
5	18- 19-03-18	69.8	39.3	12.1	16.9	500	67.6	38.0	11.3	18.1	500
6	22- 23-03-18	69.3	38.5	11.3	15.0	500	60.9	33.1	11.3	19.3	625
7	26- 27-03-18	65.5	39.3	11.3	14.4	500	59.0	33.9	11.4	17.6	625
8	30- 31-03-18	70.2	38.7	10.6	17.6	375	58.2	33.8	12.7	20.7	500
9	4- 05-04-18	66.7	39.5	10.3	15.6	500	68.0	38.9	12.2	19.2	625
10	7- 08-04-18	70.1	41.5	12.1	16.2	625	64.7	35.5	11.6	17.4	625
11	11- 12-04-18	65.3	39.3	10.9	13.8	500	65.8	36.3	13.4	19.2	625
12	15- 16-04-18	69.3	40.8	12.2	16.0	500	57.7	33.5	13.9	15.5	500
13	19- 20-04-18	69.8	40.3	10.9	18.1	625	60.4	32.8	11.5	17.0	625
14	22- 23-04-18	70.0	37.3	12.1	15.5	625	63.8	36.6	12.1	18.4	625
15	26- 27-04-18	70.2	41.7	13.5	13.8	625	66.1	38.5	12.2	19.2	500
16	29- 30-04-18	69.5	39.6	10.3	15.6	500	61.7	33.6	11.5	19.5	625
17	3- 04-05-18	69.9	40.0	10.4	13.4	375	63.3	35.0	9.1	12.3	500
18	6- 07-05-18	68.2	37.1	11.1	16.3	375	66.8	37.7	12.9	19.1	500
19	10- 11-05-18	65.3	36.5	11.0	15.9	500	68.6	38.7	12.3	18.1	625
20	14- 15-05-18	68.6	41.0	10.4	13.4	375	60.8	32.9	12.4	17.8	500
21	18- 19-05-18	68.3	38.6	11.0	15.5	500	62.1	35.1	13.7	16.7	500
22	22- 23-05-18	67.8	37.9	9.8	13.0	375	65.9	35.9	13.0	17.8	625
23	26- 27-05-18	68.5	40.7	10.4	15.9	375	57.4	34.3	11.7	17.1	500
24	30- 31-05-18	68.3	38.5	11.7	17.4	500	64.4	38.4	12.3	18.1	500
Minimum		65.3	36.4	9.8	12.5	375	57.4	32.8	9.1	12.3	500
Maximum		70.2	41.7	13.5	18.1	625	68.6	39.0	13.9	20.7	625
Average		68.3	39.1	11.3	15.4	484	63.5	35.8	12.1	17.8	563
98 percentile		70.2	41.6	13.2	18.0	625	68.3	39.0	13.8	20.1	625

Note: * Instant reading

Parameter	PM ₁₀ ($\mu\text{g}/\text{m}^3$)	PM _{2.5} ($\mu\text{g}/\text{m}^3$)	SO ₂ ($\mu\text{g}/\text{m}^3$)	NO ₂ ($\mu\text{g}/\text{m}^3$)	CO ($\mu\text{g}/\text{m}^3$)
Protocol	IS:5182 (Part 23)	Lab SOP/09	IS:5182 (Part 2)	IS:5182 (Part 6)	IS:5182 (Part 10)
National Ambient Air Quality Standards 24 hours (2009)					
Industrial, Residential, Rural & Other areas	100	60	80	80	2000

Prepared by

Rashmi

Rashmi Gupta
Administrative Manager

Checked by

Marisha

Dr. Marisha Sharma
Authorised Signatory
- end of report -

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NATIONAL AMBIENT AIR QUALITY STANDARDS**CENTRAL POLLUTION CONTROL BOARD****NOTIFICATION**Delhi, the 18th 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 11th April, 1994 and S.O. 935(E), dated 14th 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 ₂), µg/m ³	Annual* 24 hours**	50 80	20 80	- Improved West and Gaeke - Ultraviolet fluorescence
2	Nitrogen Dioxide (NO ₂), µg/m ³	Annual* 24 hours**	40 80	30 80	- Modified Jacob & Hochheiser (Na-Arsenite) - Chemiluminescence
3	Particulate Matter (size less than 10µm) or PM ₁₀ µg/m ³	Annual* 24 hours**	60 100	60 100	- Gravimetric - TOEM - Beta attenuation
4	Particulate Matter (size less than 2.5µm) or PM _{2.5} µg/m ³	Annual* 24 hours**	40 60	40 60	- Gravimetric - TOEM - Beta attenuation
5	Ozone (O ₃) µg/m ³	8 hours** 1 hour**	100 180	100 180	- UV photometric - Chemiluminescence - Chemical Method
6	Lead (Pb) µg/m ³	Annual* 24 hours**	0.50 1.0	0.50 1.0	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
7	Carbon Monoxide (CO) mg/m ³	8 hours** 1 hour**	02 04	02 04	- Non Dispersive Infra Red (NDIR) spectroscopy

(1)	(2)	(3)	(4)	(5)	(6)
8	Ammonia (NH ₃) µg/m ³	Annual* 24 hours**	100 400	100 400	-Chemiluminescence -Indophenol blue method
9	Benzene (C ₆ H ₆) µg/m ³	Annual*	05	05	- Gas chromatography based continuous analyzer - Adsorption and Desorption followed by GC analysis
10	Benzo(a)Pyrene (BaP) - particulate phase only, ng/m ³	Annual*	01	01	- Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As), ng/m ³	Annual*	06	06	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m ³	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 11th April, 1994 and S.O. 935(E), dated 14th October, 1998.

ANNEXURE : IX

TEST REPORT

Customer's Name & Address		Sample Particulars						
Rungta Mines Ltd. Dhenkanal steel Plant Village - Jharbandh, PO.- Nimabahal, Via - Meramandali Dist.- Dhenkanal - 759121 Odisha Contact Person : Mr. G.P. Sharma Phone : 06582-255261		Type of Sample	: Ground water					
		Work Order No.	: 4800012134					
		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/03-2018/3.1-3.10					
		Date of Sampling	: 11-03-2018					
		Date of Receipt	: 12-03-2018					
		Date of Testing	: 12/03/2018 to 20/03/2018					
		Date of Report	: 22-03-2018					
		Test Report No.	: MMW/03-2018/8					
Parameters	Limits (IS: 10500:2012 and Ammendment No. 1)		Protocol	TEST RESULTS				
	Desirable	Permissible		Core Zone (Hand Pump)	Jharban dh Village (Hand Pump)	Tarkabe da Village (Hand Pump)	Kadala Village (Hand Pump)	Gandijha ra Village (Hand Pump)
Odour	Agreeable	Agreeable	IS 3025 (Part 5)	Agreea ble	Agreea ble	Agreea ble	Agreea ble	Agreea ble
Turbidity, NTU	1	5	IS 3025 (Part 10)	0.52	1.21	0.33	0.25	0.09
pH value	6.5 - 8.5	No relaxation	IS 3025 (Part 11)	7.0	6.7	7.1	6.6	7.5
Specific conductance, μ mhos	-	-	IS 3025 (Part 14)	949	1140	861	825	1495
Total Dissolved Solids, mg/l	500	2000	IS 3025 (Part 16)	570	716	530	466	954
Total Suspended Solids, mg/l	-	-	IS 3025 (Part 17)	BDL	BDL	16	10	12
Total Hardness as CaCO ₃ , mg/l	200	600	IS 3025 (Part 21)	341	364	380	261	546
Alkalinity, mg/l	200	600	IS 3025 (Part 23)	399	231	404	137	641
Sulphate as SO ₄ mg/l	200	400	IS 3025 (Part 24)	70	100	38	82	71
Phosphorous as P, mg/l	-	-	IS 3025 (Part 31)	BDL	BDL	BDL	BDL	BDL
Chloride as Cl, mg/l	250	1000	IS 3025 (Part 32)	47	182	49	123	117
Nitrate as NO ₃ , mg/l	45	No relaxation	APHA (4500-NO ₃ -B)	11.88	7.54	11.84	26.95	9.70
Calcium as Ca, mg/l	75	200	IS 3025 (Part 40)	86	97	79	70	111
Sodium as Na, mg/l	-	-	IS 3025 (Part 45)	52.1	77.2	33.4	57.1	95.2
Potassium as K, mg/l	-	-	IS 3025 (Part 45)	1.8	3	2.5	2.2	1.5
Magnesium as Mg, mg/l	30	100	IS 3025 (Part 46)	30	29	44	21	65
Iron as Fe, mg/l	1.0	No relaxation	IS 3025 (Part 53)	BDL	0.19	BDL	0.15	BDL
Fluoride as F, mg/l	1.0	1.5	APHA 4500-F-D	0.52	0.63	0.56	0.58	0.70
Silver as Ag, mg/l	0.1	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Barium as Ba, mg/l	0.7	No relaxation	IS 3025 (Part 2)	0.368	0.043	0.015	0.039	0.032
Boron as B, mg/l	0.5	1	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Cadmium as Cd, mg/l	0.003	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL

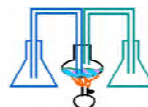
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ANNEXURE : IX Contd..

Min Mec R&D Laboratory



(A DIVISION OF MIN MEC CONSULTANCY PVT. LTD.)

A-121, Paryavaran Complex, IGNOU Road, New Delhi-110030

Phone: 29534777, 29532236, 29535891; Fax: 91-11-29532568

Email: lab.minmec@gmail.com; Website: http://www.minmec.co.in

Page 2 of 4

Report No :MMW/03-2018/8

Parameters	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)	Gandijhara Village (Hand Pump)
Chromium as Cr,mg/l	0.05	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Copper as Cu, mg/l	0.05	1.5	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Lead as Pb, mg/l	0.01	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Manganese as Mn, mg/l	0.1	0.3	IS 3025 (Part 2)	BDL	BDL	0.160	0.185	BDL
Nickel as Ni, mg/l	0.02	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Selenium as Se, mg/l	0.01	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Arsenic as As, mg/l	0.01	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Zinc as Zn, mg/l	5	15	IS 3025 (Part 2)	BDL	2.677	2.794	0.202	0.253

NOTE : BDL(Below Detection Limit) of TSS <10, P <0.1, Fe <0.1, Ag <0.01, B <0.01, Cd <0.002, Cr <0.01, Cu <0.01, Pb <0.01, Mn <0.01, Ni <0.01, Se <0.01, As <0.01, Zn <0.01 mg/l

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Contd..

TEST REPORT

Customer's Name & Address		Sample Particulars						
Rungta Mines Ltd. Dhenkanal steel Plant Village - Jharbandh, PO.- Nimabahal, Via - Meramandali Dist.- Dhenkanal - 759121 Odisha Contact Person : Mr. G.P. Sharma Phone : 06582-255261		Type of Sample	: Ground water					
		Work Order No.	: 4800012134					
		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/03-2018/3.1-3.10					
		Date of Sampling	: 11-03-2018					
		Date of Receipt	: 12-03-2018					
		Date of Testing	: 12/03/2018 to 20/03/2018					
		Date of Report	: 22-03-2018					
		Test Report No.	: MMW/03-2018/8					
Parameters	Limits (IS: 10500:2012 and Ammendment No. 1)		Protocol	TEST RESULTS				
	Desirable	Permissible		Dhuliamu nda Village (Hand Pump)	Nimidha Village (Hand Pump)	Kantimi lli Village (Hand Pump)	Benipa har Village (Hand Pump)	Kankalu Village (Hand Pump)
Odour	Agreeable	Agreeable	IS 3025 (Part 5)	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
Turbidity, NTU	1	5	IS 3025 (Part 10)	0.63	0.35	0.52	0	0.26
pH value	6.5 - 8.5	No relaxation	IS 3025 (Part 11)	7.3	7.1	6.9	7.6	7.1
Specific conductance, μ mhos	-	-	IS 3025 (Part 14)	831	726	813	2298	1390
Total Dissolved Solids, mg/l	500	2000	IS 3025 (Part 16)	538	456	486	1416	870
Total Suspended Solids, mg/l	-	-	IS 3025 (Part 17)	BDL	BDL	BDL	BDL	BDL
Total Hardness as CaCO_3 , mg/l	200	600	IS 3025 (Part 21)	348	301	249	416	550
Alkalinity, mg/l	200	600	IS 3025 (Part 23)	320	352	173	845	625
Sulphate as SO_4 mg/l	200	400	IS 3025 (Part 24)	32	42	71	133	70
Phosphorous as P, mg/l	-	-	IS 3025 (Part 31)	BDL	BDL	BDL	BDL	BDL
Chloride as Cl, mg/l	250	1000	IS 3025 (Part 32)	80	27	98	245	82
Nitrate as NO_3 , mg/l	45	No relaxation	APHA (4500- NO_3 -B)	11.53	5.91	26.63	28.52	0.64
Calcium as Ca, mg/l	75	200	IS 3025 (Part 40)	84	60	60	84	97
Sodium as Na, mg/l	-	-	IS 3025 (Part 45)	31.3	27.5	40.5	324.8	66.2
Potassium as K, mg/l	-	-	IS 3025 (Part 45)	2.1	1.5	31.5	3.1	1.5
Magnesium as Mg, mg/l	30	100	IS 3025 (Part 46)	33	36	24	49	74
Iron as Fe, mg/l	1.0	No relaxation	IS 3025 (Part 53)	BDL	0.1	BDL	BDL	BDL
Fluoride as F, mg/l	1.0	1.5	APHA 4500-F-D	0.73	0.64	0.20	0.64	0.58
Silver as Ag, mg/l	0.1	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Barium as Ba, mg/l	0.7	No relaxation	IS 3025 (Part 2)	0.272	0.326	0.105	0.092	0.026
Boron as B, mg/l	0.5	1	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Cadmium as Cd, mg/l	0.003	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL

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Parameters	Limits (IS: 10500:2012 and Ammendment No. 1)		Protocol	TEST RESULTS				
	Desirable	Permissible		Dhuliamu nda Village (Hand Pump)	Nimidha Village (Hand Pump)	Kantimi lli Village (Hand Pump)	Benipa har Village (Hand Pump)	Kankalu Village (Hand Pump)
Chromium as Cr,mg/l	0.05	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Copper as Cu, mg/l	0.05	1.5	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Lead as Pb, mg/l	0.01	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Manganese as Mn, mg/l	0.1	0.3	IS 3025 (Part 2)	0.040	BDL	BDL	0.074	BDL
Nickel as Ni, mg/l	0.02	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Selenium as Se, mg/l	0.01	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Arsenic as As, mg/l	0.01	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Zinc as Zn, mg/l	5	15	IS 3025 (Part 2)	0.547	0.124	BDL	BDL	0.028

NOTE : BDL(Below Detection Limit) of TSS <10, P <0.1, Fe <0.1, Ag <0.01, B <0.01, Cd <0.002, Cr <0.01, Cu <0.01, Pb <0.01, Mn <0.01, Ni <0.01, Se <0.01, As <0.01, Zn <0.01 mg/l

Prepared By
Rashmi
Rashmi Gupta
Administrative Manager

Checked By
Marisha
Dr. Marisha Sharma
Authorised Signatory

:: End of Report ::

NOTES :

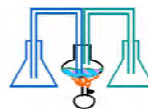
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TEST REPORT

Customer's Name & Address		Sample Particulars							
Rungta Mines Ltd. Dhenkanal Steel Plant Village - Jharbandh PO. - Nimabahal, Via - Meramandali Dist. - Dhenkanal - 759121 Odisha Contact Person : Mr. G. P. sharma Phone : 06582-255261		Type of Sample	: Surface water						
		Work Order No.	: 4800012134						
		Sampling Location	: Around Dhenkanal Steel Plant, Odisha						
		Sampling Procedure	: IS 3025 (Part 1)						
		Sample Volume/Quantity	: 1 ltr.						
		Sampling Team	: MMRDL (Manoj)						
		Sample Reg. No.	: MMW/03-2018/4.1-4.11						
		Date of Sampling	: 11-03-2018						
		Date of Receipt	: 12-03-2018						
		Date of Testing	: 12/03/2018 to 20/03/2018						
		Date of Report	: 22-03-2018						
		Test Report No.	: MMW/03-2018/8A						
Parameters	Limits (IS: 10500:2012 and Ammendment No. 1)		Protocol	TEST RESULTS					
	Desirable	Permissible		Braham ani river near khadag prasad Village (Up Stream)	Lingra nala near Plant (Up Stream)	Gandhij haran nala near Tarkabe da Village	Brahma ni river near khadag prasad Village (Down Stream)	Lingra nala near Kankalu Village (Down Stream)	Nala Near Berunpal Village
Odour	Agreeable	Agreeable	IS 3025 (Part 5)	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
Turbidity, NTU	1	5	IS 3025 (Part 10)	2.11	1.21	2.13	1.13	BDL	BDL
pH value	6.5 - 8.5	No relaxation	IS 3025 (Part 11)	7.5	7.4	7.7	7.4	7.5	7.8
Specific conductance, μ mhos	-	-	IS 3025 (Part 14)	230	360	420	235	352	394
Total Dissolved Solids, mg/l	500	2000	IS 3025 (Part 16)	146	220	256	148	222	248
Total Suspended Solids, mg/l	-	-	IS 3025 (Part 17)	22	10	24	34	BDL	BDL
Total Hardness as CaCO ₃ , mg/l	200	600	IS 3025 (Part 21)	95	127	190	79	135	162
Alkalinity, mg/l	200	600	IS 3025 (Part 23)	79	184	210	89	168	194
Sulphate as SO ₄ mg/l	200	400	IS 3025 (Part 24)	14	11	13	13	9	11
Phosphorous as P, mg/l	-	-	IS 3025 (Part 31)	BDL	BDL	BDL	BDL	BDL	BDL
Chloride as Cl, mg/l	250	1000	IS 3025 (Part 32)	23	23	23	25	25	25
Nitrate as NO ₃ , mg/l	45	No relaxation	APHA (4500-NO ₃ -B)	6.33	BDL	BDL	2.14	0.63	BDL
Dissolved oxygen, mg/l	-	-	IS 3025 (Part 38)	6.8	6.9	6.9	6.7	6.8	6.9
Calcium as Ca, mg/l	75	200	IS 3025 (Part 40)	17	29	48	21	32	38
Biochemical Oxygen Demand (BOD), mg/l	-	-	IS 3025 (Part 44)	10	5	10	10	10	15
Sodium as Na, mg/l	-	-	IS 3025 (Part 45)	6.7	15.2	14.1	12	15.1	12.6
Potassium as K, mg/l	-	-	IS 3025 (Part 45)	2.1	2.5	1.9	2.4	2.2	1.9
Magnesium as Mg, mg/l	30	100	IS 3025 (Part 46)	12	13	17	7	13	16
Iron as Fe, mg/l	1.0	No relaxation	IS 3025 (Part 53)	0.72	0.32	0.12	0.77	0.49	0.23
Fluoride as F, mg/l	1.0	1.5	APHA 4500-F-D	0.64	0.76	0.78	0.61	0.65	0.87

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Parameters	Limits (IS: 10500:2012 and Ammendment No. 1)		Protocol	TEST RESULTS					
	Desirable	Permissible		Braham ani river near khadag prasad Village (Up Stream)	Lingra nala near Plant (Up Stream)	Gandhij haran nala near Tarkabe da Village	Brahma ni river near khadag prasad Village (Down Stream)	Lingra nala near Kankalu Village (Down Stream)	Nala Near Berunpal Village
Chemical Oxygen Demand (COD), mg/l	-	-	APHA 5220 D	28	18	21	25	14	25
Oil & Grease, mg/l	-	-	IS 3025 (Part 39)	2	4	2	4	4	2
Silver as Ag, mg/l	0.1	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL	BDL
Barium as Ba, mg/l	0.7	No relaxation	IS 3025 (Part 2)	0.013	0.032	0.134	0.019	0.032	0.180
Boron as B, mg/l	0.5	1	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL	BDL
Chromium as Cr,mg/l	0.05	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL	0.011
Copper as Cu, mg/l	0.05	1.5	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL	BDL
Lead as Pb, mg/l	0.01	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL	BDL
Manganese as Mn, mg/l	0.1	0.3	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL	BDL
Nickel as Ni, mg/l	0.02	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL	BDL
Selenium as Se, mg/l	0.01	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL	BDL
Arsenic as As, mg/l	0.01	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL	BDL
Zinc as Zn, mg/l	5	15	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL	BDL
Total Coliform (MPN/100ml)	-	-	APHA 9221 B	Absent	17	Absent	Absent	21	Absent
E. Coli	-	-	APHA 9221F	Absent	Absent	Absent	Absent	Absent	Absent

NOTE : BDL(Below Detection Limit) of Turbidity (NTU) <1, TSS <10, P <0.1, NO₃ <0.5, Fe <0.1, Ag <0.01, B <0.01, Cr <0.01, Cu <0.01, Pb <0.01, Mn <0.01, Ni <0.01, Se <0.01, As <0.01, Zn <0.01 mg/l

NOTES :

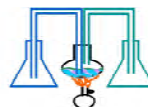
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TEST REPORT

Customer's Name & Address		Sample Particulars						
Rungta Mines Ltd. Dhenkanal Steel Plant Village - Jharbandh PO. - Nimabahal, Via - Meramandali Dist. - Dhenkanal - 759121 Odisha Contact Person : Mr. G. P. sharma Phone : 06582-255261		Type of Sample	: Surface water					
		Work Order No.	: 4800012134					
		Sampling Location	: Around Dhenkanal Steel Plant, Odisha					
		Sampling Procedure	: IS 3025 (Part 1)					
		Sample Volume/Quantity	: 1 ltr.					
		Sampling Team	: MMRDL (Manoj)					
		Sample Reg. No.	: MMW/03-2018/4.1-4.11					
		Date of Sampling	: 11-03-2018					
		Date of Receipt	: 12-03-2018					
		Date of Testing	: 12/03/2018 to 20/03/2018					
		Date of Report	: 22-03-2018					
		Test Report No.	: MMW/03-2018/8A					
Parameters	Limits (IS: 10500:2012 and Ammendment No. 1)		Protocol	TEST RESULTS				
	Desirable	Permissible		Nala near Nimbahali Village	Kusumjhor Nala near Bishwanath Village	Barajhorr nala near Karanda Village	Kanti nala near Gulihi Village	Kisinda nala near Khadagprasad Village
Odour	Agreeable	Agreeable	IS 3025 (Part 5)	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
Turbidity, NTU	1	5	IS 3025 (Part 10)	1.31	BDL	1.11	2.15	3.65
pH value	6.5 - 8.5	No relaxation	IS 3025 (Part 11)	7.6	7.8	7.8	7.9	7.5
Specific conductance, μ mhos	-	-	IS 3025 (Part 14)	311	335	315	395	379
Total Dissolved Solids, mg/l	500	2000	IS 3025 (Part 16)	188	210	202	242	238
Total Suspended Solids, mg/l	-	-	IS 3025 (Part 17)	12	BDL	14	12	22
Total Hardness as CaCO ₃ , mg/l	200	600	IS 3025 (Part 21)	139	135	123	162	131
Alkalinity, mg/l	200	600	IS 3025 (Part 23)	121	168	152	205	142
Sulphate as SO ₄ , mg/l	200	400	IS 3025 (Part 24)	16	10	9	11	26
Phosphorous as P, mg/l	-	-	IS 3025 (Part 31)	BDL	BDL	BDL	BDL	BDL
Chloride as Cl, mg/l	250	1000	IS 3025 (Part 32)	29	25	27	25	31
Nitrate as NO ₃ , mg/l	45	No relaxation	APHA (4500-NO ₃ -B)	BDL	0.63	BDL	1.08	5.87
Dissolved oxygen, mg/l	-	-	IS 3025 (Part 38)	6.9	6.7	6.8	6.7	6.8
Calcium as Ca, mg/l	75	200	IS 3025 (Part 40)	27	32	30	37	35
Biochemical Oxygen Demand (BOD), mg/l	-	-	IS 3025 (Part 44)	5	15	20	25	10
Sodium as Na, mg/l	-	-	IS 3025 (Part 45)	9.8	7.2	8.9	17.9	18.9
Potassium as K, mg/l	-	-	IS 3025 (Part 45)	2.3	2	2	1.8	2.3
Magnesium as Mg, mg/l	30	100	IS 3025 (Part 46)	17	13	11	17	10
Iron as Fe, mg/l	1.0	No relaxation	IS 3025 (Part 53)	0.62	BDL	0.31	0.34	BDL
Fluoride as F, mg/l	1.0	1.5	APHA 4500-F-D	0.68	0.57	0.63	0.65	0.59

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Parameters	Limits (IS: 10500:2012 and Ammendment No. 1)		Protocol	TEST RESULTS				
	Desirable	Permissible		Nala near Nimbah ali Village	Kusumj hor Nala near Bishwa nath Village	Barajho r nala near Karand a Village	Kanti nala near Gulihi Village	Kisinda nala near Khadag prasad Village
Chemical Oxygen Demand (COD), mg/l	-	-	APHA 5220 D	14	39	35	43	21
Oil & Grease, mg/l	-	-	IS 3025 (Part 39)	4	2	4	2	4
Silver as Ag, mg/l	0.1	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Barium as Ba, mg/l	0.7	No relaxation	IS 3025 (Part 2)	0.047	0.092	0.089	0.036	0.038
Boron as B, mg/l	0.5	1	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Chromium as Cr,mg/l	0.05	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Copper as Cu, mg/l	0.05	1.5	IS 3025 (Part 2)	BDL	BDL	BDL	0.028	BDL
Lead as Pb, mg/l	0.01	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Manganese as Mn, mg/l	0.1	0.3	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Nickel as Ni, mg/l	0.02	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Selenium as Se, mg/l	0.01	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Arsenic as As, mg/l	0.01	No relaxation	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Zinc as Zn, mg/l	5	15	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	0.785
Total Coliform (MPN/100ml)	-	-	APHA 9221 B	14	24	Absent	Absent	13
E. Coli	-	-	APHA 9221F	Absent	Absent	Absent	Absent	Absent

NOTE : BDL(Below Detection Limit) of Turbidity (NTU) <1, TSS <10, P <0.1, NO₃ <0.5, Fe <0.1, Ag <0.01, B <0.01, Cr <0.01, Cu <0.01, Pb <0.01, Mn <0.01, Ni <0.01, Se <0.01, As <0.01, Zn <0.01 mg/l

Prepared By

Rashmi

Rashmi Gupta

Administrative Manager

Checked By

Marisha

Dr. Marisha Sharma

Authorised Signatory

:: End of Report ::

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- * Unused balance of sample received shall be destroyed after one month from the date of issue of test report, unless otherwise specified
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- * Complaint register is available with the laboratory, in case required

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 5.

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, <i>Max</i>	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 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, <i>Max</i>	1	5	Part 10	—
vi)	Total dissolved solids, mg/l, <i>Max</i>	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 55)	—
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)	Calcium (as Ca), mg/l, <i>Max</i>	75	200	IS 3025 (Part 40)	—
vii)	Chloramines (as Cl ₂), mg/l, <i>Max</i>	4.0	No relaxation	IS 3025 (Part 26)* or APHA 4500-Cl G	—
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 39) Infrared partition method	—
xvi)	Nitrate (as NO ₃), mg/l, <i>Max</i>	45	No relaxation	IS 3025 (Part 34)	—
xvii)	Phenolic compounds (as C ₆ H ₅ 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 ₄) 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 ₂ 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 ₃), 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 referee 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 (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Cadmium (as Cd), mg/l, <i>Max</i>	0.003	No relaxation	IS 3025 (Part 41)	—
ii)	Cyanide (as CN), mg/l, <i>Max</i>	0.05	No relaxation	IS 3025 (Part 27)	—
iii)	Lead (as Pb), mg/l, <i>Max</i>	0.01	No relaxation	IS 3025 (Part 47)	—
iv)	Mercury (as Hg), mg/l, <i>Max</i>	0.001	No relaxation	IS 3025 (Part 48)/ Mercury analyser	—
v)	Molybdenum (as Mo), mg/l, <i>Max</i>	0.07	No relaxation	IS 3025 (Part 2)	—
vi)	Nickel (as Ni), mg/l, <i>Max</i>	0.02	No relaxation	IS 3025 (Part 54)	—
vii)	Pesticides, µg/l, <i>Max</i>	See Table 5	No relaxation	See Table 5	—
viii)	Polychlorinated biphenyls, mg/l, <i>Max</i>	0.000 5	No relaxation	ASTM 5175*	— or APHA 6630
ix)	Polynuclear aromatic hydrocarbons (as PAH), mg/l, <i>Max</i>	0.000 1	No relaxation	APHA 6440	—
x)	Total arsenic (as As), mg/l, <i>Max</i>	0.01	0.05	IS 3025 (Part 37)	—
xi)	Total chromium (as Cr), mg/l, <i>Max</i>	0.05	No relaxation	IS 3025 (Part 52)	—
xii)	Trihalomethanes:				
a)	Bromoform, mg/l, <i>Max</i>	0.1	No relaxation	ASTM D 3973-85* or APHA 6232	—
b)	Dibromochloromethane, mg/l, <i>Max</i>	0.1	No relaxation	ASTM D 3973-85* or APHA 6232	—
c)	Bromodichloromethane, mg/l, <i>Max</i>	0.06	No relaxation	ASTM D 3973-85* or APHA 6232	—
d)	Chloroform, mg/l, <i>Max</i>	0.2	No relaxation	ASTM D 3973-85* or APHA 6232	—

NOTES

1 In case of dispute, the method indicated by ** shall be the referee 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 (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to Part of IS 14194	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Radioactive materials:				
a)	Alpha emitters Bq/l, <i>Max</i>	0.1	No relaxation	Part 2	—
b)	Beta emitters Bq/l, <i>Max</i>	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'.



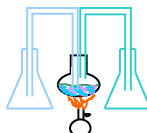
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TC-6337

: A-69 :

Min Mec R&D Laboratory



(A DIVISION OF MIN MEC CONSULTANCY PVT. LTD.)

A-121, Paryavaran Complex, IGNOU Road, New Delhi – 110 030
Phone :29534777, 29532236, 29535891; Fax : 91-11-29532568
Email : lab.minmec@gmail.com ; Visit us at :http://www.minmec.co.in

ANNEXURE : XI

TEST REPORT

NAME AND ADDRESS OF CUSTOMER	SAMPLE PARTICULARS
Rungta Mines Ltd. Dhenkanal Steel Plant Village – Jharbandh, PO.- Nimabahal, Via – Meramandali Dist. – Dhenkanal – 759121 Contact Person : Mr. G.P. Sharma Phone : 06582-255261	Type of Sample : Noise
	Work Order No. : 4800012134
	Sampling Location : In and near Dhenkanal Steel Plant, Odisha
	Sampling Procedure : Protocol for Ambient Level Noise Monitoring, CPCB
	Sample Duration : 24 hours
	Sampling Team : MMRDL (Manoj)
	Sample Reg. No. : MMN/03-18/1.1-1.10
	Date of Monitoring : 02/03/2018 to 16/03/2018
	Date of Receipt : 19/03/2018
	Date of Report : 22/03/2018
	Test Report No. : MMN/03-18/11
	Page : 1 of 2

Hours↓	Core Zone	Jharbandh Village	Nimabahal Village	Galpada Village	Nimidha Village
Date of monitoring→	2-3/3/2018	3-4/3/2018	5-6/3/2018	6-7/3/2018	8-9/3/2018
10-11	52.65	46.49	48.29	50.42	49.69
11-12	50.79	47.07	47.96	48.32	45.62
12-13	50.59	48.19	47.86	47.49	45.37
13-14	49.91	47.78	49.35	48.19	45.82
14-15	49.75	48.31	50.41	47.06	46.85
15-16	53.32	47.98	49.37	50.38	49.38
16-17	54.61	48.24	50.22	50.01	48.95
17-18	55.19	51.88	52.39	49.44	48.46
18-19	54.62	52.31	52.04	51.66	43.78
19-20	45.11	42.13	51.14	51.21	43.64
20-21	46.31	42.28	42.19	41.60	44.14
21-22	42.97	42.21	42.03	41.63	41.42
22-23	43.04	41.46	42.15	41.35	41.46
23-00	42.20	40.61	38.71	39.37	39.07
00-01	42.61	40.80	38.61	39.49	38.92
01-02	42.62	40.58	38.09	39.93	39.23
02-03	42.28	40.50	38.82	39.72	38.90
03-04	42.32	41.00	38.70	39.78	38.78
04-05	42.46	40.08	38.15	39.94	39.43
05-06	41.98	40.25	38.82	39.97	39.19
06-07	42.41	51.73	53.56	50.81	50.32
07-08	53.33	51.69	53.19	50.79	49.90
08-09	53.03	50.77	53.15	51.16	50.42
09-10	53.49	47.07	47.58	51.12	49.98
Day time Leq.	52.16	49.18	50.69	49.83	48.12
Night time Leq.	42.51	40.88	39.63	40.20	39.73
24 hour Avg. Leq.	50.39	47.51	48.85	48.06	46.44

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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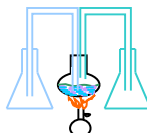
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Test Report No. : MMN/03-18/11

Page : 2 of 2

ANNEXURE : XI Contd..

Hours↓	Tarkabera Village	Kantimilli Village	Kadala Village	Shibapur Village	Mosonia Village
Date of monitoring→	9-10/3/2018	11-12/3/2018	12-13/03/2018	14-15/03/2018	15-16/03/2018
10-11	51.34	52.12	51.36	52.53	49.51
11-12	50.17	47.94	47.57	52.18	49.37
12-13	48.80	47.73	47.57	51.98	49.21
13-14	49.25	47.81	47.23	51.77	49.45
14-15	49.30	48.00	47.40	56.12	49.84
15-16	52.95	52.29	47.83	55.35	49.48
16-17	52.94	52.73	52.15	56.88	49.51
17-18	52.32	52.24	51.99	51.75	48.03
18-19	44.35	52.41	51.69	51.66	49.17
19-20	44.04	44.05	43.92	52.24	47.31
20-21	44.16	43.65	43.64	43.38	47.68
21-22	41.21	41.15	41.16	43.99	39.20
22-23	40.83	40.47	41.18	44.32	38.70
23-00	42.12	38.51	39.45	42.91	39.69
00-01	41.69	38.40	40.17	42.95	38.96
01-02	41.38	38.36	40.04	42.64	40.17
02-03	41.78	38.87	39.69	43.14	40.03
03-04	41.83	38.17	40.22	42.99	39.11
04-05	41.37	38.02	39.31	43.03	40.07
05-06	42.26	38.94	39.82	42.91	40.27
06-07	53.31	38.77	51.35	54.74	49.39
07-08	52.93	50.84	51.04	53.85	50.31
08-09	52.29	51.80	51.08	53.02	50.44
09-10	52.21	50.53	51.26	53.01	49.54
Day time Leq.	50.97	50.14	49.89	53.45	49.29
Night time Leq.	41.63	39.12	40.16	43.24	39.61
24 hour Avg. Leq.	49.22	48.30	48.12	51.65	47.52

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 :

- Day time shall mean from 6.00 a.m. to 10.00 p.m.
- Night time shall mean from 10.00 p.m. to 6.00 a.m.
- ^a[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].
- 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*

^a 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)**

MAXIMUM ALLOWABLE DURATION PER DAY, hour	NOISE LEVEL dB(A) (SLOW RESPONSE)
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**

SOUND LEVEL, dB(A)	MAXIMUM EXPOSURE HOURS
90	8
93	4
96	2
99	1
102	$\frac{1}{2}$
105	$\frac{1}{4}$
108	1/8 or 7.5 min

ANNEXURE : XIV

TRAFFIC VOLUME MONITORING RESULTS
PROJECT : DHENKANAL INTEGRATED STEEL PLANT, ORISSA

LOCATION : NIMABAHALI CHOWK
DATE OF MONITORING : 09-10/05/2018

Time (hrs)	Cycles/ Carts	Two/three wheelers	LMV	HMV	Total
0.00 to 1.00	0	0	21	250	271
1.00 to 2.00	0	0	10	409	419
2.00 to 3.00	0	0	17	318	335
3.00 to 4.00	0	6	20	364	390
4.00 to 5.00	3	13	29	350	395
5.00 to 6.00	10	18	89	458	575
6.00 to 7.00	21	22	130	484	657
7.00 to 8.00	56	46	83	364	549
8.00 to 9.00	61	51	100	382	594
9.00 to 10.00	61	151	104	182	498
10.00 to 11.00	48	179	208	205	640
11.00 to 12.00	31	158	250	136	575
12.00 to 13.00	28	141	146	182	497
13.00 to 14.00	16	218	104	202	540
14.00 to 15.00	25	119	104	91	339
15.00 to 16.00	28	106	125	136	395
16.00 to 17.00	57	95	125	159	436
17.00 to 18.00	70	139	208	227	644
18.00 to 19.00	78	152	229	273	732
19.00 to 20.00	35	190	250	318	793
20.00 to 21.00	10	63	166	318	557
21.00 to 22.00	2	13	146	364	525
22.00 to 23.00	0	13	179	409	601
23.00 to 24.00	0	11	148	409	568
TOTAL	640	1904	2991	6990	12525

**POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.**

Town/ village code	Town/village name	Populat ion	Total area	Forest land	Area under Non- Agricultural Uses	Barren & Un- cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Misc. Tree Crops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallows	Net Area Sown	Total Unirrigated Land	Area Irrigated by Source	Canals	Wells/ Tube Wells	Tanks/ Lakes	Waterf all	Other Source
District Dhenkanal Sub Distt. Parajang																			
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
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
Sub total		12865	3281.00	111.38	450.90	295.30	90.33	23.93	15.07	97.19	21.75	2175.15	1916.17	258.98	237.71	0.00	0.00	0.00	21.27
Sub Distt. Motunga																			
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	Binarkateni	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
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
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

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ANNEXURE : XV

POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	Populat ion	Total area	Forest land	Area under Non- Agricultural Uses	Barren & Un- cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Misc. Tree Crops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallows	Net Area Sown	Total Unirrigated Land	Area Irrigated by Source	Canals	Wells/ Tube Wells	Tanks/ Lakes	Waterf all	Other Source
402930	Uparbaghalunda	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	Nayabhagirathipur(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	Nayabhagirathipur(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	0.41	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
Sub total		50117	9578.00	360.29	1365.99	2138.94	232.37	138.66	295.19	944.81	499.52	3602.23	2996.31	605.92	605.92	0.00	0.00	0.00	0.00
Sub Distt. Bhusan Steel Limited																			
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

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ANNEXURE : XV Contd..

POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	Populat ion	Total area	Forest land	Area under Non- Agricultural Uses	Barren & Un- cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Misc. Tree Crops etc.	Culturable Waste Land	Fallow Land other than Current Fallow	Current Fallow	Net Area Sown	Total Unirrigated Land	Area Irrigated by Source	Canals	Wells/ Tube Wells	Tanks/ Lakes	Waterf all	Other Source
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
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
Sub total		22293	5292.00	277.79	1014.36	926.79	232.46	19.71	11.43	141.97	92.89	2574.60	2506.98	67.62	37.58	0.00	30.04	0.00	0.00
Sub Distt. Balimi																			
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	Nimabahali	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	Isvarapur	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
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	Kumursinga	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

: A-76 :

ANNEXURE : XV Contd..

**POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.**

Town/ village code	Town/village name	Populat ion	Total area	Forest land	Area under Non- Agricultural Uses	Barren & Un- cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Misc. Tree Crops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallows	Net Area Sown	Total Unirrigated Land	Area Irrigated by Source	Canals	Wells/ Tube Wells	Tanks/ Lakes	Waterf all	Other Source
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
Sub total		47592	11889.00	843.82	577.98	348.50	486.55	336.65	61.16	215.53	301.96	8716.85	8251.82	465.03	230.67	0.00	234.36	0.00	0.00
Sub Distt. Hindol																			
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
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
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
Sub total		3070	845.00	73.75	29.30	32.70	95.28	45.52	9.27	13.99	5.67	539.52	539.52	0.00	0.00	0.00	0.00	0.00	0.00
Sub Distt. Rasol																			
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
Sub total		23154	6330.00	517.94	126.94	772.87	355.19	128.56	242.63	0.94	0.97	4183.96	3839.74	344.22	237.67	0.00	106.55	0.00	0.00
District Sub Distt. Anugul Banarpal																			
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
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	Bhagabatur	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

POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	Populat ion	Total area	Forest land	Area under Non- Agricultural Uses	Barren & Un- cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Misc. Tree Crops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallows	Net Area Sown	Total Unirrigated Land	Area Irrigated by Source	Canals	Wells/ Tube Wells	Tanks/ Lakes	Waterf all	Other Source
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
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
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
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
404192	Budhapanka (CT)	6129	1219.00	-	1219.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
404194	Nuahata (CT)	5920	848.00	-	848.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub total		23432	4576.00	39.10	2689.35	127.01	160.45	16.53	0.00	2.78	44.49	1496.29	640.42	855.87	542.19	219.73	83.35	0.00	10.60
Sub Distt. Bhusan Steel Limited																			
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
Sub total		1098	249.00	0.79	119.82	2.40	36.50	1.98	0.00	0.00	5.56	81.95	50.11	31.84	19.90	9.95	1.99	0.00	0.00
RESERVED/PROTECTED FORESTS																			
	Jharbandh RF		308.00	308.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Nimidha RF		140.00	140.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Gandhigariya PF		124.00	124.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub total			572.00	572.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRAND TOTAL		183621	42612.00	2796.86	6374.64	4644.51	1689.13	711.54	634.75	1417.21	972.81	23370.55	20741.07	2629.48	1911.64	229.68	456.29	0.00	31.87
%			100.00	6.56	14.96	10.90	3.96	1.67	1.49	3.33	2.28	54.84	48.67	6.17	72.70	8.73	17.35	0.00	1.21

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ANNEXURE : XV Contd..

OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS (WILDLIFE)
 & CHIEF WILDLIFE WARDEN, ODISHA, BDA APARTMENT, 5TH FLOOR,
 PRAKRUTI BHAWAN, NILAKANTHA NAGAR, BHUBANESWAR
 Ph. No.0674-2564587, FAX No.0674-2565062
 (Website:odishawildlife.org, E. mail: odishawildlife@gmail.com)

Memo No. 3/88 /1 WL-SSP-10/2015 Dated, Bhubaneswar, the 9 th 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.5-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.

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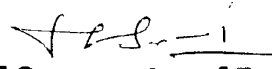
- The project proponent has to prepare and submit the Conservation Plan for the next 10 years of their lease period (balance period for which forest land remains diverted) at least one year before the expiry of the present Conservation Plan and deposit the outlay amount upon its approval. In case of 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**

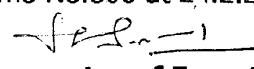
Memo No. 3189 /date 09.04.2015

Copy forwarded to the Special Secretary to Government of Odisha, F&E Deptt., Bhubaneswar for favour of information with reference to Deptt. 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.5-ORB207/2014-BHU dt 26.5.2014.


**Principal Chief Conservator of Forests (WL)
& Chief Wildlife Warden, Odisha**

Memo No. 3190 /date 09.04.2015

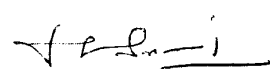
Copy forwarded to the Regional Chief Conservator of Forests, Angul Circle for information and necessary action with reference to his memo No.806 dt 24.2.2015.


**Principal Chief Conservator of Forests (WL)
& Chief Wildlife Warden, Odisha**

Memo No. 3191 /date 09.04.2015

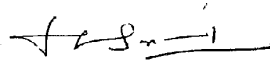
Copy forwarded to the Divisional Forest Officer, Dhenkanal Division for information and necessary action with reference to memo No.807 dt 24.2.2015 of the RCCF, Angul Circle.

**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

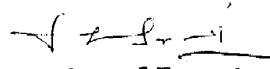
Copy forwarded to the Divisional Forest Officer, Angul Division for information and necessary action.


**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**

Kind Attn. To The Director

DIVISIONAL FOREST OFFICE: DHENKANAL

No 4030 /dt. 08-07-10

To

The Senior Manager,
Rungta Mines Ltd.
At: Korian 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
TREES			
1.	<i>Acacia auriculiformis</i>	Akasia	Mimosaceae
2.	<i>Acacia ferruginea</i>	Garkhari	Mimosaceae
3.	<i>Acacia nilotica</i>	Babul	Mimosaceae
4.	<i>Aegle marmelos</i>	Bel	Rutaceae
5.	<i>Ailanthus excelsa</i>	Mahalimb	Simaroubaceae
6.	<i>Albizia lebbek</i>	Siris	Mimosaceae
7.	<i>Albizia procera</i>	Maranga/ Tendra	Mimosaceae
8.	<i>Alstonia scholaris</i>	Chhaltian	Apocynaceae
9.	<i>Anacardium occidentale</i>	Kaju	Anacardiaceae
10.	<i>Annona reticulata</i>	Ramphal	Annonaceae
11.	<i>Annona squamosa</i>	Sharifa	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>Butea monosperma</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>	Sissu	Papilionaceae
23.	<i>Delonix regia</i>	Gulmohar	Caesalpinaceae
24.	<i>Diospyros melanoxylon</i>	Kendu	Ebenaceae
25.	<i>Eucalyptus hybrid</i>	Patas	Myrtaceae
26.	<i>Ficus benghalensis</i>	Bara	Moraceae
27.	<i>Ficus glomerata</i>	Dhumar	Moraceae
28.	<i>Ficus religiosa</i>	Aswasth	Moraceae
29.	<i>Limonia acidissima</i>	Kaltho	Rutaceae
30.	<i>Madhuca indica</i>	Mahul	Sapotaceae
31.	<i>Mangifera indica</i>	Amba	Anacardiaceae
32.	<i>Melia composita</i>	Batra	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>	Patmosu	Annonaceae
37.	<i>Pongamia pinnata</i>	Karanj	Papilionaceae
38.	<i>Psidium guajava</i>	Amrud	Myrtaceae
39.	<i>Spondis 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
Hindol Range, Hindol

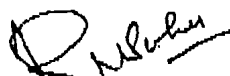
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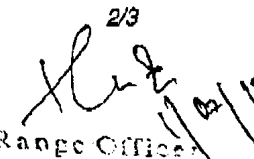
**PROPOSED INTEGRATED STEEL PLANT (1.9 MTPA) at Village – Jharbandh,
District – Dhenkanal, Orissa of M/s Rungta Mines Limited**

Sl. No.	Botanical Name	Common Name	Family Name
BAMBOOS			
1.	<i>Bambusa arundinacea</i>	Kanta bans	Bambusaceae
2.	<i>Dendrocalamus strictus</i>	Salla	Gramineae
SHRUBS			
1.	<i>Adhatoda vasica</i>	Basak	Acanthaceae
2.	<i>Calotropis gigantea</i>	Arakha	Asclepiadaceae
3.	<i>Cassia alata</i>	Candle-stick tree	Caesalpinaceae
4.	<i>Clerodendron viscosum</i>	Kumtl	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 antidysenterica</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 acaulis</i>	Bankhajuri	Palmae
14.	<i>Ricinus communis</i>	Arand	Euphorbiaceae
15.	<i>Vitex negundo</i>	Begunla	Verbenaceae
16.	<i>Woodfordia fruticosa</i>	Dhatki	Lythraceae
HERBS			
1.	<i>Achyranthus aspera</i>	Chirchira	Amaranthaceae
2.	<i>Amaranthus spinosus</i>	chauli	Amaranthaceae
3.	<i>Euphorbia hirta</i>	Dudhi bel	Euphorbiaceae
4.	<i>Leucas montana</i>	Gopha	Labiatae
5.	<i>Mimosa pudica</i>	Lajwanti	Mimosaceae
6.	<i>Ocimum gratissimum</i>	Banatuksi	Labiatae
7.	<i>Ocimum sanctum</i>	Tulsi	Labiatae
8.	<i>Solanum nigrum</i>	Bhatkadrana	Solanaceae
CLIMBERS			
1.	<i>Butea superba</i>	Palas lata	Papilionaceae
2.	<i>Ziziphus oenoplia</i>	Makai	Rhamnaceae
GRASSES			
1.	<i>Cynodon dactylon</i>	Duba	Poaceae
2.	<i>Dichanthium annulatum</i>	Marvel grass	Poaceae
3.	<i>Heteropogon contortus</i>	Sinkula	Poaceae
4.	<i>Themeda triandra</i>	Rooi grass	Poaceae

Integrated Steel Plant of RML at Jharbandh

For RUNGTA MINES LTD.


R.N. SAHU
Sr. Manager

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Range Officer
Hindol Range, Hindol

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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 FLORA IN THE CORE ZONE

Sl. No.	Botanical Name	Common Name	Family Name
TREES			
1.	<i>Acacia ferruginea</i>	Garkhari	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>	Sharifa	Annonaceae
6.	<i>Azadirachta indica</i>	Neem	Meliaceae
7.	<i>Borassus flabellifer</i>	Tal	Palmae
8.	<i>Butea monosperma</i>	Palas	Papilionaceae
9.	<i>Cocos nucifera</i>	Narkul	Palmae
10.	<i>Mangifera indica</i>	Amba	Anacardiaceae
11.	<i>Moringa oleifera</i>	Sajna	Moringaceae
12.	<i>Phoenix sylvestris</i>	Khajur	Palmae
13.	<i>Psidium guajava</i>	Amrud	Myrtaceae
14.	<i>Spondis pinnata</i>	Ambada	Anacardiaceae
15.	<i>Syzygium cumini</i>	Jambu	Myrtaceae
16.	<i>Zizyphus mauritiana</i>	Borkull	Rhamnaceae
SHRUBS			
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 acaulis</i>	Bankhajuri	Palmae
6.	<i>Ricinus communis</i>	Arand	Euphorbiaceae
7.	<i>Vitex negundo</i>	Begunia	Verbenaceae
HERBS			
1.	<i>Achyranthus aspera</i>	Chirchira	Amaranthaceae
2.	<i>Amaranthus spinosus</i>	chauili	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>	Bhatkadrana	Solanaceae
GRASSES			
1.	<i>Cynodon dactylon</i>	Duba	Poaceae
2.	<i>Dichanthium annulatum</i>	Marvel grass	Poaceae
3.	<i>Heteropogon contortus</i>	Sinkula	Poaceae
4.	<i>Themeda triandra</i>	Roal grass	Poaceae

Consent Signed.

Divisional Forest Officer,
Dhenkanal Division.

3/3
Range Officer,
Hindol Range, B.K.D.

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Integrated Steel Plant of RML at Jharbandh
For RUNGTA MINES LTD.

R.N. SAHU
Sr. Manager

**PROPOSED INTEGRATED STEEL PLANT (1.9 MTPA) at Village – Jharbandh,
District – Dhenkanal, Orissa of M/s Rungta Mines Limited**

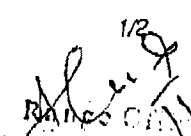
LIST OF FAUNA IN THE STUDY AREA

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	16
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>Dicrurus adsimilis</i>	King crow	Corvidae	-	-	-
9.	<i>Passer domesticus</i>	House sparrow	Passerinae	-	-	-
10.	<i>Psittacula supatria</i>	Large Indian Parakeet	Psittacidae	IV	-	11(50)

Integrated Steel Plant of RML at Jharbandh

For RUNGTA MINES LTD.


R.N. SAHU
Sr. Manager


R.N. SAHU
Hindol Range

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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

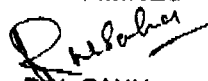
Sl. No.	Scientific Name	Common Name	Family	Reference to Schedule as per Wildlife (Protection) Act 1972, as Amended upto 2006.		
				Schedule	Part	Serial
MAMMALS						
1.	<i>Funambulus pennanti</i>	Five striped palm squirrel	Sciuridae	IV	-	3A
2.	<i>Herpestes edwardsi</i>	Common mongoose	Herpestidae	II	II	16
3.	<i>Lepus nigricollis</i>	Indian hare	Leporidae	IV	-	4
4.	<i>Macaca mulatta</i>	Rhesus macaque	Cercopithecidae	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>Calotes versicolor</i>	Common garden lizard	Agamidae	-	-	-
3.	<i>Chamaeleon zeylanicus</i>	Indian chameleon	Chamaeleonidae	II	I	24
4.	<i>Hemidactylus flaviviridis</i>	Northern house gecko	Geckonidae	-	-	-
5.	<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>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>Dicrurus adsimilis</i>	King crow	Corvidae	-	-	-
8.	<i>Psittacula supatria</i>	Large Indian Parakeet	Psittacidae	IV	-	11(50)

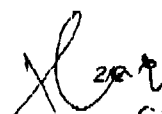
Co-ordinator Signed.

**Divisional Forest Officer
Dhenkanal Division**

Integrated Steel Plant of RML at Jharbandh

For RUNGTA MINES LTD.


R.N. SAHU
Sr. Manager


Range Officer
Pindol Range, Pindol

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VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	No. of house- holds	Population break-up			Population (0-6 years)			Schedule Caste	Schedule Tribe	Literacy level		
			Total	Male	Female	Total	Male	Female			Total literates	Male literates	Female literates
District	Dhenkanal												
Sub Distt.	Parajang												
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
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
Sub total		3303	12865	6494	6371	1308	718	590	2428	234	9160	5034	4126
Sub Distt.	Motunga												
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
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

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ANNEXURE : XVIII

VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	No. of house- holds	Population break-up			Population (0-6 years)			Schedule Caste	Schedule Tribe	Literacy level		
			Total	Male	Female	Total	Male	Female			Total literates	Male literates	Female literates
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
Sub total		11827	50117	26118	23999	5908	3180	2728	12660	2745	35842	20384	15458
Sub Distt.	Bhusan Steel Limited												
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
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

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ANNEXURE : XVII Contd..

VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	No. of house- holds	Population break-up			Population (0-6 years)			Schedule Caste	Schedule Tribe	Literacy level		
			Total	Male	Female	Total	Male	Female			Total literates	Male literates	Female literates
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
Sub total		5185	22293	12025	10268	2656	1381	1275	4859	2579	15854	9447	6407
Sub Distt.	Balimi												
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	Nimabahali	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
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

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ANNEXURE : XVIII Contd..

VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	No. of house- holds	Population break-up			Population (0-6 years)			Schedule Caste	Schedule Tribe	Literacy level		
			Total	Male	Female	Total	Male	Female			Total literate	Male literate	Female literate
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
Sub total		12057	47592	24376	23216	5254	2834	2420	10906	969	32044	18240	13804
Sub Distt.	Hindol												
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
403047	Hariharapur	141	539	278	261	56	38	18	40	0	370	205	165
403074	Baghadharia	271	987	502	485	94	47	47	209	9	647	359	288
Sub total		785	3070	1580	1490	336	191	145	598	272	2134	1177	957
Sub Distt.	Rasol												
403094	Panchupada	586	2383	1197	1186	249	138	111	722	187	1597	860	737
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
Sub total		5621	23154	11920	11234	2477	1346	1131	5022	1019	16047	9032	7015
District Sub Distt.	Anugul Banarpal												

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ANNEXURE : XVIII Contd..

VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	No. of house- holds	Population break-up			Population (0-6 years)			Schedule Caste	Schedule Tribe	Literacy level		
			Total	Male	Female	Total	Male	Female			Total literate	Male literate	Female literate
404141	Tentulihata	180	768	402	366	129	74	55	755	0	567	307	260
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
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
404165	Talatali	384	1619	815	804	146	82	64	264	34	1104	615	489
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
404175	Chakuriapal	20	73	33	40	8	3	5	8	0	63	30	33
404182	Gadatalamul	427	1813	939	874	197	104	93	629	242	1306	742	564
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
Sub total		5217	23432	12245	11187	2647	1477	1170	6251	1656	16678	9514	7164
Sub Distt.	Bhusan Steel Limited												
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
Sub total		272	1098	558	540	163	92	71	620	28	826	439	387
GRAND TOTAL		44267	183621	95316	88305	20749	11219	9530	43344	9502	128585	73267	55318
Percentage			100.00	51.91	48.09	11.30	6.11	5.19	23.61	5.17	70.03	39.90	30.13

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ANNEXURE : XVIII Contd..

VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	Employment pattern											
		Total workers	Main workers					Marginal workers					Non workers
			Total	Cultivators	Agri. Labours	HH ind.	Others	Total	Cultivators	Agr. Labours	HH ind.	Others	
District	Dhenkanal												
Sub Distt.	Parajang												
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
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
Sub total		4141	2167	623	523	171	850	1974	189	1379	32	374	8724
Sub Distt.	Motunga												
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
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

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ANNEXURE : XIX

VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	Employment pattern											
		Total workers	Main workers					Marginal workers					Non workers
			Total	Cultivators	Agri. Labours	HH ind.	Others	Total	Cultivators	Agr. Labours	HH ind.	Others	
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	Balaramprasad	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
Sub total		17314	13958	2045	1382	507	10024	3356	257	1294	173	1632	32803
Sub Distt.	Bhusan Steel Limited												
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
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

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ANNEXURE : XIX Contd..

VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	Employment pattern											
		Total workers	Main workers					Marginal workers					Non workers
			Total	Cultivators	Agri. Labours	HH ind.	Others	Total	Cultivators	Agr. Labours	HH ind.	Others	
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	Paikpuranakot	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
Sub total		7950	6317	591	383	152	5191	1633	176	509	77	871	14343
Sub Distt.	Balimi												
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	Nimabahali	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
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

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ANNEXURE : XIX Contd..

VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	Employment pattern											
		Total workers	Main workers					Marginal workers					Non workers
			Total	Cultivators	Agri. Labours	HH ind.	Others	Total	Cultivators	Agr. Labours	HH ind.	Others	
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
Sub total		16991	9255	2120	2074	487	4574	7736	649	4438	456	2193	30601
Sub Distt.	Hindol												
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
403047	Hariharapur	271	147	30	42	3	72	124	1	80	1	42	268
403074	Baghadharia	335	262	87	55	11	109	73	21	21	0	31	652
Sub total		1210	819	188	168	23	440	391	25	244	8	114	1860
Sub Distt.	Rasol												
403094	Panchupada	700	661	218	216	41	186	39	10	14	12	3	1683
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
Sub total		7808	5696	1411	927	246	3112	2112	222	867	102	921	15346
District Sub Distt.	Anugul Banarpal												

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ANNEXURE : XIX Contd..

VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	Employment pattern											
		Total workers	Main workers					Marginal workers					Non workers
			Total	Cultivators	Agri. Labours	HH ind.	Others	Total	Cultivators	Agr. Labours	HH ind.	Others	
404141	Tentulihata	198	165	52	12	96	5	33	12	2	7	12	570
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
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
404165	Talatali	444	413	37	31	5	340	31	2	19	5	5	1175
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
404175	Chakuriapal	21	18	9	3	3	3	3	1	1	0	1	52
404182	Gadatalamul	467	313	16	15	25	257	154	26	33	11	84	1346
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
Sub total		7378	5676	610	488	567	4011	1702	228	536	150	788	16054
Sub Distt. Bhusan Steel Limited													
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
Sub total		365	173	6	12	4	151	192	18	11	2	161	733
GRAND TOTAL		63157	44061	7594	5957	2157	28353	19096	1764	9278	1000	7054	120464
Percentage		34.40	24.00	17.24	13.52	4.90	64.35	10.40	9.24	48.59	5.24	36.94	65.60

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ANNEXURE : XIX Contd..

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village	Town/village 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.		
	District : Dhenkanal																														
	Sub distt.: Parajang																														
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	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.	-
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.	-
	Sub distt.: Motunga																														
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)	-	(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	Binakarkateni	N.A.	-	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.	-	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)	-	(10+ km)	-	N.A.	-	-	1	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	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.	-
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)	-	(10+ km)	-	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)	-	(10+ km)	-	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.	-
402931	Nayabhagirathipur(East)	N.A.	-	1	-	1	-	1	-	(<5 km)	-	(5-10 km)	-	(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)	-	(10+ km)	-	(5-10 km)	-	N.A.	-	(10+ km)	-	N.A.	-

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village	Town/village 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.
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)	-	(5-10 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)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	N.A.	-
402944	Balaramprasad	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)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(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)	-	(10+ km)	-	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.	-
	Sub distt.: Bhusan Steel Limited																												
402967	Mangalpur	N.A.	-	4	-	1	-	1	-	1	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	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	Chandrasekharpur	(<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.	-
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)	-

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village	Town/village 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.		
	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	Nimabahal	(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.	-
403035	Kukuta	-	1	3	-	1	-	1	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(10+ 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)	-	(10+ km)	-	N.A.	-

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village	Town/village 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.
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.	-
	Sub distt.: Hindol																												
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.	-
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.	-
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.	-
	Sub distt.: Rasol																												
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 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.	-
	District : Anugul																												
	Sub distt.: Banarpal																												
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.	-
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.	-
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.	-
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.	-
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.	-
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.	-
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.	-
	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.	-

: A-100 :

ANNEXURE : XX Contd..

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	MEDICAL FACILITIES																			
		CHC	PHC	PHSC	MCWC	TBC	HA	HAM	D	VH	MHC	FWC	NGMF- OP	NGMF- IOP	NGMF- C	NGMF- MBBS	NGMF- OD	NGMF- ND	NGMF- TPFH	NGMF- MS	NGMF- O
	District : Dhenkanal																				
	Sub distt.: Parajang																				
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)	-	-	-	-	-	-	-	-	-
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)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(<5 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)	-	-	-	-	-	-	-	-	-
	Sub distt.: Motunga																				
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)	(5-10 km)	(10+ km)	(<5 km)	(5-10 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)	(5-10 km)	(10+ km)	(5-10 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)	(5-10 km)	(10+ km)	(5-10 km)	(5-10 km)	(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)	-	-	-	-	-	-	-	-	-
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)	-	-	-	-	-	-	-	-	-
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)	-	-	-	-	-	-	-	-	-

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	MEDICAL FACILITIES																			
		CHC	PHC	PHSC	MCWC	TBC	HA	HAM	D	VH	MHC	FWC	NGMF- OP	NGMF- IOP	NGMF- C	NGMF- MBBS	NGMF- OD	NGMF- ND	NGMF- TPFH	NGMF- MS	NGMF- O
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)	1	-	-	-	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)	(10+ 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	(<5 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)	(5-10 km)	(<5 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)	-	-	-	-	-	-	-	-	-
	Sub distt.: Bhusan Ster																				
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)	(<5 km)	(10+ km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-
402981	Chandrasekharpur	(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)	(10+ km)	(<5 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)	(10+ 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	-
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)	-	-	-	-	-	-	-	-	-

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	MEDICAL FACILITIES																			
		CHC	PHC	PHSC	MCWC	TBC	HA	HAM	D	VH	MHC	FWC	NGMF- OP	NGMF- IOP	NGMF- C	NGMF- MBBS	NGMF- OD	NGMF- ND	NGMF- TPFH	NGMF- MS	NGMF- O
	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	Nimabahal	(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)	(5-10 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)	(5-10 km)	(10+ km)	(10+ 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)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(5-10 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)	(5-10 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)	(5-10 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)	(5-10 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)	(<5 km)	(10+ 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)	(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)	(5-10 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)	(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)	-	-	-	-	-	-	-	-	-
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)	-	-	-	-	-	-	-	-	-

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	MEDICAL FACILITIES																			
		CHC	PHC	PHSC	MCWC	TBC	HA	HAM	D	VH	MHC	FWC	NGMF- OP	NGMF- IOP	NGMF- C	NGMF- MBBS	NGMF- OD	NGMF- ND	NGMF- TPFH	NGMF- MS	NGMF- O
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)	-	-	-	-	-	-	-	-	-
	Sub distt.: Hindol																				
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)	-	-	-	-	-	-	-	-	-
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)	-	-	-	-	-	-	-	-	-
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)	-	-	-	-	-	-	-	-	-
	Sub distt.: Rasol																				
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 km)	(5-10 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-
403097	Badabahal	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(<5 km)	(<5 km)	(<5 km)	(5-10 km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-
403098	Giridharprasad	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(5-10 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)	-	-	-	-	-	-	-	-	-
	District : Anugul																				
	Sub distt.: Banarpal																				
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)	-	-	-	-	-	-	-	-	-
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 km)	(<5 km)	(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)	-	-	-	-	-	-	-	-	-
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)	-	-	-	-	-	-	-	-	-
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)	-	-	-	-	-	-	-	-	-
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)	-	-	-	-	-	-	-	-	-
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)	-	-	-	-	-	-	-	-	-
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	-	-	-	-
	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)	-	-	-	-	-	-	-	-	-

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

Town/ village code	Town/village name	DRINKING WATER FACILITY										COMMUNICATION SYSTEM									
		TWT	TWUT	CW	UW	HP	TW/ BW	S	R/C	T/P	WO	PO	SPO	P&T	PIN	T	PCO	MPC	IC/CSC	PCF	
	District : Dhenkanal																				
	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)	
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	Binakarkateni	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	N	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)	
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)	
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)	

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Town/ village code	Town/village name	DRINKING WATER FACILITY										COMMUNICATION SYSTEM								
		TWT	TWUT	CW	UW	HP	TW/ BW	S	R/C	T/P	WO	PO	SPO	P&T	PIN	T	PCO	MPC	IC/CSC	PCF
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)		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 Ster																			
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	Bramhanapurunakot	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	Paikpurunakot	N	Y	N	Y	Y	N	Y	Y	Y	N	1	(10+ km)	(10+ km)	759121	1	N.A.	1	(10+ km)	(10+ km)
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)

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Town/ village code	Town/village name	DRINKING WATER FACILITY										COMMUNICATION SYSTEM								
		TWT	TWUT	CW	UW	HP	TW/ BW	S	R/C	T/P	WO	PO	SPO	P&T	PIN	T	PCO	MPC	IC/CSC	PCF
	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	Kumurusinga	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)
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)

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Town/ village code	Town/village name	DRINKING WATER FACILITY										COMMUNICATION SYSTEM									
		TWT	TWUT	CW	UW	HP	TW/ BW	S	R/C	T/P	WO	PO	SPO	P&T	PIN	T	PCO	MPC	IC/CSC	PCF	
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																				
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)	
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)	
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)	
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)	
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)	
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)	
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)	
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)	
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)	
	Sub distt.: Bhusan Ster																				
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)	

SUMMARY OF AMENITIES AVAILABLE (CENSUS 2011) IN VILLAGES WITHIN THE STUDY AREA OF INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

AMENITIES	NOS.	AMENITIES	NOS.	AMENITIES	NOS.
EDUCATION FACILITIES		DRINKING WATER FACILITY		APPROACH TO VILLAGE	
PPS (Pre-Primary School)	5	TWT (Tap Water-Treated)	0	NH (National Highway)	25
PS (Primary school)	203	TWUT (Tap Water Untreated)	11	SH (State Highway)	11
MS (Middle school)	103	CW (Covered Well)	1	MDR (Major District Road)	29
SS (Secondary school)	53	UW (Uncovered Well)	151	ODR (Other District Road)	65
SSS (Sr. Sec. School)	17	HP (Hand Pump)	159	BTPR (Black Topped (pucca) Road)	102
DCAS (Deg. College Arts & Science only)	7	TW/ BW (Tube Wells/Borehole)	8	GCR (Gravel (kuchha) Roads)	150
EC (Engg. College)	3	S (Spring)	32	WBM (Water Bounded Macadam)	22
MC (Medicine College)	2	R/C (River/Canal)	68	AWR (All Weather Road)	109
MI (Management Institute)	2	T/P (Tank/Pond/Lake)	150	NWR/C (Navigable Waterways (River/Canal))	32
P (Polytechnic)	3	WO (Others)	8	FP (Foot Path)	159
VTs/ITI (Vocational Trg School/ITI)	9				
NFTC (Non Formal Training Centre)	0	COMMUNICATION SYSTEM		BANKS AND COMMERCIAL SOCIETIES	
SFD (School For Disabled)	0	PO (Post Office)	26	ATM (ATM)	1
EO (Others)	0	SPO (Sub Post Office)	6	CB (Commercial bank)	1
		P&T (Post & Telegraph office)	10	COB (Co-operative bank)	2
MEDICAL FACILITIES		PIN (Village PIN code)	159	ACS (Agricultural Credit Societies)	3
CHC (Community Health Centres)	0	T (Telephone (landline))	99	SHG (Self-Help Group (SHG))	156
PHC (Primary Health Centre)	0	PCO (Public Call Office/ Mobile PCO)	35	PDS (Public Distribution System (PDS))	104
PHSC (Primary Health Sub-Centre)	19	MPC (Mobile phone coverage)	151	M/RM (Mandis/Regular Market)	22
MCWC (Maternity And Child Welfare Centre)	8	IC/CSC (Internet Cafes/Common Service Centre)	3	WH (Weekly Haat)	32
TBC (TB Clinic)	1	PCF (Private Courier Facility)	19	AMS (Agricultural Marketing Society)	14
HA (Hospital Allopathic)	3			NCICDS (Nutritional Centres-ICDS)	34
HAM (Hospital Alternative Medicine)	1	TRANSPORT SYSTEM		NCAC (Nutritional Centres-Anganwadi Centre)	145
D (Dispensary)	10	PBS (Public Bus Service)	27	NCO (Nutritional Centres-Others)	3
VH (Veterinary Hospital)	4	PvtBS (Private Bus Service)	51	ASHA (ASHA)	155
MHC (Mobile Health Clinic)	0	RS (Railway station)	13	CC-TV (Community Centre with/without TV)	61
FWC (Family Welfare Centre)	3	MA (Auto/Modified Autos)	72		
NGMF-OP (Non Govt. Med. facilities Out Patient)	0	Taxi (Taxi)	45	SPORTS AND ENTERTAINMENT	
NGMF-IOP (Non Govt. Med. facilities In And Out Patient)	0	Van (Vans)	9	SF (Sports Field)	77
NGMF-C (Non Govt. Med. facilities Charitable)	0	T (Tractors)	78	SC/RC (Sports Club/Recreation Centre)	60
NGMF-MBBS (Non Govt. Med. facilities Medical Practitioner with MBBS Degree)	5	CPR-Man (Cycle-pulled Rickshaws (manual driven))	159	C/VH (Cinema/Video Hall)	1
		CPR-Mec (Cycle-pulled Rickshaws (machine driven))	0	PL (Public Library)	13
NGMF-OD (Non Govt. Med. facilities Medical Practitioner with other Degree)	1	CDA (Carts Driven by Animals)	147	PRR (Public Reading Room)	13
NGMF-ND (Non Govt. Med. facilities Medical Practitioner with no Degree)	1	S/R/FS (Sea/River/Ferry Service)	26	DNS (Daily Newspaper Supply)	154
		POWER SUPPLY		APS (Assembly Polling Station)	120
NGMF-TPFH (Non Govt. Med. facilities Traditional Practitioner and Faith Healer)	1	PSDU (Power Supply For Domestic Use)	147	BDRO (Birth and Death Registration Office)	3
NGMF-MS (Non Govt. Med. facilities Medicine Shop)	56	PSIAU (Power Supply For Agriculture Use)	54		
NGMF-O (Non Govt. Med. facilities Others)	1	PSCU (Power Supply For Commercial Use)	0		
		PSALL (Power Supply For All Users)	49		

SUMMARY OF AMENITIES AVAILABLE (CENSUS 2011) IN TOWNS WITHIN THE STUDY AREA OF INTEGRATED STEEL PLANT AT JHARBANDH OF RUNGTA MINES LTD.

AMENITIES	NOS.	AMENITIES	NOS.	AMENITIES	NOS.
EDUCATION		Private-MS Office (Nos.)	0	WATER SUPPLY AND SANITATION	
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	MEDICAL		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	TRANSPORT	
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	Kutch Road Length (in kms.)	10
Govt. Degree College-Art,Science and Commerce (Nos.))	0	T.B. Hospital/ Clinic (Nos.)	0	ENTERTAINMENT AND COMMODITY	
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	ELECTRICITY		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	HELP HOMES	
Private-Polytechnic (Nos.)	0	FINANCIAL		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	FIRE FIGHTING			
Govt.-MS Office (Nos.))	0	Fire Fighting Service (Status A(1)/NA(2))	4		

: A-110 :

ANNEXURE : XX Contd..

CO STARTING

TITLEONE JHARBANDH STEEL PLANT OF RML
 TITLETWO PM10 EMISSIONS FROM PHASE-1 (Without DGs)
 MODELOPT DFAULT CONC RURAL
 AVERTIME 24 PERIOD
 POLLUTID PM10
 RUNORNOT RUN
 CO FINISHED

SO STARTING

SO LOCATION S-01 POINT 10713.0732 10590.3151
 SO LOCATION S-02 POINT 10813.0732 10590.3151
 SO LOCATION S-03 POINT 10581.2358 10592.3578
 SO LOCATION S-04 POINT 10729.0215 10867.1971
 SO LOCATION S-05 POINT 10747.967 10867.1971
 SO LOCATION S-06 POINT 10572.6013 10649.986
 SO LOCATION S-07 POINT 10793.0729 10867.1971
 SO LOCATION S-08 POINT 10776.9096 10867.1971
 SO LOCATION S-09 POINT 10505.4766 10636.4607
 SO LOCATION S-10 POINT 10456.2355 10615.1393
 SO LOCATION S-11 POINT 10580.4584 10770.3572
 SO LOCATION S-12 POINT 11759.2279 10646.1222
 SO LOCATION S-13 POINT 10766.3167 11071.1425
 SO LOCATION S-14 POINT 10772.8787 11108.2784
 SO LOCATION S-15 POINT 10535.7453 11236.7544
 SO LOCATION S-16 POINT 10558.0516 11281.5121
 SO LOCATION S-17 POINT 11479.4192 10740.58
 SO LOCATION S-18 POINT 11026.6808 10867.1971
 SO LOCATION S-19 POINT 11010.5773 10970.2454
 SO LOCATION S-20 POINT 11006.2132 11070.8124
 SO LOCATION S-21 POINT 11005.3132 11152.1624
 SO LOCATION S-22 POINT 10824.6416 11084.9641
 SO LOCATION S-23 POINT 11206.4775 10817.7299
 SO LOCATION S-24 POINT 11206.4775 10881.8412
 SO LOCATION S-25 POINT 11206.4783 10945.9525
 SO LOCATION S-26 POINT 11206.479 11010.0638
 SO LOCATION S-27 POINT 11206.479 11074.1751
 SO LOCATION S-28 POINT 10942.3346 11260.8798
 SO LOCATION S-29 POINT 10451.161 10691.7309
 SO LOCATION S-30 POINT 11537.5113 11136.3431
 SO LOCATION S-31 POINT 11449.2594 11108.8985
 SO LOCATION S-32 POINT 11451.6322 11131.8174
 SO LOCATION S-33 POINT 11529.9392 11086.3266
 SO LOCATION S-34 POINT 11181.6431 10590.3214
 SO LOCATION S-35 POINT 11248.085 10590.3151
 SO LOCATION S-36 POINT 11152.6272 10633.3039
 SO LOCATION S-37 POINT 11219.9493 10633.2977
 SO LOCATION S-38 POINT 10753.3217 11025.2705
 SO LOCATION S-39 POINT 11490.7942 10754.0946
 SO LOCATION A-1 AREA 10063.4507 10911.3856

SO LOCATION A-2 AREA 10463.5756 10856.1749
 SO LOCATION A-3 AREA 10463.5756 10723.0307
 SO LOCATION A-4 AREA 10646.9926 11246.3523
 SO LOCATION A-5 AREA 10881.3308 10238.6448
 SO LOCATION A-6 AREA 11518.3988 10314.7937
 SO LOCATION A-7 AREA 11246.0567 10221.9128
 SO LOCATION A-8 AREA 11473.0735 10675.7041
 SO LOCATION A-9 AREA 11473.0735 10807.4048
 SO LOCATION A-10 AREA 11349.7746 10854.5795
 SO LOCATION A-11 AREA 11349.7746 11023.3828
 SO LOCATION A-12 AREA 11480.0703 11104.8614
 SO LOCATION A-13 AREA 11626.5819 11104.8614
 SO LOCATION A-14 AREA 11432.4491 11199.1626
 SO LOCATION A-15 AREA 11836.6645 10896.965
 SO LOCATION A-16 AREA 11836.6561 10637.3319

** Point Source QS HS TS VS DS

** Parameters: ---- ---- ---- ----

SO SRCPARAM S-01 2.604167 80 423 18.13 2.75
 SO SRCPARAM S-02 3.020833 80 423 17.67 3
 SO SRCPARAM S-03 0.625 35 323 17.38 1.7
 SO SRCPARAM S-04 0.338542 30 373 13.97 1.5
 SO SRCPARAM S-05 0.625 35 323 17.38 1.7
 SO SRCPARAM S-06 0.755208 35 323 18.74 1.8
 SO SRCPARAM S-07 0.416667 30 373 17.19 1.5
 SO SRCPARAM S-08 0.755208 35 323 18.74 1.8
 SO SRCPARAM S-09 2.447917 70 440 16.75 4
 SO SRCPARAM S-10 0.338542 30 373 13.97 1.5
 SO SRCPARAM S-11 0.169271 30 373 13.97 1.5
 SO SRCPARAM S-12 0.46875 35 323 13.04 1.7
 SO SRCPARAM S-13 0.25 35 423 13.54 1.8
 SO SRCPARAM S-14 0.484375 47 313 11.65 1.8
 SO SRCPARAM S-15 9.010417 55 423 18.97 5
 SO SRCPARAM S-16 0.833333 45 313 16.23 2
 SO SRCPARAM S-17 0.911458 85 493 17.89 2.5
 SO SRCPARAM S-18 0.614583 35 373 14.26 2
 SO SRCPARAM S-19 0.614583 35 373 14.26 2
 SO SRCPARAM S-20 0.614583 35 373 14.26 2
 SO SRCPARAM S-21 0.307292 35 373 8.8 1.8
 SO SRCPARAM S-22 3.265625 60 403 20.47 4
 SO SRCPARAM S-23 0.482813 60 638 8.52 3
 SO SRCPARAM S-24 0.482813 60 638 8.52 3
 SO SRCPARAM S-25 0.482813 60 638 8.52 3
 SO SRCPARAM S-26 0.482813 60 638 8.52 3
 SO SRCPARAM S-27 1.088542 80 638 10.8 4
 SO SRCPARAM S-28 0.482813 60 638 8.52 3
 SO SRCPARAM S-29 0.273175 30 373 6.34 2
 SO SRCPARAM S-30 0.817708 30 318 17 2
 SO SRCPARAM S-31 3.666667 80 393 20 4
 SO SRCPARAM S-32 4.947917 60 336 21 4
 SO SRCPARAM S-33 0.15625 35 351 16 1

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SO SRCPARAM S-34 1.94375 90 423 9.47 6
 SO SRCPARAM S-35 3.8875 110 423 13.92 7
 SO SRCPARAM S-36 1.963542 45 323 6.31 5
 SO SRCPARAM S-37 3.927083 45 323 12.63 5
 SO SRCPARAM S-38 0.421875 30 423 11.84 2.5
 SO SRCPARAM S-39 0.496875 30 423 13.95 2.5
 SO SRCPARAM A-1 1.60853605841918E-10 1 40.459 56.8455 126 4
 SO SRCPARAM A-2 2.00210692806123E-10 1 25.7166 63.5122 0 4
 SO SRCPARAM A-3 2.00210692806123E-10 1 25.7166 63.5122 0 4
 SO SRCPARAM A-4 4.62554858300006E-10 1 73.3624 128.3222 0 4
 SO SRCPARAM A-5 3.31602524144127E-09 1 637.068 202.9619 0 4
 SO SRCPARAM A-6 3.31602524144127E-09 1 82.5805 126.813 0 4
 SO SRCPARAM A-7 1.60853605841918E-10 1 154.2384 72.7122 137 4
 SO SRCPARAM A-8 4.62554858300006E-10 1 63.8352 23.5821 0 4
 SO SRCPARAM A-9 4.62554858300006E-10 1 63.8352 23.5821 0 4
 SO SRCPARAM A-10 2.29341206764266E-11 1 67.3527 158.2784 0 4
 SO SRCPARAM A-11 2.29341206764266E-11 1 67.3527 158.2784 0 4
 SO SRCPARAM A-12 6.24028525469661E-09 1 62.9988 28.395 0 4
 SO SRCPARAM A-13 6.24028525469661E-09 1 62.9988 28.395 0 4
 SO SRCPARAM A-14 1.60853605841918E-10 1 502.2029 177.7935 0 4
 SO SRCPARAM A-15 1.52764302467638E-09 1 35.6592 259.6545 0 4
 SO SRCPARAM A-16 1.52764302467638E-09 1 35.6592 259.6545 0 4
 SO SRCGROUP ALL
 SO FINISHED

RE STARTING

GRIDPOLR POL1 STA
 GRIDPOLR POL1 ORIG 11328 10978
 GRIDPOLR POL1 DIST 1500 2000 2500 3000 3500 4000 5000 7000 10000
 GRIDPOLR POL1 GDIR 16 0 22.5
 GRIDPOLR POL1 END
 DISCCART 11858.33 11508.33
 DISCCART 11615.01 11670.91
 DISCCART 11328.00 11728.00
 DISCCART 11040.99 11670.91
 DISCCART 11328.00 9978.00
 DISCCART 11710.68 10054.12
 DISCCART 12035.11 10270.89
 DISCCART 12251.88 10595.32
 DISCCART 12328.00 10978.00
 DISCCART 12035.11 11685.11
 DISCCART 11710.68 11901.88
 DISCCART 11328.00 11978.00
 DISCCART 10945.32 11901.88
 DISCCART 10620.89 11685.11
 DISCCART 10404.12 11360.68
 DISCCART 10620.89 10270.89
 DISCCART 10945.32 10054.12
 DISCCART 11363.31 10816.9
 DISCCART 14662.73 11118.76
 DISCCART 10876.32 17523.53

DISCCART 11444.70 12436.35
 DISCCART 13292.04 12707.34
 DISCCART 11423.82 9111.708
 DISCCART 8484.586 9517.753
 DISCCART 9118.692 16434.20
 RE FINISHED

ME STARTING

INPUTFIL JHARBAND.MET
 ANEMHGT 5.0
 SURFDATA 99999 2018 XXX
 UAIRDATA 99999 2018 XXX
 WDROTATE 180
 ME FINISHED

OU STARTING

OU RECTABLE 24 FIRST
 OU MAXTABLE 24 50
 OU PLOTFILE 24 ALL FIRST JBPM10.PLT
 OU FINISHED

 *** SETUP Finishes Successfully ***

*** 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 (M)	Y (M)						
A-1	0	1.61E-10	9.25E-11	10063.5	10911.4	0	1	40.46	56.85	126	4
A-2	0	2.00E-10	1.15E-10	10463.6	10856.2	0	1	25.72	63.51	0	4
A-3	0	2.00E-10	1.15E-10	10463.6	10723	0	1	25.72	63.51	0	4
A-4	0	4.63E-10	2.66E-10	10647	11246.4	0	1	73.36	128.32	0	4
A-5	0	3.32E-09	1.91E-09	10881.3	10238.6	0	1	637.07	202.96	0	4
A-6	0	3.32E-09	1.91E-09	11518.4	10314.8	0	1	82.58	126.81	0	4
A-7	0	1.61E-10	9.25E-11	11246.1	10221.9	0	1	154.24	72.71	137	4
A-8	0	4.63E-10	2.66E-10	11473.1	10675.7	0	1	63.84	23.58	0	4
A-9	0	4.63E-10	2.66E-10	11473.1	10807.4	0	1	63.84	23.58	0	4
A-10	0	2.29E-11	1.32E-11	11349.8	10854.6	0	1	67.35	158.28	0	4
A-11	0	2.29E-11	1.32E-11	11349.8	11023.4	0	1	67.35	158.28	0	4
A-12	0	6.24E-09	3.59E-09	11480.1	11104.9	0	1	63	28.39	0	4
A-13	0	6.24E-09	3.59E-09	11626.6	11104.9	0	1	63	28.39	0	4
A-14	0	1.61E-10	9.25E-11	11432.4	11199.2	0	1	502.2	177.79	0	4
A-15	0	1.53E-09	8.78E-10	11836.7	10897	0	1	35.66	259.65	0	4
A-16	0	1.53E-09	8.78E-10	11836.7	10637.3	0	1	35.66	259.65	0	4

: A-112 :

ANNEXURE : XXI CONTD.

ANNEXURE : XXI CONTD.

*** POINT SOURCE DATA ***

SOURCE ID	PART. CATS.	EMISSION RATE (GRAMS/SEC)				X (M)	Y (M)	BASE ELEV. (M)	STACK HEIGHT (M)	STACK TEMP. ("K)	STACK EXIT VEL. (M/SEC)	STACK DIA. (M)	BUILDING EXISTS
		PM10	PM2.5	SO2	NO2								
S-01	0	2.60E+00	1.50E+00	2.98E+01	8.92E-02	10713.1	10590.3	0	80	423	18.13	2.75	NO
S-02	0	3.02E+00	1.74E+00	3.58E+01	1.07E-01	10813.1	10590.3	0	80	423	17.67	3	NO
S-03	0	6.25E-01	3.59E-01			10581.2	10592.4	0	35	323	17.38	1.7	NO
S-04	0	3.39E-01	1.95E-01			10729	10867.2	0	30	373	13.97	1.5	NO
S-05	0	6.25E-01	3.59E-01			10748	10867.2	0	35	323	17.38	1.7	NO
S-06	0	7.55E-01	4.34E-01			10572.6	10650	0	35	323	18.74	1.8	NO
S-07	0	4.17E-01	2.40E-01			10793.1	10867.2	0	30	373	17.19	1.5	NO
S-08	0	7.55E-01	4.34E-01			10776.9	10867.2	0	35	323	18.74	1.8	NO
S-09	0	2.45E+00	1.41E+00	5.45E+00	8.01E-02	10505.5	10636.5	0	70	440	16.75	4	NO
S-10	0	3.39E-01	1.95E-01			10456.2	10615.1	0	30	373	13.97	1.5	NO
S-11	0	1.69E-01	9.73E-02			10580.5	10770.4	0	30	373	13.97	1.5	NO
S-12	0	4.69E-01	2.70E-01			11759.2	10646.1	0	35	323	13.04	1.7	NO
S-13	0	2.50E-01	1.44E-01	4.44E+00	3.33E+00	10766.3	11071.1	0	35	423	13.54	1.8	NO
S-14	0	4.84E-01	2.79E-01			10772.9	11108.3	0	47	313	11.65	1.8	NO
S-15	0	9.01E+00	5.18E+00	3.82E+00	2.23E-02	10535.7	11236.8	0	55	423	18.97	5	NO
S-16	0	8.33E-01	4.79E-01			10558.1	11281.5	0	45	313	16.23	2	NO
S-17	0	9.11E-01	5.24E-01			11479.4	10740.6	0	85	493	17.89	2.5	NO
S-18	0	6.15E-01	3.53E-01			11026.7	10867.2	0	35	373	14.26	2	NO
S-19	0	6.15E-01	3.53E-01			11010.6	10970.2	0	35	373	14.26	2	NO
S-20	0	6.15E-01	3.53E-01			11006.2	11070.8	0	35	373	14.26	2	NO
S-21	0	3.07E-01	1.77E-01			11005.3	11152.2	0	35	373	8.8	1.8	NO
S-22	0	3.27E+00	1.88E+00			10824.6	11085	0	60	403	20.47	4	NO
S-23	0	4.83E-01	2.78E-01	6.58E+00	3.89E+00	11206.5	10817.7	0	60	638	8.52	3	NO
S-24	0	4.83E-01	2.78E-01	6.58E+00	3.89E+00	11206.5	10881.8	0	60	638	8.52	3	NO
S-25	0	4.83E-01	2.78E-01	6.58E+00	3.89E+00	11206.5	10946	0	60	638	8.52	3	NO
S-26	0	4.83E-01	2.78E-01	6.58E+00	3.89E+00	11206.5	11010.1	0	60	638	8.52	3	NO
S-27	0	1.09E+00	6.26E-01	1.06E+01	6.25E+00	11206.5	11074.2	0	80	638	10.8	4	NO
S-28	0	4.83E-01	2.78E-01	4.27E+00	2.78E+00	10942.3	11260.9	0	60	638	8.52	3	NO
S-29	0	2.73E-01	1.57E-01			10451.2	10691.7	0	30	373	6.34	2	NO
S-30	0	8.18E-01	4.70E-01			11537.5	11136.3	0	30	318	17	2	NO
S-31	0	3.67E+00	2.11E+00	8.21E-01	1.31E+00	11449.3	11108.9	0	80	393	20	4	NO
S-32	0	4.95E+00	2.85E+00			11451.6	11131.8	0	60	336	21	4	NO
S-33	0	1.56E-01	8.98E-02			11529.9	11086.3	0	35	351	16	1	NO
S-34	0	1.94E+00	1.12E+00	1.73E+01	1.73E+01	11181.6	10590.3	0	90	423	9.47	6	NO
S-35	0	3.89E+00	2.24E+00	3.46E+01	3.46E+01	11248.1	10590.3	0	110	423	13.92	7	NO
S-36	0	1.96E+00	1.13E+00			11152.6	10633.3	0	45	323	6.31	5	NO
S-37	0	3.93E+00	2.26E+00			11219.9	10633.3	0	45	323	12.63	5	NO
S-38	0	4.22E-01	2.43E-01		2.66E-01	10753.3	11025.3	0	30	423	11.84	2.5	NO
S-39	0	4.97E-01	2.86E-01	2.10E+00	1.08E+00	11490.8	10754.1	0	30	423	13.95	2.5	NO

*** GRIDDED RECEPTOR NETWORK SUMMARY ***

*** NETWORK ID: POL1 ; NETWORK TYPE:

GRIDPOLR ***

*** ORIGIN FOR POLAR NETWORK ***
X-ORIG = 11328.00 ; Y-ORIG = 10978.00 (METERS)*** DISTANCE RANGES OF NETWORK ***
(METERS)

7000.0,	1500.0,	2000.0,	2500.0,	3000.0,	3500.0,	4000.0,	5000.0,
	10000.0,						

*** DIRECTION RADIALS OF NETWORK ***
(DEGREES)

157.5,	360.0,	22.5,	45.0,	67.5,	90.0,	112.5,	135.0,
	180.0,	202.5,					
	225.0,	247.5,	270.0,	292.5,	315.0,	337.5,	

*** DISCRETE CARTESIAN RECEPTORS ***
(X-COORD, Y-COORD, ZELEV, ZFLAG)
(METERS)

(11858.3, 11508.3, .0, .0);	(11615.0, 11670.9, .0, .0);
(11328.0, 11728.0, .0, .0);	(11041.0, 11670.9, .0, .0);
(11328.0, 9978.0, .0, .0);	(11710.7, 10054.1, .0, .0);
(12035.1, 10270.9, .0, .0);	(12251.9, 10595.3, .0, .0);
(12328.0, 10978.0, .0, .0);	(12035.1, 11685.1, .0, .0);
(11710.7, 11901.9, .0, .0);	(11328.0, 11978.0, .0, .0);
(10945.3, 11901.9, .0, .0);	(10620.9, 11685.1, .0, .0);
(10404.1, 11360.7, .0, .0);	(10620.9, 10270.9, .0, .0);
(10945.3, 10054.1, .0, .0);	(11363.3, 10816.9, .0, .0);
(14662.7, 11118.8, .0, .0);	(10876.3, 17523.5, .0, .0);
(11444.7, 12436.3, .0, .0);	(13292.0, 12707.3, .0, .0);
(11423.8, 9111.7, .0, .0);	(8484.6, 9517.8, .0, .0);
(9118.7, 16434.2, .0, .0);	

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*** THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

FILE: JHARBAND.MET

SURFACE STATION NO.: 99999

NAME: XXX

YEAR: 2018

FORMAT: (4I2,2F9.4,F6.1,I2,2F7.1,f9.4,f10.1,f8.4,i4,f7.2)

UPPER AIR STATION NO.: 99999

NAME: XXX

YEAR: 2018

YEAR	MONTH	DAY	HOUR	FLOW VECTOR	SPEED (M/S)	TEMP (K)	STAB CLASS	MIXING RURAL	HEIGHT (M) URBAN	USTAR (M/S)	M-O LENGTH (M)	Z-0 (M)	IPCODE	PRATE (mm/HR)
18	3	1	1	187.8	3.70	296.1	4	228.0	228.0	.0000	.0	.0000	0	.00
18	3	1	2	282.1	2.80	296.1	5	218.0	218.0	.0000	.0	.0000	0	.00
18	3	1	3	271.0	1.50	295.6	6	200.0	200.0	.0000	.0	.0000	0	.00
18	3	1	4	245.3	1.40	296.0	6	180.0	180.0	.0000	.0	.0000	0	.00
18	3	1	5	241.4	2.10	295.4	5	153.0	153.0	.0000	.0	.0000	0	.00
18	3	1	6	264.2	1.40	296.0	1	85.0	85.0	.0000	.0	.0000	0	.00
18	3	1	7	232.8	.90	296.6	1	105.0	105.0	.0000	.0	.0000	0	.00
18	3	1	8	307.7	.30	297.5	1	313.0	313.0	.0000	.0	.0000	0	.00
18	3	1	9	247.3	.20	297.9	1	563.0	563.0	.0000	.0	.0000	0	.00
18	3	1	10	226.7	.50	301.1	1	868.0	868.0	.0000	.0	.0000	0	.00
18	3	1	11	178.4	.80	303.5	1	1200.0	1200.0	.0000	.0	.0000	0	.00
18	3	1	12	282.3	.20	304.8	1	1625.0	1625.0	.0000	.0	.0000	0	.00
18	3	1	13	269.4	3.70	305.6	2	1675.0	1675.0	.0000	.0	.0000	0	.00
18	3	1	14	248.4	1.70	304.9	1	1900.0	1900.0	.0000	.0	.0000	0	.00
18	3	1	15	253.2	1.40	306.7	1	1700.0	1700.0	.0000	.0	.0000	0	.00
18	3	1	16	257.2	.50	305.0	1	1525.0	1525.0	.0000	.0	.0000	0	.00
18	3	1	17	303.1	2.10	305.2	2	1375.0	1375.0	.0000	.0	.0000	0	.00
18	3	1	18	233.5	5.70	305.0	3	1075.0	1075.0	.0000	.0	.0000	0	.00
18	3	1	19	303.2	4.10	303.6	2	825.0	825.0	.0000	.0	.0000	0	.00
18	3	1	20	259.0	3.30	301.0	4	598.0	598.0	.0000	.0	.0000	0	.00
18	3	1	21	251.0	3.10	300.6	4	498.0	498.0	.0000	.0	.0000	0	.00
18	3	1	22	243.1	3.00	298.4	4	423.0	423.0	.0000	.0	.0000	0	.00
18	3	1	23	266.2	2.40	298.3	5	358.0	358.0	.0000	.0	.0000	0	.00
18	3	1	24	286.4	.00	296.2	6	285.0	285.0	.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 Ph-I of 2.85 MTPA Dhenkanal Steel Plant, Odisha of RML

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*** THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
*** NETWORK ID: POL1 ; NETWORK TYPE: GRIDPOLR ***

		** CONC OF PM10		IN MICROGRAMS/M**3		**	
DIRECTION		DISTANCE (METERS)					
(DEGREES)		1500.00	2000.00	2500.00	3000.00	3500.00	
360.0	9.83176 (18050324)	8.14172 (18050324)	6.74453 (18052524)	6.11313 (18052524)	5.60238 (18052524)		
22.5	7.12930 (18041424)	6.28847 (18050324)	5.78662 (18041424)	5.48622 (18041424)	5.22814 (18041424)		
45.0	8.30680 (18051724)	6.96395 (18051724)	6.05701 (18051724)	5.38726 (18051724)	4.84390 (18051724)		
67.5	8.69067 (18041624)	8.16222 (18041624)	7.68135 (18041624)	7.21517 (18041624)	6.83670 (18041624)		
90.0	7.35995 (18052724)	5.86552 (18052724)	5.01972 (18052724)	4.36379 (18052724)	3.85206 (18052724)		
112.5	7.70667 (18040824)	6.89351 (18040824)	5.98596 (18040824)	5.20870 (18040824)	4.58509 (18040824)		
135.0	10.13292 (18040824)	7.94490 (18040824)	6.16955 (18040824)	4.95075 (18040824)	4.12408 (18040824)		
157.5	8.21736 (18041524)	7.08128 (18041524)	5.87201 (18041524)	4.84296 (18041524)	4.02272 (18041524)		
180.0	10.81796 (18052824)	9.83000 (18052824)	8.69179 (18052824)	7.42510 (18052824)	6.20748 (18052824)		
202.5	9.05411 (18052824)	7.22175 (18052824)	5.48937 (18052824)	3.57365 (18052824)	2.61638c (18031124)		
225.0	5.45514 (18052924)	4.88776 (18052924)	4.37071 (18052924)	3.92845 (18052924)	3.55495 (18052924)		
247.5	12.16749 (18052924)	7.83942 (18052924)	5.86767 (18052924)	4.57170 (18052924)	3.69207 (18052924)		
270.0	11.72195c (18051924)	7.10512c (18032324)	5.71744c (18032324)	4.71451c (18032324)	3.93378c (18032324)		
292.5	13.81660c (18051924)	10.70616c (18051924)	9.45401c (18051924)	8.40464c (18051924)	7.52344c (18051924)		
315.0	15.35949 (18053024)	13.20855 (18053024)	11.47331 (18053024)	9.49203 (18053024)	7.96895 (18053024)		
337.5	11.53280 (18042624)	9.75007 (18042624)	7.99924 (18053024)	7.44065 (18053024)	6.92842 (18053024)		
(DEGREES)		4000.00	5000.00	7000.00	10000.00		
360.0	5.20283 (18052524)	4.68538 (18052524)	4.38641 (18052524)	4.22116 (18052524)			
22.5	4.99805 (18041424)	4.57098 (18041424)	3.78429 (18041424)	2.88280 (18041424)			
45.0	4.38279 (18051724)	3.69003 (18051724)	2.87170 (18051724)	2.19230 (18051724)			
67.5	6.52767 (18041624)	6.00677 (18041624)	5.18688 (18041624)	4.30209 (18041624)			
90.0	3.45149 (18052724)	2.98339c (18051024)	2.41589c (18051024)	2.17369 (18040824)			
112.5	4.09713 (18040824)	3.40549 (18040824)	2.45432 (18040824)	1.51806 (18040824)			
135.0	3.53439 (18040824)	2.75719 (18040824)	1.98957 (18040824)	1.49625 (18040824)			
157.5	3.38110 (18041524)	2.48423 (18041524)	1.54910 (18041524)	1.00013 (18041524)			
180.0	5.15261 (18052824)	3.58992 (18052824)	1.95738 (18052824)	1.06600 (18052824)			
202.5	2.06484c (18031124)	1.48176 (18030224)	1.12182 (18031824)	1.12990 (18031824)			
225.0	3.24124 (18052924)	2.75222 (18052924)	2.11041 (18052924)	1.56036 (18052924)			
247.5	3.07273 (18052924)	2.30025 (18031624)	1.67298 (18031624)	1.19200 (18031624)			
270.0	3.31685c (18032324)	2.43892c (18032324)	1.68184 (18052924)	1.19373 (18052924)			
292.5	6.80947c (18051924)	5.78093c (18051924)	4.62972c (18051924)	3.73559c (18051924)			
315.0	6.93469 (18053024)	5.57802 (18053024)	4.56903 (18052024)	4.15739 (18052024)			
337.5	6.47481 (18053024)	5.72329 (18053024)	4.67241 (18053024)	3.69654 (18053024)			

ISCST3 Model for Ph-I of 2.85 MTPA Dhenkanal Steel Plant, Odisha of RML

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X-COORD (M) Y-COORD (M) CONC (YYMMDDHH)				X-COORD (M) Y-COORD (M) CONC (YYMMDDHH)			
11858.33	11508.33	11.09067	(18051724)	11615.01	11670.91	9.26515	(18042924)
11328.00	11728.00	9.17195	(18051224)	11040.99	11670.91	12.55358	(18052524)
11328.00	9978.00	10.30302	(18041524)	11710.68	10054.12	9.52117	(18033124)
12035.11	10270.89	12.04381	(18040824)	12251.88	10595.32	11.45331	(18052724)
12328.00	10978.00	9.97573	(18052724)	12035.11	11685.11	10.32880	(18051724)
11710.68	11901.88	8.12976	(18050924)	11328.00	11978.00	10.32003	(18050324)
10945.32	11901.88	12.39577	(18052324)	10620.89	11685.11	16.63349	(18052324)
10404.12	11360.68	17.13714	(18052024)	10620.89	10270.89	7.67452	(18052824)
10945.32	10054.12	8.46589	(18041524)	11363.31	10816.90	8.15744	(18052724)
14662.73	11118.76	3.79772	(18052724)	10876.32	17523.53	4.72726	(18052524)
11444.70	12436.35	9.96188	(18050324)	13292.04	12707.34	5.99456	(18051724)
11423.82	9111.71	9.53940	(18052824)	8484.59	9517.75	5.73387	(18052924)
9118.69	16434.20	5.05466	(18053024)				

RANK CONC (YYMMDDHH) AT				RANK CONC (YYMMDDHH) AT			
1.	17.13714	(18052024)	AT (	26.	11.45331	(18052724)	AT (
2.	16.63349	(18052324)	AT (	27.	11.39157	(18052524)	AT (
3.	16.51442	(18052424)	AT (	28.	11.33974	(18051424)	AT (
4.	16.32792	(18053024)	AT (	29.	11.30873c	(18033024)	AT (
5.	16.11977	(18053024)	AT (	30.	11.09067	(18051724)	AT (
6.	15.35949	(18053024)	AT (	31.	10.99950	(18042624)	AT (
7.	15.17390	(18052424)	AT (	32.	10.96064	(18051524)	AT (
8.	14.63518c	(18051924)	AT (	33.	10.81796	(18052824)	AT (
9.	13.81660c	(18051924)	AT (	34.	10.81340	(18051324)	AT (
10.	13.34694	(18052024)	AT (	35.	10.73486c	(18051824)	AT (
11.	13.34085	(18052424)	AT (	36.	10.72523	(18052324)	AT (
12.	13.33552c	(18051824)	AT (	37.	10.71112	(18050324)	AT (
13.	13.20855	(18053024)	AT (	38.	10.70616c	(18051924)	AT (
14.	12.73468	(18042624)	AT (	39.	10.68676	(18052324)	AT (
15.	12.55358	(18052524)	AT (	40.	10.67460	(18041424)	AT (
16.	12.39577	(18052324)	AT (	41.	10.62278	(18042724)	AT (
17.	12.25561	(18052324)	AT (	42.	10.60401	(18051224)	AT (
18.	12.24710c	(18033024)	AT (	43.	10.56315	(18053024)	AT (
19.	12.16749	(18052924)	AT (	44.	10.53404	(18052424)	AT (
20.	12.05278	(18042624)	AT (	45.	10.45714	(18042724)	AT (
21.	12.04381	(18040824)	AT (	46.	10.41747	(18051324)	AT (
22.	11.72195c	(18051924)	AT (	47.	10.40073	(18052424)	AT (
23.	11.61269	(18052524)	AT (	48.	10.32880	(18051724)	AT (
24.	11.53280	(18042624)	AT (	49.	10.32003	(18050324)	AT (

ISCST3 Model for Ph-I of 2.85 MTPA Dhenkanal Steel Plant, Odisha of RML

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25.	11.47331	(18053024)	AT (	9560.23,	12745.77)	GP	50.	10.30302	(18041524)	AT (	11328.00,	9978.00)	DC
*** THE				1ST HIGHEST 24-HR AVERAGE CONCENTRATION				VALUES FOR SOURCE GROUP: ALL				***	
				** CONC OF PM2.5 IN MICROGRAMS/M**3									

DIRECTION		DISTANCE (METERS)											
(DEGREES)		1500.00			2000.00			2500.00			3000.00		
360.0	5.65326	(18050324)	4.68149	(18050324)	3.87811	(18052524)	3.51505	(18052524)	3.22137	(18052524)	3.00618	(18041424)	
22.5	4.09935	(18041424)	3.61587	(18050324)	3.32731	(18041424)	3.15457	(18041424)	3.09768	(18051724)	2.78524	(18051724)	
45.0	4.77641	(18051724)	4.00428	(18051724)	3.48278	(18051724)	4.14677	(18041624)	2.50918	(18052724)	2.21493	(18052724)	
67.5	4.99714	(18041624)	4.69328	(18041624)	3.37268	(18052724)	3.44193	(18040824)	2.99500	(18040824)	2.63643	(18040824)	
90.0	4.23197	(18052724)	3.72681	(18052724)	3.54749	(18040824)	3.37640	(18041524)	2.84668	(18040824)	2.37134	(18040824)	
112.5	4.43133	(18040824)	4.72498	(18041524)	4.07173	(18041524)	4.99778	(18052824)	2.78470	(18041524)	2.31306	(18041524)	
135.0	5.82643	(18040824)	6.22032	(18052824)	5.65225	(18052824)	4.26944	(18052824)	4.26944	(18052824)	3.56930	(18052824)	
157.5	4.23197	(18052724)	5.20611	(18052824)	4.15251	(18052824)	3.15639	(18052824)	2.05485	(18052824)	1.50442c	(18031124)	
180.0	3.13671	(18052924)	2.81046	(18052924)	2.51316	(18052924)	2.25886	(18052924)	2.04410	(18052924)	2.04410	(18052924)	
202.5	6.99631	(18052924)	4.50766	(18052924)	3.37391	(18052924)	2.62873	(18052924)	2.12294	(18052924)	2.12294	(18052924)	
225.0	6.74012c	(18051924)	4.08545c	(18032324)	3.28753c	(18032324)	2.71084c	(18032324)	2.26192c	(18032324)	2.26192c	(18032324)	
247.5	7.94455c	(18051924)	6.15604c	(18051924)	5.43606c	(18051924)	4.83266c	(18051924)	4.32598c	(18051924)	4.32598c	(18051924)	
270.0	8.83170	(18053024)	7.59492	(18053024)	6.59715	(18053024)	5.45791	(18053024)	4.58214	(18053024)	4.58214	(18053024)	
292.5	6.63136	(18042624)	5.60629	(18042624)	4.59956	(18053024)	4.27838	(18053024)	3.98384	(18053024)	3.98384	(18053024)	

(DEGREES)		4000.00			5000.00			7000.00			10000.00		
360.0	2.99162	(18052524)	2.69409	(18052524)	2.52218	(18052524)	2.42717	(18052524)	1.65761	(18041424)	1.26057	(18051724)	
22.5	2.87387	(18041424)	2.62831	(18041424)	2.17597	(18041424)	1.65123	(18051724)	2.98246	(18041624)	2.47370	(18041624)	
45.0	2.52010	(18051724)	3.45389	(18041624)	1.71545c	(18051024)	1.38914c	(18051024)	1.24987	(18040824)	1.24987	(18040824)	
67.5	3.75341	(18041624)	1.95816	(18040824)	1.41123	(18040824)	.87288	(18040824)	.86035	(18040824)	.57507	(18041524)	
90.0	1.98461	(18052724)	1.58538	(18040824)	1.14400	(18040824)	.89073	(18041524)	.61295	(18052824)	.64969	(18031824)	
112.5	2.35585	(18040824)	1.42843	(18041524)	1.12550	(18052824)	.64505	(18031824)	.89721	(18052924)	.68540	(18031624)	
135.0	2.03227	(18040824)	2.06421	(18052824)	1.40238c	(18032324)	.96706	(18052924)	.68640	(18052924)	2.14797c	(18051924)	
157.5	1.94414	(18041524)	.85201	(18030224)	2.66209c	(18051924)	2.62719	(18052024)	2.39050	(18052024)	2.12551	(18053024)	
180.0	2.96275	(18052824)	1.58253	(18052924)	1.21348	(18052924)	.89721	(18052924)	.68540	(18031624)	2.14797c	(18051924)	
202.5	1.18728c	(18031124)	1.32264	(18031624)	.96196	(18031624)	.68540	(18031624)	.68640	(18052924)	2.14797c	(18051924)	
225.0	1.86371	(18052924)	1.40238c	(18032324)	.96706	(18052924)	.68640	(18052924)	2.14797c	(18051924)	2.39050	(18052024)	
247.5	1.76682	(18052924)	3.32403c	(18051924)	2.66209c	(18051924)	2.62719	(18052024)	2.39050	(18052024)	2.12551	(18053024)	
270.0	1.90719c	(18032324)	3.20736	(18053024)	2.62719	(18052024)	2.39050	(18052024)	2.12551	(18053024)			
292.5	3.91545c	(18051924)	3.20736	(18053024)	2.62719	(18052024)	2.39050	(18052024)	2.12551	(18053024)			
315.0	3.98745	(18053024)	3.29089	(18053024)	2.68664	(18053024)	2.68664	(18053024)	2.68664	(18053024)			
337.5	3.72302	(18053024)											

ISCST3 Model for Ph-I of 2.85 MTPA Dhenkanal Steel Plant, Odisha of RML

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X-COORD (M)		Y-COORD (M)	CONC		(YYMMDDHH)	X-COORD (M)		Y-COORD (M)	CONC		(YYMMDDHH)
	11858.33	11508.33		6.37714	(18051724)		11615.01	11670.91		5.32746	(18042924)
	11328.00	11728.00		5.27387	(18051224)		11040.99	11670.91		7.21831	(18052524)
	11328.00	9978.00		5.92423	(18041524)		11710.68	10054.12		5.47467	(18033124)
	12035.11	10270.89		6.92519	(18040824)		12251.88	10595.32		6.58565	(18052724)
	12328.00	10978.00		5.73604	(18052724)		12035.11	11685.11		5.93905	(18051724)
	11710.68	11901.88		4.67461	(18050924)		11328.00	11978.00		5.93402	(18050324)
	10945.32	11901.88		7.12757	(18052324)		10620.89	11685.11		9.56425	(18052324)
	10404.12	11360.68		9.85386	(18052024)		10620.89	10270.89		4.41286	(18052824)
	10945.32	10054.12		4.86789	(18041524)		11363.31	10816.90		4.69053	(18052724)
	14662.73	11118.76		2.18369	(18052724)		10876.32	17523.53		2.71817	(18052524)
	11444.70	12436.35		5.72808	(18050324)		13292.04	12707.34		3.44687	(18051724)
	11423.82	9111.71		5.48515	(18052824)		8484.59	9517.75		3.29697	(18052924)
	9118.69	16434.20		2.90642	(18053024)						

RANK		CONC	(YYMMDDHH)	AT	*** THE MAXIMUM RECEPTOR	50 24-HR AVERAGE CONCENTRATION (XR,YR) OF TYPE	RANK	CONC	(YYMMDDHH)	AT	VALUES FOR SOURCE GROUP: ALL RECEPTOR	*** (XR,YR) OF TYPE	
1.	9.85386	(18052024)	AT	(	10404.12,	11360.68) DC	26.	6.58565	(18052724)	AT	(	12251.88,	10595.32) DC
2.	9.56425	(18052324)	AT	(	10620.89,	11685.11) DC	27.	6.55015	(18052524)	AT	(	10945.32,	11901.88) DC
3.	9.49579	(18052424)	AT	(	10620.89,	11685.11) DC	28.	6.52036	(18051424)	AT	(	10620.89,	11685.11) DC
4.	9.38855	(18053024)	AT	(	10620.89,	11685.11) DC	29.	6.50252c	(18033024)	AT	(	9942.18,	11552.03) GP
5.	9.26886	(18053024)	AT	(	10404.12,	11360.68) DC	30.	6.37714	(18051724)	AT	(	11858.33,	11508.33) DC
6.	8.83170	(18053024)	AT	(	10267.34,	12038.66) GP	31.	6.32471	(18042624)	AT	(	11040.99,	11670.91) DC
7.	8.72500	(18052424)	AT	(	10404.12,	11360.68) DC	32.	6.30236	(18051524)	AT	(	11040.99,	11670.91) DC
8.	8.41523c	(18051924)	AT	(	10404.12,	11360.68) DC	33.	6.22032	(18052824)	AT	(	11328.00,	9478.00) GP
9.	7.94455c	(18051924)	AT	(	9942.18,	11552.03) GP	34.	6.21771	(18051324)	AT	(	11040.99,	11670.91) DC
10.	7.67450	(18052024)	AT	(	9942.18,	11552.03) GP	35.	6.17254c	(18051824)	AT	(	10620.89,	11685.11) DC
11.	7.67099	(18052424)	AT	(	10267.34,	12038.66) GP	36.	6.16700	(18052324)	AT	(	10404.12,	11360.68) DC
12.	7.66793c	(18051824)	AT	(	10404.12,	11360.68) DC	37.	6.15889	(18050324)	AT	(	11040.99,	11670.91) DC
13.	7.59492	(18053024)	AT	(	9913.79,	12392.21) GP	38.	6.15604c	(18051924)	AT	(	9480.24,	11743.37) GP
14.	7.32244	(18042624)	AT	(	10620.89,	11685.11) DC	39.	6.14488	(18052324)	AT	(	10753.97,	12363.82) GP
15.	7.21831	(18052524)	AT	(	11040.99,	11670.91) DC	40.	6.13790	(18041424)	AT	(	11040.99,	11670.91) DC
16.	7.12757	(18052324)	AT	(	10945.32,	11901.88) DC	41.	6.10810	(18042724)	AT	(	10945.32,	11901.88) DC
17.	7.04697	(18052324)	AT	(	11040.99,	11670.91) DC	42.	6.09731	(18051224)	AT	(	11040.99,	11670.91) DC
18.	7.04208c	(18033024)	AT	(	10404.12,	11360.68) DC	43.	6.07381	(18053024)	AT	(	10945.32,	11901.88) DC
19.	6.99631	(18052924)	AT	(	9942.18,	10403.97) GP	44.	6.05708	(18052424)	AT	(	10945.32,	11901.88) DC
20.	6.93035	(18042624)	AT	(	10945.32,	11901.88) DC	45.	6.01285	(18042724)	AT	(	10620.89,	11685.11) DC
21.	6.92519	(18040824)	AT	(	12035.11,	10270.89) DC	46.	5.99005	(18051324)	AT	(	10620.89,	11685.11) DC
22.	6.74012c	(18051924)	AT	(	9828.00,	10978.00) GP	47.	5.98042	(18052424)	AT	(	9913.79,	12392.21) GP
23.	6.67730	(18052524)	AT	(	10620.89,	11685.11) DC	48.	5.93905	(18051724)	AT	(	12035.11,	11685.11) DC
24.	6.63136	(18042624)	AT	(	10753.97,	12363.82) GP	49.	5.93402	(18050324)	AT	(	11328.00,	11978.00) DC

ISCST3 Model for Ph-I of 2.85 MTPA Dhenkanal Steel Plant, Odisha of RML

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25.	6.59715	(18053024)	AT (	9560.23,	12745.77)	GP	50.	5.92423	(18041524)	AT (	11328.00,	9978.00)	DC	
			*** THE	1ST HIGHEST 24-HR AVERAGE			CONCENTRATION	VALUES FOR SOURCE GROUP: ALL			***			
				** CONC OF SO2				IN MICROGRAMS/M**3				**		
DIRECTION				DISTANCE (METERS)										
(DEGREES)	1500.00			2000.00			2500.00			3000.00			3500.00	
360.0	25.42169	(18052524)		22.34074	(18052524)		19.42552	(18052524)		17.02724	(18052524)		15.11843	(18052524)
22.5	11.58538	(18050824)		10.24127	(18050324)		10.35726	(18050324)		9.95425	(18050324)		9.37958	(18050324)
45.0	17.31231	(18051724)		14.14642	(18051724)		11.90831	(18051724)		10.32216	(18051724)		9.17912	(18051724)
67.5	13.08138	(18051724)		10.55364	(18051724)		9.23772	(18042924)		8.22327	(18042924)		7.35007	(18042924)
90.0	14.88084	(18052724)		12.68803	(18052724)		11.07804	(18052724)		9.81596	(18052724)		8.80473	(18052724)
112.5	18.09944	(18052724)		14.23085	(18052724)		11.39491	(18052724)		10.45755	(18040824)		9.67718	(18040824)
135.0	18.29674	(18040824)		17.00085	(18033124)		15.14572	(18033124)		12.96794	(18033124)		11.01322	(18033124)
157.5	17.07796	(18033124)		14.98115	(18041524)		13.77931	(18041524)		11.88567	(18041524)		10.00858	(18041524)
180.0	17.60894	(18041524)		19.53580	(18052824)		21.45839	(18052824)		19.77358	(18052824)		16.87762	(18052824)
202.5	14.06301c	(18031124)		16.42006c	(18031124)		13.60744c	(18031124)		10.49654c	(18031124)		8.06703c	(18031124)
225.0	9.57935	(18052924)		10.77751	(18052924)		8.95688	(18052924)		7.73921	(18052924)		6.88252	(18052924)
247.5	22.90430	(18052924)		19.71571	(18052924)		14.44498	(18052124)		11.67086	(18052124)		9.29723	(18052124)
270.0	22.81936c	(18051924)		17.48918c	(18051924)		12.82628c	(18032324)		11.01338c	(18032324)		9.24561c	(18032324)
292.5	28.36186	(18052024)		24.79355	(18052024)		21.06208	(18052024)		18.10686c	(18051924)		15.81030c	(18051924)
315.0	34.72644	(18052424)		27.44581	(18052424)		21.07095	(18052424)		17.56019	(18053024)		15.55316	(18053024)
337.5	26.48170	(18052324)		22.94237	(18042624)		19.54916	(18042624)		17.52972	(18052424)		16.02647	(18052424)
(DEGREES)	4000.00			5000.00			7000.00			10000.00				
360.0	13.60410	(18052524)		11.43937	(18052524)		9.14497	(18052524)		7.44926	(18052524)		6.11383	(18053024)
22.5	8.79114	(18050324)		7.74038	(18050324)		6.38844	(18041424)		4.96405	(18041424)		4.65930	(18051724)
45.0	8.32580	(18051724)		7.13988	(18051724)		5.78827	(18051724)		4.82163	(18041624)		4.82163	(18041624)
67.5	6.62498	(18042924)		5.82511	(18041624)		5.41385	(18041624)		5.09473	(18052724)		3.74130	(18052724)
90.0	7.97877	(18052724)		6.71415	(18052724)		4.87542	(18040824)		3.22416	(18041624)		3.22416	(18041624)
112.5	8.81053	(18040824)		7.18346	(18040824)		4.82275	(18033124)		3.42898	(18033124)		3.42898	(18033124)
135.0	9.41286	(18033124)		7.14981	(18033124)		3.65950	(18041724)		2.49874	(18030824)		2.49874	(18030824)
157.5	8.38729	(18041524)		5.98415	(18041524)		5.13628	(18052824)		2.81972	(18052824)		2.81972	(18052824)
180.0	14.01792	(18052824)		9.63091	(18052824)		2.87309	(18031324)		1.97256	(18031824)		1.97256	(18031824)
202.5	6.30339c	(18031124)		4.47354	(18031324)		4.34170	(18052924)		3.44321	(18052924)		3.44321	(18052924)
225.0	6.24788	(18052924)		5.36936	(18052924)		3.24684	(18052224)		2.37089	(18052224)		2.37089	(18052224)
247.5	7.46517	(18052124)		5.04171	(18052124)		4.88508	(18052924)		3.50658	(18052924)		3.50658	(18052924)
270.0	8.05263	(18052924)		6.63012	(18052924)		8.91330c	(18051924)		7.09086c	(18051924)		7.09086c	(18051924)
292.5	13.94918c	(18051924)		11.41488c	(18051924)		8.84005	(18053024)		6.11383	(18053024)		6.11383	(18053024)
315.0	14.09911	(18053024)		11.92924	(18053024)		9.54119	(18052424)		7.25129	(18053024)		7.25129	(18053024)
337.5	14.68836	(18052424)		12.49452	(18052424)									

X-COORD (M) Y-COORD (M) CONC (YYMMDDHH)				X-COORD (M) Y-COORD (M) CONC (YYMMDDHH)			
11858.33	11508.33	22.96377	(18051724)	11615.01	11670.91	16.03125	(18051724)
11328.00	11728.00	17.52553	(18052524)	11040.99	11670.91	25.19156	(18052524)
11328.00	9978.00	10.92366	(18041524)	11710.68	10054.12	14.01138	(18033124)
12035.11	10270.89	14.71025	(18052724)	12251.88	10595.32	22.64461	(18052724)
12328.00	10978.00	17.44185	(18052724)	12035.11	11685.11	21.85413	(18051724)
11710.68	11901.88	14.04763	(18040724)	11328.00	11978.00	24.41106	(18052524)
10945.32	11901.88	32.24828	(18052524)	10620.89	11685.11	34.81072	(18052324)
10404.12	11360.68	22.19315	(18052024)	10620.89	10270.89	4.21491	(18031324)
10945.32	10054.12	5.68317	(18052824)	11363.31	10816.90	5.09960c	(18030124)
14662.73	11118.76	8.29491	(18052724)	10876.32	17523.53	9.77529	(18052524)
11444.70	12436.35	22.59698	(18052524)	13292.04	12707.34	12.58712	(18051724)
11423.82	9111.71	17.69314	(18041524)	8484.59	9517.75	9.34985	(18052924)
9118.69	16434.20	10.75711	(18052424)				
*** THE MAXIMUM 50 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***				*** THE MAXIMUM 50 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***			
RANK	CONC	(YYMMDDHH)	AT	RANK	CONC	(YYMMDDHH)	AT
1.	34.81072	(18052324)	AT	26.	22.93385	(18051524)	AT
2.	34.72644	(18052424)	AT	27.	22.90430	(18052924)	AT
3.	33.26102	(18053024)	AT	28.	22.81936c	(18051924)	AT
4.	32.56103	(18053024)	AT	29.	22.80090	(18051624)	AT
5.	32.24828	(18052524)	AT	30.	22.64461	(18052724)	AT
6.	32.16875	(18052424)	AT	31.	22.59698	(18052524)	AT
7.	28.36186	(18052024)	AT	32.	22.34074	(18052524)	AT
8.	27.47520	(18052324)	AT	33.	22.33037	(18052424)	AT
9.	27.44581	(18052424)	AT	34.	22.19315	(18052024)	AT
10.	26.58469	(18051624)	AT	35.	22.18274	(18050324)	AT
11.	26.48170	(18052324)	AT	36.	22.07464	(18042624)	AT
12.	25.49124c	(18051924)	AT	37.	22.06300	(18053024)	AT
13.	25.42169	(18052524)	AT	38.	21.98683	(18051424)	AT
14.	25.25641	(18052524)	AT	39.	21.94421	(18053024)	AT
15.	25.19156	(18052524)	AT	40.	21.86691	(18051624)	AT
16.	24.88996	(18053024)	AT	41.	21.85413	(18051724)	AT
17.	24.79355	(18052024)	AT	42.	21.75153	(18052324)	AT
18.	24.47471	(18051524)	AT	43.	21.60497	(18050324)	AT
19.	24.41106	(18052524)	AT	44.	21.45839	(18052824)	AT
20.	23.49169	(18052324)	AT	45.	21.39289	(18052024)	AT
21.	23.29851	(18051524)	AT	46.	21.32975	(18042724)	AT
22.	23.25750	(18052524)	AT	47.	21.29900	(18053024)	AT
23.	23.04119c	(18051924)	AT	48.	21.07095	(18052424)	AT
24.	22.96377	(18051724)	AT	49.	21.06208	(18052024)	AT
25.	22.94237	(18042624)	AT	50.	20.86780c	(18033024)	AT

ISCST3 Model for Ph-I of 2.85 MTPA Dhenkanal Steel Plant, Odisha of RML

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		*** THE	1ST HIGHEST 24-HR AVERAGE CONCENTRATION		VALUES FOR SOURCE GROUP: ALL		***
			** CONC OF NO2	IN MICROGRAMS/M**3		**	
DIRECTION		DISTANCE (METERS)					
(DEGREES)		1500.00	2000.00	2500.00	3000.00	3500.00	
360.0		11.15420 (18052524)	9.29019 (18052524)	7.83955 (18052524)	6.75157 (18052524)	5.93149 (18052524)	
22.5		5.52240 (18051324)	4.93875 (18050324)	4.90455 (18050324)	4.61924 (18050324)	4.26212 (18050324)	
45.0		6.39029 (18051724)	5.33162 (18051724)	4.55254 (18051724)	3.98324 (18051724)	3.56086 (18051724)	
67.5		5.02764 (18051724)	4.37795 (18051724)	4.01904 (18042924)	3.68157 (18042924)	3.32280 (18042924)	
90.0		6.16650 (18052724)	5.18681 (18052724)	4.49318 (18052724)	3.96856 (18052724)	3.55623 (18052724)	
112.5		7.05003 (18052724)	5.70259 (18052724)	5.28084 (18040824)	5.01578 (18040824)	4.65911 (18040824)	
135.0		7.25282 (18033124)	7.14339 (18033124)	6.52822 (18033124)	5.73104 (18033124)	4.95510 (18033124)	
157.5		6.10591 (18041524)	6.18255 (18041524)	5.70974 (18041524)	5.00119 (18041524)	4.26646 (18041524)	
180.0		7.17552 (18052824)	8.08151 (18052824)	7.69909 (18052824)	6.83495 (18052824)	5.88083 (18052824)	
202.5		3.60537c (18031124)	3.07423 (18031324)	2.75556 (18031324)	2.43542 (18031324)	2.14276 (18031324)	
225.0		3.32892 (18031524)	2.94405 (18031524)	2.46343 (18031524)	2.06049 (18031524)	1.82740 (18052924)	
247.5		8.69136 (18052924)	6.84147 (18052924)	5.31355 (18052924)	4.18995 (18052924)	3.35562 (18052924)	
270.0		8.82669 (18052924)	6.32666 (18052924)	5.22384 (18052924)	4.51949 (18052924)	3.97953 (18052924)	
292.5		12.70673 (18052024)	9.51962c (18051924)	7.88257c (18051924)	6.78254c (18051924)	5.95432c (18051924)	
315.0		12.83016 (18053024)	9.48880 (18053024)	7.80919 (18053024)	6.66244 (18053024)	5.79120 (18053024)	
337.5		12.32043 (18052424)	10.74846 (18052424)	9.46371 (18052424)	8.37961 (18052424)	7.47023 (18052424)	
(DEGREES)		4000.00	5000.00	7000.00	10000.00		
360.0		5.30527 (18052524)	4.45661 (18052524)	3.65884 (18052524)	3.04240 (18052524)		
22.5		3.92059 (18050324)	3.34989 (18050324)	2.85201 (18041424)	2.25307 (18041424)		
45.0		3.23681 (18051724)	2.76798 (18051724)	2.21892 (18051724)	1.77546 (18051724)		
67.5		2.99170 (18042924)	2.54961 (18041624)	2.34148 (18041624)	2.07273 (18041624)		
90.0		3.22296 (18052724)	2.71623 (18052724)	2.06939 (18052724)	1.52746 (18052724)		
112.5		4.25739 (18040824)	3.47190 (18040824)	2.32178 (18040824)	1.44516 (18040824)		
135.0		4.28720 (18033124)	3.30271 (18033124)	2.24144 (18033124)	1.57384 (18033124)		
157.5		3.60625 (18041524)	2.70901 (18041724)	1.72556 (18030824)	1.18660 (18030824)		
180.0		5.00704 (18052824)	3.65301 (18052824)	2.15795 (18052824)	1.29550 (18052824)		
202.5		1.89154 (18031324)	1.50416 (18031324)	1.02795 (18031324)	.89000 (18031824)		
225.0		1.68058 (18052924)	1.46178 (18052924)	1.17710 (18052924)	.91821 (18052924)		
247.5		2.73443 (18052924)	1.91290 (18052924)	1.27578 (18052224)	.94603 (18052224)		
270.0		3.55244 (18052924)	2.92223 (18052924)	2.15779 (18052924)	1.55378 (18052924)		
292.5		5.30867c (18051924)	4.38608c (18051924)	3.33822c (18051924)	2.55071c (18051924)		
315.0		5.11303 (18053024)	4.12339 (18053024)	3.31851 (18052024)	2.88044 (18052024)		
337.5		6.71301 (18052424)	5.55046 (18052424)	4.10095 (18052424)	3.07444 (18053024)		

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X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
11858.33	11508.33	7.17816	(18051724)	11615.01	11670.91	5.68512	(18051724)
11328.00	11728.00	7.28114	(18052524)	11040.99	11670.91	9.08782	(18051524)
11328.00	9978.00	3.94925	(18052824)	11710.68	10054.12	5.04689	(18041524)
12035.11	10270.89	6.26237	(18033124)	12251.88	10595.32	7.28979	(18052724)
12328.00	10978.00	6.95730	(18052724)	12035.11	11685.11	7.73187	(18051724)
11710.68	11901.88	5.52339	(18051524)	11328.00	11978.00	10.97788	(18052524)
10945.32	11901.88	11.28078	(18052324)	10620.89	11685.11	13.32311	(18052424)
10404.12	11360.68	14.18052	(18052024)	10620.89	10270.89	2.83569	(18031324)
10945.32	10054.12	4.04867	(18052824)	11363.31	10816.90	3.14930	(18040824)
14662.73	11118.76	3.25834	(18052724)	10876.32	17523.53	3.78513	(18052524)
11444.70	12436.35	10.64934	(18052524)	13292.04	12707.34	4.79079	(18051724)
11423.82	9111.71	8.30242	(18052824)	8484.59	9517.75	3.53080	(18052924)
9118.69	16434.20	4.72598	(18052424)				

RANK	CONC	(YYMMDDHH)	AT	RECEPTOR	50 24-HR AVERAGE CONCENTRATION (XR,YR)	OF TYPE	RANK	CONC	(YYMMDDHH)	AT	RECEPTOR	50 24-HR AVERAGE CONCENTRATION (XR,YR)	OF TYPE
1.	14.18052	(18052024)	AT	(10404.12,	11360.68)	DC	26.	9.44622c	(18033024)	AT	(10404.12,	11360.68)	DC
2.	13.32311	(18052424)	AT	(10620.89,	11685.11)	DC	27.	9.29019	(18052524)	AT	(11328.00,	12978.00)	GP
3.	12.94860	(18053024)	AT	(10620.89,	11685.11)	DC	28.	9.08851	(18042624)	AT	(10753.97,	12363.82)	GP
4.	12.83016	(18053024)	AT	(10267.34,	12038.66)	GP	29.	9.08782	(18051524)	AT	(11040.99,	11670.91)	DC
5.	12.70673	(18052024)	AT	(9942.18,	11552.03)	GP	30.	9.06692	(18053024)	AT	(10562.63,	12825.76)	GP
6.	12.37117c	(18051924)	AT	(9942.18,	11552.03)	GP	31.	8.82669	(18052924)	AT	(9828.00,	10978.00)	GP
7.	12.32043	(18052424)	AT	(10753.97,	12363.82)	GP	32.	8.81551	(18052024)	AT	(9480.24,	11743.37)	GP
8.	12.05185	(18052424)	AT	(10267.34,	12038.66)	GP	33.	8.69136	(18052924)	AT	(9942.18,	10403.97)	GP
9.	11.28078	(18052324)	AT	(10945.32,	11901.88)	DC	34.	8.62268	(18051524)	AT	(11328.00,	11978.00)	DC
10.	11.15420	(18052524)	AT	(11328.00,	12478.00)	GP	35.	8.59597c	(18051824)	AT	(10267.34,	12038.66)	GP
11.	11.04606	(18053024)	AT	(10753.97,	12363.82)	GP	36.	8.58874c	(18033024)	AT	(9480.24,	11743.37)	GP
12.	10.97788	(18052524)	AT	(11328.00,	11978.00)	DC	37.	8.50242	(18052224)	AT	(10753.97,	12363.82)	GP
13.	10.87761	(18051524)	AT	(10945.32,	11901.88)	DC	38.	8.37961	(18052424)	AT	(10179.95,	13749.64)	GP
14.	10.75811	(18052324)	AT	(10753.97,	12363.82)	GP	39.	8.35773	(18042624)	AT	(10562.63,	12825.76)	GP
15.	10.74846	(18052424)	AT	(10562.63,	12825.76)	GP	40.	8.30242	(18052824)	AT	(11423.82,	9111.71)	DC
16.	10.73234c	(18033024)	AT	(9942.18,	11552.03)	GP	41.	8.28406	(18051424)	AT	(10945.32,	11901.88)	DC
17.	10.70702	(18052424)	AT	(10945.32,	11901.88)	DC	42.	8.24683	(18052324)	AT	(10562.63,	12825.76)	GP
18.	10.65315	(18052324)	AT	(10620.89,	11685.11)	DC	43.	8.23946	(18051224)	AT	(11444.70,	12436.35)	DC
19.	10.64934	(18052524)	AT	(11444.70,	12436.35)	DC	44.	8.21766	(18042724)	AT	(10753.97,	12363.82)	GP
20.	10.30491	(18053024)	AT	(10945.32,	11901.88)	DC	45.	8.09697	(18051524)	AT	(10753.97,	12363.82)	GP
21.	9.96355	(18052524)	AT	(10945.32,	11901.88)	DC	46.	8.08151	(18052824)	AT	(11328.00,	8978.00)	GP
22.	9.51962c	(18051924)	AT	(9480.24,	11743.37)	GP	47.	8.05823	(18051624)	AT	(10753.97,	12363.82)	GP
23.	9.50730	(18051624)	AT	(10945.32,	11901.88)	DC	48.	8.01848	(18051624)	AT	(11328.00,	11978.00)	DC
24.	9.48880	(18053024)	AT	(9913.79,	12392.21)	GP	49.	7.99279	(18051224)	AT	(11328.00,	11978.00)	DC
25.	9.46371	(18052424)	AT	(10371.29,	13287.70)	GP	50.	7.95147	(18052224)	AT	(10945.32,	11901.88)	DC

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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 -----

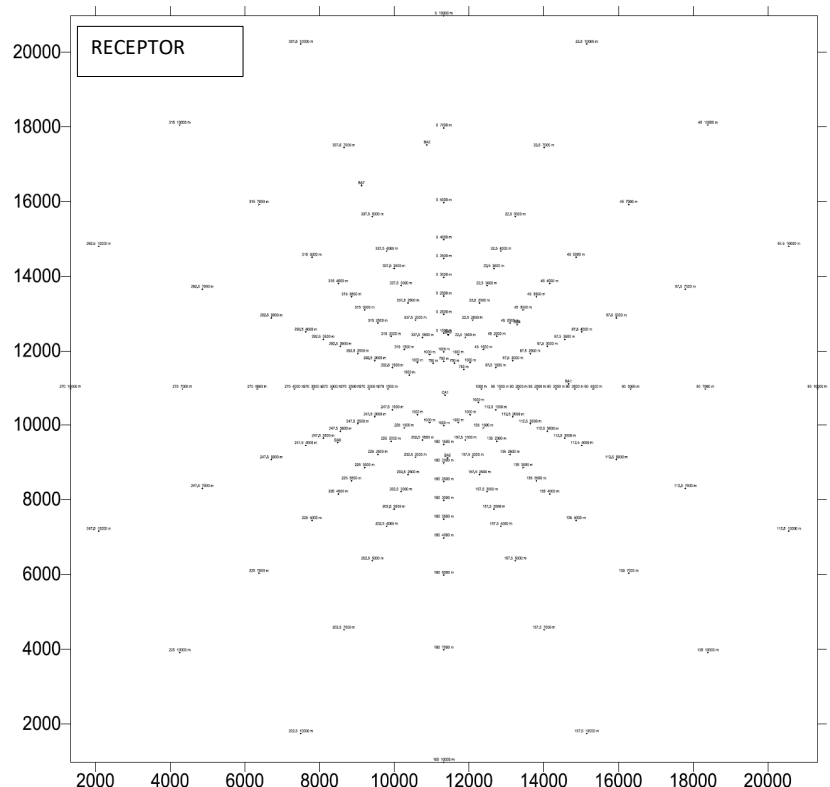
A Total of 0 Fatal Error Message(s)
A Total of 0 Warning Message(s)
A Total of 29 Informational Message(s)

A Total of 29 Calm Hours Identified

***** FATAL ERROR MESSAGES *****
*** NONE ***

***** WARNING MESSAGES *****
*** NONE ***

*** ISCST3 Finishes Successfully ***



ISCST3 Model for Ph-I of 2.85 MTPA Dhenkanal Steel Plant, Odisha of RML

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