DRAFT
ENVIRONMENTAL IMPACT ASSESSMENT
AND
ENVIRONMENTAL MANAGEMENT PLAN
OF
EXPANSION OF DHENKANAL STEEL PLANT
AT
VILLAGES JHARBANDH, GALPADA, TARKABEDA, KOTHALU, BERUANPAL, KANKALU, BENIPATHAR, KADALA, BADAMUNDA, PAIK PURANA KOTE, NARAHARIPUR, CHANDRASEKHARPUR, SANAMUNDA, KALIAKOLI, KANTIMILI, SULANALI, JANHAMUNDA, PATALA AND NUAPADA
DISTRICT DHENKANAL, ODISHA
(PRODUCTION: 3.55 TO 7.53 MTPA STEEL, AREA: 715.9 TO 1444.35 HA)

Project Proponent:

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ToR granted: Letter no. J-11011/309/2018-IA.II (I) dated 13th August 2021

BASELINE DATA PERIOD: 1ST MARCH TO 31ST MAY 2021
COLLECTED BY: MIN MEC R&D LABORATORY, NEW DELHI
(NABL Certificate No.TC-6337 Valid Till 20.11.2021, MOEF&CC Recognition Valid Till 2024)

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Estb. 1983

An ISO 9001:2015 approved company

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UNDERTAKING

I, Pradeep Kumar Chaturvedi S/o Late- Ramlal Chaturvedi hereby, undertake that prescribed Standard TOR vide letter no. J-11011/309/2018-IA II.(I) dated 13.08.2021 with respect to EIA/EMP studies of Expansion of Dhenkanal Steel Plant from 3.55 MTPA to 7.3 MTPA finished steel at villages Jharbandh, Galpada, Tarkabeda, Kothalu, Beruanpal, Kankalu, Benipathar, Kadala, Badamunda, Paika Puruna Kote, Narahari pur, Chandrasekharpur, Sanamunda, Kaliakoli, Kantimili, Solanali, Janhamunda, Patal and Nuapada in Dhenkanal district of Odisha, has been complied while conducting the EIA studies. The contents (Information and data) as given by our consultant in the EIA/EMP report are factually correct, with full knowledge of the undersigned.

Dated: 09.10.2021
Place: Dhenkanal

Signature
Name: P.K.Chaturvedi
Designation: Director

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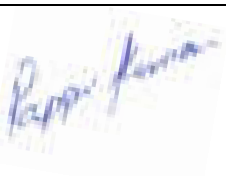
DECLARATION BY EXPERTS CONTRIBUTING TO THE "EIA FOR EXPANSION OF DHENKANAL STEEL PLANT AT VILLAGES JHARBANDH, GALPADA, TARKABEDA, KOTHALU, BERUANPAL, KANKALU, BENIPATHAR, KADALA, BADAMUNDA, PAIK PURANA KOTE, NARAHARIPUR, CHANDRASEKHARPUR, SANAMUNDA, KALIAKOLI, KANTIMILI, SULANALI, JANHAMUNDA, PATALA AND NUAPADA, DISTRICT DHENKANAL, ODISHA (PRODUCTION: 3.55 TO 7.53 MTPA, AREA: 715.9 TO 1444.35 HA)".

I, hereby, certify that I was a part of the team in the following capacity that developed the above EIA.

EIA coordinator
Name: Marisha Sharma
Signature and Date:
Period of involvement: From February 2021 till date (intermittently)
Contact information: Mobile- 9811077603, Email id: minmec@gmail.com

Functional Area Experts:

Sl. No.	Functional Area	Name of the expert/s	Involvement (period and task)		Signature and date
1.	Air pollution monitoring, prevention and control (AP)	Marisha Sharma	**Period:**	From February 2021 to till date (intermittently)	
			Task:	Supervise monitoring and scrutiny of sections related to air quality, impact and management, interpretation of baseline air environment and preparation of sections of air environment.	
		TM-M.S. Yadav	**Period:**	From February 2021 to till date (intermittently)	
			Task:	Planning of air monitoring station network	
		FAE(B) - Pappu Kumar	**Period:**	From February 2021 to till date (intermittently)	
			Task:	Assistance in planning & monitoring of air sampling stations & meteorology station, interpretation of ambient air quality result, air quality management measures; Traffic Impact assessment and management proposal, report writing under guidance of FAE.	
2.	Water pollution monitoring, prevention and control (WP)	Dr. Marisha Sharma	**Period:**	From February 2021 to till date (intermittently)	
			Task:	Selection of sampling stations & supervise sampling and analysis, scrutiny of section of baseline water environment, assessment of impact	

Sl. No.	Functional Area	Name of the expert/s	Involvement (period and task)		Signature and date
				on water environment & waste water management.	
		TM-Gaurav Yadav	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Water & microbiological analysis and interpretation of results, comparison with limits for writing in present baseline scenario.	
3.	Solid and hazardous waste management (SHW)	Dr. Marisha Sharma	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Identification of different sources & types, quantity, handling mechanism and proposed management measures of all types of solid wastes and checking of related sections in the report.	
		FAE(B)-Pappu Kumar	**Period:**	From July 2021 to till date (intermittently)	
			Task:	MSW Generation, impact and management proposal	
4.	Socio-economics (SE)	Dr. Marisha Sharma	**Period:**	From February 2021 to till date (intermittently)	
			Task:	Analysis of socio-economic status of the area, proposed intervention for CSR activities with budget, socio-economic impact & management.	
5.	Ecology and biodiversity (EB)	Rashmi Gupta	**Period:**	From February 2021 to till date (intermittently)	
			Task:	Overall responsibility of ecological surveys, information/ data interpretation and preparation of ecology section in EIA/EMP report.	
		TM-Gaurav Yadav	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Writing ecology section of the report, precaution & safety measure for protection of flora & fauna.	
6.	HG	B. D. Sharma	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Preparation of hydrology & hydro-geology section for baseline environment, assessment of hydrogeological impact due to project along with mitigation measures.	

Sl. No.	Functional Area	Name of the expert/s	Involvement (period and task)		Signature and date
7.	Geology (Geo)	B. D. Sharma	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Prepare geological section of the report.	
8.	Soil conservation (SC)	Rashmi Gupta	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Impact on soil quality during excavation and stacking, mitigation measures for conservation of soil and soil quality in chapter 4.	
		TM- Gaurav Yadav	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Interpretation of soil analysis results for writing in present baseline scenario. Report writing under guidance of FAE.	
9.	Meteorology, air quality modeling and prediction (AQ)	B. D. Sharma	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Gave guidance on the estimation of emission from the project and scrutinised the air modeling section	
		TM- M.S. Yadav	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Processing of micro meteorological data from field, air quality prediction planning (sources, emission, receptor, etc.), developing micro-meteorological input file and emissions input file for air modelling, model run, collating outputs into annexure, plotting GLC contours.	
		FAE (B)- Pappu Kumar	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Quantification of emission from project, traffic, etc. for input to air quality modeling, assistance in air quality models run, incorporation of incremental impact in EIA report.	
10.	Noise and vibration (NV)	Rajesh Kumar Chopra	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Review of the section of noise and ground vibration and recommended mitigation measures for control of noise and ground vibration.	
		TM- M.S. Yadav	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Calculation for attenuation of noise.	

Sl. No.	Functional Area	Name of the expert/s	Involvement (period and task)		Signature and date
		FAE (B)- Pappu Kumar	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Analysis and interpretation of noise results, impact & mitigation of noise & traffic movement, report writing under guidance FAE.	
11.	Land use (LU)	Dr. Marisha Sharma	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Satellite image interpretation and preparation of land use map of study area, prediction of impact on land use pattern (existing & proposed), suggest mitigation measures.	
12.	Risk Assessment and hazard management (RH)	B. D. Sharma	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Assess risk due to project and prepare chapter on disaster management plan.	
		TM- D.K. Bansal	**Period:**	From July 2021 to till date (intermittently)	
			Task:	Assist in preparation of disaster management plan.	

Declaration by the Head of the accredited consultant organization/ authorized person

I, Dr. Marisha Sharma, hereby, confirm that the above-mentioned experts prepared the "EIA for expansion of Dhenkanal Steel Plant at villages Jharbandh, Galpada, Tarkabeda, Kothalu, Beruanpal, Kankalu, Benipathar, Kadala, Badamunda, Paik Purana Kote, Naraharipur, Chandrasekharpur, Sanamunda, Kaliakoli, Kantimili, Sulanali, Janhamunda, Patala and Nuapada, District Dhenkanal, Odisha (production: 3.55 to 7.53 MTPA, area: 715.9 to 1444.35 ha)". I also confirm that the consultant organization shall be fully accountable for any misleading information mentioned in this statement.

Signature: 

Name: Dr. Marisha Sharma
Designation: Director (Technical)
Name of the consultant organization: Min Mec Consultancy Pvt. Ltd.
NABET Certificate No.: 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 XXIV**)

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LIST OF ABBREVIATIONS

AAQ	-	Ambient Air Quality
ABC	-	After Burning Chamber
AFBC	-	Atmospheric Fluidized Bed Combustion
AMSL	-	Above mean sea level
AOD	-	Argon Oxygen Decarburization
APHA	-	American Public Health Association
AQIP	-	Air Quality Impact Prediction
ASTM	-	American Society for Testing and Materials
ATR	-	Action Taken Report
BDL	-	Below Detectable Limit
BF	-	Blast Furnace in context of equipment & processes/ Bag filters in context of air pollution control equipment
bgl	-	Below Ground Level
BOD	-	Biological Oxygen Demand
BOF	-	Basic Oxygen Furnace
C_6H_6	-	Benzene
CCM	-	Continuous Casting Machine
CD	-	Community Development
CER	-	Corporate Environment Responsibility
CFBC	-	Circulating Fluidized Bed Combustion
CGWA	-	Central Ground Water Authority
CGWB	-	Central Ground Water Board
cm	-	Centimeter
CMB	-	Common Monitoring Basin
CO	-	Carbon Monoxide, also Coke Oven
COD	-	Chemical Oxygen Demand
COG	-	Coke Oven Gas
COP	-	Coke Oven Plant
CPCB	-	Central Pollution Control Board
CPP	-	Captive Power Plant
CREP	-	Corporate Responsibility for Environmental Protection
CRGO	-	Cold Rolled Grain Oriented
CRZ	-	Coastal Regulation Zone
CTO	-	Consent to Operate
cum	-	Cubic meter
CWC	-	Central Water Commission
DEM	-	Digital Elevation Model
DG	-	Diesel Generator
DI	-	Ductile Iron
Dia	-	Diameter
DO	-	Dissolved Oxygen
DRI	-	Direct Reduction Iron
DSP	-	Dhenkanal Steel Plant
DSV	-	Design Service Volume
E	-	East

EAF	-	Electric Arc Furnace
EC	-	Environmental Clearance/ Electrical Conductivity
ECG	-	Electrocardiogram
EIA	-	Environmental Impact Assessment
EL	-	Evaporation Loss
EMP	-	Environmental Management Plan
ENE	-	East North East
EOF	-	Energy Optimisation Furnace
EOT	-	Electric Overhead Traveling
ESC	-	Enterprise Social Commitment
ESE	-	East South East
ESP	-	Electro static precipitator
ETP	-	Effluent Treatment Plant
FBC	-	Fluidized Bed Combustion
FES	-	Fume Extraction System
FY	-	Financial Year
g	-	gram
GCP	-	Gas Cleaning Plant
GLC	-	Ground Level Concentration
Ha	-	Hectare
HB	-	Hard Bright
HFL	-	High Flood Line
HMV	-	Heavy Motor Vehicle
HR	-	Hot Rolled
HRC	-	Hot Rolled Coil
IF	-	Induction Furnace
IMD	-	Indian Meteorology Department
IRS	-	Indian Remote Sensing
IS	-	Indian Standards
ISO	-	International Organization for Standardization
ISP	-	Integrated Steel Plant
JIS	-	Japanese Industrial Standard
JSPCB	-	Jharkhand State Pollution Control Board
Kcal	-	Kilo calorie
Kg	-	Kilogram
KL	-	Kilo litre
KLD	-	Kilo litre/day
KVA	-	Kilo Volt Ampere
KW	-	Kilo Watt
KWH	-	Kilo Watt Hour
KWH/T	-	Kilo Watt Hour per Tonne
L	-	Litres
LED	-	Light Emitting Diode
LF	-	Ladle Furnace
LMV	-	Light Motor Vehicle
Lpd	-	Litres per day
LRF	-	Ladle Refining Furnace

LRPC	-	Low Relaxation Pre-stressed concrete
M	-	Meter
m^2	-	Square meter
m^3	-	Cubic meter
MBF	-	Mini Blast Furnace
MC	-	Maximum Capacity
MCM	-	Million Cubic Meter
MoEFCC	-	Ministry of Environment, Forests & Climate Change
MOU	-	Memorandum of Understanding
MTPA	-	Million Tonnes Per Annum
MVA	-	Megavolt amperes
MW	-	Megawatt
N	-	North
NAAQS	-	National Ambient Air Quality Standards
NABET	-	National Accreditation Board for Education and Training
NABL	-	National Accreditation Board for Testing and Calibration Laboratories
NE	-	North East
NH	-	National Highway
NH_3	-	Ammonia
NNE	-	North North East
NNW	-	North North West
NO_2	-	Nitrogen Dioxide
NOC	-	No Objection Certificate
NOF	-	New Oxygen Furnace
Nos.	-	Numbers
NTU	-	Nephelometric Turbidity Unit
NW	-	North West
OHS	-	Occupational Health & Safety
OMC	-	Odisha Mining Corporation
PAH	-	Poly Aromatic Hydrocarbons
PBFS	-	Portland Blast Furnace Slag
PCCF	-	Principal Chief Conservator of Forests
PCM	-	Pig Casting Machine
PEL	-	Permissible Exposure Level
PF	-	Protected Forest
PGP	-	Producer Gas Plant
PM	-	Particulate Matter
PM10	-	Respirable Particulate Matter
PM2.5	-	Fine particulate matter
PPC	-	Portland Pozzolana Cement
PTFE	-	Polytetrafluoroethylene
PWD	-	Public Works Department
RABH	-	Reverse Air Bag Filter
RDS	-	Respirable Dust Sampler
RF	-	Reserved Forests

RH	-	Ruhrstahl Heraeus
RL	-	Reduced Level
RM	-	Rolling Mill
RML	-	Rungta Mines Limited
ROM	-	Run of Mine
RPM	-	Respirable Particulate Matter
RS	-	Railway Station
S	-	South
SAF	-	Submerged Arc Furnace
SC	-	Scheduled Caste
SE	-	South East
SMS	-	Steel Melting Shop
SO_2	-	Sulphur Dioxide
SPCB	-	State Pollution Control Board
SSE	-	South South East
SSW	-	South South West
ST	-	Scheduled Tribe
STP	-	Sewage Treatment Plant
SW	-	South West
T	-	Tonnes
TDS	-	Total Dissolved Solids
TG	-	Turbo Generator
TMT	-	Thermo Mechanically Treated
TOR	-	Terms of Reference
TPA	-	Tonnes Per Annum
TPD	-	Tonnes Per Day
TPM	-	Tonnes Per Month
TRT	-	Top Pressure Recovery Turbine
TSCR	-	Thin Slab Casting and Rolling
TSS	-	Total Suspended Solids
VD	-	Vacuum Degassing
VOC	-	Volatile Organic Compound
W	-	West
WHR	-	Waste Heat Recovery
WHRB	-	Waste Heat Recovery Boiler
WSW	-	West South West

CHAPTER 1

INTRODUCTION

1.1 PURPOSE OF THE EIA REPORT

Background

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

(i) J-11011/241/2009-IA.II(I) dated 02.08.2010 for integrated steel plant 1.9 MTPA steel and 385 MW power plant

(ii) J-11011/241/2009-IA.II(I) dated 25.01.2011 for amendments in the environmental clearance to add lime plant, dolo plant, oxygen plant and vacuum degassing.

(iii) J-11011/241/2009-IA.II(I) dated 27.08.2015 for validity extension (i.e. within 5 years) but due to MOEF&CC's Notification dated, the validity was extended by default to 7 years. Nearing 7 years from date of environmental clearance.

(iv) J-11011/241/2009-IA.II(I) 07.07.2017 for extension of validity of EC

(v) J-11011/241/2009-IA.II(I) dated 20.09.2018 for change in configuration of power plant

(vi) J-11011/309/2018.IA.II.(I) dated 11.09.2019 for expansion to 2.85 MTPA steel with public hearing on 07.03.2019

(vii) J-11011/309/2018.IA.II.(I) dated 13.04.2020 for change in configuration of pellet plant from 2x1.47 MTPA to 1x2.948 MTPA

(viii) J-11011/309/2018.IA.II.(I) dated 04.06.2020 for expansion to 3.0 MTPA under clause 7(ii) of EIA Notification 2006. This environmental clearance is in supercession of the environmental clearance dated 11.09.2019.

(ix) J-11011/309/2018.IA.II.(I) dated 15.02.2021 for expansion to 3.55 MTPA and Power plant from 385 MW to 695 MW. (Copy given in ***Annexure II(a)***)

Now Rungta Mines Limited (Dhenkanal Steel Plant) proposes to enhance production capacity from 3.55 MTPA to 7.53 MTPA steel by expansion of facilities such as DRI plant (from 2.247 to 4.403 MTPA), blast furnace (from 1.943 to 4.984 MTPA), sinter plant (from 2.827 to 7.48 MTPA), coke oven plant (from 1.07 to 2.75 MTPA), steel melting shop (from 3.22 to 7.409 MTPA), continuous casting machine- billets/ bloom caster/ slab (from 3.156

to 7.303 MTPA), finished product facilities (from 3.55 to 7.53 MTPA), oxygen plant (from 0.294 to 1.134 MTPA), cement grinding plant (from 1.686 to 3.2775 MTPA), clinker production unit (from 0.96 to 5.6 MTPA) and captive power plant (from 695 to 1290 MW). The capacity of beneficiation plant (5.4 MTPA), coal washery (5.029 MTPA), producer gas plant (5387 million Nm^3/annum) and pelletisation plant (28.75 MTPA) shall remain same.

Need for study

This Environmental Impact Assessment report has been prepared for the expansion of the 3.55 to 7.53 MTPA steel. As per procedure laid down in the EIA Notification dated 14th September 2006 and its amendments, Form-I, proposed terms of reference (TOR) for the EIA along with the pre-feasibility report was submitted to Ministry of Environment, Forest & Climate Change (MoEF&CC) vide online application no. IA/OR/IND/224229/2021 dated 11.08.2021. MOEF&CC granted standard TOR vide letter no J-11011/309/2018.IA.II.(I) dated 13.08.2021 (for 7.53 MTPA) (copy given in **Annexure I**). Based on the ToR, draft Environmental Impact Assessment (EIA)/ Environment Management Plan (EMP) is prepared to conduct public hearing and obtain environmental clearance. After public hearing, the final EIA/ EMP report is prepared.

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

TABLE 1.1: ITEM NUMBER OF FACILITIES IN SCHEDULE OF EIA NOTIFICATION 2006

Sub-Project	Existing	Proposed	Item No.	Category
DRI, MBF, SMS	√	√	3(a)	A
Coal washery	√	No change	2(a)	A
Pellet Plant with PGP	√	No change	2(b)	A
Beneficiation Plant	√	No change	2(b)	A
Coke oven plant	√	√	4(b)	A
Captive Power Plant	√	√	1(d)	A
Cement Plant	√	√	3(b)	A

1.2 IDENTIFICATION OF THE PROJECT

Present status: The construction of facilities of Dhenkanal Steel plant sanctioned under environmental clearance dated 11.09.2019 were commenced and subsequently an environmental clearance dated

15.02.2021 has been obtained. The facilities of the clearance dated 11.09.2019 were amalgamated into the clearance dated 15.02.2021. Thus, part of the facilities have been constructed and are operation, part of them are under construction and the balance are yet to be constructed. The facilities that has become operational are in line with the consent to operate dated 06.05.2021 (copy given in **Annexure V**), while those under construction are in line with the consent to Establish dated 24.08.2021 (copy given in **Annexure IV**). They are summarised in **Table 1.2**.

TABLE 1.2: IMPLEMENTATION STATUS OF THE EXISTING EC

Sl. No.	Proposed Plant facilities	Unit	As per EC dated 15.02.2021	Status as on 02.08.2021	Production as per CTO
	Overall finished steel capacity	**MTPA**	**3.55**	Yet to install	
1	Beneficiation Plant	MTPA	5.4 (2X2.69 MTPA)	Yet to install	
2	Pelletisation Plant				
2.1	Pellet Plant (I)	MTPA	3.75 (1X3.75 MTPA)	2.948 MTPA under construction	
2.2	Pellet Plant (II)	MTPA	25.0 (4X3.75 MTPA +10X1 MTPA)	Yet to install	
	Total	**MTPA**	**28.75**		
3	Coal Washery	MTPA	5.029 (1X400TPH+1X235 TPH)	Yet to install	
4	DRI Plant				
4.1	DRI (I)	MTPA	0.5218 (2X500 TPD)	1x500 TPD under operation 1x500 TPD under constriction	260,570 TPA
4.2	DRI (II)	MTPA	0.8626 (3X600 TPD)	1x600 TPD order placed	
4.3	DRI (III)	MTPA	0.8626 (2X900 TPD)	To be implemented	
	Total	**MTPA**	**2.247**		
5	Mini Blast Furnace	MTPA			
5.1	MBF I	MTPA	0.777 (1X600 cum.)	Yet to install	
5.2	MBF II	MTPA	1.166 (2X450 cum.)	Yet to install	
	Total		**1.943**		
6	Sinter Plant				
6.1	Sinter Plant (I)	MTPA	1.520 (2X80 sq.m.)	Yet to install	
6.2	Sinter Plant (II)	MTPA	1.307 (1X110 sq.m.)	Yet to install	
	Total	**MTPA**	**2.827**		
7	Coke Oven Plant	MTPA	1.07	Yet to install	

Sl. No.	Proposed Plant facilities	Unit	As per EC dated 15.02.2021	Status as on 02.08.2021	Production as per CTO
			(6 batteries x 70,000 TPA + 1 battery x 250,000 TPA + 1 battery x 400,000 TPA)		
8	Steel Melting Shop				
8.1	Steel Melting via Induction Furnace Route	MTPA	1.54 (15 X20 T IF + 4x25T LRF + 3x45 T LRF)	IF 2x20 T under operation IF 3x20 T under construction and 5x20 T order placed	231,000 TPA
8.2	Steel Melting via Electric Arc Furnace-Vacuum Degassing-Argon Oxygen Decarburization Route	MTPA	1.680 (1X90 T+1X110 T and 1x90 T LRF+1x110T LRF)	Yet to install	
	Total	**MTPA**	**3.22**		
	Continuous Casting Machine (Billets/ Bloom Caster/ Slab)	MTPA	3.156 (11 nos. X 4 Strand)	1x 3 strand under operation	
9	Finished Product Facilities				
9.1	Rolling Mill (TMT/ Flat/ Round/ Wire Rod/ Structural Mill/others	MTPA	2.55 (2 nos.X0.2 + 4 nos.X0.3 + 1 no. X0.45 + 1 nos. X0.5 MTPA)	1x0.20 MTPA TMT and 1x0.30 MTPA wire rod under construction	
9.2	Strip Mill/ Sheet/ Coil/ Wire & Bar Mill/ Wire Rope	MTPA	0.5 (1 no.X0.2 + 1no.X0.3 MTPA)	Yet to install	
9.3	Ductile Pipe Plant	MTPA	0.5 (2 nos.X0.25 MTPA)	Yet to install	
	Total	**MTPA**	**3.55**		
10	Producer Gas Plant	Million Nm^3/ Annum	5387 (20 nos.X3000 + 32 nos.X12500 + 28 nos.x7500 Nm^3/hr)	Yet to install	
11	Oxygen Plant	MTPA	0.294 (2 nos.X180 TPD + 1 no.X220 TPD + 2 nos.X130TPD)	Yet to install	
12	Lime Plant	MTPA	0.3045 (1 no.X390 + 1 no.X 480 TPD)	Yet to install	
13	Cement Plant	MTPA			
13.1	Cement Grinding Unit	MTPA	1.686 (1 no.X2600 + 1 no.X2300 TPD)	Yet to install	
13.3	Clinker Production Unit	MTPA	0.96	Yet to install	

Sl. No.	Proposed Plant facilities	Unit	As per EC dated 15.02.2021	Status as on 02.08.2021	Production as per CTO
14	Captive Power Plant				
14.1	Waste Heat Recovery Boiler (WHRB) based Captive Power Plant (CPP)				
(a)	DRI Kiln exit gas based	MW	150 (2 nos.X50 + 3 nos.X85 TPH + 2 nos.X120 TPH)	1x50 TPH WHRB based power under operation 1x50 TPH under construction	
(b)	MBF Gas based	MW	35 (1 no.X50 + 2 nos.X45 TPH)	Yet to install	
(c)	Coke Oven Gas based	MW	40 (2 no.X60 + 1no.X40TPH)	Yet to install	
(d)	TRT	MW	10	Yet to install	
	Sub Total	MW	235		
14.2	AFBC/CFBC based CPP	MW	460 (10 nos.x125 + 1 nos.X130 + 3nos.X250 TPH)	25 MW under operation 25 MW under construction and 50 MW WO placed	25 MW
	Total	**MW**	**695**		

Present sanctioned capacity and additional capacities of facilities, as per TOR dated 15.02.2021, are given in **Table 1.3**.

TABLE 1.3: EXISTING FACILITIES AS PER EC DT. 15.02.2021 AND PROPOSED FACILITIES & PRODUCTION FOR EXPANSION

Sl. No.	Proposed Plant facilities	Unit	As per EC dated 15.02.2021	Proposed Additional	Total After expansion
	Overall finished steel capacity	**MTPA**	**3.55**	**3.98**	**7.53**
1	Beneficiation Plant	MTPA	5.4 (2X2.69 MTPA)	-	5.4 (2X2.69 MTPA)
2	Pelletisation Plant				
2.1	Pellet Plant (I)	MTPA	3.75 (1X3.75 MTPA)	-	3.75 (1X3.75 MTPA)
2.2	Pellet Plant (II)	MTPA	25.0 (4X3.75 MTPA +10X1 MTPA)	-	25.0 (4X3.75 MTPA +10X1 MTPA)
	Total	**MTPA**	**28.75**		**28.75**
3	Coal Washery	MTPA	5.029 (1X400TPH+1X235 TPH)	-	5.029 (1X400TPH+1X235 TPH)
4	DRI Plant				
4.1	DRI (I)	MTPA	0.5218 (2X500 TPD)	-	0.5218 (2X500 TPD)

Sl. No.	Proposed Plant facilities	Unit	As per EC dated 15.02.2021	Proposed Additional	Total After expansion
4.2	DRI (II)	MTPA	0.8626 (3X600 TPD)	-	0.8626 (3X600 TPD)
4.3	DRI (III)	MTPA	0.8626 (2X900 TPD)	-	0.8626 (2X900 TPD)
4.4	DRI (IV)	MTPA	-	2.156 (5X900 TPD)	2.156 (5X900 TPD)
	Total	**MTPA**	**2.247**	**2.156**	**4.403**
5	Mini Blast Furnace	MTPA			
5.1	MBF I	MTPA	0.777 (1X600 cum.)	-	0.777 (1X600 cum.)
5.2	MBF II	MTPA	1.166 (2X450 cum.)	-	1.166 (2X450 cum.)
5.3	MBF III	MTPA	-	1.7290 (2X650 cum.)	1.7290 (2X650 cum.)
5.4	BF	MTPA	-	1.3125 (1X1250 cum.)	1.3125 (1X1250 cum.)
	Total		**1.943**	**3.0415**	**4.984**
6	Sinter Plant				
6.1	Sinter Plant (I)	MTPA	1.520 (2X80 sq.m.)	-	1.520 (2X80 sq.m.)
6.2	Sinter Plant (II)	MTPA	1.307 (1X110 sq.m.)	-	1.307 (1X110 sq.m.)
6.3	Sinter Plant (III)	MPTA	-	2.574 (2X130 sq.m.)	2.5740 (2X130 sq.m.)
6.4	Sinter Plant (IV)	MTPA	-	2.079 (1X210 sq.m.)	2.0790 (1X210 sq.m.)
	Total	**MTPA**	**2.827**	**4.653**	**7.48**
7	Coke Oven Plant	MTPA	1.07 (6 batteries x 70,000 TPA + 1 battery x 250,000 TPA + 1 battery x 400,000 TPA)	1.680 (12 batteries x 70,000 TPA + 2 batteries x 420,000 TPA)	2.75 (18 batteries x 70,000 TPA + 1 battery x 250,000 TPA + 1 battery x 400,000 TPA + 2 batteries x 420,000 TPA)
8	Steel Melting Shop				
8.1	Steel Melting via Induction Furnace Route	MTPA	1.54 (15 X20 T IF + 4x25T LRF + 3x45 T LRF)	1.12 (20 X20 T IF + 8x45 T LRF)	2.66 (35 X20 T IF + 4x25T LRF + 11x45 T LRF)
8.2	Steel Melting via Electric Arc Furnace-Vacuum Degassing-Argon Oxygen Decarburization Route	MTPA	1.680 (1X90 T+1X110 T and 1x90 T LRF+1x110T LRF)	-	1.680 (1X90 T+1X110 T and 1x90 T LRF+1x110T LRF)
8.3	Steel Melting via BOF/ NOF/ EOF/ EAF-LF-VD/ RH/ AOD	MTPA	-	3.069 (2X65 T+4X45 T and 2x65 T LRF+4x45T LRF)	3.069 (2X65 T+4X45 T and 2x65 T LRF+4x45T LRF)
	Total	**MTPA**	**3.22**	**4.189**	**7.409**

Sl. No.	Proposed Plant facilities	Unit	As per EC dated 15.02.2021	Proposed Additional	Total After expansion
	Continuous Casting Machine (Billets/ Bloom Caster/ Slab)	MTPA	3.156 (11 nos. X 4 Strand)	4.147 (7 nos. X 4 Strand)	7.303 (18 nos. X 4 Strand)
9	Finished Product Facilities				
9.1	Rolling Mill (TMT/ Flat/ Round/ Wire Rod/ Structural Mill/ wire drawing/ HB Wire*/ Binding Wire*/ LRPC wire*/ others followed by one or more in series of pickling, cold rolling, annealing, galvanizing	MTPA	2.55 (2 nos.X0.2 + 4 nos.X0.3 + 1 no. X0.45 + 1 nos. X0.5 MTPA) (TMT/ Flat/ Round/ Wire Rod/ Structural Mill/others)	Change in product mix TMT/ Flat/ Round/ Wire Rod/ Structural Mill/ wire drawing/ HB Wire*/ Binding Wire*/ LRPC wire*/others followed by one or more in series of pickling, cold rolling, annealing, galvanizing	2.55 (2 nos.X0.2 + 4 nos.X0.3 + 1 no. X0.45 + 1 nos. X0.5 MTPA)
9.2	Strip Mill/ Sheet/ Coil/ Wire & Bar Mill/ Wire Rope	MTPA	0.5 (1 no.X0.2 + 1no.X0.3 MTPA)	-	0.5 (1 no.X0.2 + 1no.X0.3 MTPA)
9.3	Ductile Pipe Plant (& fittings*)	MTPA	0.5 (2 nos.X0.25 MTPA)	-	0.5 (2 nos.X0.25 MTPA)
9.4	Rolling mill (Long/ TMT/ Flat/ Strip/ Round/ Wire Rod/ Hot Rolled/ HRC/ Structural Mill/ Plate/ Pipe & Tube Products/ wire drawing/ HB Wire*/ Binding Wire*/ LRPC wire*, etc) followed by one or more in series of pickling, cold rolling, annealing, galvanizing	MTPA	-	2.78 (2 X 0.55 MTPA+4X0.42 MTPA	2.78 (2 X 0.55 MTPA+4X0.42 MTPA
9.5	Rolling Mill (Long/ TMT/ Flat/ Strip/ Round/ Wire Rod/ Hot Rolled/ HRC/ Structural Mill/ Tin Plate/ Electrical Steel/ CRGO/ Wire Drawing followed by (1) Pipe & Tube Products or (2) one or more in series of pickling, cold	MTPA	-	1.2	1.2

Sl. No.	Proposed Plant facilities	Unit	As per EC dated 15.02.2021	Proposed Additional	Total After expansion
	rolling, annealing, galvanizing and colour coating as follows:				
9.5.1	Cold Rolling Mill/ Plate Mill/Pipe Mill etc	MTPA		1.2 (2x0.3+3x0.2)	1.2 (2x0.3+3x0.2)
9.5.2	Galvanising Line/Galvanneal/GI-Auto/Tin Mill Products/Coated/ Plated Products/ Galvalume/CRGO etc	MTPA		1.2 (2x0.3+3x0.2)	1.2 (2x0.3+3x0.2)
9.5.3	Colour Coated Line, etc	MTPA		1.2 (2x0.3+3x0.2)	1.2 (2x0.3+3x0.2)
	Total	**MTPA**	**3.55**	**3.98**	**7.53**
10	Producer Gas Plant	Million Nm^3/ Annum	5387 (20 nos.X3000 + 32 nos.X12500 + 28 nos.x7500 Nm^3/hr)	-	5387 (20 nos.X3000 + 32 nos.X12500 + 28 nos.x7500 Nm^3/hr)
11	Oxygen Plant	MTPA	0.294 (2 nos.X180 TPD + 1 no.X220 TPD + 2 nos.X130TPD)	0.84 (2 nos.X600 TPD + 1 no.X1200 TPD)	1.134 (2 nos.X180 TPD + 1 no.X220 TPD + 2 nos.X130TPD + 2 nos.X600 TPD + 1 no.X1200 TPD)
12	Lime Plant	MTPA	0.3045 (1 no.X390 + 1 no.X 480 TPD)	0.462 (1 no.X600 + 2 no.X 400 TPD)	0.7665 (1 no.X390 + 1 no.X 480 TPD + 1 no.X600 + 2 no.X 400 TPD)
13	Cement Plant	MTPA			
13.1	Cement Grinding Unit	MTPA	1.686 (1 no.X2600 + 1 no.X2300 TPD)	Existing revised to 1.725 (2X2500 TPD) with change in configuration And additional 1.5525 (3 X 1500 TPD)	3.2775 (2X2500 TPD + 3 X 1500 TPD)
13.3	Clinker Production Unit	MTPA	0.96	Existing revised to 1.2 and additional 4.4	5.6 (3X1.2 MTPA + 1X2 MTPA)
14	Captive Power Plant				
14.1	Waste Heat Recovery Boiler (WHRB) based Captive Power Plant (CPP)				
(a)	DRI Kiln exit gas based	MW	150 (2 nos.X50 + 3	150 (5 nos.X120	300 (2 nos.X50 + 3 nos.X85

Sl. No.	Proposed Plant facilities	Unit	As per EC dated 15.02.2021	Proposed Additional	Total After expansion
			nos.X85 TPH + 2 nos.X120 TPH)	TPH)	TPH + 7 nos.X120 TPH)
(b)	MBF Gas based	MW	35 (1 no.X50 + 2 nos.X45 TPH)	70 (2 no.X90 + 1 nos.X120 TPH)	105 (1 no.X50 + 2 nos.X45 TPH + 2 no.X90 + 1 nos.X120 TPH)
(c)	Coke Oven Gas based	MW	40 (2 no.X60 + 1no.X40TPH)	Exiting revised to 75 (2 no.X60 + 1no.X40TPH + 1 no.X140 TPH) and additional 120 (3 no.X50 +2 no.X75 2no.X150TPH)	195 (2 no.X60 + 1no.X40TPH + 1 no.X140 TPH + 3 no.X50 +2 no.X75 + 2no.X150TPH)
(d)	TRT	MW	10	20	30
(e)	WHRB(Clinker Plant)	MW	-	25 (2 nos.X25 TPH+1 x 50 TPH)	25 (2 nos.X25 TPH+1 x 50 TPH)
	Sub Total	MW	235	420	655
14.2	AFBC/CFBC based CPP	MW	460 (10 nos.x125 + 1 nos.X130 + 3nos.X250 TPH)	175 (2 nos.x260 TPH+ 1x 180 TPH)	635 (10 nos.x125 + 1 nos.X130 + 3nos.X250 TPH + 2 nos.x260 TPH+ 1x 180 TPH)
	Total	**MW**	**695**	**595**	**1290**

**** additional products proposed after receiving Terms of Reference***
Note : 9.5.1 to 9.5.3 added for further detailing of the unit

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

TABLE 1.4: SALIENT FEATURES OF THE EXISTING & PROPOSED PROJECT

Project name	Expansion of Dhenkanal Steel Plant
Project proponent	Rungta Mines Limited
Location	Villages Jharbandh, Galpada, Tarkabeda, Kothalu, Beruanpal, Kankalu, Benipathar, Kadala, Badamunda, Paik Purana Kote, Naraharipur, Chandrasekharpur, Sanamunda, Kaliakoli, Kantimili, Sulanali, Janhamunda, Patala and Nuapada District Dhenkanal, Odisha
Co-ordinates (as per google earth as on 10.08.2021)	22°43'09.48'' to 20°46'33.50'' N 85°13'58.34" to 85°19'13.34" E
Total Area	Existing: 1769 acres (715.9 ha) Proposed additional: 1800 acres (728.45 ha) **Total: 3569 acres (1444.35 ha**)
Status of Land	1800 acres additionally required which consists of 1609.80 acres private land and 190.20 acres government land. It is to be acquired.
Product	Steel, power, pellet, cement, clinker, surplus of pig iron

	from blast furnace, sinter and coke.
Rated capacity existing & Proposed	1. Beneficiation Plant 5.4 MTPA, no change 2. Pellet Plant 28.75 MTPA, no change 3. Coal Washery 5.029 MTPA, no change 4. DRI from 2.247 to 4.403 MTPA 5. Mini Blast Furnace from 1.943 to 4.984 MTPA 6. Coke Oven Plant from 1.07 to 2.75 MTPA 7. SMS from 3.22 to 7.409 MTPA 8. Continuous casting machine from 11X4 to 18X4 strand 9. Rolling mill from 3.55 to 7.53 MTPA 10. Producer Gas Plant 5387 Million Nm^3/hr, no change 11. Oxygen plant from 0.294 to 1.134 MTPA 12. Lime Plant from 0.3045 to 0.7665 MTPA 13. Cement Grinding Unit from 1.686 to 3.2775 MTPA 14. Clinker Production Unit from 0.96 to 5.6 MTPA 15. Power plant from 695 to 1290 MW
Working days	**Existing:** 355 **Proposed**: 355
Manpower	**Existing:** 4,850 **Proposed Additional** : 1,800 **Total** : 6,650
Expected cost of the project	**Existing** : Rs. 13,386.9 Cr. **Proposed Additional** : Rs. 11,001 Cr. **Total** : Rs. 24,387.9 Cr.
Water requirement	**Existing :** 3,752 cum/hr **Proposed Additional** : 2,750 cum/hr **Total** : 6,502 cum/hr
Source of water	Brahmani river and rain water harvesting
Power requirement	**Existing** : 694 MW **Proposed Additional** : 596 MW **Total** : 1290 MW
Power source	Captive Power Plant
Implementation Schedule	84 months from the date of EC

1.3 PROJECT PROPONENT

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

The Corporate office of Rungta Mines Limited is located at Chaibasa, Jharkhand. The company's vision and mission is to utilise its core values and strengths, complemented with the vast experience gained, to help it keep pace with the changing times and respond to domestic & international

market forces by maintaining consistent quality and dispatch schedules, making RML synonymous with reliability.

1.4 BRIEF DESCRIPTION OF THE PROJECT

1.4.1 Nature of project

The proposed project is an Integrated Steel Plant of 7.53 million tonnes per annum finished steel production. It is an expansion from 3.55 million tonnes steel production, which was sanctioned vide environmental clearance dated 15.02.2021. Details of sanctioned and proposed manufacturing facilities have already been given in **Table 1.3**.

1.4.2 Size

Dhenkanal Steel Plant proposes to enhance steel production capacity from 3.55 MTPA to 7.53 MTPA steel. The total area of existing plant is 1769 acres and expansion area shall be in an additional area of 1800 acres. The total plant area after expansion shall be 3569 acres.

1.4.3 Location

The existing & proposed site for plant is located in villages Jharbandh, Galpada, Tarkabeda, Kothalu, Beruanpal, Kankalu, Benipathar, Kadala, Badamunda, Paik Purana Kote, Naraharipur, Chandrasekharpur, Sanamunda, Kaliakoli, Kantimili, Sulanali, Janhamunda, Patala and Nuapada District Dhenkanal, Odisha and is shown in **Fig 1.1**.

The location of plant and study area can be seen in Survey of India Open Series No. F45T1, F45T2, F45T5 & F45T6. The co-ordinates of the site as per google earth are as given in **Table 1.5**.

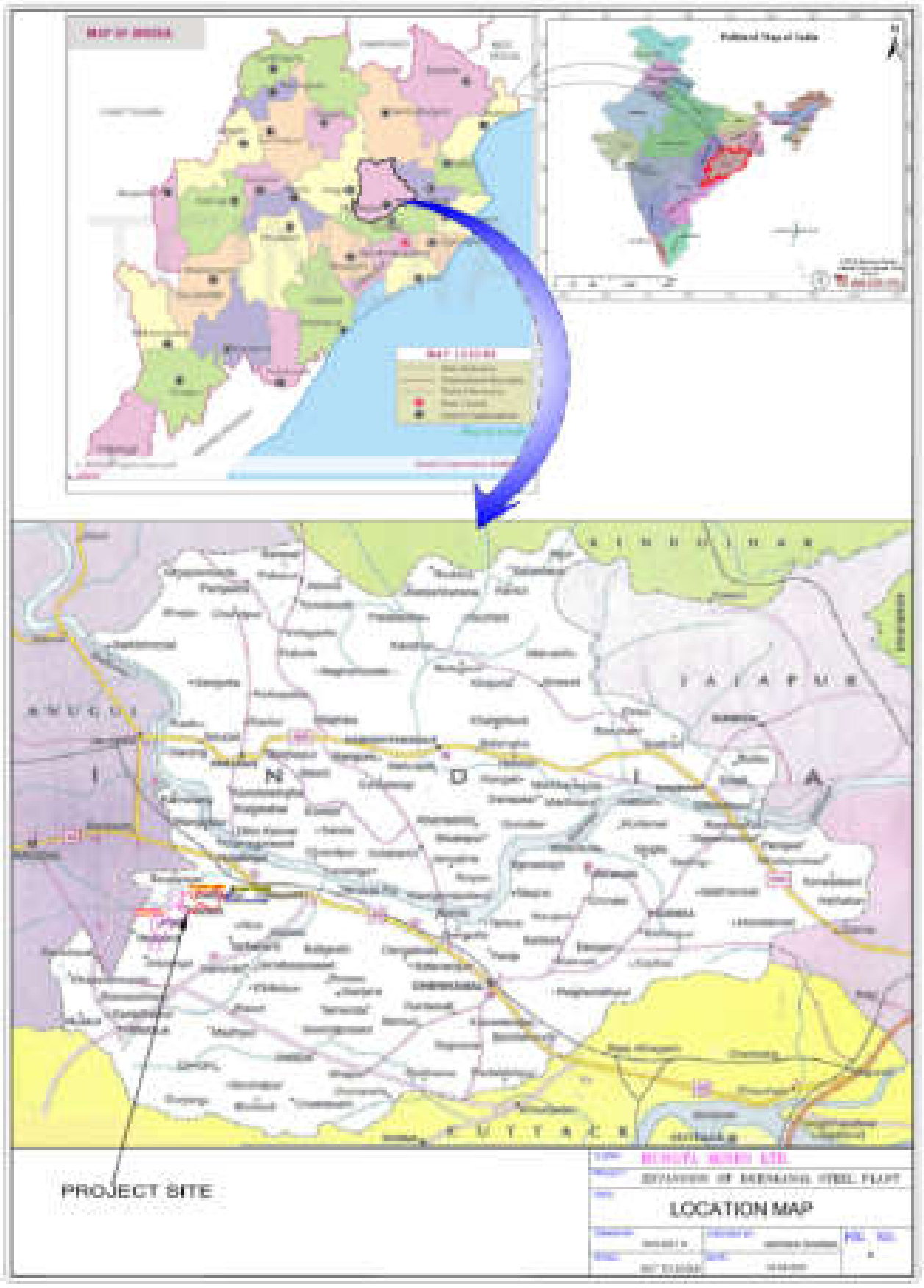
TABLE 1.5: CO-ORDINATES OF THE SITE

Point		North most	East most	South most	West most
Plant Area	**Latitude, N**	20° 46’ 23’’	20° 46’ 00’’	20°43’ 10’’	20°43’ 26’’
	Longitude, E	85° 16’ 57’	85° 18’ 39’	85° 14’ 32”	85°13’ 58”
Water Reservoir Area	**Latitude, N**	20° 46’ 03’’	20° 45’ 52’’	20° 45’ 51’’	20° 45’ 56’’
	Longitude, E	85° 18’ 54’	85° 18’ 55’	85° 18’ 39’	85° 18’ 39’
Colony Area	**Latitude, N**	20° 46’ 33’’	20° 46’ 32’’	20° 46’ 14’’	20° 46’ 14’’
	Longitude, E	85° 19’ 04’	85° 19’ 13’	85° 18’ 58’	85° 18’ 58’

1.4.4 Communication

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

FIG 1.1: LOCATION MAP



1.4.5 Importance to country & region

National Scenario

India was the 2nd largest producer of crude steel in the world in 2019. In 2019-20, production of total finished steel (alloy/stainless + non alloy) was 102.62 million tonnes (MT). Production of Pig Iron in 2019-20 was 5.42 MT, a decline of 15.5% over last year. India was the largest producer of Sponge Iron in the world in 2019. The coal- based route accounted for 82% of total Sponge Iron production (37.10 MT) in the country in 2019-20.

Data on production of Pig Iron, Sponge Iron and Total Finished Steel (alloy/stainless + non-alloy) are given below for last five years:

TABLE 1.6: INDIAN STEEL INDUSTRY: PRODUCTION (IN MILLION TONNES)

Category	2015-16	2016-17	2017-18	2018-19	2019-20
Pig Iron	10.24	10.34	5.73	6.41	5.42
Sponge Iron	22.43	28.76	30.51	34.71	37.1
Total Finished Steel	106.60	120.14	126.85	101.29	102.62

Source: "An Overview of Steel Sector", https://steel.gov.in/sites/default/files/ An%20OVERVIEW%20OF%20 STEEL%20SECTOR.pdf accessed 14.09.2021

Exports and imports of finished steel stood at 8.36 million tonnes and 6.77 million tonnes, respectively, in 2019-20.

In order to increase the domestic steel production, the Government has come out with National Steel Policy 2017 on 8th May, 2017, to facilitate faster growth and development of steel industry in the country. The Government has also announced a policy for providing preference to domestically manufactured Iron & Steel products in Government procurement. This policy seeks to accomplish PM's vision of 'Make in India' with objective of nation building and encourage domestic manufacturing and is applicable on all government tenders where price bid is yet to be opened. Further, the Policy provides a minimum value addition of 15% in notified steel products which are covered under preferential procurement. In order to provide flexibility, Ministry of Steel may review specified steel products and the minimum value addition criterion.[1]

The National Steel Policy, 2017 envisage 300 million tonnes of production capacity by 2030-31. The per capita consumption of steel has increased from 57.6 kgs to 74.1 kgs during the last five years. The government has a fixed objective of increasing rural consumption of steel from the current 19.6 kg/per capita to 38 kg/per capita by 2030-31. As per Indian Steel Association (ISA), steel demand will grow by 7.2% in 2019-20 and 2020-21[2].

[1] Source : National Steel Policy 2017, https://steel.gov.in/national-steel-policy-nsp-2017 accessed 14.09.2021
[2] Source: https://www.ibef.org/industry/steel.aspx dated 14.09.2021

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.[3]

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.[4]

1.5 LEGAL ASPECTS

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

1. The Factories Act, 1948
2. Indian Boiler Act, 1923 and its amendments till date, Indian Boiler Regulations 1950 and their amendments
3. The Air (Prevention and Control of Pollution) Act, 1981
4. The Water (Prevention and Control of Pollution) Act, 1974
5. Environment (Protection) Act, 1986 and Rules thereunder
6. Environmental (Protection) Rules,1986 (and its Amendments till date)
7. Environment Impact Assessment Notification 2006 and its amendments
8. Manufacture, Storage and Import of Hazardous Chemical Rules 1989 amended in 1994 and 2000.

[3] Source: http://www.Odishaminerals.gov.in/ website/ MineralProc. aspx? GL=mines&PL=2
[4] Source: http://www.Odishaminerals.gov.in/ website/ Govt_ steel. aspx?GL=sip&PL=4

9. Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and amendments 2016, 2017, 2018
10. Solid Waste Management Rules, 2016
11. Construction and Demolition Waste Management Rules 2016
12. Plastic Waste Management Rules 2016 and amendment 2018
13. Batteries (Management and Handling) Rules, 2001 and amendment 2010
14. E-Waste Management Rules, 2016 and amendment 2018
15. Fly ash in construction activities, Responsibilities of Thermal Power Plants and Specifications for use of ash-based products/responsibility of other agencies, Notification, 1999 and amendment 2003, 2009, 2016
16. GSR 94(E): Mandatory Implementation of Dust Mitigation Measures for all Construction and Demolition Activities
17. Noise Pollution (Regulation and Control) Rules 2000 and amendment 2000, 2002, 2017
18. Wildlife Protection Act, 1972 and amendments 2002, 2006
19. Wetland Rules, 2017
20. Forest (Conservation) Act, 1980
21. The Petroleum Act, 1934 and amendments thereunder
22. Motor Vehicles Act 1988 and the amendments thereunder
23. Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996
24. Ozone Depleting Substances (Regulation and Control) Rules, 2000
25. Public Liability Insurance Act, 1991 and amendments till date
26. Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996

Compliance to State Rules and Notifications is being and will also be ensured along with the environmental clearance being sought for expansion to 7.53 MTPA under EIA Notification 2006 from MOEF&CC Government of India.

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

The Environmental Impact Assessment and Environment Management Plan for the expansion of the integrated steel plant addressing the environment related issues are prepared in accordance with the requirements of Terms

of Reference (TOR) prescribed by Ministry of Environment, Forest and Climate Change, Govt. of India.

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

The main objectives of the present EIA study area:

- To record the proposed project details
- To establish the baseline environmental scenario.
- To identify, predict and assess the impacts of proposed project on the environment.
- To suggest preventive measures to minimize adverse impacts and to maximize beneficial impacts.
- To prepare a detailed action plan for implementation of mitigative measures.
- To suggest a monitoring programme to evaluate the effectiveness of 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 social development.

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

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

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

Baseline environmental data was generated by Min Mec R&D Laboratory (NABL accredited &MOEF&CC recognised) as given in **Table 1.7**.

TABLE 1.7: BASELINE DATA GENERATED

Sl. No.	Description	No. of locations	Total no. of samples
1.0	**AIR** Ambient air monitoring (24 hourly samples), twice a week for 3 months) **Parameters :** PM_{10}, $PM_{2.5}$, SO_2, NO_2 & CO	9 (one in existing area, one in expansion area and 7 in buffer zone)	216
	Benzene, NH_3, BaP, Ni, Pb & As - Twice a week at existing and expansion area for 3 months and one week in buffer zone	9 (one in existing area, one in expansion area and 7 in buffer zone)	62
1.1	Meteorological parameters measured at hourly duration simultaneously at one air monitoring station for 3 months for Wind speed, direction, Relative humidity, Temperature & Rainfall.	1	92 days
2.0	**WATER** Water samples collected from various locations (surface and ground water) in core and buffer zone (10 km radius). Parameters tested for physical, chemical and biological parameters	Ground water - 10 (one in existing area, one in expansion area and 8 in buffer zone) and	19

Sl. No.	Description	No. of locations	Total no. of samples
	Ground water parameters: Odour, Turbidity, pH, EC, TDS, TSS, Hardness, Alkalinity, Suphate, chloride, Calcium, Magnesium, Sodium, Potassium, Iron, Fluoride, Aluminium, Siver, Lead, Mangenese, Nickel, Selenium, Arsenic, Zinc, Mercury, Molybdenum, Nitrate **Surface water parameters:** in addition to the ground water parameters, DO, BOD, COD, oil & Grease, Total Coliform, E.Coli,	Surface water - 9 (one in existing area, one expansion area and 8 in buffer zone)	
3.0	**SOIL** Parameters: pH, EC, $CaCO_3$, Specific gravity, Moisture, Sodium, Potassium, Textural Classification, Grain size analysis, Colour, Organic Carbon, Organic matter, Phosphorus, Nitrate Nitrogen.	4 (Two in expansion area, one in existing area and two in buffer zone)	4
4.0	**NOISE** Hourly readings taken for 24 hours (Leq)	9 (one in expansion area and 8 in buffer zone)	9
5.0	**TRAFFIC VOLUME**	2	2

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

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

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

❖ **Chapter 1: Introduction**

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

❖ **Chapter 2: Project Description**

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

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

❖ **Chapter 3: Present Baseline Scenario**

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

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

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

The impact assessment and mitigation is proposed for:

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

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

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

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

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

❖ **Chapter 6: Environmental Monitoring Program**

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

❖ **Chapter 7: Additional Studies**

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

❖ **Chapter 8 : Project benefits**

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

❖ **Chapter 9: Environmental Cost Benefit Analysis**

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

❖ **Chapter 10: Environmental Management Plan**

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

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

This will constitute the summary of the EIA Report.

❖ **Chapter 12: Disclosure of Consultants engaged**

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

1.7 STATUS OF LITIGATIONS

There are no litigations/ court cases pending against the project as on 21.10.2021 related to pollution and environment.

1.8 COMPLIANCE OF TERMS OF REFERENCE (TOR)

The Standard Terms of Reference were prescribed online vide MoEF&CC letter no. J-11011/309/2018-IA.II(I) dated 13.08.2021. The copy of said letter is given in **Annexure I**. **Table 1.8, 1.9, 1.10, 1.11, 1.12 & 1.13** gives the compliance of received Terms of Reference for expansion of Dhenkanal Steel Plant to 7.53 MTPA.

Table 1.8: It lists the common points in the ToR issued for 3A: metallurgical industries (ferrous & non ferrous), 3B : Cement Plant and 4B : Coke Oven Plant compliance

Table 1.9: Specific terms of reference for EIA studies for metallurgical Industries (Ferrous & Non Ferrous)

Table 1.10: Additional TORs for Integrated Steel Plant

Table 1.11: Specific Terms of Reference for EIA studies for cement plant

Table 1.12: Specific TOR for Coke oven plant

Table 1.13: Compliance to standard terms of reference for mineral beneficiation plant

TABLE 1.8: COMPLIANCE TO STANDARD TERMS OF REFERENCE ISSUED BY MOEF&CC FOR 3A- METALLURGICAL INDUSTRIES (FERROUS & NON FERROUS), 3B: CEMENT PLANT AND 4B: COKE OVEN PLANT COMPLIANCE

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
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	same	same
2	**Introduction**			
i)	Details of the EIA Consultant including NABET accreditation.	Refer Chapter 12.	same	same
ii)	Information about the project proponent	Information about the project proponent is given in section 1.3 of Chapter 1.	same	same
iii)	Importance and benefits of the project	For importance of the project refer section 1.4.5 of Chapter 1. Benefits of project is given in Chapter 8	same	same
3.	**Project Description**			
i)	Cost of project and time of completion.	Cost of the expansion project will be Rs. 11001 crores. Proposed time schedule for implementation of project shall be 84 months from date of receipt of EC.	same	same
ii)	Products with capacities for the proposed project	Please refer Table 1.4 of Chapter 1.	same	same
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 1.4 of Chapter 1. Adequate land is available for the expansion. Previous EC is given in **Annexure II(a) & II(b)**.	same	same
iv)	List of raw materials required and their source along with mode of transportation	Refer Table 2.46, of Chapter 2	Same	Same
v)	Other chemicals and	Refer Table 2.46, of	Same	Same

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
	materials required with quantities and storage capacities	Chapter 2 for consolidated list of raw materials		
vi)	Details of Emission, effluents, hazardous waste generation and their management.	Please refer the following of Chapter 4 Emissions: Section 4.4 Effluents: Section 4.6 Hazardous waste: 4.7.2.1	Same	Same
vii)	Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)	Please refer the following of Chapter 2: Water : Section 2.7, Power: Section 2.6 and Table 2.48 Manpower : Section 2.8	Same	Same
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.	Refer Section 2.7.1 pf chapter 2 and **Annexure VII.**	same	Same
ix)	Process description along with major equipment and machineries, process flow sheet (quantitative) from raw material to products to be provided	Please refer section 2.3 of Chapter 2 for flow sheet of manufacturing processes in different units in proposed steel plant	Section 2.3.13 of Chapter 2 for process, material balance and flow sheet of cement plant	Section 2.3.7 of Chapter 2 for process, material balance and flow sheet of coke plant
x)	Hazard identification and details of proposed safety systems	Refer section 7.1 & Table 7.1 for Hazard identification. Refer section 7.3 for preventive measures.	Same	Same
xi)	**Expansion/ modernization proposals**			
a)	Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure.	ECs granted by MOEF&CC have been listed in section 1.1 of chapter 1. Copy of ECs are given in **Annexure II(a) & II(b).**	Same	Same

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
	A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing/ existing operation of the project from SPCB shall be attached with the EIA-EMP report.	A certified report of the latest monitoring of the Regional Office Ranchi is enclosed as **Annexure III.** The compliance to the Consent to Operate is given in **Annexure VI**.		
b)	In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and /or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005 - 2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.	For existing capacity, EC has been obtained on 15.02.2021 and given in **Annexure II(a)** & **II(b).** Copies of the CTOs are given in **Annexure V**. The CTO's give reference to their corresponding CTE's.	same	same
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. Justification for selecting the site, refer section 5.1 of Chapter 5.	same	same
ii)	A topo-sheet of the study area of radius of 10 km and	Please refer Fig 3.1 of Chapter 3	same	same

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
	site location on 1:50,000/ 1:25,000 scale on an A3/A2 sheet (including all eco-sensitive areas and environmentally sensitive places).			
iii)	Details w.r.t option analysis for selection of site	The justification of site selection is given in section 5.1, chapter 5. Since this is expansion of an existing plant, hence the intent was to expand into adjoining lands to the extent possible to be able to use common facilities	same	Same
iv)	Co-ordinates (lat-long) of all four corners of the site.	Refer section 1.4.3 of chapter 1.	Not included in prescribed ToR for this sector	Not included in prescribed ToR for this sector
v)	Google map- Earth downloaded of the project site.	Please refer Fig. No. 2.3 of Chapter 2.	same	Same
vi)	Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, green belt area, utilities etc. If located within an industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.	Please refer Fig. No. 2.1 of Chapter 2	same	Same
vii)	Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/ greenbelt, in particular.	Please refer Fig. No.2.2 of Chapter 2.	Same	Same
viii)	Land use break-up of total land of the project site (identified and acquired), government / private-agriculture, forest, wasteland, water bodies, settlements,	Please refer section 2.2 of Chapter 2.	Same	Same

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
	etc. shall be included (not required for industrial area).			
ix)	A list of major industries with name and type within study area (10 km radius) shall be incorporated. Land use details of the study area.	List of industries in 10 km radius is given in Section 3.13, Table 3.25	Same	Same
x)	Geological features and Geo-hydrological status of the study area shall be included	Refer section 3.6.2 for Geology and Hydrogeology of Chapter 3.	Same	Same
xi)	Details of Drainage of the project up to 5 km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided (mega green field projects).	Refer section 3.2.2 of chapter 3 regarding drainage of the study area. There is no major river within 1 km radius of the site. Refer section 7.2.1.2 for the flood hazard details (project area lies in the "no significant flooding".zone)	Same	Same
xii)	Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.	Please refer section 3.9.1 of Chapter 3	same	Same
xiii)	R & R details in respect of land in line with State Government policy	Refer Section 4.11a, Chapter 4.	Same	Same
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)	Not applicable since no forest land is there in the expansion area. Forest land in existing area has already received FC.	Same	Same
ii)	Land use map based on High	Land use map based on	Same	

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
	resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)	High resolution interpreted satellite imagery is given in Fig. 3.9 of Chapter 3.		
iii)	Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.	No Forest land involved	Same	Same
iv)	The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animal; the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-a-vis the project location and the recommendations or comments of the Chief Wildlife Warden - thereon.	No National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animal is present within 10 km radius of plant. However, Wildlife Conservation Plan has been prepared and got approved from Chief Wildlife Warden. The copy of the approval letter is given in **Annexure XVII**.	Same	Same
v)	Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the state government for conservation of schedule I fauna, if any exists in the study area.	Wildlife Conservation Plan has been prepared and got approved from Chief Wildlife Warden. The copy of the approval letter is given in **Annexure XVII**.	Same	Same
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.	Same	Same
6.	**Environmental Status**			
i)	Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative	The site specific micro-meteorological data has been collected from the site during March to May 2021. Micro-meteorology	Same	Same

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
	humidity, hourly wind speed and direction and rainfall.	data is given in **Annexure VIII** and is summarized in section 3.4 of Chapter 3. Atmospheric inversion is given in Section 4.4.1.3, Chapter 4.		
ii)	AAQ data (except monsoon) at 8 locations for PM10, $PM_{2.5}$, SO_2, NOx, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.	The AAQ data has been collected from the site during March to May 2021. AAQ data is given in **Annexure IX** and is summarized in Table 3.7 of Chapter 3. Location of sampling stations is given in Table 3.5 and shown in Fig. No. 3.6 of Chapter 3.	Same	Same
iii)	Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.	AAQ data is given in **Annexure IX** and is summarized in Table 3.7 of Chapter 3.	Same	Same
iv)	Surface water quality of nearby River (100m 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 XI.** Locations of sampling stations are shown in Fig. 3.6 of Chapter 3.	Same	Same
v)	Whether the site falls near to polluted stretch of river identified by the CPCB / MoEF&CC, if yes give details	No	Same	Same
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	Same	Same

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
		presented in **Annexure XI** and Surface & ground water summarized results is given in Table 3.9 and 3.10 of Chapter 3. Locations of sampling stations are given in Table 3.8 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 IX**	Same	Same
viii)	Soil Characteristics as per CPCB guidelines.	Soil Characteristics as per CPCB guidelines is given in Section 3.10 of Chapter 3.	Same	Same
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 2 locations and shown in Fig. 4.5 of Chapter 4. The details are given in **Annexure XV**.	Same	Same
x)	Detailed description on flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.	The details of flora and fauna are given in section 3.11 of Chapter 3. List of flora and fauna is given in pages 15-23 of **Annexure XVII.** Wildlife Conservation Plan has been prepared and got approved from Chief Wildlife Warden. The copy of the approval letter is given in **Annexure XVII.**	Same	Same
xi)	Socio-economic status of the study area.	Socio-economic status of the study area as per census 2011 is given in **Annexure XVIII, XIX & XX** and summarized in section 3.12 of Chapter 3.	Same	Same

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
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, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modeling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.	The prediction modeling for Ground Level Concentration of pollutants from the stack emissions is given in section 4.4.1.1 to 4.4.1.6, of Chapter 4 and the detailed study is given in **Annexure XXV(a)** & **XXV(b)**	Same	Same
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. The expansion project is a Zero Liquid Discharge hence no water shall be discharged outside the unit. Hence, no water modelling study has been conducted.	Same	Same

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
iii)	Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.	Impact of transportation is given in section 4.9.1 of chapter 4.	Same	Same
iv)	A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.	Refer section 4.6.2, Table 4.14 & 4.6.3 of Chapter 4	Same	Same
v)	Details of stack emission and action plan for control of emissions to meet standards.	Details of stack emission is given in section 4.4.1.1, Table 4.2, of Chapter 4. Action plan to control emissions is given in section 4.4.3, of chapter 4.	Same	Same
vi)	Measures for fugitive emission control	Measures for fugitive emission control is given in section 4.4.2(b) of chapter 4	Same	Same
vii)	Details of hazardous waste generation, and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste minimization, recycle/ reuse/ recover techniques, Energy	Please refer section 4.7.2.1 of Chapter 4 for hazardous waste. The reuse of the solid waste is given in Section 4.7.2 B and Table 4.19, Chapter 4. For natural conservation of resources, the	Same	Same

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
	conservation, and natural resource conservation.	rainwater runoff in the plant premises will be collected & used as given in section 4.6.6, Chapter 4. Treated effluents will also be 100% reused throughout the year (section 4.6.2). Technology and process interventions such pre-heating, WHRB, use of BF/CO gases as fuel, LEDs for lighting, use of 5 star rated appliances, solar energy, etc conserve energy.		
viii)	Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.	Ash utilization is given in Section 4.7.2.5 & Table 4.22 of Chapter 4. Fly ash Notification 1999 and its amendments of 2003, 2009, 2016 shall be followed.	Same	Same
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. 477.12 ha (1179 acres) of total plant area and it will be maintained. Details are given in section 4.10.2 of Chapter 4 and can be seen in Table 4.26 of Chapter 4.	Same	Same
x)	Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh	Rain water harvesting measures will be practised existing & proposed project. The details are given in section 4.6.6 of Chapter-4.	Same	Same

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
	water and reduce the water requirement from other sources.			
xi)	Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.	Total capital and recurring cost per annum for environmental pollution control measures is given in Chapter 10, Section 10.6 Table 10.4 & 10.5.	Same	Same
xii)	Action plan for post-project environmental monitoring shall be submitted.	Refer section 6.3 of Chapter 6.	Same	Same
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 section 7.1.3 & section 7.4 of Chapter 7 for Onsite & Off site Disaster Preparedness and Emergency Plan.	Same	Same
8.	**Occupational health:**			
i)	Plan and fund allocation to ensure the occupational health and safety of all contract and casual workers.	Refer section 4.12.6 of Chapter 4 and Table 10.4 & 10.5 of Chapter 10.	Same	same
ii)	Details of existing Occupational & Safety Hazards. What are the exposure levels of above mentioned hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved.	Refer section 4.12 of Chapter 4. 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).	Same	Same
iii)	Details of exposure specific health status evaluation of worker. If the workers' health	The plant is under operation and the format of evaluation is given in	same	same

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
	is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre-placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.	**Annexure XXI** and the health data has been summarised in **Annexure XXII**. Plan of OHS management is given in section 4.12.3 to 4.12.6 of Chapter 4.		
iv)	Annual report of health status of workers with special reference to Occupational Health and Safety.	Summary of OHS monitoring of workers of Dhenkanal Steel plant Expansion is given in **Annexure XXII**.	Same	same
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 given in section 10.5, Fig 10.2, Chapter 10).	Same	Same
ii)	Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.	Yes, refer section 10.5 of Chapter 10.	Same	Same
iii)	What is the hierarchical system or Administrative order of the company to deal	Yes, refer section 10.5 of Chapter 10.	Same	Same

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
	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.	Yes, refer section 10.5 of Chapter 10.	Same	Same
10	Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.	In the existing factory, infrastructure facilities are provided to casual workers including truck drivers. During the construction of proposed expansion project, all facilities will be provided/ arranged for the labour force. Refer section 2.8 of Chapter 2**.**	Same	Same
11	**Enterprise Environment Responsibility (CER) / Enterprise Social Commitment (ESC)**			Same
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	Corporate Environment Responsibility (CER) notified vide MOEF&CCs office memorandum dated 01.05.2018 stands superceded vide MOEF&CCs office memorandum dated 30.09.2020. Now the concerns related to public hearing have to be addressed in the EMP. The company shall allocate the budget to	Same	Same

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
	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/ Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.	meet the demands for public hearing and earmark 2% of its average profit of last three years for socio-economic development activities as a part of CSR.		
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	No litigation has arisen or pending against and/ or any direction/ order passed by any Court of Law against the Existing Plant/ Proposed Expansion Project till date under Environment (Protection) Act.	Same	Same

ToR No.	ToR Point	Compliance status		
		3a : metallurgical industries (ferrous & non ferrous)	3b : Cement Plant	4b : Coke Oven Plant
	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.	Please refer Table 1.8 to 1.13, Chapter 1.	Same	Same

TABLE 1.9: SPECIFIC TERMS OF REFERENCE FOR EIA STUDIES FOR METALLURGICAL INDUSTRIES (FERROUS & NON FERROUS)

B	ToR Point	Compliance status
1)	Complete process flow diagram describing each unit, its processes and operations, along with material and energy inputs & outputs (material and energy balance).	Refer following sections, figures and Tables of Chapter 2 for Process description, flow sheet and material balance. • Pelletisation Plant- Section 2.3.2, Fig 2.5, Table 2.5 • Coal washery- Section 2.3.3, Fig. 2.6, Table 2.8 • DRI Plant - Section 2.3.4, Fig. 2.7, Table 2.10 • Mini Blast Furnace - Section 2.3.5, Fig. 2.8 and Table 2.12 • Sinter Plant - Section 2.3.6, Fig. 2.9, Table 2.14 • Coke Oven Plant- Section 2.3.7, Fig. 2.10 & Table 2.16 • SMS via IF-LRF- CCM Route - Section 2.3.8.1, Fig. 2.11, Table 2.18 • SMS via EAF - Section 2.3.8.2, Fig. 2.12, Table 2.20 • CCM- section 2.3.8.3, Table 2.22 • Rolling Mill- section 2.3.9.1, Table 2.26 & Fig 2.13. • Strip Mill- section 2.3.9.2, Table. 2.28. • DIP- section 2.3.9.3, Table 2.30 & Fig.2.14. • Producer gas plant- section 2.3.10, Table 2.34. • Oxygen plant- section 2.3.11, Table 2.37. • Lime Plant- section 2.3.12, Table 2.39. • Cement Plant- section 2.3.13, Table 2.41 & Fig. 2.15 • CPP-WHRB- section 2.3.14.1

B	ToR Point	Compliance status
		• CPP-AFBC/CFBC- section 2.3.14.2, Table 2.44.
2)	Details on blast furnace/ open hearth furnace/ basic oxygen furnace/ladle refining, casting and rolling plants etc.	Please refer section 2.3.5, Chapter 2 For other processes please refer point 1 above
3)	Details on installation/activation of opacity meters with recording with proper calibration system	Online stack monitoring systems will be installed which will be connected to OSPCB/ CPCB and monitor the pollutants emitted.
4)	Details on toxic metals including mercury, arsenic and fluoride emissions	The heavy metals have been analysed in the raw materials and the results have been given in Chapter 3, Section 3.16, Table 3.26 and 3.27
5)	Details on stack height requirement for integrated steel	Please refer Section 4.4.1.1, Chapter 4. stack heights higher than the heights that come by calculation using CPCBs formula $Q=14H^{0.3}$ where H is sulphur dioxide emissions in kg/hr and H is stack height in metres
6)	Details on ash disposal and management -Non-ferrous metal	Please refer Section 4.7.2.5 and Table 4.22 of Chapter 4
7)	Complete process flow diagram describing production of lead/zinc/copper/ aluminium, etc.	Process flow diagrams of various units are given in their respective sections of Chapter 2. For all processes please refer point 1 earlier in this table. No production of lead, zinc, copper, aluminium will be there
8)	Raw materials substitution or elimination	Please refer the processes described in section 2.3, Chapter 2 as given in point 1 earlier and for material balance, the following tables may be referred: Pelletisation Plant- Table 2.5 Coal washery- Table 2.8 DRI Plant - Table 2.10 Mini Blast Furnace - Table 2.12 Sinter Plant - Table 2.14 Coke Oven Plant- Table 2.16 SMS via IF-LRF- CCM Route - Table 2.18 SMS via EAF - Table 2.20 CCM- Table 2.22 Rolling Mill- Table 2.26 Strip Mill- Table. 2.28. DIP- Table 2.30 Producer gas plant- Table 2.34. Oxygen plant- Table 2.37. Lime Plant- Table 2.39. Cement Plant- Table 2.41 CPP-WHRB-CPP-AFBC/CFBC - Table 2.44.

B	ToR Point	Compliance status
9)	Details on smelting, thermal refining, melting, slag fuming, and Waelz kiln operation	Please refer the processes described in section 2.3, Chapter 2.
10)	Details on Holding and de-gassing of molten metal from primary and secondary aluminum, materials pre-treatment, and from melting and smelting of secondary aluminium	Not applicable as no melting or smelting of aluminum is proposed.
11)	Details on solvent recycling	No solvent generation is anticipated in any of the proposed processes, hence, not applicable
12)	Details on precious metals recovery	No precious metals usage is envisaged, hence, no precious metals recovery is proposed
13)	Details on composition, generation and utilization of waste/fuel gases from coke oven plant and their utilization.	Coke oven gas will serve as fuel for the coke oven itself during coke production. Thereafter, it shall be used for 195 MW energy generation via WHRBs after expansion to 7.53 MTPA steel plant. After cooling, coke oven gas will have calorific value and used as fuel in other units of the steel plant.
14)	Details on toxic metal content in the waste material and its composition and end use (particularly of slag).	Please refer Table 3.26 & 3.27 of section 3.16, Chapter 3 as well as Table 4.21 of Chapter 4.
15)	Trace metal mercury, arsenic and fluoride emissions in the raw materials	The heavy metals have been analysed in the raw materials and the results have been given in Chapter 3, Section 3.16, Table No. 3.26 & Table 3.27
16)	Trace metal in waste material especially slag	The heavy metals in slag have been measured and the results have been given in Chapter 3, Section 3.16, Table 3.27
17)	Plan for trace metal recovery	Trace metal recovery is not proposed. However, recovery of metals from IF slag shall be done.
18	Trace metals in water	Please refer **Annexure XI** and Table 3.9 and 3.10 of Chapter 3

TABLE 1.10: ADDITIONAL TORS FOR INTEGRATED STEEL PLANT

C	ToR Point	Compliance status
1	Iron ore/ coal linkage documents along with the status of environmental clearance for limestone and coal mines	**Iron ore**: It shall be source from OMC/ Other private Mines. **Coal:** It is proposed to import coal (from South Africa, Indonesia, etc.) and also use domestic coal procured through e-auction or from commercial suppliers.
2	Quantum of production of coal & iron ore from coal & iron ore	These will be procured from open market, e-auction and different commercially supplied

C	ToR Point	Compliance status
	mines and the projects they cater to. Mode of transportation to the plant and its impacts.	sources, hence, information about their production is not available. However the mode of transportation shall be road and its impact has been assessed in Sections 4.9 and 4.4.1.5 in Chapter 4.
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.	A Digital Elevation Model for the 10 km radius is given in Fig. No. 3.2 of Chapter 3.
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.	The Satellite Imagery is given in Fig. No. 3.9 of Chapter 3.
5	Respirable Suspended Particulate Matter (RSPM) present in the ambient Air must be analyzed for source analysis – Natural dust/RSPM generated from Plant operations (trace elements). The RSPM shall also be analysed for presence of poly-aromatic hydrocarbons (PAH), I.e. Benzene soluble fraction, where applicable. Chemical characterization of RSPM and incorporating of RSPM data.	Please refer Section 3.5.3, of chapter 3
6	All Stock piles will have to be on top of a stable liner to avoid leaching of materials to ground water	Yes. Stable lines will be given as mentioned in section 4.5.2 & 4.7.2.3 of Chapter 4.
7	Plan for the implementation of the recommendations made for the steel plants in the CREP guidelines.	CREP guidelines will be implemented in the proposed project. Refer section 10.4 of Chapter 10.
8	Plan for slag utilization	Plan for slag utilization from various unit of plant is given in section 4.7.2, Table 4.19 of Chapter 4

C	ToR Point	Compliance status
9	Plan for utilization of energy in off gases (coke oven, Blast furnace)	Gases release from coke oven plant and Blast furnace shall be utilized for power generation (WHRB- 655 MW) and thereafter used as fuel within the plant
10	Systems for coke quenching adopted with justification	Refer section 5.2.4 of chapter 5.

TABLE 1.11: SPECIFIC TERMS OF REFERENCE FOR EIA STUDIES FOR CEMENT PLANT

B	ToR Point	Compliance status
1)	Limestone and coal linkage documents along with the status of environmental clearance of limestone and coal mines	**Limestone**: It shall be source from open market and other private mines. **Coal:** It is proposed to import coal (from South Africa, Indonesia, etc) and also use domestic coal procured through e-auction or from commercial suppliers.
2)	Quantum of production of coal and limestone from coal & limestone mines and the projects they cater to;	These will be procured from open market, e-auction and different commercially supplied sources, hence, information about their production is not available.
3)	For large Cement Units, a 3-D view i.e. DEM (Digital Elevation Model) for the area in 10 km radius from the proposal site.	Digital Elevation Model has been provided in Fig. 3.2 of Chapter 3.
4)	Present land use shall be prepared based on satellite imagery. High-resolution satellite image data having 1m-5m spatial resolution like quickbird, Ikonos, IRS P-6 pan sharpened etc. for the 10 Km radius area from proposed site. The same shall be used for land used/land-cover mapping of the area	Land use map based on High resolution satellite imagery (GPS) has been given in Fig. 3.9 of Chapter 3.
5)	If the raw materials used have trace elements, an environment management plan shall also be included	Refer Table 4.19 of chapter 4. No trace metals are expected in limestone.
6)	Plan for the implementation of the recommendations made for the cement plants in the CREP guidelines must be prepared.	The CREP guidelines made for the cement will be implemented as detailed in **Annexure XXVI.**
7)	Energy consumption per ton of clinker and cement grinding	60 KW hour per tonne of cement.

B	ToR Point	Compliance status
8)	Provision of waste heat recovery boiler	The exhaust gases from the cement plant will be used for pre-heating. Waste heat recovery boilers are proposed based on exhaust gases of DRI, coke oven, blast furnace and cement plant clinker kiln.
9)	Arrangement for use of hazardous waste.	No hazardous waste is envisaged from the cement plant except used oil, which will be given to authorised recyclers.

TABLE 1.12: SPECIFIC TOR FOR COKE OVEN PLANT

B	ToR Point	Compliance status
1)	Justification for selecting recovery/non-recovery (beehive) type batteries with the proposed unit size.	Choice of technology justified in section 5.2.4, of chapter 5. The size of the batteries is based on the coke requirement for MBF
2)	Details of proposed layout clearly demarcating various facilities such as coal storages, coke making, by-product recovery area, etc within the plant.	Refer Fig. 2.1 in Chapter 2
3)	Details of coke oven plant (recovery/non-recovery type) including coal handling, coke oven battery operations, coke handling and preparation.	Refer Section 2.3.7 in Chapter 2

TABLE 1.13: COMPLIANCE TO STANDARD TERMS OF REFERENCE FOR MINERAL BENEFICIATION PLANT / PELLETISATION PLANT

ToR No.	ToR Point	Compliance
1	The alternate sites considered, the relative merits and demerits and the reasons for selecting the proposed site for the Beneficiation Plant should be indicated.	It is an expansion project. Pellet plant is existing plant area, hence, no alternate sites were evaluated. Advantage of site are discussed in Section 5.1, Chapter 5.
2	Details of the technology and process involved for beneficiation should be given.	Technology selected after assessment the alternative is given in section 5.2.1, Chapter 5 for beneficiation plant.
3	Location of the proposed plant w.r.t. the source of raw material and mode of transportations of the ore from mines to the beneficiation plant should be justified	Refer table 2.46 for source & mode of transportation of the raw materials. The project is located in iron ore rich state of Odisha and at a viable distance from the iron-ore mines in the Koida & Sundargarh regions
4	Treatment of run of mine (ROM) and or of the fines/waste dump should be spelt out	**Washery**- ROM coal will be washed in three stream washery. The washed coal will be used in process, the middlings in power plant and the rejects will be

ToR No.	ToR Point	Compliance
		temporarily stored till they can be sent back for backfilling in mine. **Beneficiation plant** - Tailings collected in tailing decantation tank, dewatered and dredged for 100% reutilisation as sand substitute in infrastructure/ fine concrete aggregate/ cement manufacture **Pelletisation plant** - ROM iron ore fines/ blue dust will be agglomerated and utilised in process. The waste dusts collected in the air pollution control systems shall be sent back to the mixing unit of the pelletisation plant for 100% reuse.
5	Estimation of the fines going into the washings should be made and its management described.	The raw material for the pellet plant will be 100% iron ore fines or blue dust (fines). No washing of fines is envisaged prior to pellet plant. Beneficiation of lump ore is envisaged in beneficiation plant.
6	Details of the equipment, settling pond etc. should be furnished.	In pellet plant, only agglomeration of fines shall be taking place and washing is required, hence, no settling pond shall be there.
7	Detailed material balance should be provided	The material balance for the pelletisation Plant is given in Table 2.5.
8	Sources of raw material and its transportation should be indicated. Steps proposed to be taken to protect the ore from getting air borne should be brought out.	Please refer Table 2.46, Chapter 2. Refer section 4.42 of chapter 4.
9	Management and disposal of tailings and closure plan of the tailing pond, if any after the project is over, should be detailed in a quantified manner.	The project will have a tailing decantation tank attached to the beneficiation unit. The tailings will be temporarily collected in it, water recovered and reused. The solids from the tailing are reuseable as sand substitute in infrastructure/ fine concrete aggregate/ cement manufacture.
10	The water requirement for the project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the project should also be indicated	Refer Section 2.7, Table 2.49 chapter 2 For water balance diagram refer Fig. 2.17 (existing sanctioned) and 2.18 (proposed after expansion), Chapter 2.
11	A copy of the document in support of the fact that the Proponent is the rightful lessee	There is no lease. Company will acquire the 1800 acres of additional land

ToR No.	ToR Point	Compliance
	of the unit should be given	required for expansion through IDCO.
12	All documents including EIA and public hearing should be compatible with one another in terms of the production levels, waste generation and its management and technology and should be in the name of the lessee.	All documents are compatible with one another as required.
13	All corner coordinates of the Unit, superimposed on a High Resolution Imagery/Toposheet should be provided. Such an Imagery of the proposed Unit should clearly show the land use and other ecological features of the study area (core and buffer zone).	Please refer section 1.4.3 and Table 1.5, Chapter 1. The boundary is super imposed on google earth image and given in Fig 2.3, Chapter 2 and a satellite image in figure 3.1, Chapter 3.
14	It should be clearly indicated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.	Please refer Section 10.5, Chapter 10 for Environment Policy and for infringement/ deviation/ violation reporting procedure with hierarchical system.
15	Issues relating to Safety should be detailed. The proposed safeguard measures in each case should also be provided. Disaster management plan shall be prepared and included in the EIA/EMP Report.	Hazards and risks associated with the plant have been identified and given in section 7.1 of Chapter 7. Disaster management plan is given in section 7.1.3, Occupational safety measures are given in Section 4.12 of Chapter 4.
16	The study area will comprise of 10 km zone around the Plant.	Complied. EIA study has been done for the study area of 10 km zone around the plant. Study map shown in Fig. 3.1, Chapter 3.
17	Cumulative impact study of both Beneficiation Plant with suggested mitigation measures as per the study should	Beneficiation plant is part of the integrated steel plant and has been considered for impact assessment with

ToR No.	ToR Point	Compliance
	be described.	all the other sub-units.
18	Location of railway siding with its handling capacity and safety measures should be indicated.	A private railway siding is proposed at New Bhagirathipur with a capacity of inward 5.285 rakes/day and outward 1.232 rakes/ day. A road shall be used for the transportation from project site to the proposed private railway siding as shown in Fig 4.6, of Chapter 4. The measures for safe unloading, safe loading, derailing, signalling, interlocking etc shall be there.
19	Option to provide only silo for storage of minerals instead of open stacking to avoid fugitive dust should be explored and arrangements finalized justified.	There will be a mix of silo storage arrangement as well as open storage, the former being the preferable storage method.
20	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the lease area should be prepared to encompass pre operational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	Please refer section 3.9.2 and Fig 3.8, chapter 3
21	Details of the land for any Over Burden Dumps outside the lease, such as extent of land area, distance from lease, its land use, R&R issues, if any, should be given.	No land is required for dumping outside the project. R&R is required as habitation is present within proposed plant area. Approx. 2100 land losers and 126 displacees have been identified. All displacees and land looser will be compensated as per government policy and IDCO terms. Refer section 4.11 of Chapter 4.
22	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the Project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest	No forest land is present in the plant area. This is evidenced from the land records available from the revenue department.

ToR No.	ToR Point	Compliance
	Department to assist the Expert Appraisal Committees.	
23	Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	Not Applicable since no forest land involved in 1800 acres expansion area
24	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	Not Applicable since no forest land involved in 1800 acres expansion area
25	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	Please refer section 3.11.1 and Table 3.19 and Fig. 3.10, Chapter 3.
26	A study shall be got done to ascertain the impact of the Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted	A “Site Specific Conservation Plan” has been prepared and approved by PCCF (Wild Life) Govt. of Jharkhand, the approval letter of which is given in **Annexure XVII**. Salient features from the same have been included in Section 3.11, Chapter 3 and section 4.10.3 Chapter 4.
27	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished	There are no National parks, Wildlife Sanctuary, Biospheres reserves and migratory corridor within 10 km radius. Nearest Wildlife Sanctuary is Satkosia Gorge present at a distance of 22 km, SW, Baisipalli Wildlife Sanctuary at a distance of 43 SW and Simplipal National park is at 137 km, NE and from the project site.
28	A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study	A “Site Specific Conservation Plan” has been prepared and approved by PCCF (Wild Life) Govt. of Jharkhand, the approval letter of which is given in **Annexure XVII** Salient features from the same have been included in Section 3.11, Chapter 3 along with the findings of the biological study and section 4.10.3 Chapter 4.

ToR No.	ToR Point	Compliance
	area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	
29	Proximity to Areas declared as 'Critically Polluted' shall also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB/CPCB shall be secured and furnished to the effect that the proposed activities could be considered	The project area falls within critically polluted industrial cluster of “Angul-Talcher area”.
30	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the unit w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	Plant does not lie in coastal area.
31	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects, should be discussed in the report.	R&R is required as habitation is present within proposed plant area. Approx. 2100 land losers and 126 displacees have been identified. All displacees and land looser will be compensated as per government policy and IDCO terms. Refer section 4.11 of Chapter 4.
32	One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season); December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification	Monitoring period from March to May 2021 and the same have been complied in EIA/EMP report. The Air sampling stations and justification for selecting the stations are

ToR No.	ToR Point	Compliance
	of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the unit in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.	tabulated in Table 3.5 of Chapter 3.
33	Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.	The prediction modeling for Ground Level Concentration of pollutants from the stack emissions is given in section 4.4.1.3 to 4.4.1.4, of Chapter 4 and the detailed study is given in **Annexure XXV(a) to XXV(b)** for stack and fugitive emissions and for GLCs due to traffic, refer **Annexure XXV(c).** The GLC contour maps are given in **Annexure XXV(b)** along with windrose diagram**.**
34	The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.	Refer section 2.7, chapter 2.
35	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be secured and copy furnished.	Please refer section 2.7, chapter 2 and **Annexure VII.**
36	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	Please refer section 4.6, Table 4.13, Chapter 4. For rainwater harvesting refer section 4.6.6
37	Impact of the project on the water quality, both surface and groundwater should be assessed and necessary safeguard measures, if any required, should be provided.	Please refer section 4.6 Chapter 4.

ToR No.	ToR Point	Compliance
38	Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.	Please refer section 3.2.2, Chapter 3 for existing drainage features and section 4.2.2, Chapter 4 for impact and mitigation.
39	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the project. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to the pollution.	Please refer section 4.10.2, Chapter 4
40	Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered.	Please refer section 4.9.1, Chapter 4
41	Details of the onsite shelter and facilities to be provided to the workers should be included in the EIA report.	Refer section 2.8 chapter 2
42	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area should be detailed.	Please refer section 4.12, of chapter 4. OHS format is attached in **Annexure XXI**. Health checkup report is attached in **Annexure XXII**.
43	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with	Will be carried out after public hearing.

ToR No.	ToR Point	Compliance
	budgetary allocations.	
44	Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	Please refer section 4.11, Chapter 4
45	Public hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	Will be carried out after public hearing.
46	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the project should be given	No litigation pending against the project till date on pollution control or environment related matters.
47	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	Please refer section 10.6, Table 10.4 & 10.5 in Chapter 10.
48	A brief background of the Project, its financial position, Group Companies and legal issues etc. should be provided with past and current important litigations if any.	Please refer Section 1.4 and section 1.7, chapter 1
49	Benefits of the Project, if the project is implemented should be outlined. The benefits of the projects shall clearly indicate environmental, social, economic, employment potential, etc.	Refer Chapter 8
50	Besides the above, the below mentioned general points are also to be followed:-	
a)	All documents to be properly referenced with index and continuous page numbering.	All documents are properly referenced with index and page number.
b)	Where data are presented in the report especially in Tables, the period in which the data were collected and the sources should be indicated.	Complied
c)	Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the project.	For test reports of Water (**Annexure XI**), Air (**Annexure IX**), Soil (Table 3.17, Chapter 3), Noise (**Annexure XIII**) etc. of this EIA report. Testing has been done by Min Mec R&D Laboratory, New Delhi (NABL accredited/ MoEF&CC Recognised Lab). Certificate of lab is given in **Annexure**

ToR No.	ToR Point	Compliance
		XXIII.
d)	Where the documents provided are in a language other than English, an English translation should be provided	Complied
e)	The Questionnaire for environmental appraisal of project as devised earlier by the Ministry shall also be filled and submitted.	Not applicable since as per latest MoEF OM's Form 2 shall be filled online when applying for EC.
f)	While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should also be followed	Complied
g)	Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.	They following additions have been added in the rolling mill after the receipt of TOR: 1) Addition of three more products - HB Wire, Binding Wire, LRPC wire from same rolling mills with no change in capacity. These will not impact the reheating furnace or the emissions, effluents and solid waste from it. The additional products will give flexibility according to market scenario. 2) Further detailing of the proposed 1.2 MTPA rolling mill has been carried out and mentioned
h)	As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified Report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project by the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	Complied. Refer **Annexure III**.

CHAPTER 2

PROJECT DESCRIPTION

2.1 PRODUCTS AND CAPACITY

Rungta Mines Limited proposes expansion of Dhenkanal Steel Plant from 3.55 MTPA to 7.53 MTPA steel in the existing plant facilities by adopting DRI-IF/ EAF-LF-VD/ BOF/ NOF/ EOF/ EAF/ RH/ AOD Route followed by casting & rolling (including annealing, pickling, galvanising, colouring) with enhancement of CPP. The production capacity and the plant facilities granted by environmental clearance dated 15.02.2021 by MOEF&CC and proposed for expansion is listed in **Table 1.3** of Chapter 1**.** The plant configuration for expansion from 3.55 MTPA to 7.53 MTPA steel is such that it includes the under operation as well as under construction units.

2.2 PLANT LAYOUT

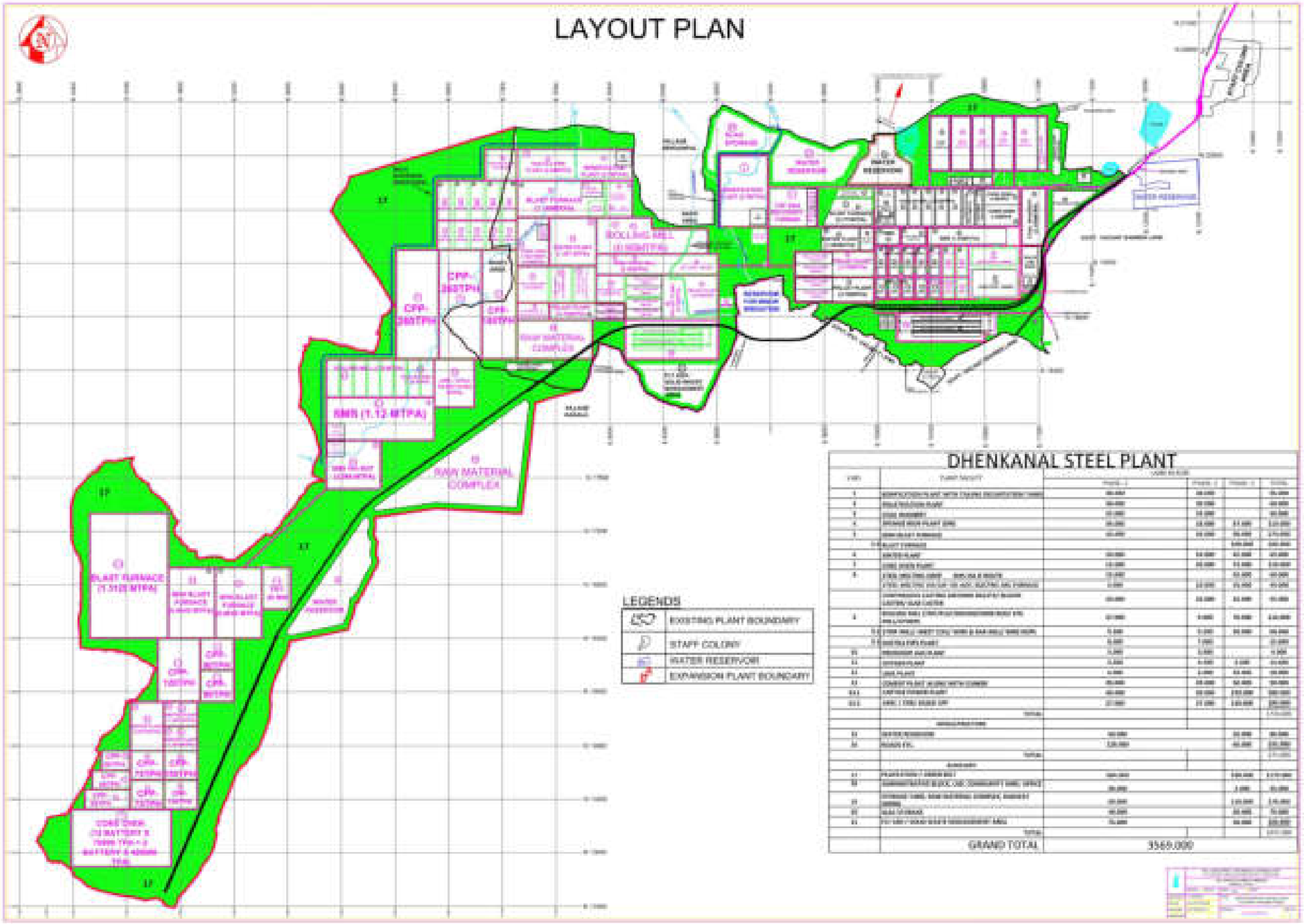
Total land for the existing project (as approved in EC dated 15.02.2021) is 1769 acres for industrial units, greenbelt, raw material stock yard, water reservoir, amenities, temporary solid waste storage, colony, etc. 1800 acres land is additionally required which consists of 1609.80 acres is private land and 190.20 acres is government land. It is to be acquired. Thus, the total plant area shall be 3569 acres.

The proposed layout map is shown in **Fig 2.1**. The breakup of area under major units is given in **Table 2.1.** 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 2.1: BREAK UP OF PLOT AREA IN ACRES

Sl. No.	Description	As per EC dated 15.02.2021		Revised existing		Proposed Additional	Total After Expansion	
		Area	%	Area	%	Area	Area	%
1	Plants, facilities, colony	750.4	42.42	776.4	43.89	953.6	1730	48.47
2	Stock yards, raw material complex, railway siding	128	7.24	128	7.24	50	178	4.99
3	Area for solid waste	116	6.56	116	6.56	60	176	4.93
4	Green belt & plantation	584	33.01	584	33.01	595	1179	33.03
5	Administration & other buildings	30	1.7	30	1.7	5	35	0.98
6	Water reservoir	60	3.39	34	1.92	46	80	2.24
7	Roads	100.6	5.69	100.6	5.69	90.4	191	5.35
	Total	**1769**	**100**	**1769**	**100**	**1800**	**3569**	**100**

FIG 2.1: PLANT LAYOUT MAP



It may noted that compared to the layout and land use sanctioned vide EC dated 15.02.2021, the water reservoir area has been exchanged with the colony area. Thus, the water reservoir area has reduced from 60 acres to 34 acres and the colony area will increase from 34 acres to 60 acres.

Outside project area, the following additional land have been acquired/ allotted:

- 3.14 acres land in Jharbandh village, to meet the residential accommodation requirements of the plant personnel.
- 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.
- 69.324 acres in and around Naya Bhagirathipur and other villages for establishment of private railway siding

Latest site photographs showing plant area are shown in **Fig 2.2.**

The Google image of project site is shown in **Fig 2.3.**

2.3 PROCESS DESCRIPTION

The process descriptions of the various units sanctioned as per EC dated 15.02.2021 as well as proposed in expansion phase are described in subsequent sections.

2.3.1 Beneficiation Plant (5.4 MTPA, no change)

The EC has been obtained for 5.4 MTPA beneficiation plant and there will be no change in it. The configuration of beneficiation plant is given in **Table 2.2.**

TABLE 2.2: CONFIGURATION OF BENEFICIATION PLANT

Description	As per EC dated 15.02.2021
Nos.	2
Throughput Capacity, MTPA	5.4
No. of working days/ annum	330
No. of working hours/ day	24
Beneficiated ore production, MTPA	3.23

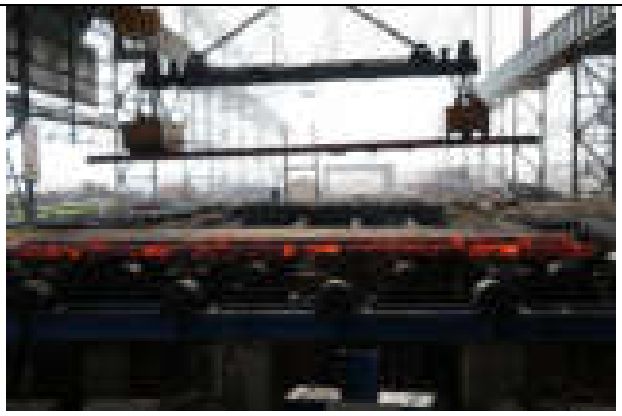
FIG 2.2: PLANT SITE PHOTOGRAPHS



1X500 TPD DRI Kiln



ESPs and Stacks



Caster



SMS furnace



Display Board at entry



132 KV Stringing



AAQMS-1
(Near Store)



AAQMS-2
(Near Galapada Gate)



AAQMS-3
(Near Reservoir)



AAQMS-4
(Near Labour Colony)

FIG 2.3: GOOGLE IMAGE OF PROJECT SITE



Material balance for the iron ore beneficiation plant is given in **Table 2.3.**

TABLE 2.3: MATERIAL BALANCE FOR SANCTIONED BENEFICIATION PLANT (NO CHANGE IN EXPANSION PHASE)

Raw Material Inputs	Specific Consumption T/T of Product	Total Quantity (TPA)	Total %
Low Grade Iron Ore Fines	1.00	5389927	99.995%
Flocculant	0.00005	269	0.005%
Total	**1.00005**	**5390196**	**100%**
Outputs	**Specific Generation T/T of Product**		
Beneficiated Iron Ore (product)	0.60000	3233956	60%
Tailing	0.40000	2155971	40%
Emission losses	0.00005	269	
Total	**1.00005**	**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_2O_3	-	2.5 - 3% max
SiO_2	-	2.5 - 3% max
L.O.I.	-	2% max

The process flow sheet for beneficiation is given in **Fig 2**.4.

Process Description

Beneficiation process 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 (0-5 mm) 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.

FIG 2.4: PROCESS FLOW SHEET FOR BENEFICIATION PLANT



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 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.

The tailing from HGMS is fed to a tailing thickener. The tailing thickener underflow is pumped to a tailing decantation tank 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 decantation tank shall be lost in evaporation and seepage. In addition to the decantation tanks, there shall be paste thickener for quicker drying of tailings/ pressure filter to minimise storage within premises.

2.3.2 Pelletisation Plant (28.75 MTPA, no change)

This is a unit already sanctioned in the EC dated 15.02.2021 and no change is proposed. Its capacity is 28.75 MTPA and will produce iron oxide pellets suitable for use in DRI and Blast Furnace. Out of this, 2.948 MTPA pellet plant is under construction as per CTE dated 24.08.2021 and an earlier EC dated 04.06.2020. The configuration of the pellet plant is given in **Table 2.4.**

TABLE 2.4: CONFIGURATION OF PELLETISATION PLANT

Description	As per EC dated 15.02.2021
Configurations	5 nos. X 3.75 MTPA + 10 nos. X 1 MTPA
Number of days per year	335
No. of working hours/day	24
Total Capacity (Based on output)	**28,750,000 TPA**

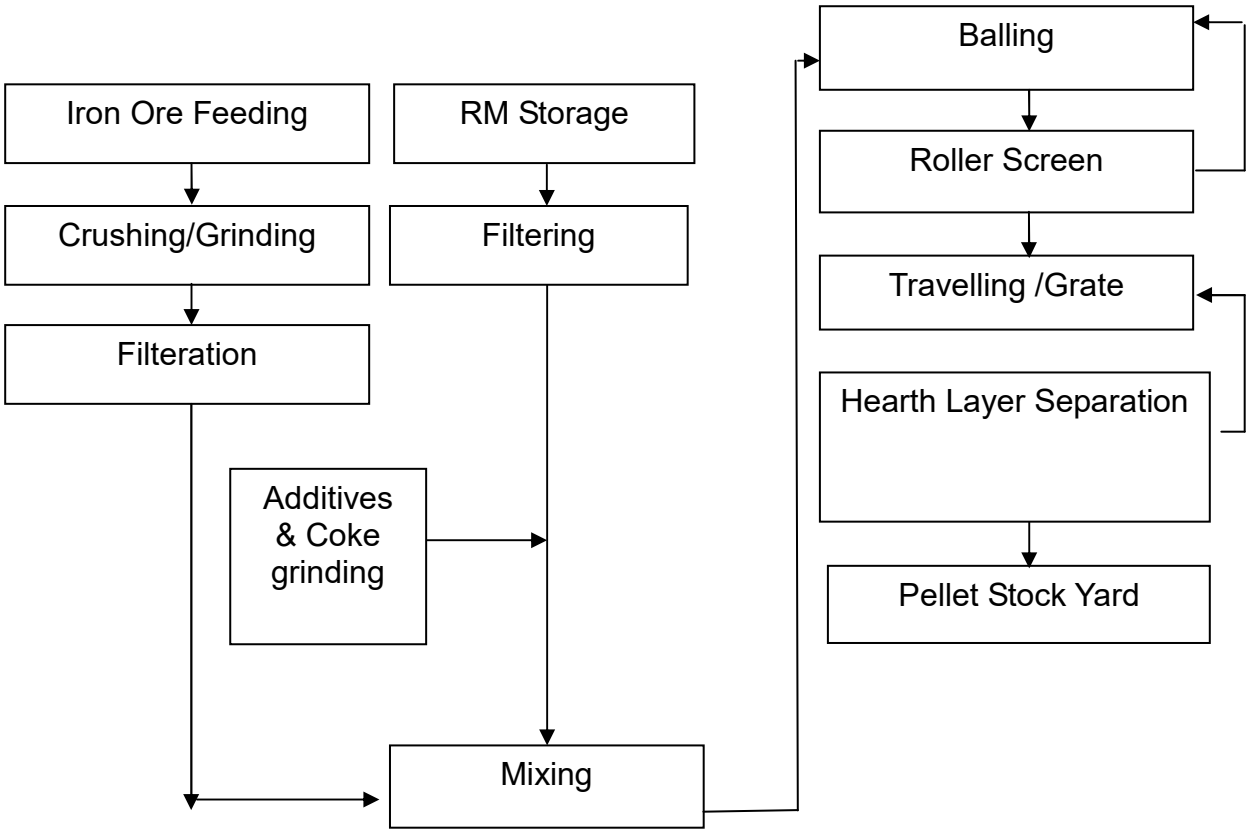
Material balance of the pelletisation plant is given in **Table 2.5**. Process flow sheet is given in **Fig 2.5**.

TABLE 2.5: MATERIAL BALANCE OF PELLETISATION PLANT

	As per EC dated 15.02.2021	
Input	**Quantity (TPA)**	**Specific consumption (T/T)**
Iron Ore/ Fines/ concentrate/Dusts	31,538,750	1.097
Dolomite (Flux)	402,500	0.014
Bentonite	431,250	0.015
Coke Breeze	488,750	0.017
Coal >= 5500 Kcal /kg (emergency use)	960,250	0.033
Sub-Total (solids)	**33,821,500**	**1.176**
Producer Gas (Nm3)/year	5,382,000,000	187.2
Sub-Total (gas)	**5,382,000,000**	**187.2**
Output	**Quantity (TPA)**	**Specific generation (T/T)**
Pellets	28,750,000	1.000
Dust (Iron Ore, Coke, Coal Fines)	2,348,097	0.082
Losses	2,723,403	0.095
Sub-Total (Solids)	**33,821,500**	**1.177**
Combustion Gas (Nm^3)	5,382,000,000	187.2
Sub-Total (gas)	**5,382,000,000**	**187.2**

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

FIG 2.5: PROCESS FLOW OF PELLETISATION PROCESS



Process Description

The pellet plant will produce iron oxide pellets. 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 main steps of feed preparation, green ball formation, pellet induration and product dispatch. Detailed steps involved in pelletisation process are given below:

- Lime stone will be ground together with coke breeze in a ball mill. A hot gas generator using fuel oil will be attached to the ball mill to dry the additives. The ground coke/ limestone mix will be sent to the day bins in the mixing area.
- Bentonite will be ground in a roller mill separately. It will be equipped with a hot gas generator for the simultaneous drying of the ground product, bag filter and fan. Ground products will be stored in silos and transported pneumatically to bin/ mixing building.
- Iron ore fines will be received from the mine, stored in silos and transported pneumatically to bin/ mixing building.
- Pre-weighed portions of iron ore fines, coke breeze/limestone mix and bentonite will be mixed in EIRICH mixer, enabling intensive mixing of above materials.
- The above mixture will be conveyed to a bin directly above pelletizing discs.
- The green ball formation will be done through disc pelletizers (6 working & 1 standby).
- The green balls will be fed to an indurating machine wherein pellets will be produced. Green balls (green pellets) will be indurated on a traveling grate which will consist of an endless chain of pellet cars moving on tracks.
- To avoid thermal shocks to grate bars, green pellets will be charged over a layer of indurated pellets, called ‘hearth layer’. Pellet sidewalls (both sided) will also be protected from excessive heat, with indurated pellets called ‘side layers’.
- A storage bin for hearth and side layers having three outlet chutes will be provided at the feed end of the travelling grate. First, hearth layer will be fed onto the indurating machine followed by simultaneous feeding of side layers (both sides) and green balls in the process of induration.

The indurated and cooled pellets will be discharged from the indurating machine onto a product conveyor through a product discharge bin. This belt conveyor will discharge product pellets into a hearth layer separation bin, having two outlets. From one bottom outlet, the amount of pellets required

as hearth & side layer will be 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 will be discharged for transportation to the pellet stock pile.

Quality of pellets DR Grade

The expected chemical composition of DR/BF grade pellets and their chemical, physical & metallurgical properties are given in **Table 2.6**.

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

TABLE 2.6: 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_2O_3	3.10% max	P	0.04% max
Na_2O	0.05% max	S	0.02% max
K_2O	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 (5.029 MTPA, no change)

The EC has been obtained for 5.029 MTPA coal washery and no change has been proposed. The configuration is given in **Table 2.7** and material balance is given in **Table 2.8.**

TABLE 2.7: CONFIGURATION OF COAL WASHERY PLANT

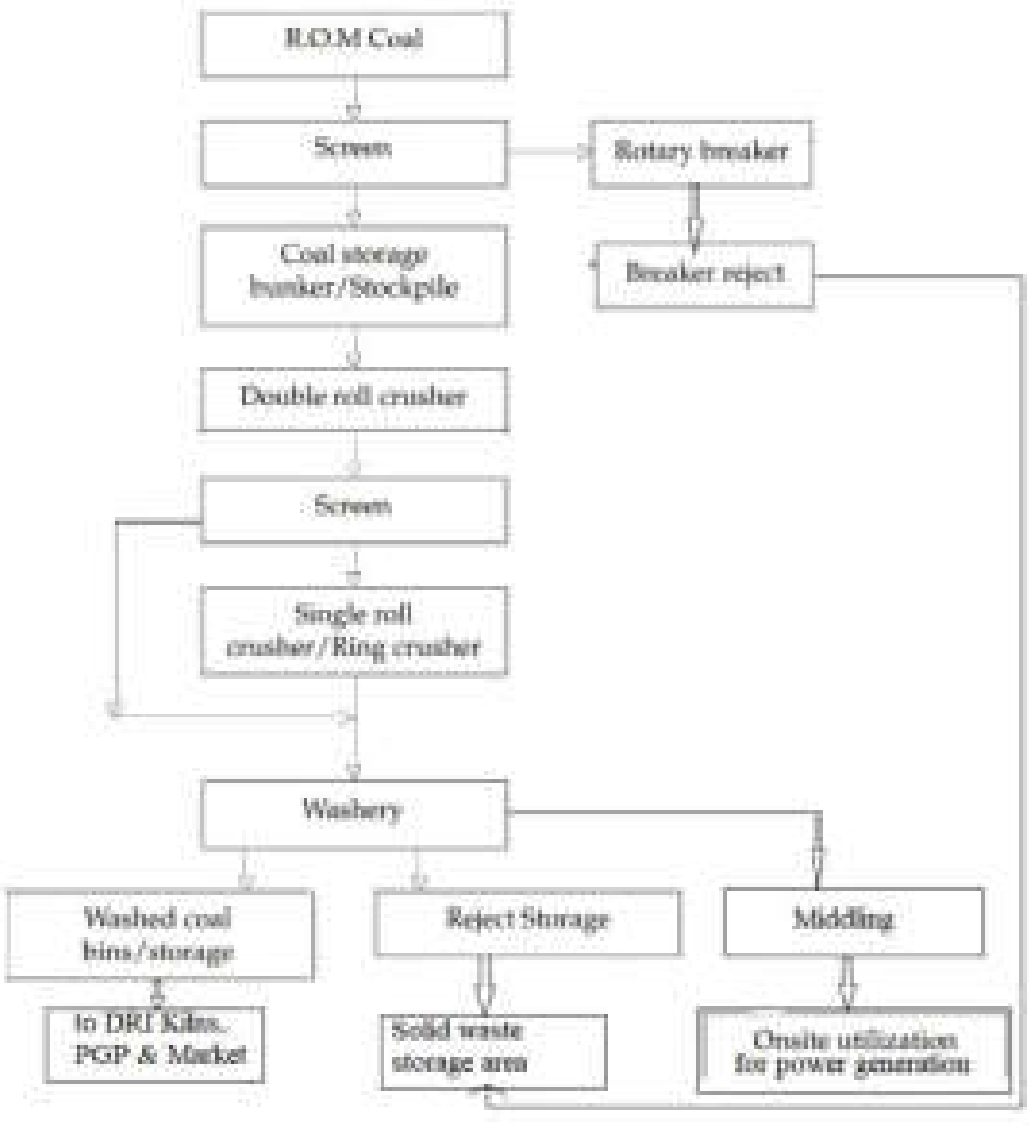
Description	**As per EC dated 15.02.2021**
Configurations	1 no. X 400 TPH + 1 no. X 235 TPH
Number of days per year	330
No. of working hours/day	24
Total Capacity (Based on output)	**5,029,200 TPA**

TABLE 2.8: MATERIAL BALANCE OF COAL WASHERY

	As per EC dated 15.02.2021	
Input	**Quantity (TPA)**	**Specific Consumption (T/T)**
ROM Coal	5029200	1
Total	**5029200**	**1**
Outputs	**Quantity (TPA)**	**Specific Generation (T/T)**
Washed Coal	2514600	0.5
Middlings	2137410	0.425
Reject	377190	0.075
Total	**5029200**	**1**

The process flow sheet of washery is given in **Fig 2.6**.

FIG 2.6: COAL WASHERY PROCESS



Process Description

Coal beneficiation consists of cleaning of raw coal by separation of mineral matter (ash) from 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 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 reject storage will be temporary in the solid waste storage area till the time it can be reutilised for backfilling in abandoned mine or land leveling and filling.

2.3.4 DRI Plant (expansion from 2.247 to 4.403 MTPA)

Existing: The project has obtained EC for 2X500 TPD, 3X600 TPD and 2X900 TPD DRI units for the production of 2,247,150 TPA. Out of this 1X500 TPD is already in operation at Dhenkanal Steel Plant while 1X500 TPD is under construction and rest is yet to be installed.

Proposed: An additional 5X900 TPD or 6X650+1X600 TPD DRI unit is proposed for the production of 2,156,625 TPA. The 5X900 TPD configuration was sanctioned in the TOR dated 13.08.2021. However, for flexibility according to market scenario and raw material availability at the time of implementation, an alternate configuration of 6X650+1X600 TPD is being considered with the same total production. The change in configuration will not cause any alteration in the material balance i.e. quantity of raw material inputs and products.

The existing & the proposed configuration & capacity is given in **Table 2.9**.

TABLE 2.9: CONFIGURATION OF DRI PLANT (EXISTING AND PROPOSED)

Description	Unit	Sanctioned capacity as per EC dated 15.02.2021	Proposed Additional	Total
DRI Kilns nos. & capacity	Nos. X TPD	2X500 + 3x600 + 2x900	5x900 or 6X650 + 1X600	2X500 + 3x600 + 7x900 or 2X500 + 4x600 + 6X650 + 2x900
No. of working days	Days/ Annum	355	355	355
No. of working hours	Hours/ Day	24	24	24
Daily DRI production	TPD	6,330	6,075	12,405
Total Production	**TPA**	**2,247,150**	**2,156,625**	**4,403,775**

The specific consumption and annual requirement of these raw materials for the proposed as well as under installation/installed plants are given in **Table 2.10.**

TABLE 2.10: MATERIAL BALANCE OF DRI PLANT (EXISTING & PROPOSED)

	As per EC dated 15.02.2021		Proposed Additional	Total after Expansion	
Raw Material & Fuel Inputs	**Quantity (TPA)**	**Specific consumption (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific consumption (T/T)**
Iron Ore	3,370,725	1.5	3,234,938	6,605,663	1.5
Coal	1,975,245	0.879	1,895,673	3,870,918	0.879
Dolomite	89,886	0.04	86,265	176,151	0.04
Total	**5,435,856**	**2.419**	**5,216,876**	**10,652,732**	**2.419**
Outputs	**Quantity (TPA)**	**Specific generation (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific generation (T/T)**
Sponge Iron (DRI)	2,247,150	1	2,156,625	4,403,775	1
Char	414,347	0.184	395,948	810,295	0.184
ESP, bag filter dust	141,447	0.063	135,991	277,438	0.063
Bag Filter Dust, scrapper etc.	40,414	0.018	38,854	79,268	0.018
Losses	2,592,498	1.154	2,489,458	5,081,956	1.154
Total	**5,435,856**	**2.419**	**5,216,876**	**10,652,732**	**2.419**

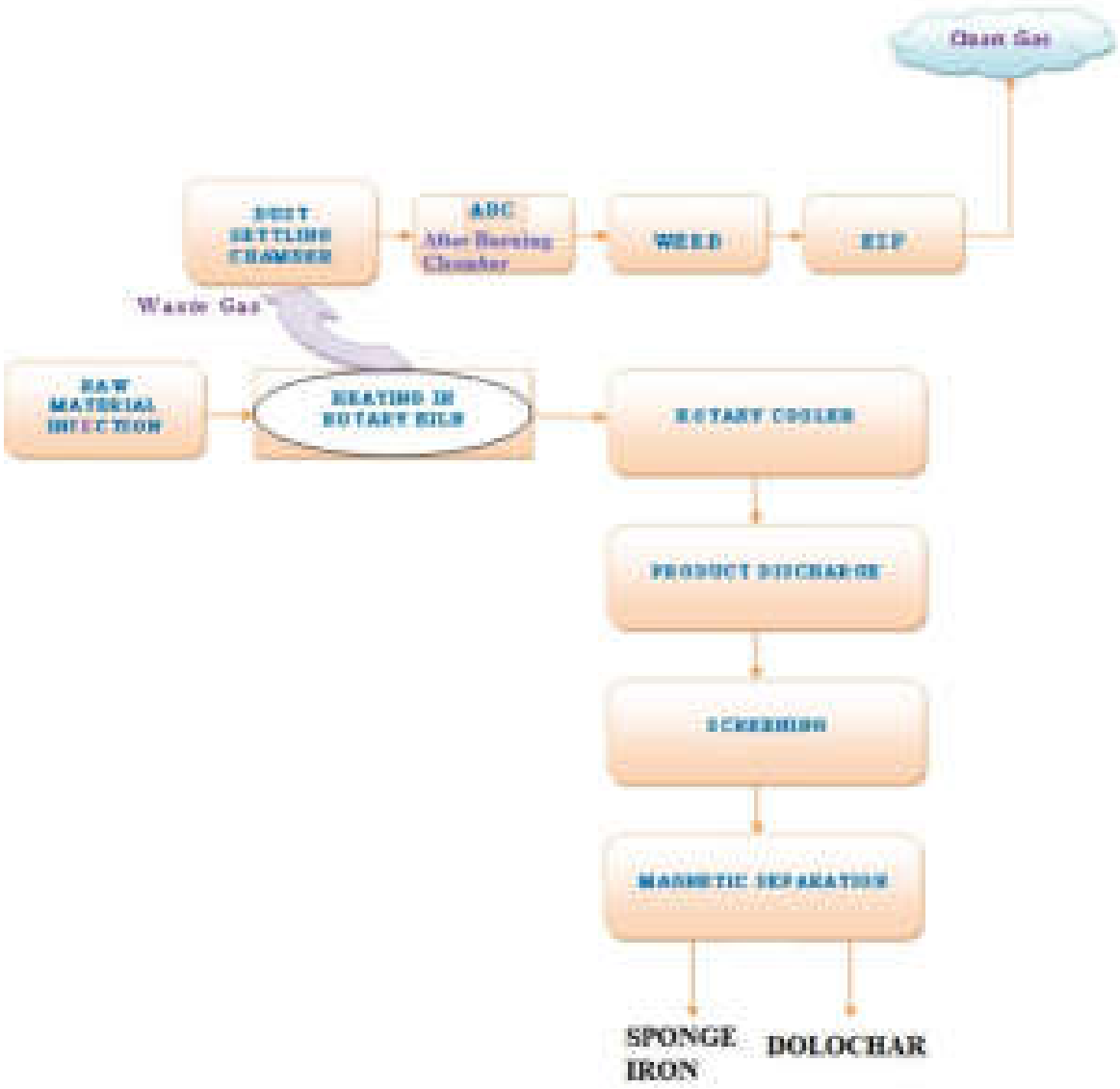
Process Description

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.

Process flow sheet for DRI plant is shown in **Fig 2.7**.

FIG 2.7: FLOW SHEET DRI 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:

- $C + O_2 = CO_2$
- $CO_2 + C = 2CO$
- $Fe_2O_3 + CO = Fe_3O_4 + CO_2$
- $Fe_3O_4 + CO = FeO + CO_2$
- $FeO + CO = Fe + CO_2$

Raw Material Handling System

Main raw materials- iron ore pellets, coal & dolomite will be 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 will be weighed individually and fed to the kiln through a rotary airlock feeder. The feed mix will be fed through feed tube, which is being sealed for leakage of gases with a sealing air fan, which creates a positive pressure to avoid the gas escape. The injection coal system will inject 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 will be used for initial heating of the kiln up to 400°C. Calibrated quantity of combustion air will also be fed through the same opening.

Main Processing System - Kiln

The main reduction process occurs in a rotary kiln. The kilns are/ will be made by boiler quality plate. The drive unit consists of 2 nos. main drive gearbox and 1 auxiliary gearbox. The kiln is supported by tyres, support rollers, one girth gear and two pinions. Calibrated quantity of air is fed to the kiln by shell air fans mounted on the kiln shell. The iron ore is reduced by the carbon monoxide generated by burning coal. The product of kiln is taken to a sealed rotary cooler where the product is cooled by indirect water spray, which is discharged to a conveyor at about 90°C.

The cooler discharge is also sealed with a collecting hopper. There are slip seals at kiln inlet, kiln outlet, cooler inlet and cooler outlet being made up of Ni hard steel. The seals are also being lubricated to avoid false air entry into the kiln and gas leakage from the kiln. At inlet side of the kiln a back flow chute is made which is sealed with a double pendulum flap gate valve.

Cooling System

The material is discharged in the rotary cooler at a temperature of about 700ºC, which is cooled up to 90°C. The drive unit consists of one main gearbox and one auxiliary gearbox. The cooler is supported by tyres and support rollers. This is being cooled by indirect circulating cooling water system, the hot water being collected and passed through the cooling tower. The evaporation loss is made up with makeup water.

Product Separation System

The cooler discharge material consists of sponge iron lumps, fines and ash of coal (char), and is taken to a vibratory screen and two nos. magnetic

separator by belt conveyor. The magnetic and non magnetic material are separated here and 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. The pollution control measures are listed in Chapter 4.

2.3.5 Mini blast furnace/ Blast Furnace (1.943 to 4.984 MTPA)

Dhenkanal Steel Plant has obtained an EC for 1x600 cum and 2x450 cum to produce 1,942,500 TPA hot metal/Pig Iron. Additional units of 2x650 cum and 1x1250 cum is proposed to produce 3,041,500 TPA.

Configuration of existing and proposed blast furnace is given in **Table 2.11**.

TABLE 2.11: CONFIGURATION CONFIGURATION OF BLAST FURNACE

Description		Sanctioned capacity as per EC dt.15.02.2021		Proposed additional		Total
Effective Volume	CUM	600	450	650	1250	600, 2x450 2X650, 1250
MBF/BF	Nos.	1	2	2	1	6
Utilisation coefficient	(T/ cum)	3.7	3.7	3.8	3.0	3.0, 3.7 and 3.8
Working days	Days/ Annum	350	350	350	350	350
No. of working hours	Hours/ Day	24	24	24	24	24
Total Production	**TPA**	**777,000**	**1,165,500**	**1,729,000**	**1,312,500**	**4,984,000**

The material balance of the MBF is given in **Table 2.12**.

TABLE 2.12: MATERIAL BALANCE OF BLAST FURNACE (EXISTING & PROPOSED)

	As per EC dated 15.02.2021		Proposed Additional	Total after Expansion	
Input	**Quantity (TPA)**	**Specific consumption (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific consumption (T/T)**
Iron Ore	165,113	0.085	258,527	423,640	0.085
Sinter	2,806,913	1.445	4,394,967	7,201,880	1.445
Pellet	330,225	0.17	517,055	847,280	0.17
Coke	835,275	0.43	1,307,845	2,143,120	0.43
Coal dust	291,375	0.15	456,225	747,600	0.15
Dolomite	271,950	0.14	425,810	697,760	0.14
Quartz	101,010	0.052	158,158	259,168	0.052
Total	**4,801,861**	**2.472**	**7,518,587**	**12,320,448**	**2.472**

	As per EC dated 15.02.2021		Proposed Additional	Total after Expansion	
Outputs	**Quantity (TPA)**	**Specific generation (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific generation (T/T)**
Hot Metal/Pig Iron	1,942,500	1	3,041,500	4,984,000	1
BF Slag	582,750	0.3	912,450	1,495,200	0.3
Dust (Iron Ore, Coke, Sinter Fines)	97,125	0.05	152,075	249,200	0.05
Losses	2,179,485	1.122	3,412,563	5,592,048	1.122
Total	**4,801,860**	**2.472**	**7,518,588**	**12,320,448**	**2.472**

By using superior quality raw material, the blast furnace charge mix can comprise of upto 85% Sinter & 15% blast furnace grade iron-ore/ pellet. Blast furnace productivity can be maintained high by use of low ash coke and following best operation & maintenance practices.

Manufacturing Process and facilities

Process flow sheet of the blast furnaces is given in **Fig 2.8.**

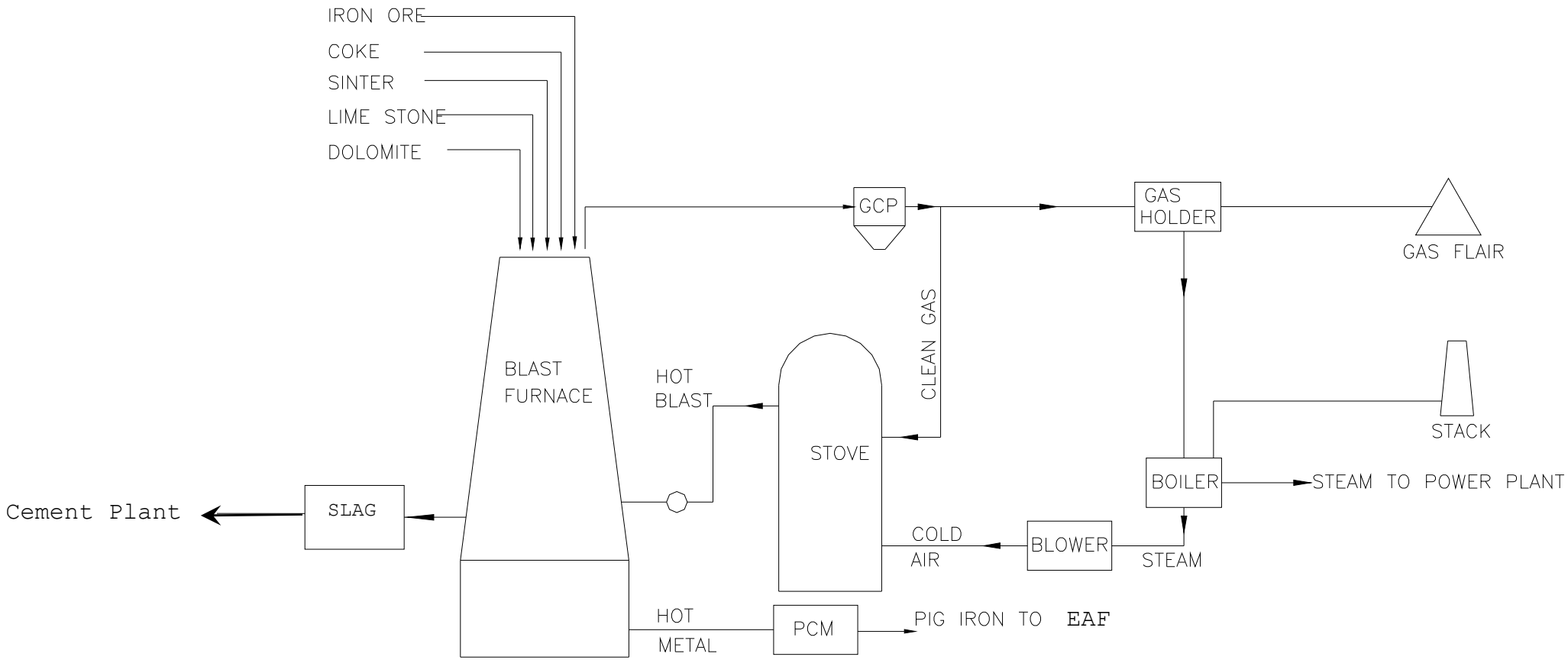
The purpose of a blast furnace is to chemically reduce and physically convert iron oxides into liquid iron called "hot metal". The blast furnace is a huge, steel lined with refractory brick, where iron ore, coke and limestone are dumped into the top, and preheated air is blown into the bottom. The raw 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 blast furnace and pig casting machine along with the requisite support facilities, namely the stock house, coal injection system, cast house, gas cleaning plant, de-dusting facilities, slag granulation unit, etc. However, the blast furnace flue gas will be passed through Waste Heat Recovery Boiler and 105 MW power will be generated from heat recovery. Thereafter, gas will be cleaned in Dry Gas Cleaning Plant and utilized for stove of blast furnace and other plant uses such as reheating furnaces. Unutilised gas shall be flared.

Since high pressure axial blower having air blowing pressure of 3 kg/cm^2 is being opted for and dry gas cleaning plant is proposed for 450 cum and larger blast furnaces, it will be possible to install a Top Gas Pressure Recovery turbine (TRT) for power generation. Total power generation envisaged through TRT will be 30 MW.

FIG 2.8: PROCESS FLOW SHEET OF MINI BLAST FURNACE



Stock House

The sized ore, fluxes, coke, etc., from the raw material storage yard, will be 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 will be 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 temperature 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. Cast house fume extraction system with dry gas cooling shall be provided.

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 used in proposed cement plant.

2.3.6 Sinter plant (2.827 to 7.48 MTPA)

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. 2 X 80 sq.m. and 1 X 110 sq.m. sinter plant has been sanctioned in the existing EC with a production of 2,827,440 TPA. Three new sinter machines are proposed of 2 X 130 sq.m. and 1 X 210 sq.m., to produce 4,653,000 TPA sinter, which will be adequate for feeding the blast furnace. The configuration of sinter plant is as given in **Table 2.13**.

TABLE 2.13: CONFIGURATION OF SINTER PLANT

Description	Unit	Sanctioned capacity as per EC dt. 15.02.2021	Proposed expansion		Total quantity
Sinter Plant	Nos.	3	2	1	6
Capacity	sq.m.	2x80 & 110	130	210	2x80 & 110 2X130 & 210
working days	days/ annum	330	330	330	330
working hours	Hours/ day	20 & 24	20	20	20 & 24
Productivity	Tonnes/ sq.m.	1.4 & 1.5	1.5	1.5	1.4 & 1.5
Production	**TPA**	**2,827,440**	**2,574,000**	**2,079,000**	**7,480,440**

The material balance is shown in **Table 2.14.**

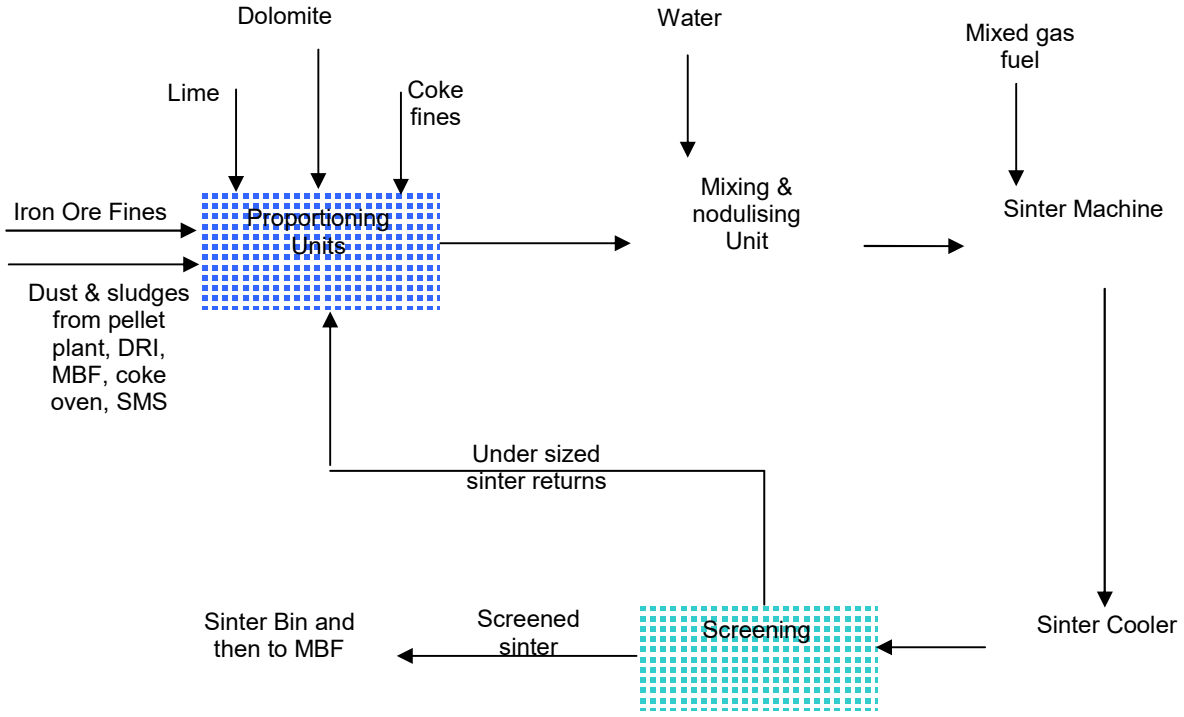
TABLE 2.14: MATERIAL BALANCE OF SINTER PLANT (EXISTING & PROPOSED)

	As per EC dated 15.02.2021		Proposed Additional	Total After Expansion	
Raw Material Inputs	**Quantity (TPA)**	**Specific consumption (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific consumption (T/T)**
Iron Ore Fines	2,544,696	0.9	1,411,843	3,956,539	0.529
Coke Fines	234,700	0.083	386,177	620,877	0.083
Lime Stone	367,567	0.13	604,890	972,457	0.13
Dolomite	367,567	0.13	604,890	972,457	0.13
From Pellet plant (iron ore fines)	2,348,097	0.83	Less 2,348,097	0	0
ESP, BF dust, etc. from DRI	141,447	0.05	215,259	356,706	0.048

	As per EC dated 15.02.2021		Proposed Additional	Total After Expansion	
Raw Material Inputs	**Quantity (TPA)**	**Specific consumption (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific consumption (T/T)**
Dust (Iron Ore, Coke, Sinter Fines) from MBF	97,125	0.034	152,075	249,200	0.033
Bag Filter Dust from coke oven plant	48,471	0.017	75,279	123,750	0.017
BF dust from IF	37,496	0.013	26,344	63,840	0.009
BF dust from EAF	38,094	0.013	71,133	109,227	0.015
Mill Scale from SMS and RM			105,655	105,655	0.014
Sinter Return Fines	424,116	0.15	697,950	1,122,066	0.15
Total	**6,649,376**	**2.350**	**2,003,398**	**8,652,774**	**1.158**
Outputs	**Quantity (TPA)**	**Specific generation (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific generation (T/T)**
Sinter	2,827,440	1	4,653,000	7,480,440	1
Sinter Return Fines	424,116	0.15	697,950	1,122,066	0.15
LOI & losses	3,397,821	1.202	Less 3,347,553	50,268	0.007

The process flow of sinter plant is shown in **Fig 2.9**.

FIG 2.9: PROCESS FLOW OF SINTER PLANT



Process description

(i) 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.

(ii) 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.

(iii) 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.

(iv) 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, Spheroidal Graphite 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.

(v) 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.

(vi) 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.

2.3.7 Coke oven plant (1.07 to 2.75 MTPA)

Coke oven plant has obtained EC (dt. 15.02.2021) for 6 batteries of 70,000 TPA, 1 battery of 250,000 TPA and 1 battery of 400,000 TPA. Based on the requirement, Rungta Mines Ltd. proposes to install 12 batteries of 70,000 TPA and 2 batteries of 420,000 TPA. The configuration of coke oven plant is given in **Table 2.15.**

TABLE 2.15: CONFIGURATION OF COKE OVEN PLANT

Description	Coke Oven Batteries	Capacity	Working days	Working hours	Production	Total Production
Unit	**Nos.**	**TPA**	**days/annum**	**Hours /day**	**TPA**	**TPA**
Sanctioned capacity as per EC dt. 15.02.2021	6	70,000	350	24	420,000	**10,70,000**
	1	2,50,000	350	24	250,000	
	1	4,00,000	350	24	400,000	
Proposed additional	12	70,000	350	24	840,000	**16,80,000**
	2	4,20,000	350	24	840,000	
Total	18	70,000	350	24	1,260,000	**27,50,000**
	1	2,50,000	350	24	250,000	
	1	4,00,000	350	24	400,000	
	2	4,20,000	350	24	840,000	

The material balance is given in **Table 2.16.**

TABLE 2.16: MATERIAL BALANCE OF COKE OVEN (EXISTING & PROPOSED)

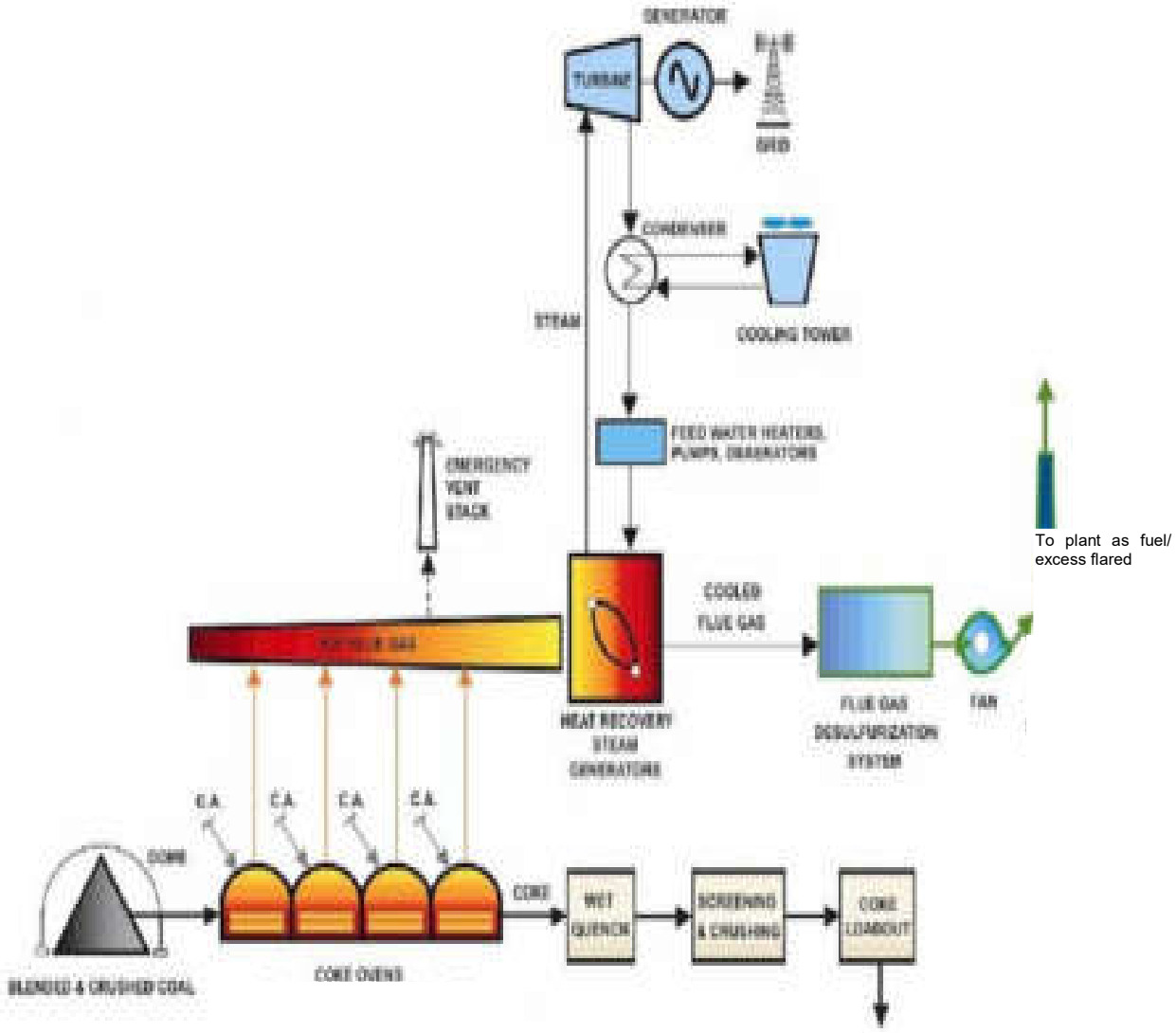
	As per EC dated 15.02.2021		Proposed Additional	Total after Expansion	
Raw Material Inputs	**Quantity (TPA)**	**Specific consumption (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific consumption (T/T)**
Coking Coal	1,615,700	1.51	2,536,800	4,152,500	1.51
Total	**1,615,700**	**1.510**	**2,536,800**	**4,152,500**	**1.510**
Outputs	**Quantity (TPA)**	**Specific generation (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific generation (T/T)**
Coke	1,070,000	1	1,680,000	2,750,000	1
Bag Filter Dust	48,471	0.045	75,279	123,750	0.045
Losses & COG	497,229	0.465	781,521	1,278,750	0.465
Total	**1,615,700**	**1.510**	**2,536,800**	**4,152,500**	**1.510**

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 process flow of coke oven is shown in **Fig 2.10**.

FIG 2.10: COKE OVEN PLANT



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 will get converted to coke within 36 to 38 hours. The coke is then pushed out from the oven and quenched by water.

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.

Modified Wet Coke Quenching system

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

2.3.8 Steel melting shop (3.22 to 7.409 MTPA)

The Steel Melt Shop will comprise of Induction Furnaces (IF), Electric Arc furnace (EAF), basic oxygen furnace (BOF), new oxygen furnace (NOF), energy optimisation furnace (EOF), ladle refining furnaces (LRF), vacuum degassing (VD), argon oxygen decarburization (AOD) and Ruhrstahl Heraeus (RH). Details are described in subsequent paragraphs.

2.3.8.1 Induction Furnace-LRF-CCM Route (1.54 to 2.66 MTPA)

The configuration for existing and proposed SMS via IF-LRF-CCM route is given in **Table 2.17.** Out of this 2x20 T is already in operation at Dhenkanal Steel Plant while 3x20 T is under construction and rest is yet to be installed.

A brief description of the manufacturing process is given in subsequent paragraphs.

TABLE 2.17: CONFIGURATION OF SMS VIA IF ROUTE (EXISTING & PROPOSED)

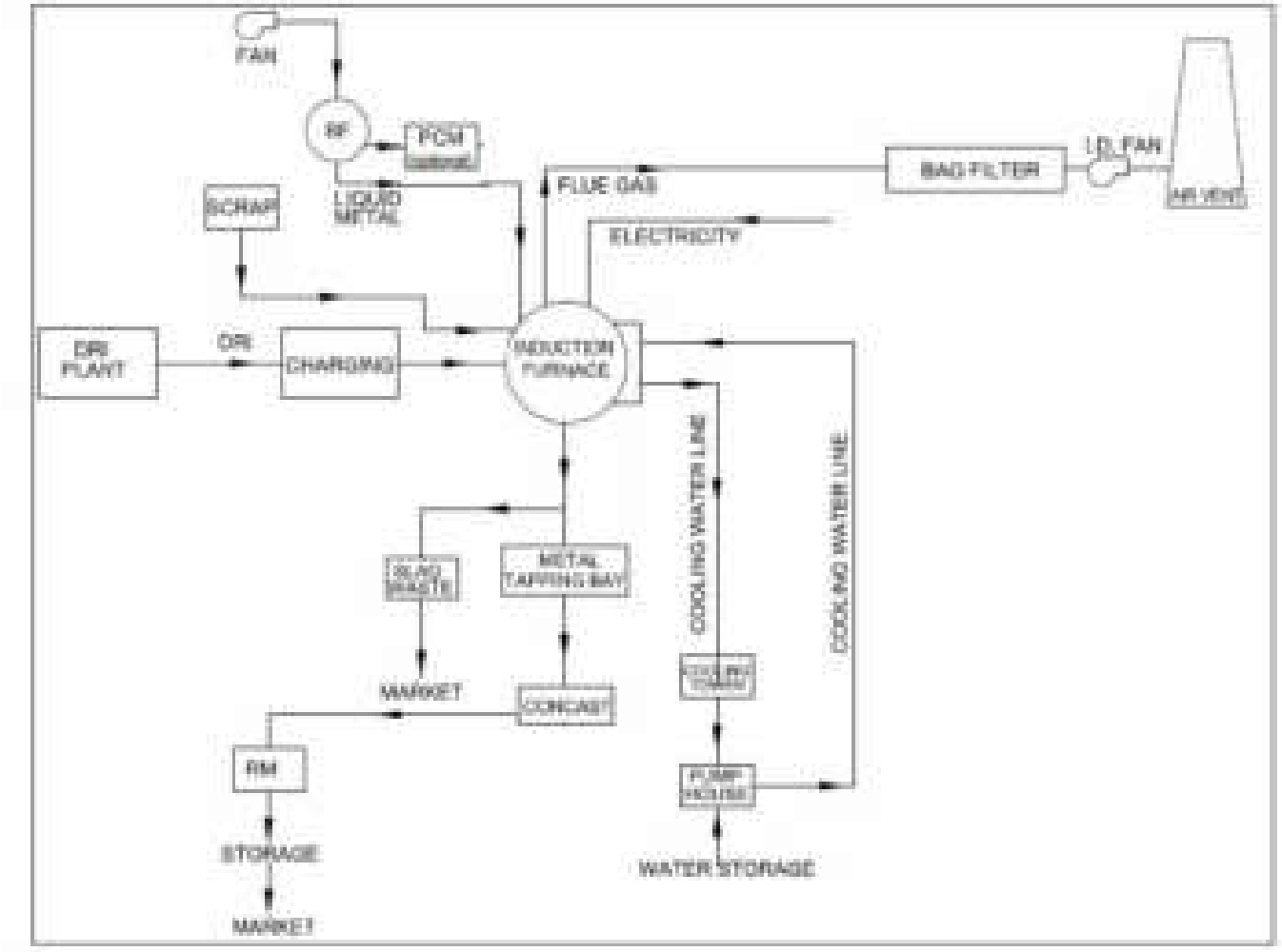
Description	Sanctioned capacity as per EC dated 15.02.2021	Proposed additional	Total
Induction Furnace	15	20	35
Capacity	20 T	20 T	20 T
No. of Heats	11	8	11, 8
No. of working days	350	350	350
No. of working hrs	24	24	24
Ladle refining furnace	4x25T + 3x45 T	8 X 45 T	4x25T + 11x45 T
Production (Total)	**1,540,000**	**1,120,000**	**2,660,000**

Material balance of SMS-IF is given in **Table 2.18**. Process flow sheet of SMS via IF route is given in **Fig 2.11**.

TABLE 2.18: MATERIAL BALANCE OF SMS VIA IF ROUTE (EXISTING & PROPOSED)

	As per EC dated 15.02.2021		Proposed Additional	Total after expansion	
Input	**Quantity (TPA)**	**Specific consumption (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific consumption (T/T)**
DRI	1,540,000	1	1,120,000	2,660,000	1
Pig Iron / Hot Metal	251,087	0.163	182,493	433,580	0.163
Steel Scrap	83,696	0.054	59,944	143,640	0.054
Total	**1,874,783**	**1.217**	**1,362,437**	**3,237,220**	**1.217**
Outputs	**Quantity (TPA)**	**Specific generation (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific generation (T/T)**
Liquid metal to CCM	1,540,000	1	1,120,000	2,660,000	1
BF dust and losses	37,496	0.024	26,344	63,840	0.024
Slag	297,287	0.193	216,093	513,380	0.193
Total	**1,874,783**	**1.217**	**1,362,437**	**3,237,220**	**1.217**

FIG 2.11: PROCESS FLOW SHEET OF INDUCTION FURNACE



Process Description

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 LRF will be constructed 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 offers an advantage of quick melting of the charge with 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 will be loaded manually and large capacity furnaces with the aid of buckets.

2.3.8.2 Electric arc furnace/ Basic Oxygen Furnace/ Energy Optimisation Furnace/ New Oxygen Furnace-LRF-CCM Route (1.680 to 4.749 MTPA)

The configuration for existing and proposed SMS via EAF/ BOF/ EOF/ NOF-LRF-CCM route is given in **Table 2.19**.

TABLE 2.19: CONFIGURATION OF SMS (EAF/BOF/ NOF/ EOF ROUTE)

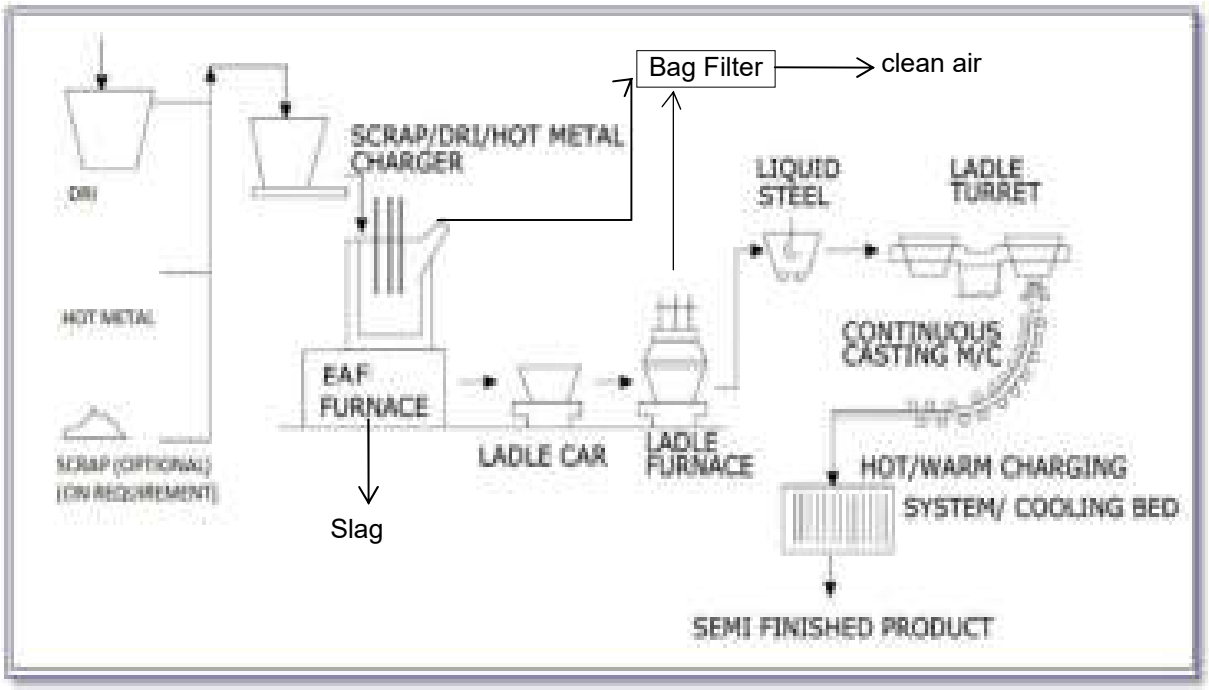
Description	Unit	As per existing EC dated 15.02.2021	Proposed Additional	Total after expansion
Electric Arc Furnace	No.	2	-	2
Capacity	Ton			
Electric Arc Furnace/ Basic oxygen furnace/ Energy Optimisation Furnace/ New Oxygen Furnace	Nos. X capacity	EAF- 1X90 T,1X110 T	2X65 T, 4X45T	1X 90 T, 1x110 T 2x65 T, 4x45T
Working days	days/Annum	350	330	330 & 350
Working hours	Hours /Day	24	24	24
No. of Heats through BOF route	Heats	24	30	24, 30
Production	**TPA**	**1,680,000**	**3,069,000**	**4,749,000**

The charge mix being considered for Electric Arc Furnaces is 28% DRI and 60% hot metal/ pig iron. The material balance given in **Table 2.20.** Electric Arc Furnaces Process flow sheet of the EAF is given in **Fig 2.12**.

TABLE 2.20: MATERIAL BALANCE OF SMS VIA EAF/ BOF/ NOF/ EOF ROUTE (EXISTING & PROPOSED)

Material Balance	As per EC dated 15.02.2021		Proposed additional	Total After expansion	
Input	**Quantity (TPA)**	**Specific consumption (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific consumption (T/T)**
DRI	707,150	0.421	1,036,625	1,743,775	0.367
Hot Metal/Pig Iron from MBF	1,197,550	0.713	2,537,110	3,734,660	0.786
Lime	304,500	0.181	462,000	766,500	0.162
Total (Liquid metal to CCM)	**2,209,200**	**1.315**	**4,035,735**	**6,244,935**	**1.315**
Outputs	**Quantity (TPA)**	**Specific generation (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific generation (T/T)**
Liquid metal to CCM	1,680,000	1	3,069,000	4,749,000	1
BF dust	38,094	0.023	71,133	109,227	0.023
Losses	60,900	0.036	110,064	170,964	0.036
Slag	430,206	0.256	785,538	1,215,744	0.256
Total	**2,209,200**	**1.315**	**4,035,735**	**6,244,935**	**1.315**

FIG 2.12: PROCESS FLOW SHEET OF ELECTRIC ARC FURNACE



Process description

Electric arc furnaces (EAF) : 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. One of the most remarkable aspects of an EAF is the ultralow phoscontent (< 0.01 %) which may be reached consistently, without impairing the high productivity of the furnace.

Basic oxygen furnace (BOF) : In basic oxygen furnace, oxygen is blown through molten pig iron that is heated to approximately 1,600°C to convert it into steel. In the case of the basic oxygen steel making processes (BOF), on the other hand, the danger arises that the expensive alloying elements will be absorbed at least in part by the slag.

New Oxygen Furnace (NOF) has a controlled and efficient steel making process. NOF has the flexibility of converting various charge mix of raw material i.e. from 100 per cent DRI to 90 per cent Hot Metal (Zero Electric Power) into steel efficiently. In new oxygen furnace, steel is made by charging upto 90 per cent of liquid Hot Metal and using only chemical energy; without the aid of Electrical Energy; and it also leads to lower slag generation and zero electrode consumption.

Energy optimisation furnaces (EOF) work with combined submerged and atmosphere oxygen blown in an initial charge containing hot metal, preheated solid scrap and fluxes for slag formation.

Vacuum degassing (VD) plant: The VD has also been considered as an alternate to the RH/ AOD units in expansion phase. A Vacuum Degassing unit is used for degassing (hydrogen and nitrogen removal) and for decarburizing of the melt. It creates optimal conditions for desulfurization with proper slag management and removal of inclusions. During VD treatment, the liquid steel ladle is placed in a vacuum tank (stationary or movable). A vacuum pump system is used to achieve vacuum. Inert gas is injected through porous plugs to assist stirring.

Ruhrstahl Hereaus (RH) unit: The RH has also been considered as an alternate to the VD/ AOD units in expansion phase. The melt is vacuum treated in a refractory-lined vessel. The vessel has two snorkels immersed in the steel bath. When the pressure is reduced in the system, the melt rises into the vessel. Circulation is induced by injection of inert gas into the up-leg snorkel. The system removes hydrogen and nitrogen, uses less expensive high-carbon alloys and has improved steel cleanliness in terms of non-metallic inclusions.

Argon Oxygen Decarburization (AOD): The AOD has also been considered as an alternate to the VD/ RH units in expansion phase. It is used for extensive decarburization of the melt. Oxygen and inert gas (argon or nitrogen) is injected via submerged tuyeres. Through a top lance,

additional oxygen is blown. This process is suitable for producing stainless steel as well as other high-grade alloys since argon/nitrogen dilution minimizes unwanted chromium oxidation.

2.3.8.3 Continuous Casting Machine (CCM)

The Caster is complete with ladle stand, mould assembly, Strand guide segments and supports withdrawal and straightening system, mould cooling system, Cut- off equipment including length measuring device, marking machine etc. The sanctioned and proposed configuration and production of the continuous casting machine is given in **Table 2.21.**

TABLE 2.21: SANCTIONED & PROPOSED CONFIGURATION & PRODUCTION OF CCM

Plant facilities	Sanctioned as per EC	Proposed Additional	Total capacity after Expansion
Continuous Casting Machine (Billets/ Bloom Caster/ Slab caster), MTPA	3.156	4.147	7.303
Configuration	11 nos. X 4 strand	7 nos. X 4 strand	18 nos. X 4 strand

The material balance of caster from IF is given in **Table 2.22.**

TABLE 2.22: MATERIAL BALANCE OF CASTER FROM IF (EXISTING & PROPOSED)

	As per EC dated 15.02.2021		Proposed Additional	Total after expansion	
Raw Material Inputs	**Quantity (TPA)**	**Specific consumption (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific consumption (T/T)**
Liquid Metal from Furnace	1,540,000	1.02	1,120,000	2,660,000	1.02
Total	**1,540,000**	**1.020**	**1,120,000**	**2,660,000**	**1.020**
Outputs	**Quantity (TPA)**	**Specific generation (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific generation (T/T)**
Semi-Finished Product from CCM	1,509,200	1.00	1,097,600	2,606,800	1
Mill Scale	30,800	0.02	22,400	53,200	0.02
Total	**1,540,000**	**1.020**	**1,120,000**	**2,660,000**	**1.020**

Material balance of caster from EAF/ BOF/ NOF/ EOF route is given in **Table 2.23.**

TABLE 2.23: MATERIAL BALANCE OF CASTER FROM EAF/ BOF/ NOF/ EOF ROUTE (EXISTING & PROPOSED)

	As per EC dated 15.02.2021		Proposed additional	Total After expansion	
Raw Material Inputs	**Quantity (TPA)**	**Specific consumption (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific consumption (T/T)**
Liquid Metal from Furnace	1,680,000	1.02	3,069,000	4,749,000	1.02
Total	**1,680,000**	**1.020**	**3,069,000**	**4,749,000**	**1.020**
Outputs	**Quantity (TPA)**	**Specific generation (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific generation (T/T)**
Semi-Finished Product from CCM	1,646,400	1	3,007,620	4,654,020	1
Mill scale	33,600	0.02	61,380	94,980	0.02
Total	**1,680,000**	**1.020**	**3,069,000**	**4,749,000**	**1.020**

2.3.9 Rolling Mill, Strip Mill & Ductile Pipe Plant (3.55 to 7.53 MTPA)

Semi-finished product from the CCMs of IF and EAF/ BOF/ EOF/ NOF is converted into finished products such as TMT, Flat, Round, Wire Rod, Structural, Ductile pipe and others products. The configuration of existing and proposed Rolling Mill is given in **Table 2.24**.

TABLE 2.24: CONFIGURATION OF ROLLING MILL (EXISTING & PROPOSED)

Facilities	Unit	Existing as per EC dated 15.02.2021	Proposed additional	Total
Rolling Mill (TMT/ Flat/ Round/ Wire Rod/ Structural Mill/ wire drawing / HB Wire*/ Binding Wire*/ LRPC wire*/ others followed by one or more in series of pickling, cold rolling, annealing, galvanizing)	MTPA	2.55 (2 nos.X0.2 + 4 nos.X0.3 + 1 no. X0.45 + 1 nos. X0.5 MTPA) (TMT/ Flat/ Round/ Wire Rod/ Structural Mill/others)	Change in product mix TMT/ Flat/ Round/ Wire Rod/ Structural Mill/ wire drawing/ HB Wire*/ Binding Wire*/ LRPC wire*/others followed by one or more in series of pickling, cold rolling, annealing, galvanizing	2.55 (2 nos.X0.2 + 4 nos.X0.3 + 1 no. X0.45 + 1 nos. X0.5 MTPA)
Strip Mill/ Sheet/ Coil/ Wire & Bar Mill/ Wire Rope	MTPA	0.5 (1 no.X0.2 + 1no.X0.3 MTPA)	-	0.5 (1 no.X0.2 + 1no.X0.3 MTPA)
Ductile Pipe Plant (& fittings*)	MTPA	0.5 (2 nos.X0.25 MTPA)	-	0.5 (2 nos.X0.25

Facilities	Unit	Existing as per EC dated 15.02.2021	Proposed additional	Total
				MTPA)
Rolling mill (Long/TMT/ Flat/Strip/ Round/ Wire Rod/Hot Rolled/HRC/ /Structural Mill/Plate/ Pipe& Tube Products /wire drawing/ HB Wire*/ Binding Wire*/ LRPC wire* etc) followed by one or more in series of pickling, cold rolling, annealing, galvanizing	MTPA	-	2.78 (2 X 0.55 MTPA+4X0.42 MTPA	2.78 (2 X 0.55 MTPA+4X0.42 MTPA
Rolling Mill (Long/ TMT/ Flat/ Strip/ Round/ Wire Rod/ Hot Rolled/ HRC/ Structural Mill/ Tin Plate/ Electrical Steel/ CRGO/ Wire Drawing followed by (1) Pipe & Tube Products or (2) one or more in series of pickling, cold rolling, annealing, galvanizing and colour coating as follows:	MTPA	-	1.2 (1 X 1.2)	1.2
(1) Cold Rolling Mill/ Plate Mill/ Pipe Mill etc	MTPA		1.2 (2x0.3+3x0.2)	1.2 (2x0.3+3x0.2)
(2) Galvanising Line/ Galvanneal/ GIAuto/ Tin Mill Products/ Coated/ Plated Products/ Galvalume/ CRGO etc	MTPA		1.2 (2x0.3+3x0.2)	1.2 (2x0.3+3x0.2)
(3) Colour Coated Line etc	MTPA		1.2 (2x0.3+3x0.2)	1.2 (2x0.3+3x0.2)
Total	**MTPA**	**3.55**	**3.98**	**7.53**

**** additional products proposed after receiving Terms of Reference***

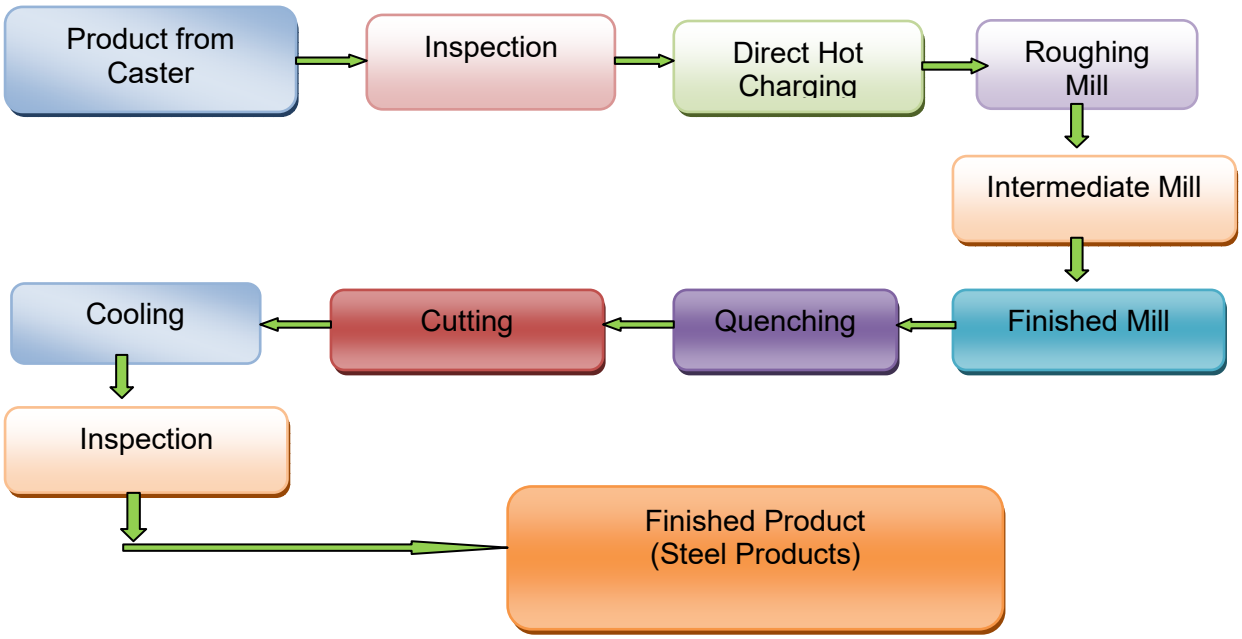
*2.3.9.1 Rolling Mills (***Rolling mill with Annealing & Pickling & Galavanising Line (TMT/ flat/ Round/ wire rod/Wire drawing structural mill/ others*) (2.55 MTPA, Change in product mix)***

Rolling is the process of plastically deforming the metal into desired thickness and profile. This is achieved by passing it through a set of rollers rotating in opposite directions. Since steel is not ductile at room temperature, it is required to be heated to make it ductile. This is carried out in a reheating furnace. Therefore, hot rolling operation is always preceded by reheating operation. The other option is to directly do hot charging to the rolling mill, thereby reducing the requirement of reheating considerably, by as much as 80% and above. The advantages of direct hot charging are:

- It reduces energy consumption, process time and associated costs
- Consumes less fuel for reheating
- Reduces overall emissions into the atmosphere

Semi-finished product from the casters will be converted into finished products such as TMT/ Flat/ Round/ Wire Rod/ Structural Mill/ wire drawing/ HB Wire/ Binding Wire/ LRPC wire/ other products followed by one or more in series of pickling, cold rolling, annealing, galvanizing as shown in **Fig 2.13**.

FIG 2.13: PROCESS FLOW OF ROLLING MILL



After making the steel product in the rolling mill, further treatment of the product can be undertaken to give it special properties. These are annealing (to reduce hardness, increase ductility and eliminate internal stress), pickling (surface treatment to remove impurities, rust and scale) and galvanising (Zinc coating). Pickled steel product is directly sellable but pickling is also a pre-requisite to galvanising, hence the two are explained together below.

Galvanising is intended for steel products to protect them from corrosion. Hot-dip galvanising is a relatively simple process compared to other methods. In this, a series of steps are carried out comprising of surface preparation, galvanizing, and post-treatment.

1) **Pre-treatment** consists of treating the surface by **removing burrs** and rough points.

2) Thereafter, **degreasing** is carried out by immersion in strong base (NaOH or KOH) at high temperature. In addition to alkaline solutions, neutral non-ionic degreasers can be used in spray systems. Degreasing can be carried out by organic solvents as well, wherein the

organic solvents can be recovered by distillation. However, this is not a preferred method in view of their climate change impact. one of the most effective degreasing procedures is the use of a strongly alkaline electrolyte with cathode electrical current.

3) Subsequently the steel product is **rinsed** to remove salts resulting due to saponification reactions. The rinsing bath water is changed/ recharged due to emulsification of fluids. Contaminated waste water is produced in this stage.

4) **Pickling** process involves removal of oxide scales from the surface of the steel product. It is done by treating it with dilute hydrochloric or sulphuric acid. The material is dipped into a vat of “pickle liquor”. The reaction that occurs area a combination of chemical reaction and mechanical separation of scales due to evolution of hydrogen. As a result of this stage, effluent and sludge are formed from the removal of the oxides.

5) **Pickling washing** consists of rinsing the steel products to prevent the carry over of acid to the subsequent process stages. Contaminated waste water is produced in this stage.

6) Next step is **galvanising**. In this process, iron or steel is immersed in a bath of molten zinc to produce a corrosion resistant, multi-layered coating of zinc-iron alloy and zinc metal. A metallurgical reaction occurs between the iron in the steel and the molten zinc. This reaction is a diffusion process, so the coating forms perpendicular to all surfaces creating a uniform thickness throughout the product. Zinc ash/ skimming and zinc dross are created as waste at this stage.

7) It is necessary to follow up the galvanising with another **rinse** and transfer to the **passivation process** in order to produce a protective layer on the product. Strong acids such as chromic and sulfuric are usually used in this process.Depending upon the electrodeposition residence time, the pH of the bath, stirring and temperature, different passivation structures will be obtained. These are passivated bluish iridescence (zinc-plated rainbow), passivated (olive color), passivated (zinc-plated iris) and passivated black zinc. After the passivation process, a rinse removes reagents and drying is performed.

The finished product facilities configuration is given in **Table 2.25.**

TABLE 2.25: CONFIGURATION OF ROLLING MILL AS PER EC DT. 15.02.2021

Description	Unit	Sanctioned capacity as per EC dated 15.02.2021
Rolling Mill	Nos.	8
working days	days/Annum	350
Working hours	Hours /Day	20

Description	Unit	Sanctioned capacity as per EC dated 15.02.2021
Production		
2x0.2 MTPA	TPA	400,000
4x0.3 MTPA	TPA	1,200,000
1x0.45 MTPA	TPA	450,000
1x0.5 MTPA	TPA	500,000
Total	**TPA**	**2,550,000**

The Material balance for Rolling Mill is given in the **Table 2.26.** Process flow of Rolling mill is given in **Fig 2.13.**

TABLE 2.26: MATERIAL BALANCE OF ROLLING MILL (EXISTING)

	As per EC dated 15.02.2021	
Input	**Quantity (TPA)**	**Specific Consumption (T/T)**
Semi Finished Product from IF-CCM	1,509,200	0.592
Semi Finished Product from EAF-CCM	1,119,666	0.439
Total	**2,628,866**	**1.031**
Outputs	**Quantity (TPA)**	**Specific Generation(T/T)**
Finished Product	2,550,000	1
Reject	35,490	0.014
Mill Scale	43,376	0.017
Total	**2,628,866**	**1.031**

2.3.9.2 Strip mill (Strip/Sheet/ Coil/ Wire & Bar, Wire Rope) (0.5 MTPA, No Change)

The strip mill has obtained EC for production of 500,000 TPA and there will be no change in it. Semi finished product from the CCMs 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 AS PER EC DT. 15.02.2021

Description	Unit	Total
Strip Mill	Nos.	2
Capacity	MTPA	0.2 & 0.3

Description	Unit	Total
Working days	days/Annum	350
Working hours	Hours /Day	20
Production	TPA	500,000

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

TABLE 2.28: MATERIAL BALANCE OF STRIP MILL

	As per EC dated 15.02.2021	
Raw Material Inputs	**Specific Consumption (T/T)**	**Quantity (TPA)**
Semi Finished Product from CCM	1.02	510,204
Total	**1.02**	**510,204**
Outputs	**Specific Generation (T/T)**	**Quantity (TPA)**
Finished Product	1.00	500,000
Reject	0.009	4,592
Mill Scale	0.011	5,612
Total	**1.02**	**510,204**

2.3.9.3 Ductile Pipe Plant (0.5 MTPA, No Change)

The ductile pipe plant has obtained EC for production of 500,000 TPA and there will be no change in it. Ductile pipe plant will receive hot metal directly from the MBF and manufacture finished product comprising of ductile pipes and fittings. Configuration of Ductile Pipe Plant is given in **Table 2.29.**

TABLE 2.29: CONFIGURATION OF DUCTILE PIPE PLANT AS PER EC DT. 15.02.2021

Description	Unit	Quantity
Ductile Pipe Plant	Nos.	2
Capacity	MTPA	0.25
working days	Days/Annum	350
working hours	Hours /Day	16
Production	**TPA**	**500,000**

The material balance for Ductile Pipe Plant is given in the **Table 2.30** and flow sheet is given in **Fig 2.14.**

TABLE 2.30: MATERIAL BALANCE OF DUCTILE PIPE PLANT (EXISTING)

	As per EC dated 15.02.2021	
Raw Material Inputs	**Specific Consumption (T/T)**	**Total Quantity (TPA)**
Hot Metal from Blast Furnace	1.02	510,204
Total	**1.02**	**510,204**
Outputs	**Specific Generation (T/T)**	
Finished Product	1.00	500,000
Reject	0.01	4,592
Mill Scale	0.01	5,612
Total	**1.02**	**510,204**

Manufacturing process

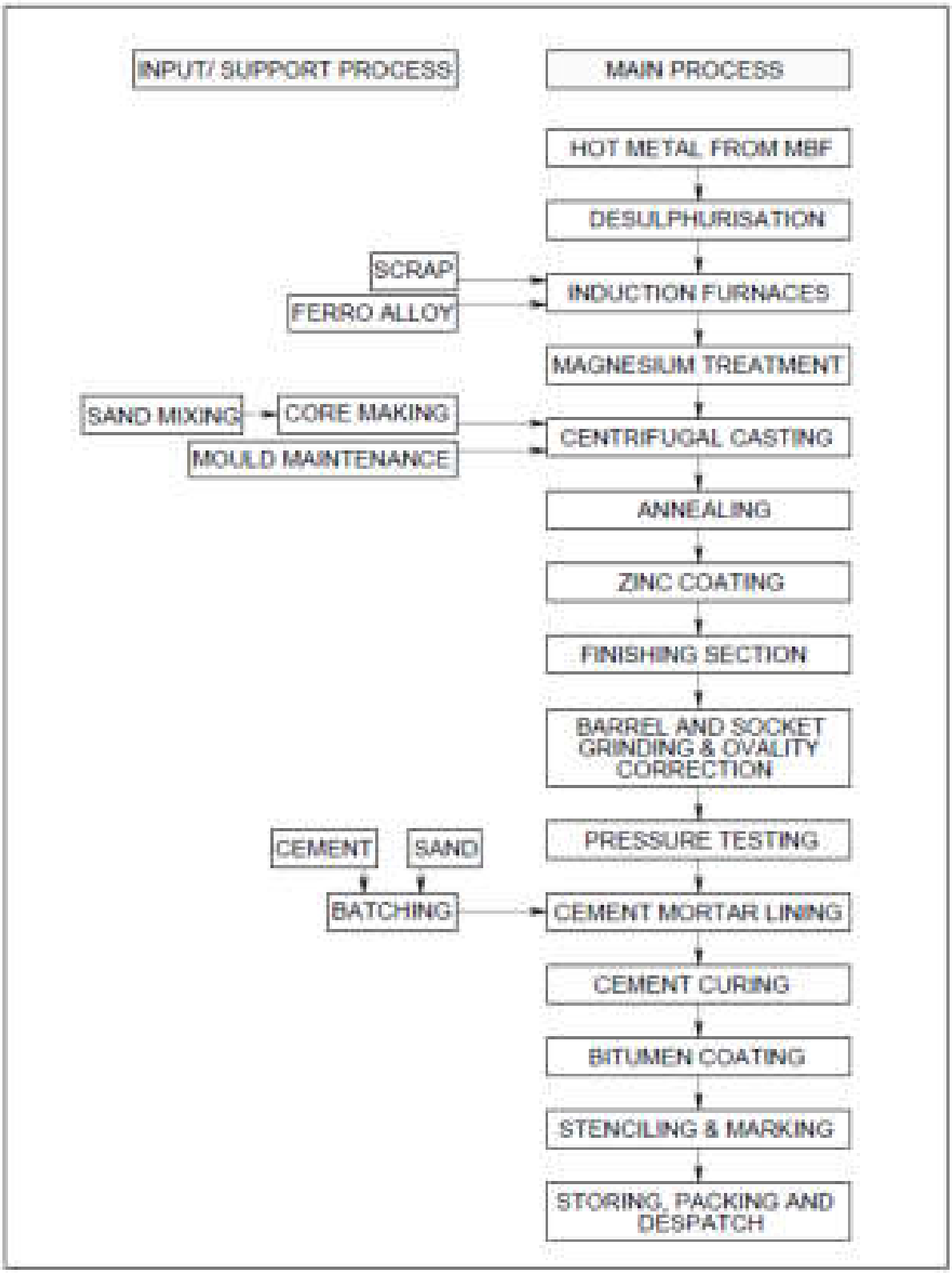
Ductile pipe plant will receive hot metal directly from the MBF and manufacture finished product comprising of ductile pipes. After receiving hot metal, it is heated in holding furnace. Magnesium addition is done in magnesium converter. Once this process is completed, melted metal is fed and spun in the mould. With the rotation of mould body, centrifugal force distributes the liquid metal uniformly and pipe wall is formed.

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

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

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

FIG 2.14: PROCESS FLOW OF DUCTILE PIPE PLANT



2.3.9.4 Rolling Mill (Long/ TMT/ Flat/ Strip/ Round/ Wire Rod/ Hot Rolled/ HRC/ Cold Rolled/ Structural Mill/ Pipe& Tube Products / Skin Passed/ Plate/ Tin Plate/ Electrical Steel/ CRGO Wire drawing/HB Wire/ Binding Wire/ LRPC wire followed by one or more in series of Pickling-Cold Rolling-Annealing-Galvanising-Colour Coating or pie & tube products (3.98 MTPA, New unit)

Configuration of proposed rolling mill is given in **Table 2.31.**

TABLE 2.31: PROPOSED ROLLING MILL CONFIGURATION

Sl. No.	Facilities	Total, MTPA
1	Rolling mill (Long/TMT/ Flat/Strip/ Round/ Wire Rod/Hot Rolled/HRC/ /Structural Mill/Plate/ Pipe& Tube Products /wire drawing/ HB Wire*/ Binding Wire*/ LRPC wire* etc) followed by one or more in series of pickling, cold rolling, annealing, galvanizing	2.78 (2 X 0.55 MTPA+4X0.42 MTPA
2	Rolling Mill (Long/ TMT/ Flat/ Strip/ Round/ Wire Rod/ Hot Rolled/ HRC/ Structural Mill/ Tin Plate/ Electrical Steel/ CRGO/ Wire Drawing followed by (1) Pipe & Tube Products or (2) one or more in series of pickling, cold rolling, annealing, galvanizing and colour coating as follows:	1.2
	(i) Cold Rolling Mill/ Plate Mill/ Pipe Mill etc.	1.2 (2x0.3+3x0.2)
	(ii) Galvanising Line/ Galvanneal/ GIAuto/ Tin Mill Products/ Coated/ Plated Products/ Galvalume/ CRGO etc	1.2 (2x0.3+3x0.2)
	(iii) Colour Coated Line etc	1.2 (2x0.3+3x0.2)
	Total	**7.53**

Material balance is given in **Table 2.32.**

TABLE 2.32: MATERIAL BALANCE OF ROLLING MILLS (PROPOSED)

Raw Material Inputs	Quantity(TPA)	Specific Consumption (T/T)
Semi-finshed product from IF	587,396	0.148
Semi-finshed product from EAF/ EOF/ NOF/ BOF	3,534,354	0.888
Total	**4,121,750**	**1.036**
Outputs	**Quantity(TPA)**	**Specific Generation (T/T)**
Finished Product	3,980,000	1
Reject	70,875	0.018
Mill Scale	70,875	0.018
Total	**4,121,750**	**1.036**

2.3.10 Producer gas plant (5387 Million Nm^3/annum)

A producer gas plant (PGP) of 5387 Million Nm^3/annum has been sanctioned in the EC dt. 15.02.2021. The configuration of the producer gas plant has been arrived at as shown in **Table 2.33.**

TABLE 2.33: CONFIGURATION OF PRODUCER GAS PLANT

Sl. No.	Description	Unit	As per EC dated 15.02.2021
1	Heat required for one ton of Pellet	KCal/Ton	220,000
2	Total Pellet Production	TPA	28,750,00
3	Total Heat Required	KCal/Year	$632.5x10^{10}$
4	CV of Producer Gas	$KCal/Nm^3$	1100-1200
5	Design CV of Producer Gas	$KCal/Nm^3$	1157-1353.78
6	Producer Gas Requirement	Nm^3/Year	5386.8 $X10^6$
7	No. of Operational Day per Annum	Days	335
8	No. of Operational Hours per Day	Hours	24
9	Per Hour Requirement	Nm^3/Hr	669525
10	Per Unit Capacity	Nm^3/Hr	3,000 & 12,500 & 7,500
11	No. of Units	Nos.	80 (20x3,000) + (32x12,500 & 28x7,500)

Material balance is given in **Table 2.34.**

TABLE 2.34: MATERIAL BALANCE OF PRODUCER GAS PLANT

	As per EC dated 15.02.2021	
Input	**Quantity (TPA)**	**Specific Consumption (Kg/Nm3 of PG)**
Coal	1,632,364	0.0003
Total	**1,632,364**	**0.0003**
Outputs	**Quantity (TPA)**	**Specific Generation (Kg/Nm3 of PG)**
Coal Ash	359,120	0.00007
Coal Tar	65,295	0.00001
Losses on ignition & gas	1,207,949	0.00022
Total	**1,632,364**	**0.00030**

Process Description

The process stages for Producer Gas are as follows:

1. Crushed coal of the specified quality and size will be carried to the top of the bunker by means of Bucket Elevator and is put into 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 Low Temperature Coal Carbonisation (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-carburetted to a much higher calorific value before it comes out to the LTC 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: $C + O_2 \rightleftharpoons CO_2 + 42643$ K. Cal

   b) Primary Reduction zone :

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

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

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

   (Within 300 mm from Oxidation zone)

   c) Secondary Reduction zone :

   Reactions are: $CO + H_2O \rightleftharpoons CO_2 + H_2$. 326 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.

2.3.11 Oxygen plant (0.294 to 1.134 MTPA)

The Oxygen Plant is required to meet the oxygen & argon requirement for mini blast furnace & electric arc furnace to improve lancet, which reduces the electricity consumption and also reduces considerable tap to tap time increasing productivity. Occasional purging need of the steel plant will be met by nitrogen, which will also be generated from the oxygen plant. Existing configuration of oxygen plant is given in **Table 2.35** and proposed configuration is given in **Table 2.36.**

TABLE 2.35: CONFIGURATION OF OXYGEN PLANT (AS PER EC DATED 19.01.2021)

Description	Unit	As per EC Dated 15.02.2021				
Plant for which oxygen/ argon required		EAF 1x90	EAF 1x110	MBF 1x600	MBF 1x450	MBF 1x450
Capacity of MBF/ EAF	TPA	756,000	924,000	777,000	582,750	58,2750
Oxygen required for 1 Ton Liquid Steel	Cum/ T	52	52	60	60	60
Working Days	Days/ annum	350	350	350	350	350
Working Hours	Hours/ day	24	24	24	24	24
Daily requirement of Oxygen	cum/ day	112,320	137,280	133,200	99,900	99,900
Oxygen Volume	Cum/ ton	700	700	700	700	700
Daily requirement of Oxygen in Ton	TPD	161	196	190	143	143
Plant Capacity	**TPD**	**2x180, 1x220, 2x130**				

TABLE 2.36: CONFIGURATION OF OXYGEN PLANT (PROPOSED ADDITIONAL)

Description	Unit	Proposed Additional			
Plant		EAF 2x65	EAF 4x45	MBF 2x650	MBF 1x1250
Capacity of MBF/ EAF	TPA	1,287,000	1,782,000	1,729,000	1,312,500
Oxygen required for 1 Ton Liquid Steel	Cum/ T	70	70	55	55

Description	Unit	Proposed Additional			
Working Days	Days/ annum	350	350	350	350
Working Hours	Hours/ day	24	24	24	24
Daily requirement of Oxygen	cum/ day	257,400	356,400	271,700	206,250
Oxygen Volume	Cum/ ton	700	700	700	700
Daily requirement of Oxygen in Ton	TPD	368	509	388	295
Plant Capacity	**TPD**	**2x600, 1x1200**			

Material balance of oxygen plant is given in **Table 2.37.**

TABLE 2.37: MATERIAL BALANCE OF OXYGEN PLANT

Raw Material Inputs	Specific Production/ Generation of Product	Constituent	Sanctioned as per EC Quantity, TPA	Proposed Additional, TPA	Total Quantity, TPA
Air	4.76	100%	1,400,028	4,000,080	5,400,108
Total	**4.76**	**100%**	**1,400,028**	**4,000,080**	**5,400,108**
Products Outputs					
Oxygen	1.000	21.00%	294,006	840,017	1,134,023
Nitrogen	3.714	78.00%	1,092,022	3,120,062	4,212,084
Argon	0.048	1.00%	14,000	40,001	54,001
Total	**4.76**	**100%**	**1,400,028**	**4,000,080**	**5,400,108**

2.3.12 Lime plant (0.3045 to 0.7665 MTPA)

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. Configuration of Lime Plant is given in **Table 2.38.**

TABLE 2.38: CONFIGURATION OF LIME PLANT

Description	Unit	Sanctioned as per EC dated 15.02.2021	Proposed additional	Total Quantity
Working Days	Days/annum	350	330	330 & 350
Working Hours	Hours	24	24	24
Plant Capacity	TPD	390 &480	600 & 2x400	390, 480, 600 & 2x400
Annual Capacity	**TPA**	**304,500**	**462,000**	**766,500**

Material balance of Lime plant is given in **Table 2.39**.

TABLE 2.39: MATERIAL BALANCE OF LIME PLANT (EXISTING & PROPOSED)

	As per EC dated 15.02.2021		Proposed Additional	Total After Expansion	
Input	**Quantity (TPA)**	**Specific consumption (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific consumption (T/T)**
Lime Stone	548,100	1.800	831,600	1,379,700	1.800
Fuel Oil	60,900	0.200	92,400	153,300	0.200
Total	**609,000**	**2.000**	**924,000**	**1,533,000**	**2.000**
Output	**Quantity (TPA)**	**Specific generation (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific generation (T/T)**
Lime	304,500	1.000	462,000	766,500	1.000
LOI & others	304,500	1.000	462,000	766,500	1.000
Total	**609,000**	**2.000**	**924,000**	**1,533,000**	**2.000**

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:

$CaCO_3$ + heat → CO_2 + CaO (high calcium lime)
$CaCO_3.MgCO_3$+ heat →$2CO_2$ + CaO.MgO (dolomitic lime)

2.3.13 Cement plant [Cement Grinding Unit (1.686 to 3.2775 MTPA) & Clinker Production Unit (0.96 to 5.6 MTPA)]

The EC has been obtained for 1X2600 + 1X2300 cement plant for production of 1,685,600 TPA. The existing configuration will be revised to

2x2500 TPD for production of 1,725,000 TPA and additional 3x1500 TPD is proposed for production of 1,552,500 TPA. The existing and proposed Cement Plant configuration is given in **Table 2.40.**

TABLE 2.40: CONFIGURATION OF CEMENT PLANT (EXISTING AND PROPOSED)

Cement Plant	Unit	As per EC dated 15.02.2021	Revised existing	Proposed Additional	Total
Units	Nos.	2	2	3	5
Capacity	TPD	2,600 & 2,300	2,500	1,500	2x2,500 + 3X1,500
Working days	days/year	344	345	345	345
Working hours	Hrs /Day	24	24	24	24
Total	**TPA**	**1,685,600**	**1,725,000**	**1,552,500**	**3,277,500**

Material balance of cement grinding unit and clinker production unit is given in **Table 2.41.**

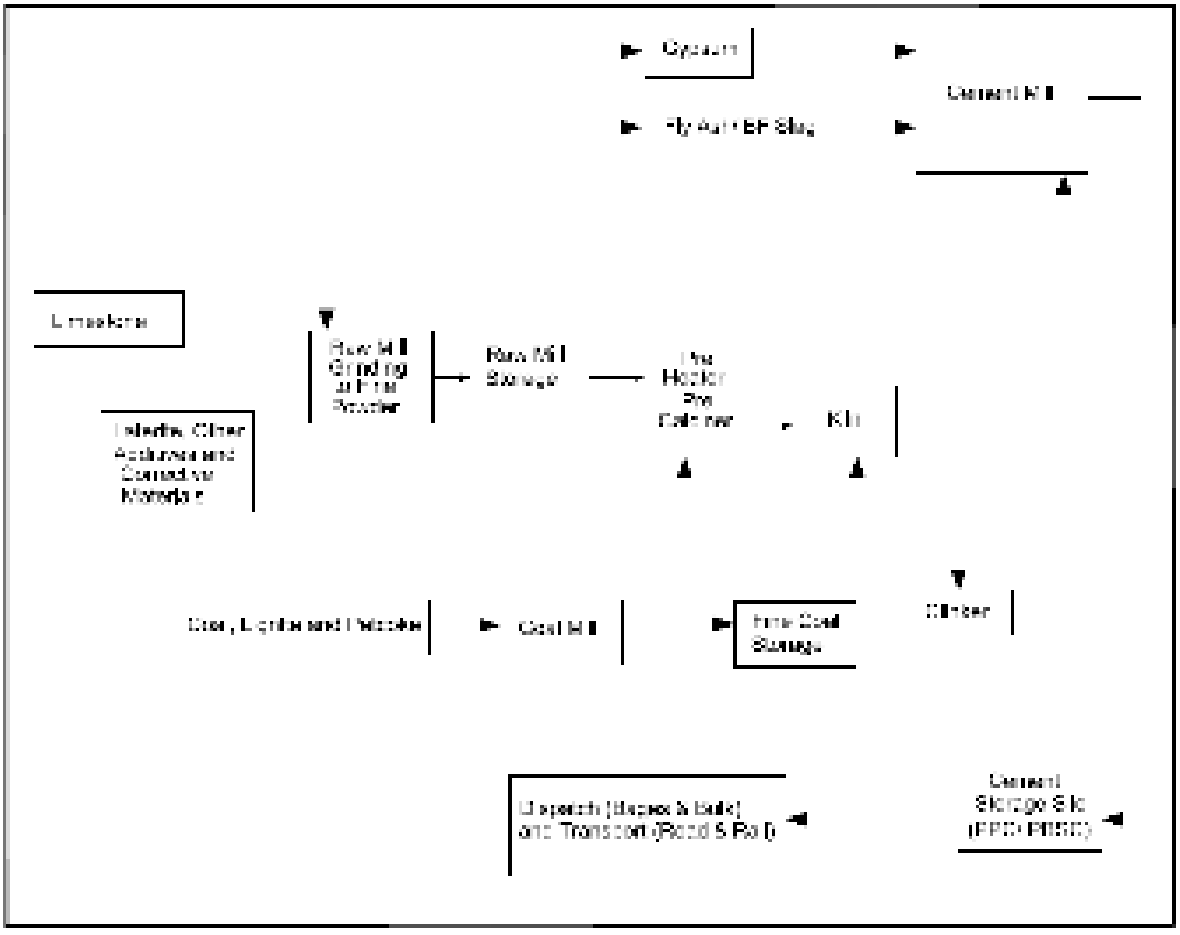
TABLE 2.41: MATERIAL BALANCE CEMENT AND CLINKER PLANT (EXISTING AND PROPOSED)

	As per EC dated 15.02.2021		Proposed additional	Total after expansion	
Input	**Quantity (TPA)**	**%**	**Quantity (TPA)**	**Quantity (TPA)**	**%**
(1) Cement Plant					
Portland Blast Furnace Slag Cement					
Slag Generation from Blast Furnace	382,750	40	1,112,450	1,495,200	65.17
Clinker	526,281	55	158,094	684,375	29.83
Gypsum	47,844	5	66,869	114,713	5
Sub-Total	**956,875**	**100**	**1,337,412**	**2,294,250**	
Portland Pozzolana Cement					
Fly Ash from coal, middlings & char	255,054	35	89,084	344,138	35
Clinker	437,235	60	152,715	589,950	60
Gypsum	36,436	5	12,727	49,163	5
Sub-Total	**728,725**	**100**	**254,525**	**983,250**	
Total	**1,685,600**		**1,591,937**	**3,277,500**	
Outputs	**Quantity (TPA)**	**%**	**Quantity (TPA)**	**Quantity (TPA)**	**%**
Cement	1,685,600		1,591,900	3,277,500	
Total	**1,685,600**	**0**	**1,591,900**	**3,277,500**	**0**

Raw Material Inputs	Quantity (TPA)	Specific consumption (T/T)	Quantity (TPA)	Quantity (TPA)	Specific consumption (T/T)
(2) Clinker Plant					
Lime stone	1,445,274	1.5	6,954,726	8,400,000	1.5
Clay component	28,905	0.03	139,095	168,000	0.03
Silica component	38,541	0.04	185,459	224,000	0.04
Mill scale (from CCM/ RM/ SM/ DPP)	28,905	0.03	139,095	168,000	0.03
Coal	192,703	0.2	927,297	1,120,000	0.2
Others	9,635	0.01	46,365	56,000	0.01
Total	**1,743,963**	**1.810**	**8,392,037**	**10,136,000**	**1.810**
Outputs	**Quantity (TPA)**	**Specific generation (T/T)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific generation (T/T)**
Clinker	963,516	1	4,636,484	5,600,000	1
Burning & other losses	780,448	0.81	3,755,552	4,536,000	0.81
Total	**1,743,964**	**1.810**	**8,392,036**	**10,136,000**	**1.810**

The typical process diagram for cement manufacturing is depicted in the **Fig 2.15.**

FIG 2.15: MANUFACTURING PROCESS



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 install 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.

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.

2.3.14 Captive power plant (695 to 1290 MW)

2.3.14.1 WHRB power generation unit (235 to 655 MW)

235 MW WHRB based power plant has already obtained EC including TRT, which will be revised to 270 MW and additional 385 MW WHRB is proposed for reutilization of flue gas from DRI exit gases, coke oven gases, blast furnace gas and clinker plant. For waste heat recovery, boiler and steam turbines to be used are given in Table **2.42.**

TABLE 2.42: CONFIGURATION OF WHRB CONFIGURATION OF CPP (EXISTING & PROPOSED)

Facilities	Sanctioned capacity as per EC dated 15.02.2021	Revised existing	Proposed Additional	Total
WHRBs Connected with 500 TPD DR Kilns	25 MW 2X50 TPH	25 MW 2X50 TPH	-	25 MW 2X50 TPH
WHRBs Connected with 600 TPD DR Kilns	65 MW 3 X 85 TPH	65 MW 3 X 85 TPH	-	65 MW 3 X 85 TPH
WHRBs Connected with 900 TPD DR Kilns	60 MW 2 X 120 TPH	60 MW 2 X 120 TPH	-	60 MW 2 X 120 TPH
WHRBs Connected with 900 TPD DR Kilns	-	-	150 MW 5 X 120 TPH	150 MW 5 X 120 TPH
WHRB Connected with MBFs	35 MW 1X50 +2X45 TPH	35 MW 1X50 +2X45 TPH	70 MW 2X90 + 1X120 TPH	105 MW 1X50 +2X45 + 2X90 + 1X120 TPH
WHRB connected with	10 MW	10 MW	20 MW	30 MW

Facilities	Sanctioned capacity as per EC dated 15.02.2021	Revised existing	Proposed Additional	Total
MBFs TRT				
WHRB Connected with Coke Oven	40 MW 2X60 +1X40 TPH	75 MW 2X60 +1X40 + 1X140 TPH	120 MW 3X50 +2X75 TPH	195 MW 2X60 +1X40 + 1X140 + 3X50 +2X75 TPH
WHRB Connected with clinker Plant	-	-	25 MW 2X25 + 1X50 TPH	25 MW 2X25 + 1X50 TPH
Total Power (MW)	**235 MW**	**270 MW**	**385 MW**	**655 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/cm^2 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 30 mg/m^3.

2.3.14.2 AFBC/CFBC Power generation unit (460 to 635 MW)

460 MW AFBC based power plant has already obtained EC. Additional 175 MW power plant based on coal fines and char from DRI kilns has been proposed. Configuration of AFBC/ CFBC based power plant is given in **Table 2.43**.

TABLE 2.43: CONFIGURATION OF CPP (EXISTING & PROPOSED)

Description	Unit	Sanctioned Capacity as per EC dated 15.02.2021	Proposed	Total Quantity
AFBC/ CFBC units	Nos.	13	3	16
AFBC/ CFBC Capacity	TPH	10x125 + 1x130 + 3x250	2x260 + 1x190	10x125 + 1x130 + 3x250 + 2x260 + 1x190
Working days	Per/ Annum	350	350	350
Working hours	Hours /Day	24	24	24
Total Production Capacity	**MW**	**460**	**175**	**635**

Material and energy balance is given in **Table 2.44**.

TABLE 2.44: MATERIAL BALANCE OF CPP (EXISTING AND PROPOSED)

Material Balance	As per EC dated 15.02.2021		Revised existing & proposed additional	Total after Expansion	
Raw Material Inputs	**Quantity (TPA)**	**Specific consumption (kg/MW-h)**	**Quantity (TPA)**	**Quantity (TPA)**	**Specific consumption (kg/MW-h)**
Char Generation from DR Plant	414,347	0.107	395,948	810,295	0.152
Middlings from Coal Washery	2,137,410	0.553	0	213,7410	0.401
Coal Fines from RM handling at DR Plant	237,029	0.061	0	237029	0.044
Coal required for Balance Power	908,989	0.235	437,677	1,346,666	0.252
Limestone	78,578	0.02	42,799	121,377	0.023
Total	**3,776,353**		**876,424**	**4,652,777**	
Outputs	**Quantity (TPA)**	**% of material**	**Quantity (TPA)**	**Quantity (TPA)**	**% of material**
Material Handling Loss (5%)	188,818	5.00	43,821	232,639	5
Material combusted in AFBC/CFBC (FC, VM, etc)	1,565,124	41.45	358,975	1,924,099	41.35
Ash from Char (52% Ash)	215,460	5.71	205,893	421,353	9.06
Ash from Middlings (56% Ash)	1,196,950	31.70	0	1,196,950	25.73
Ash from Coal fines (45% Ash)	106,663	2.82	0	106,663	2.29
Ash from Coal (45% Ash)	409,045	10.83	196,955	606,000	13.02
Gypsum from limestone	94,293	2	70,780	165,073	3.55
Total	**3,776,353**		**876,424**	**4,652,777**	

Coal Handling System

The coal received will be crushed and screened at plant for the use of steel making. In this process coal fines will be generated. These coal fines will be utilized for energy generation. Char generated from the sponge iron kiln will also be utilized as source of fuel for the power plant.

Ash handling system

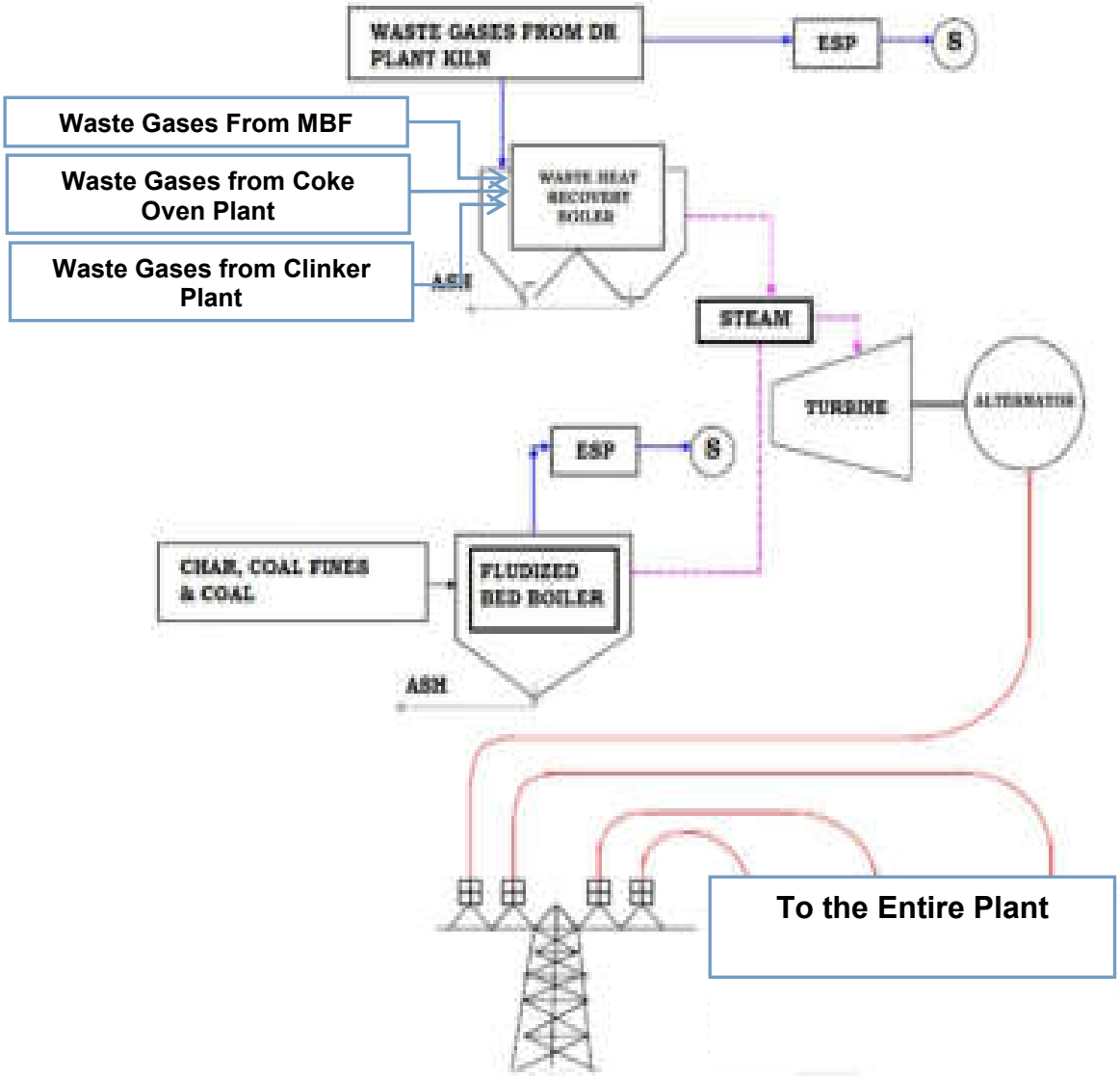
For handling of fly ash of the steam generator, dense phase, pneumatic conveying system will be provided. The ash collected in the hoppers located

in economizer, air pre-heated sections of ESP hoppers will be pneumatically conveyed and collected. Ash will be utilized in manufacture brick manufacturing, cement making and road making.

Cooling water system

Cooling water system is the main consumer of water in a thermal power plant. Cooling water is required for condenser and auxiliary cooling. The water required for condenser cooling should be soft water, free from suspended solids. A circulating water system with a cooling tower, make-up water system and blow down system shall be provided. Flow sheet of CPP is given in **Fig 2.16**.

FIG 2.16: TYPICAL FLOW DIAGRAM OF POWER PLANT



2.4 RAW MATERIAL

The unit wise detail of raw material is given in **Table 2.45** and consolidated list of raw material with their sources are given in **Table 2.46**. Raw material will be transport through Rail/ Road. Presently raw material is being transport by road.

TABLE 2.45: UNIT WISE DETAILS OF RAW MATERIAL REQUIREMENT FOR ENTIRE 7.53 MTPA ISP, IN TPA

Sl. No.	Unit	Raw Material	As per EC dated 15.02.2021	Proposed Additional	Total After Expansion	Inhouse	Outhouse
1	Beneficiation Plant	Low Grade Iron Ore Fines	5,389,927	0	5,389,927	0	5,389,927
		Flocculant	269	0	269	0	269
2	Pellet Plant	Iron Ore/ Fines/ concentrate/Dusts	31,538,750	0	31,538,750	5,582,053	25,956,697
		Dolomite (Flux)	402,500	0	402,500	0	402,500
		Bentonite	431,250	0	431,250	0	431,250
		Coke Breeze	488,750	0	488,750	0	488,750
		Coal >= 5500 Kcal /kg (emergency use)	960,250	0	960,250	0	960,250
3	Coal Washery	ROM Coal	5,029,200	0	5,029,200	0	5,029,200
4	DRI	Iron Ore	3,370,725	3,234,938	6,605,663	6,605,663	0
		Coal	1,975,245	1,895,673	3,870,918	2,514,600	1,356,318
		Dolomite	89,886	86,265	176,151	0	176,151
5	MBF	Iron Ore	165,113	258,527	423,640	0	423,640
		Sinter	2,806,913	4,394,967	7,201,880	7,201,880	0
		Pellet	330,225	517,055	847,280	847,280	0
		Coke	835,275	1,307,845	2,143,120	2,143,120	0
		Coal dust	291,375	456,225	747,600	0	747,600
		Dolomite	271,950	425,810	697,760	0	697,760
		Quartz	101,010	158,158	259,168	0	259,168
6	Sinter Plant	Iron Ore Fines	2,544,696	1,411,843	3,956,539	0	3,956,539
		Coke Fines	234,700	386,177	620,877	0	620,877

Sl. No.	Unit	Raw Material	As per EC dated 15.02.2021	Proposed Additional	Total After Expansion	Inhouse	Outhouse
		Lime Stone	367,567	604,890	972,457	0	972,457
		Dolomite	367,567	604,890	972,457	0	972,457
		From Pellet plant (iron ore fines)	2,348,097	-2,348,097	0		0
		ESP, BF dust, etc. from DRI	141,447	215,259	356,706	356,706	0
		Dust (Iron Ore, Coke, Sinter Fines) from MBF	97,125	152,075	249,200	249,200	0
		Bag Filter Dust from coke oven plant	48,471	75,279	123,750	123,750	0
		BF dust from IF	37,496	26,344	63,840	63,840	0
		BF dust from EAF	38,094	71,133	109,227	109,227	0
		Mill Scale from SMS and RM	0	105,655	105,655	105,655	0
		Sinter Return Fines	424,116	697,950	1,122,066	1,122,066	0
7	Coke Oven Plant	Coking Coal	1,615,700	2,536,800	4,152,500	0	4,152,500
8.1	SMS-IF	DRI	1,540,000	1,120,000	2,660,000	2,660,000	0
		Pig Iron / Hot Metal	251,087	182,493	433,580	433,580	0
		Steel Scrap	83,696	59,944	143,640	115,549	28,091
	SMS-IF-CCM	Liquid Metal from Furnace	1,540,000	1,120,000	2,660,000	2,660,000	0
8.2	SMS-EAF/EOF/NOF/BOF	DRI	707,150	1,036,625	1,743,775	1,743,775	0
		Hot Metal/Pig Iron from MBF	1,197,550	2,537,110	3,734,660	3,734,660	0
		Lime	304,500	462,000	766,500	766,500	0
	SMS-EAF/EOF/NOF/BOF-CCM	Liquid Metal from Furnace	1,680,000	3,069,000	4,749,000	4,749,000	0
9.1	Rolling Mill	Semi Finished Product from IF-CCM	1,509,200	0	1,509,200	1,509,200	0
		Semi Finished Product from EAF-CCM	1,119,666	0	1,119,666	1,119,666	0
9.2	Strip Mill	Semi Finished Product from CCM	510,204	0	510,204	510,204	0
9.3	DPP	Hot Metal from Blast Furnace	510,204	0	510,204	510,204	0
9.4	Color coated/ Galvanized/ pipe	Semi Finished Product from IF-CCM		587,396	587,396	587,396	0
		Semi Finished Product from EAF-CCM		3,534,354	3,534,354	3,534,354	0

Sl. No.	Unit	Raw Material	As per EC dated 15.02.2021	Proposed Additional	Total After Expansion	Inhouse	Outhouse
10	PGP	Coal	1,632,364	0	1,632,364	0	1,632,364
11	Lime Plant	Lime Stone	548,100	831,600	1,379,700	0	1,379,700
		Fuel Oil	60,900	92,400	153,300	0	153,300
12	Cement Plant	PBFC					0
		Slag Generation from Blast Furnace	382,750	1,112,450	1,495,200	1,495,200	0
		Clinker	526,281	158,094	684,375	684,375	0
		Gypsum	47,844	66,869	114,713	0	114,713
		PPC					0
		Fly Ash from Middlings & Char	255,054	89,084	344,138	344,138	0
		Clinker	437,235	152,715	589,950	589,950	0
		Gypsum	36,436	12,727	49,163	0	49,163
	Clinker Plant	Lime stone	1,445,274	6,954,726	8,400,000	0	8,400,000
		Clay component	28,905	139,095	168,000	0	168,000
		Silica component	38,541	185,459	224,000	0	224,000
		Mill scale (from CCM/RM/SM/DPP)	28,905	139,095	168,000	168,000	0
		Coal	192,703	927,297	1,120,000	0	1,120,000
		Others	9,635	46,365	56,000	0	56,000
13	Power Plant	Char Generation from DR Plant	414,347	395,948	810,295	810,295	0
		Middlings from Coal Washery	2,137,410	0	2,137,410	2,137,410	0
		Coal Fines from RM handling at DR Plant	237,029	0	237,029	237,029	0
		Coal required for Balance Power	908,989	437,677	1,346,666	0	1,346,666
		Limestone	78,578	42,799	121,377	0	121,377
		Total	**83,144,226**	**42,768,981**	**125,913,207**	**58,125,524**	**67,787,683**

TABLE 2.46: CONSOLIDATED RAW MATERIAL REQUIREMENT (IN TPA) AND THEIR SOURCES FOR 7.53 MTPA ISP

Sl. No.	Raw Material	As per EC dated 15.02.2021	Proposed Additional	Total After Expansion	Inhouse	Outhouse	Source	Distance (km)	Mode of transportation
1	Bag filter and ESP dust	362,633	540,090	902,723	902,723	0	Inhouse	0	Internal
2	Bentonite	431,250	0	431,250	0	431,250	Rajasthan	1,800	By Rail/Road
3	Char	414,347	395,948	810,295	810,295	0	Inhouse	0	Internal
4	Clay component	28,905	139,095	168,000	0	168,000	Jharkhand	300	By Rail/Road
5	Clinker	963,516	310,809	1,274,325	1,274,325	0	Inhouse	0	Internal
6	Coal/ Coal fines/ Coal dust	11,227,155	3,716,872	14,944,027	2,751,629	12,192,398	Talcher	30	By Rail/Road
7	Coke	835,275	1,307,845	2,143,120	2,143,120	0	Inhouse	0	Internal
8	Coke fines and breeze	723,450	386,177	1,109,627	0	1,109,627	Imported	185	By Rail/Road
9	Coking Coal	1,615,700	2,536,800	4,152,500	0	4,152,500	Imported	185	By Rail/Road
10	Dolomite	1,131,903	1,116,965	2,248,868	0	2,248,868	Rajgangpur, Odisha	300	By Rail/Road
11	DRI	2,247,150	2,156,625	4,403,775	4,403,775	0	Inhouse	0	Internal
12	Flocculent	269	0	269	0	269	Bhubneshwar	130	By Road
13	Fly Ash	255,054	89,084	344,138	344,138	0	Inhouse	0	Internal
14	Iron ore, fines and concentrates and Pellet	45,687,533	3,074,266	48,761,799	13,034,996	35,726,803	OMC/ Other Pvt. Mines	240	By Rail/Road
15	Fuel Oil	60,900	92,400	153,300	0	153,300	Bhubaneshwar	130	By Road
16	Gypsum	84,280	79,595	163,875	0	163,875	Bhubaneshwar	130	By Road
17	Pig Iron/ Hot Metal	1,958,841	2,719,603	4,678,444	4,678,444	0	Inhouse	0	Internal
18	Lime	304,500	462,000	766,500	766,500	0	Inhouse	0	Internal
19	Lime Stone	2,439,519	8,434,015	10,873,534	0	10,873,534	Rajgangpur, Odisha	300	By Rail/Road

Sl. No.	Raw Material	As per EC dated 15.02.2021	Proposed Additional	Total After Expansion	Inhouse	Outhouse	Source	Distance (km)	Mode of transportation
20	Liquid Metal from Furnace	3,220,000	4,189,000	7,409,000	7,409,000	0	Inhouse	0	Internal
21	Middlings	2,137,410	0	2,137,410	2,137,410	0	Inhouse	0	Internal
22	Mill Scale	28,905	244,750	273,655	273,655	0	Inhouse	0	Internal
23	Others	9,635	46,365	56,000	0	56,000	Bhubaneswar	130	By Road
24	Quartz	101,010	158,158	259,168	0	259,168	Jharkhand	300	By Rail/Road
25	Semi Finished Product from CCM	3,139,070	4,121,750	7,260,820	7,260,820	0	Inhouse	0	Internal
26	Silica component	38,541	185,459	224,000	0	224,000	Bhubaneswar	130	By Road
27	Sinter	2,806,913	4,394,967	7,201,880	7,201,880	0	Inhouse	0	Internal
28	Sinter Return Fines	424,116	697,950	1,122,066	1,122,066	0	Inhouse	0	Internal
29	Slag from BF	382,750	1,112,450	1,495,200	1,495,200	0	Inhouse	0	Internal
30	Steel Scrap	83,696	59,944	143,640	115,549	28,091	Imported	185	By Rail/Road
	Total	**83,144,226**	**42,768,981**	**125,913,207**	**58,125,524**	**67,787,683**			

In addition to above, the fuel requirement shall be for the dozers and heavy machinery used for handling and management of raw materials and solid waste, which is anticipated to the tune of 50,000 litre per annum. The producer gas will be used in pellet plant to the tune of 5,382,000,000 Nm^3/yr. The furnace oil will be used @32litre/T in rolling mills. The total FO requirement will be 153,300 KL/annum.

2.5 FINISHED PRODUCTS

The finished products from the plant which shall be consumed in-house or sold are given in **Table 2.47**.

TABLE 2.47: FINISHED PRODUCT DETAILS FOR ENTIRE 7.53 MTPA PLANT, TPA

Sl. No.	Unit	Product	As per EC dated 15.02.2021	Proposed Additional	Total After Expansion	Consumed Inhouse	Sale
1	Beneficiation Plant	Beneficiated Iron Ore	3,233,956	0	3,233,956	3,233,956	0
2	Pellet Plant	Pellets	28,750,000	0	28,750,000	7,452,943	21,297,057
3	Coal Washery	Washed Coal	2,514,600	0	2,514,600	2,514,600	0
4	DRI	Sponge Iron (DRI)	2,247,150	2,156,625	4,403,775	4,403,775	0
5	MBF	Hot Metal/Pig Iron	1,942,500	3,041,500	4,984,000	4,678,444	305,556
6	Sinter Plant	Sinter	2,827,440	4,653,000	7,480,440	7,201,880	278,560
7	Coke Oven Plant	Coke	1,070,000	1,680,000	2,750,000	2,143,120	606,880
8.1	SMS-IF	Liquid metal to CCM	1,540,000	1,120,000	2,660,000	2,660,000	0
	SMS-IF-CCM	Semi-Finished Product from CCM	1,509,200	1,097,600	2,606,800	2,606,800	0
8.2	SMS-EAF/EOF/NOF/BOF	Liquid metal to CCM	1,680,000	3,069,000	4,749,000	4,749,000	0
	SMS-EAF/EOF/NOF/BOF-CCM	Semi-Finished Product from CCM	1,646,400	3,007,620	4,654,020	4,654,020	0
9.1	Rolling Mill	Finished Product	2,550,000	0	2,550,000	0	2,550,000
9.2	Strip Mill	Finished Product	500,000	0	500,000	0	500,000
9.3	DPP	Finished Product	500,000	0	500,000	0	500,000
9.4	Color coated/ Galvanized/ pipe	Finished Product		3,980,000	3,980,000	0	3,980,000
10	Lime Plant	Lime	304,500	462,000	766,500	766,500	0
11	Cement Plant	Cement	1,685,600	1,591,900	3,277,500	0	3,277,500
	Clinker Plant	Clinker	963,516	4,636,484	5,600,000	1,274,325	4,325,675
	Total		**55,464,862**	**30,495,729**	**85,960,591**	**48,339,363**	**37,621,228**

2.6 POWER

Captive power generation will be from two major source:

1) **Without using fossil fuel i.e. from waste heat and pressure (655 MW):** The power generation from these has been planned as 300 MW from DRI exit gases, 105 MW from MBF Gases and 195 MW from coke oven gases. In addition to this, top pressure recovery turbine will be connected with MBF to obtain 30 MW. A WHRB on the clinker plant is expected to generated 25 MW.

2) **Using fossil fuel (635 MW)**: The non-renewable power sources will be from the AFBC/ CFBC power plants utilising dolochar, middlings and coal with a total capacity of 635 MW.

Thus, the plant will generate 1,290 MW energy in form of electricity from its captive power plant and will utilize the total power generated in its existing as well as proposed Steel plant. Energy consumption is given in **Table 2.48**

In case generation exceeds with respect to consumption during plant operation, then upto 25 MW can be sent to ferro alloy plant of M/s Rungta Mines Ltd. at village Tulsidiha, Angul, Odisha.

TABLE 2.48: ENERGY CONSUMPTION FOR ENTIRE 7.53 MTPA PLANT

Sl. No.	Description	As per EC dated 15.02.2021					Proposed Additional		Total after Expansion				
		No of Days	No of Hours	KWH Req	Capacity (TPA)	Power Requirement (MW)	Capacity (TPA)	Power Requirement (MW)	No of Days	No of Hours	KWH Req	Capacity (TPA)	Power Require-ment (MW)
1	Sponge Iron Plant	355	24	55	2,247,150	14.51	2,156,625	13.92	355	24	55	4,403,775	28.43
2	Pellet Plant	335	24	50	28,750,000	178.79	0	0	335	24	50	28,750,000	178.79
3	Iron Ore benefication	330	24	3	5,389,927	2.04	0	0	330	24	3	5,389,927	2.04
4	Coal Washery	330	20	8	5,029,200	6.1	0	0	330	20	8	5,029,200	6.10
5	Mini Blast Furnace	350	24	125	1,942,500	28.91	3,041,500	45.26	350	24	125	4,984,000	74.17
6	Sinter	330	24	45	2,827,440	16.07	4,653,000	26.44	330	24	45	7,480,440	42.51
7	Coke Oven Plant	350	24	10	1,070,000	1.27	1,680,000	2	350	24	10	2,750,000	3.27
8.1	SMS-IF	350	24	700	2,233,000	128.33	1,120,000	151.09	350	24	700	3,353,000	279.42
8.2	SMS-EAF/EOF/NOF/BOF	350	24	400	1,680,000	80	3,069,000	155	350 and 330	24	400	4,749,000	235.00
8.3	SMS-CCM	350	24	100	3,220,000	38.33	4,105,220	48.87	350	24	100	7,325,220	87.20
9.1	Flat/Round/Wire/Rod/ Structural Mill	350	20	130	2,550,000	47.36	0	0	350	20	130	2,550,000	47.36
9.2	Strip Mill/Sheet/Coil/ Wire & Bar Mill/Wire Rope	350	20	130	500,000	9.29	0	0	350	20	130	500,000	9.29
9.3	Ductile Pipe Plant	350	16	350	500,000	31.25	0	0	350	16	350	500,000	31.25
9.4	Color coated/ Galvanized/ pipe						3,980,000	113.71	350	20	200	3,980,000	113.71
10	Producer Gas Plant	335	24	0.015	5,386,800,000	10.05	0	0	335	24	0.015	5,386,800,000	10.05
11	Oxygen Plant	350	24	1	129,850,000	15.46	840,000	0.1	350	24	1	130,690,000	15.56
12	Lime Plant	350	24	1	304,500	0.04	462,000	0.06	350 and 330	24	1	766,500	0.10
13	Cement Plant	344	24	60	1,685,600	12.25	1,591,900	11.54	344 & 345	24	60	3,277,500	23.79
14	Power	350	24		695	69.5	595	27	350	24		1,290	96.28
15	Misc					3.9		1				0	5.14
	Total Requirement					**694**		**596**				**0**	**1,290**
	Power Generation					**695**		**595**					**1,290**
	Power from previous CPP							1					
	Power for outside sale					**1**							

Source : Rungta Mines Ltd.

2.7 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.

2.7.1 Water requirement for entire plant

Existing: Fresh water requirement for 3.55 MTPA complex, under envisaged operating conditions, is estimated 3,752 KLH. Water withdrawal permission of 28.94 cusec (2950 KLH) from Brahmani River has been obtained from the Water Resource Department, Govt. of Odisha vide letter dated 03.10.2019. IPICOL recommended additional 7.86 cusec (801.25 KLH) water from Bramhani river vide letter no. CGM/SLNA/RML-225/18/2160 dated 24.08.2020. Copies of both the permission & recommendation is given in **Annexure VII**.

Proposed: The water required for the plant shall be sourced from Brahmani river and rain water harvesting. Additional water requirement for the proposed expansion shall be 2,750 KLH. Thus, the total fresh water requirement for the entire 7.53 MTPA project will be 6,502 KLH. The application for the same shall be made.

Daily make up water requirement for entire plant has been given in **Table 2.49**.

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, ash quenching and gardening. No waste water will be discharged outside the plant premises.

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

TABLE 2.49: WATER REQUIREMENT FOR ENTIRE 7.53 MTPA PLANT (KLH)

Sl. No.	Plant	Unit	As per EC dated 15.02.2021				Proposed Additional				Total after Expansion			
			Capacity (TPA)	Fresh/ Make-up Water	Evaporation/ Consumed water	Discharge/ Waste Water	Capacity (TPA)	Fresh/ Make-up Water	Evaporation/ Consumed water	Discharge/ Waste Water	Capacity (TPA)	Fresh/ Make-up Water	Evaporation / Consumed water	Discharge/ Waste Water
1	Sponge Iron Plant	TPA	2,247,150	198	198	0	2,156,625	190	190	0	4,403,775	388	388	0
2	Pellet Plant	TPA	28,750,000	1,073	896	177	0	0	0	0	28,750,000	1073	896	177
3	Iron ore Beneficiation Plant	TPA	5,389,927	136	16	120	0	0	0	0	5,389,927	136	16	120
4	Coal Washery	TPA	5,029,200	83	9	74	0	0	0	0	5,029,200	83	9	74
5	Mini Blast Furnace	TPA	1,942,500	185	112	73	3,041,500	290	175	115	4,984,000	475	287	188
6	Sinter Plant	TPA	2,827,440	107	99	8	4,653,000	176	163	13	7,480,440	283	262	21
7	Coke Oven	TPA	1,070,000	102	102	0	1,680,000	160	160	0	2,750,000	262	262	0
8	SMS	TPA	3,220,000	307	302	5	4,189,000	399	393	6	7,409,000	706	695	11
9.1	TMT/Flat/ Round/ Wire/ Rod/ Structural Mill	TPA	2,550,000	182	177	5	0	0	0	0	2,550,000	182	177	5
9.2	Strip mill/sheet	TPA	500,000	36	35	1	0	0	0	0	500,000	36	35	1
9.3	Ductile pipe	TPA	500,000	45	45	0	0	0	0	0	500,000	45	45	0
9.4	Color coated/ Galvanized/ pipe	TPA					3,980,000	483	466	17	3,980,000	483	466	17
10	PGP	Million NM3/hr	5,386,800,000	154	0	154	0	0	0	0	5,386,800,000	154	0	154
11	Oxygen	TPA	294,000	2	2	0	840,000	6	6	0	1,134,000	8	8	0
12	Lime plant	TPA	304,500				462,000	0	0	0	766,500	0	0	0
13	Cement plant	TPA	1,685,600	180	180	0	1,591,900	170	170	0	3,277,500	350	350	0
14	Power plant	TPA	695	938	800	138	595	803	685	118	1,290	1741	1485	256
15	Drinking Water and Sanitary			26	16	10		71	3	68		97	19	78
	Total			**3,752**	**2,988**	**765**		**2,750**	**2,412**	**337**		**6,502**	**5,400**	**1,102**

Source: Rungta Mines Ltd.

FIG 2.17: WATER BALANCE DIAGRAM FOR 3.55 MTPA ISP (EXISTING)

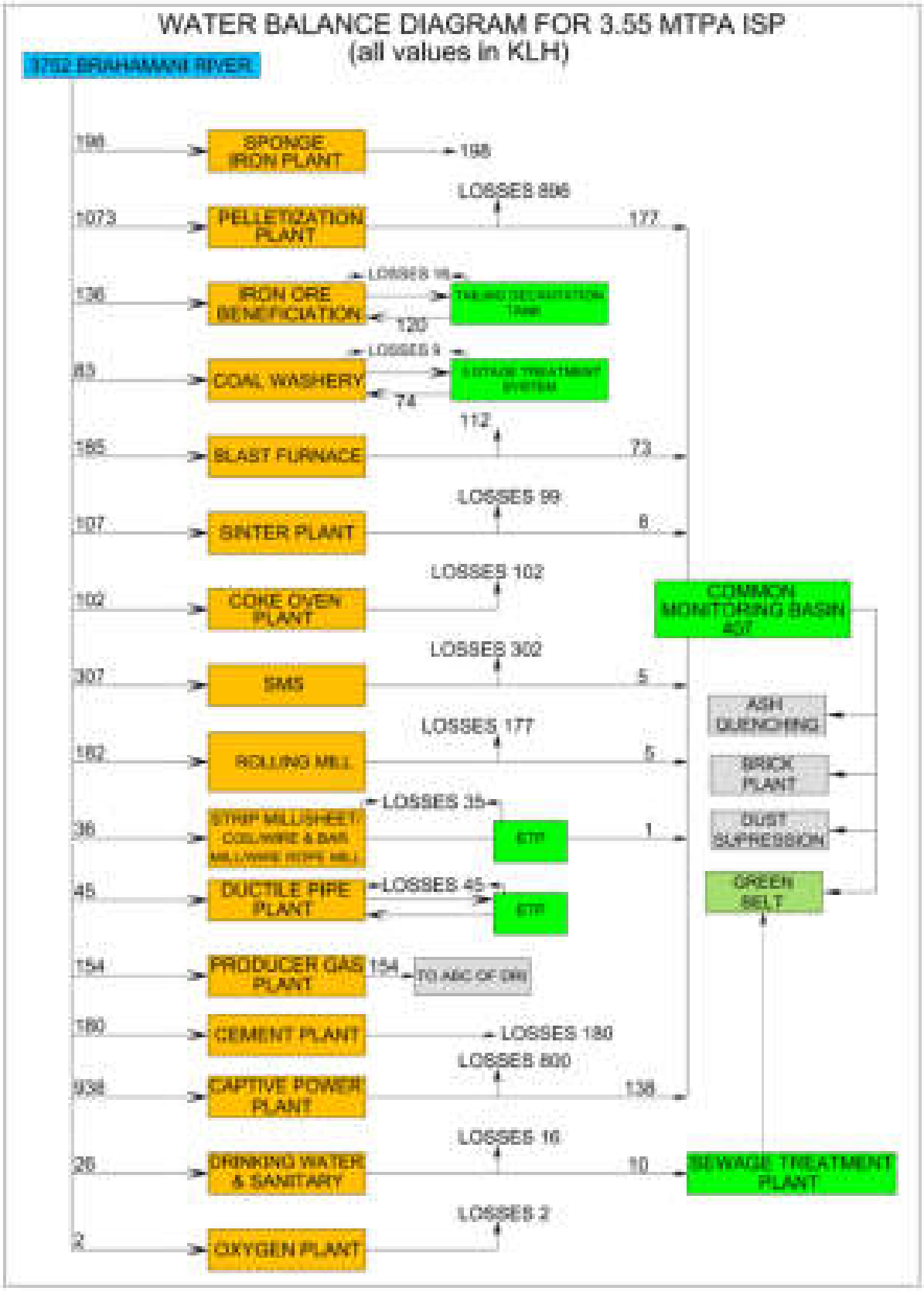
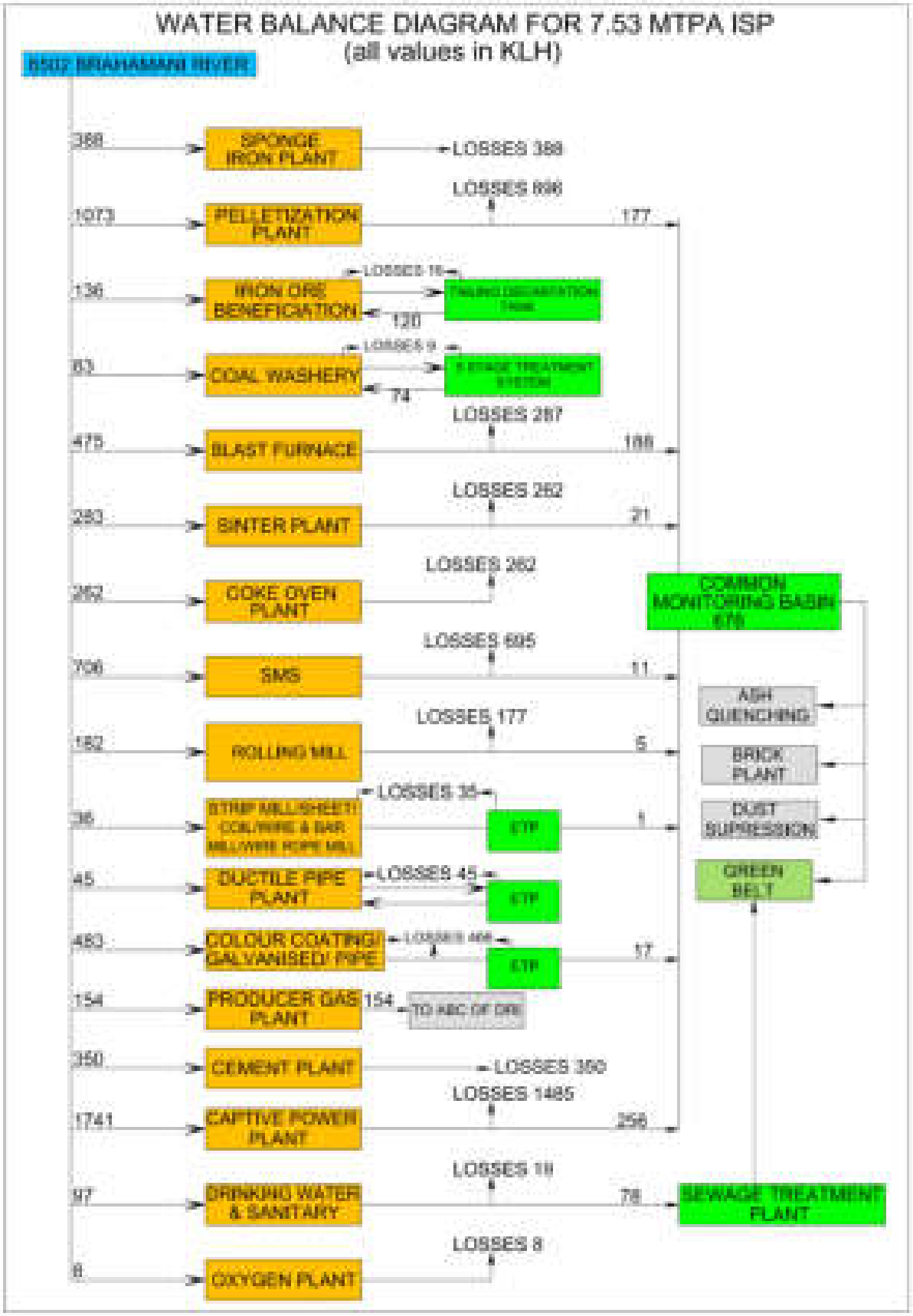


FIG 2.18: WATER BALANCE DIAGRAM FOR 7.53 MTPA ISP (AFTER EXPANSION)



2.8 MANPOWER

The manpower requirement for the sanctioned capacity is 4850 persons. Additional 1800 person will be required for the proposed expansion. The total manpower after the expansion of the project will be 6650. Many more persons will also get employment in the ancillary & other services connected with this project.

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.

2.9 PROJECT IMPLEMENTATION SCHEDULE

The implementation schedule for the proposed additional units will tentatively be as given in **Table 2.50**, counted from the day of obtaining the last statutory clearance including land acquisition, environmental clearance, consent to establish, etc.

TABLE 2.50: PROJECT IMPLEMENTATION SCHEDULE

Sl. No.	Facilities	Completion schedule	Status as on 20.10.2021
1.	DRI plant	80 month	1X500 TPD operational, 1X500 TPD under construction, 1x600 TPD order placed
2.	Mini Blast Furnace	60 month	To be constructed
3.	SMS	60 month	IF 2x20 T under operation, IF 3x20 T under construction and 5x20 T order placed; 1x 3 strand caster under operation
4.	Rolling mill	80 month	1x0.20 MTPA TMT and 1x0.30 MTPA wire rod under construction
5.	Power plant	80 month	1x50 TPH WHRB based power under operation, 1x50 TPH under construction, 25 MW under operation, 25 MW under construction and 50 MW work order placed
6.	Oxygen Plant	60 month	To be constructed
7.	Lime Plant	60 month	To be constructed
8.	Sinter plant	60 month	To be constructed
9.	Coke oven plant	60 month	To be constructed
10.	Cement plant	60 month	To be constructed

Sl. No.	Facilities	Completion schedule	Status as on 20.10.2021
	Existing sanctioned units		
11.	Beneficiation Plant	84 months	To be constructed
12.	Pelletisation plant	84 month	2.948 MTPA under construction
13.	Coal washery	84 month	To be constructed
14.	Strip Mill	80 month	To be constructed
15.	Ductile pipe	80 month	To be constructed
16.	Producer gas plant	84 month	To be constructed

In view of the stones that are likely to be encountered during construction, it is intended to establish a stone crusher (2X40 TPH) for duration of the construction phase to be able to reutilise them.

CHAPTER 3

DESCRIPTION OF THE ENVIRONMENT

3.1 GENERAL

As per the procedure laid down in the EIA Notification dated 14th September 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/224229/2021 dated 11th August 2021. The information of the environmental data that had been generated during the preceding summer season i.e. from 01.03.2021 to 31.05.2021 was also submitted. Thereafter, MoEF&CC issued the standard Terms of Reference (TOR) vide letter no. J-11011/309/2018.IA.II.(I) dated 13th August 2021 (for 7.53 MTPA) (copy given in **Annexure I**).

3.1.1 Sources of Environmental Data

The baseline information on micro-meteorological data, ambient air quality, water quality, soil quality and noise levels have been recorded at site by M/s Min Mec R&D Laboratory, New Delhi (NABL certificate no. TC 6337 valid upto 20/11/2021 and MoEF&CC notification no. SO 3744(E) at Sl. No. 97, valid upto 16/10/2024, certificates enclosed in **Annexure XXIII**). Long term meteorological data was collected from the nearest IMD station, Angul. Micro-meteorological data was collected at the site using an automatic weather monitoring station during the monitoring period. Data on water quality, soil quality, air quality, noise levels, flora, fauna, traffic volumes, etc. have been monitored/ measured/ collected during field visits. Apart from these, secondary data have been collected from Census Handbook, Revenue Records, approved Wildlife Conservation Plan, Forest Department, etc.

3.1.2 Study area

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

3.2 TOPOGRAPHY AND DRAINAGE

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

3.2.1 Topography

Core zone: The core zone represents almost flat but gently sloping land. The ground elevation of the project area (including existing & expansion

area) varies from 65-114 m amsl, as per google earth elevation accessed on 20.10.2021. The overall slope is towards the northern side towards Nigra Nala (also known as Lingra Nala). Construction has been partly carried out in the existing plant area (1769 acres), is partly underway and yet to be constructed in part. The elevation of the proposed colony area is 87 to 98 m. It is almost flat land located near Jharbandh Village. The elevation of the proposed water reservoir area is 93-169 m and is located at slope of the base of Jharbandh Hill.

Buffer zone: The study area represents a flat to gently undulating topography with few scattered hillocks. The area south of the Brahmani River gently slopes towards the northeast. The surface elevation in buffer zone varies from 42 m to 447 m.

The notable hills are Jharbandh Reserve Forest with a peak at 229 m, lying on the eastern side of the project site. The hill of Nimidha RF has a peak at an elevation of 312 m, lying in north-north-east of the project. The Kai reserved forest with a peak of 442 m, lies on the south-south-west of the project. Another hill is Ambithi RF having peak elevation of 447 m, which is located in south west of the proposed project. The fifth prominant hill is a dense jungle of Sal near village Naraharipur lying west of the expansion project. Smaller hills exist on a line from Jharbandh reserve forest in the centre of the study area towards south west side.

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

3.2.2 Drainage

Core zone: The existing and proposed expansion project site is located 0.7 km south of Nigra (Lingra) Nala and 4.90 km south west of Brahmani River. As seen on toposheet, eight first order seasonal drains (of which three are in expansion area), one second order stream, one aquaduct and one reservoir overflow stream originate in within the existing & proposed plant boundary or originate from its immediate vicinity and flow out from the northern boundary. These drains originate from and connect multiple seasonal ponds before flowing into Nigra Nala, which ultimately joins the Brahmani river. Although the ponds are rain-fed, some of the ponds contain water all throughout the year. As per toposheet, a total of twenty eight ponds exist in the existing (17 nos.) & proposed (11 nos.) plant area.

Buffer zone: The drainage of the area is controlled by the south-easterly flowing Brahmani river situated in the north-eastern part of the study area. The river is fed by various seasonal sub-parallel nalas like Nigra (Lingra), Kisinda Jhor, Kusumder Jhor, Bade Jhor, etc. Rivers/ water bodies present in 10 km radius are given in **Table 3.1**.

FIG 3.1: TOPOGRAPHY AND DRAINAGE MAP OF THE STUDY AREA

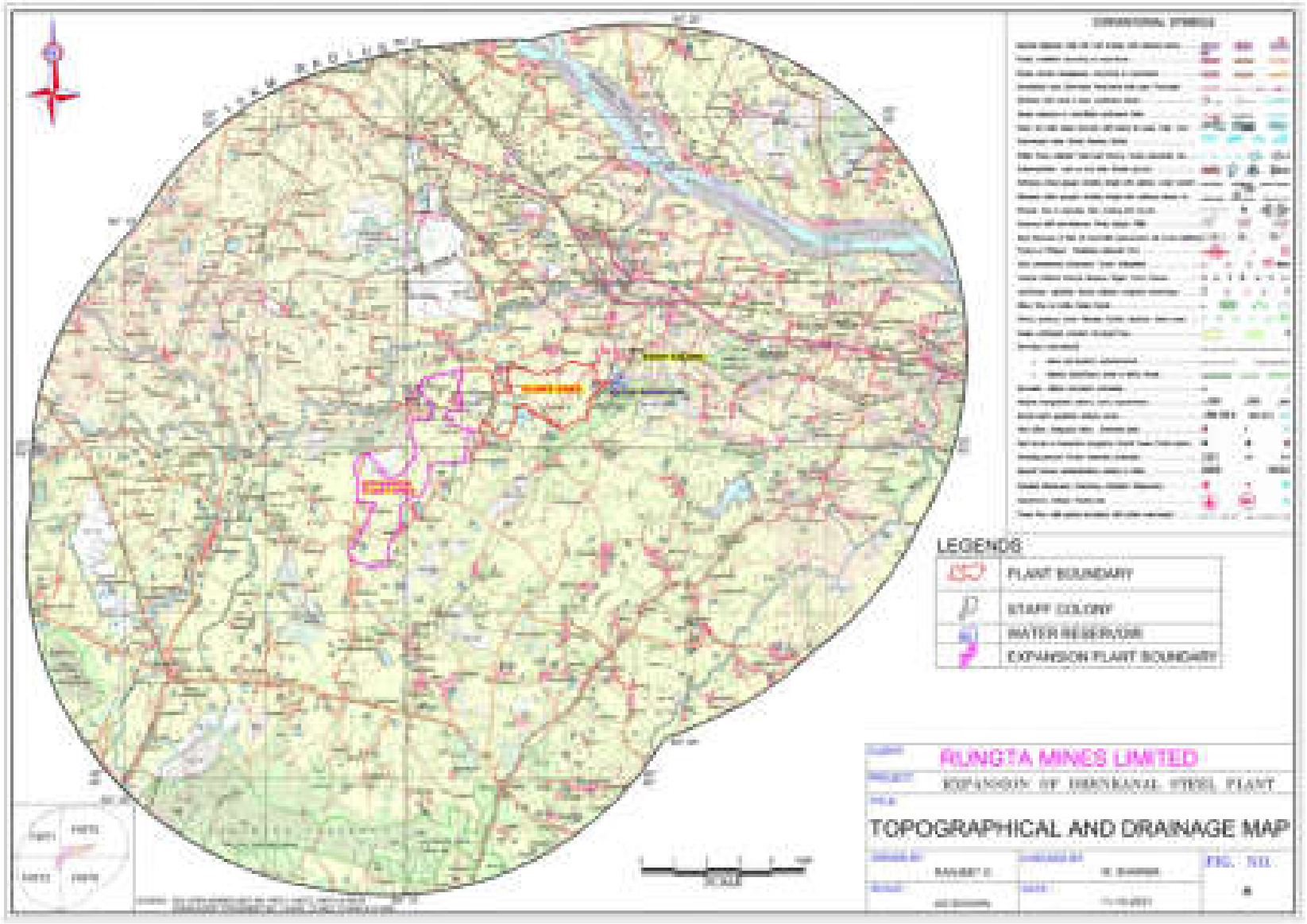


FIG 3.2: DIGITAL ELEVATION MODEL OF THE STUDY AREA

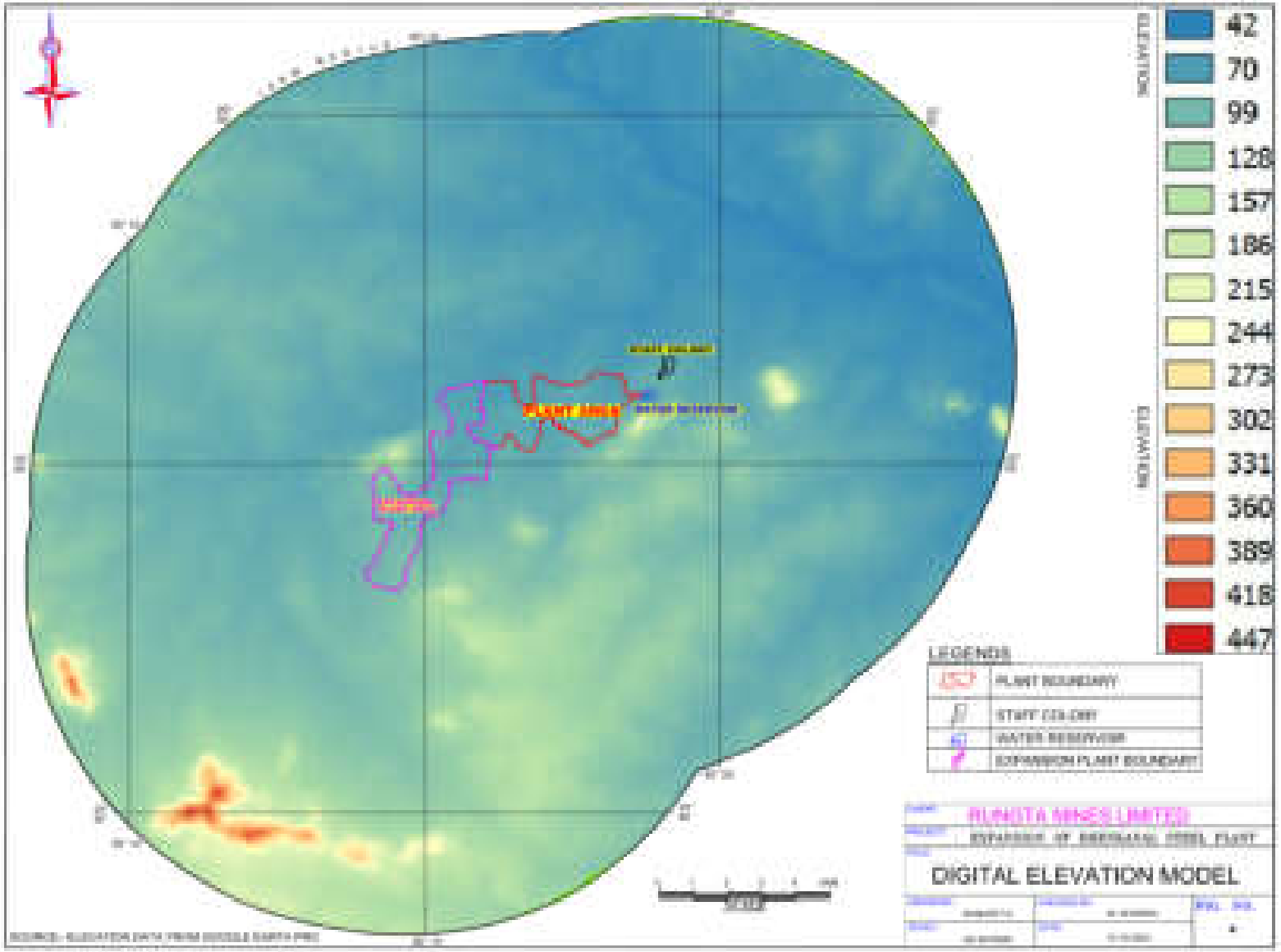


TABLE 3.1: RIVER, NALA, DRAIN & WATER BODY PRESENT IN 10 KM RADIUS

Sl. No.	Particulars	Distance (km) & from		Direction
1.	Nigra or Lingra Nala	0.7	EP	N
2.	Brahmani River	4.9	SC	NE
3.	Kisinda Jhor	5.0	EP	N
4.	Kantei Nala	2.2	PP	W
5.	Matilia Nadi	4.1	PP	W
6.	Bauli Nala	3.9	PP	W
7.	Barha Jor	7.8	EP	SE
8.	Kusumdor Jor	3.6	EP	SE
9.	Agana Nadi	9.3	SC	ESE
10.	Barasingha Minor	8.3	PP	NW
11.	Parjang Branch Canal	7.9	SC	NE
12.	Ria Jor	5.9	SC	NE
13.	Rengali Right Main Canal	0.7	SC	N
14.	Reservoir Near Nua	4.2	EP	SE
15.	Bangur asingha Nala	8.6	SC	E
16.	Sarapa Canal	4.7	SC	ESE
17.	Pond in Khajuria	6.5	PP	SE
18.	Pond in Ranjagol	5.4	PP	SE
19.	Pond in Sanamunda	0.1	PP	W
20.	Pond in Bankirhi	1.2	PP	WSW
21.	Pond in Durgaprasadpur	7.5	PP	SW
22.	Pond in Garhasantri	7.0	PP	NW
23.	Pond in Brundabanpur	9.7	EP	NNW
24.	Pond in Barhamunda	0.7	EP	S
25.	Pond in Sanahindola	5.5	PP	SE
26.	Pond in Kantimili	0.4	PP	E
27.	Pond in Nuaparha	0.02	PP	SE
28.	Pond in Talamulapatana	3.6	PP	W
29.	Pond in Krushnachandrapur	2.4	PP	S
30.	Pond in Jhanjiribahal	8.9	PP	NW
31.	Pond in Barasingh	9.2	PP	WNW
32.	Pond in Taltali	4.6	PP	NW
33.	Pond in Kalandapal	6.8	PP	WNW
34.	Pond in Madhupur	1.2	EP	SE

Sl. No.	Particulars	Distance (km) & from		Direction
35.	Pond in Nua	3.3	EP	SE
36.	Pond in Barsingh	4.1	EP	SSE
37.	Pond in Meramundali	1.0	SC	NE
38.	Pond in Malibirha	3.3	SC	NE
39.	Pond in Paribhandar	7.6	SC	NNE
40.	Pond in Parha	5.5	PP	SSW
41.	Pond in Hatura	4.4	PP	SSW
42.	Pond in Garhatalamula	3.5	PP	W
43.	Pond in Kusuna	5.6	PP	WNW
44.	Pond in Rakala	2.9	PP	WNW
45.	Pond in Dhalapur	5.9	SC	E
46.	Pond in Kateni	6.4	SC	NNE
47.	Pond in Kummitha	5.0	PP	SW
48.	Pond in Nimidha	3.4	SC	E
49.	Pond in Jharband	0.10	WR	N

Abbreviation used: EP- Existing Plant, PP-Proposed Plant, WR-Water Reservoir, SC-Staff Colony

It may be noted that, although there are many small ponds in the buffer zone, the ponds having significant area/ size have been considered and mentioned in the above table.

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 (17.1 km, NW) during 1981-2010, which have been sourced from Climatological Normals (1981-2010) issued by IMD Pune. The data is briefly discussed in the subsequent sections.

3.3.1 Temperature, Rainfall and Relative Humidity

The average daily maximum and minimum temperature, relative humidity and average rainfall for each of the twelve months for the period 1981-2010 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)	No. of Rainy Days
	Maximum	Minimum	at 8.30 hrs	at 17.30 hrs		
January	28.7	14.2	73	55	8.5	0.7
February	32	16.8	69	49	16	1.1
March	36.1	19.9	69	47	28.4	1.7
April	39.6	24.2	67	45	35.4	2.3
May	39.9	25.5	66	48	81.8	4.1
June	36.7	25.1	71	63	194.6	8.6
July	32.7	24	80	74	282.6	12.2
August	31.8	23.6	81	77	303.5	13
September	32.4	23.5	79	76	205.4	10.6
October	32.7	21.4	74	67	93.4	4.8
November	30.6	17.4	70	59	23.4	1.1
December	28.6	13.8	70	57	4.6	0.2
Average	**33.5**	**20.8**	**72**	**60**	**Total 1277.5**	**Total 60.4**

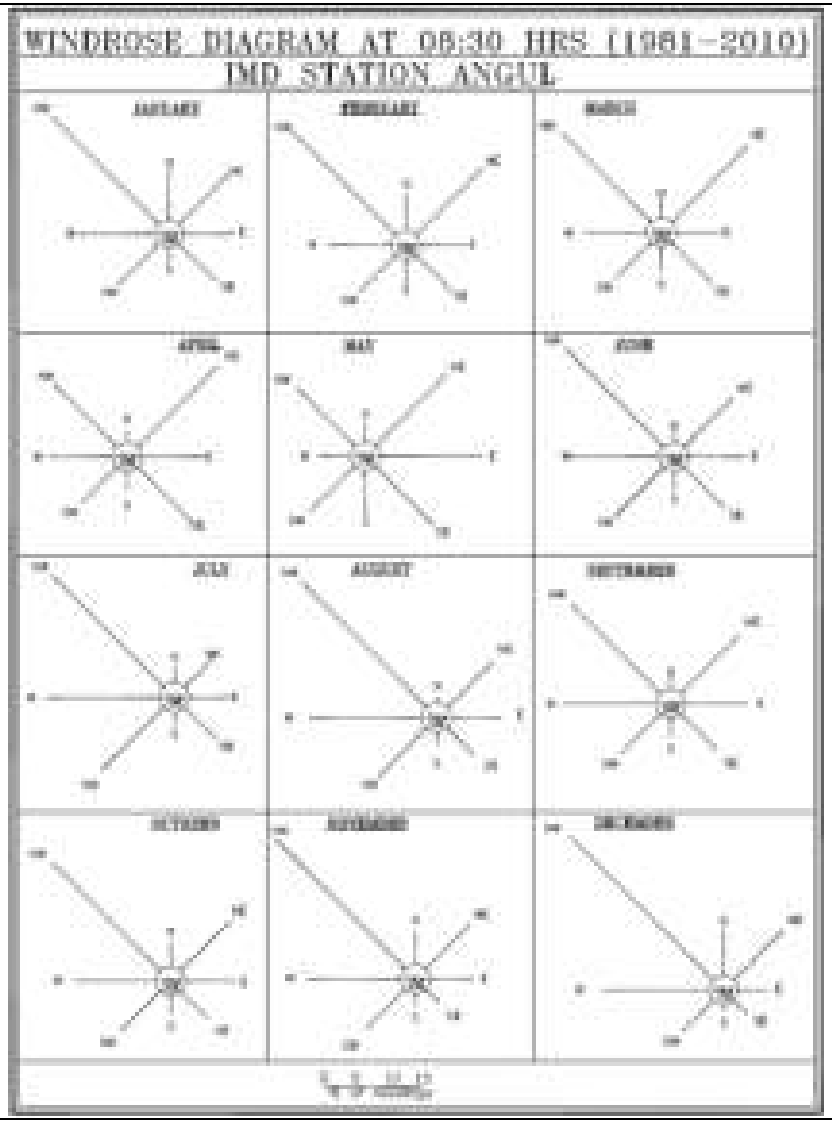
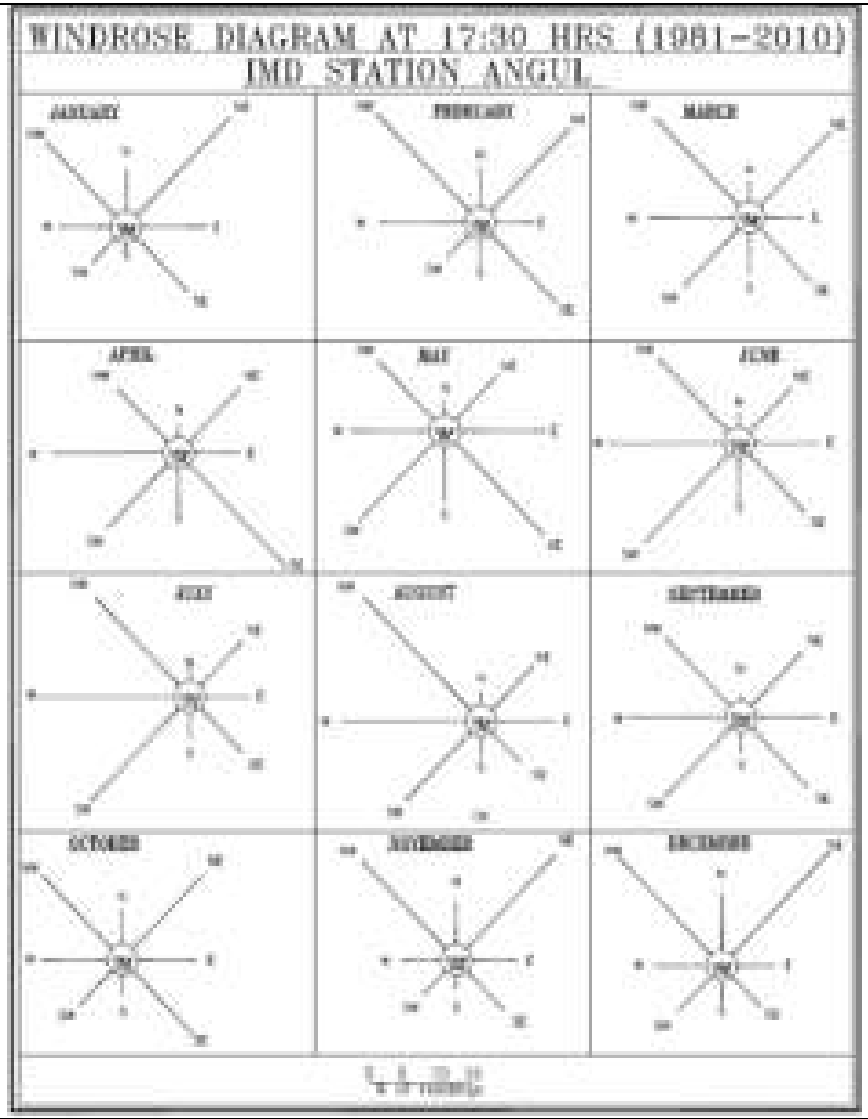
- **Temperature:** For the period (1981-2010), monthly average of minimum temperatures recorded at IMD station Angul ranged from 13.8°C in December to 25.5°C in May. The monthly average of maximum temperature ranged from 28.6°C in December to 39.9°C in May.

- **Relative humidity** is higher in the morning hours averaging 72% compared to evening hours averaging 60%. During June to October it is observed higher and during other months it remains low.

- **Rainfall:** The rainfall data shows that the average monthly rainfall varies between 4.6 mm (December) to 303.5 mm (August). The total of monthly average rainfall for the period 1981-2010 comes to 1277.5 mm. Bulk of the rainfall in the study area is received during the south west monsoon between June to September. More than 70% of the rainfall is recorded in the months of June, July, August and September.

3.3.2 Wind speed and windroses

The windrose diagrams for the period 1981-2010, as derived from Climatological Normals of IMD Angul, are presented in **Fig 3.3** and **Fig 3.4** for 8:30 hrs and 17:30 hrs respectively. It can been seen that in the morning, wind flows predominantly from the north-west during January to March and June to December and from north-east during only two months i.e. April to May. In the evening, wind flows from north-east during January and October to December, from north-west during February to March and August to September, from south-east for two months during April & May and during June and July wind flows predominantly from south-west.

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 site specific micro-meteorological data of the study area have been recorded by Min Mec R&D Laboratory, New Delhi with an automatic weather station from 1st March to 31st May 2021. However, due to Yaas cyclone in the area, there was power cut and the equipment was shut down on 25/05/2021 after 0600 hrs and restarted on 27/05/2021 from 1900 hrs. This was done for safety of the equipment as well. The daily average of the monitored micro-meteorological data is given in **Annexure VIII** and summarized in **Table 3.3**. The various parameters are discussed in subsequent paragraphs.

TABLE 3.3: SUMMARY OF MONITORED MICRO-METEOROLOGICAL DATA (MARCH TO MAY 2021)

Particulars	Minimum	Maximum	Average
Temperature (°C)	20.40	42.80	32.78
Relative humidity (%)	20.20	96.80	51.51
Wind speed (km/h)	Calm	47.80	10.15
Predominant wind direction	SW (12.45% Readings)		

Note : Calm is <1.8 km/h

The above table shows that temperature was recorded as a minimum of 20.40°C and maximum of 42.80°C and relative humidity as a minimum of 20.20% and maximum of 96.80%. The wind speed varied between calm (less than 1.8 km/h) to 47.80 km/h with an average of 10.15 km/hr. The predominant wind direction, including calms, was observed from SW with 12.45% of occurrences. The wind frequency table is given in **Table 3.4** and the corresponding wind rose diagram is shown in **Fig 3.5**.

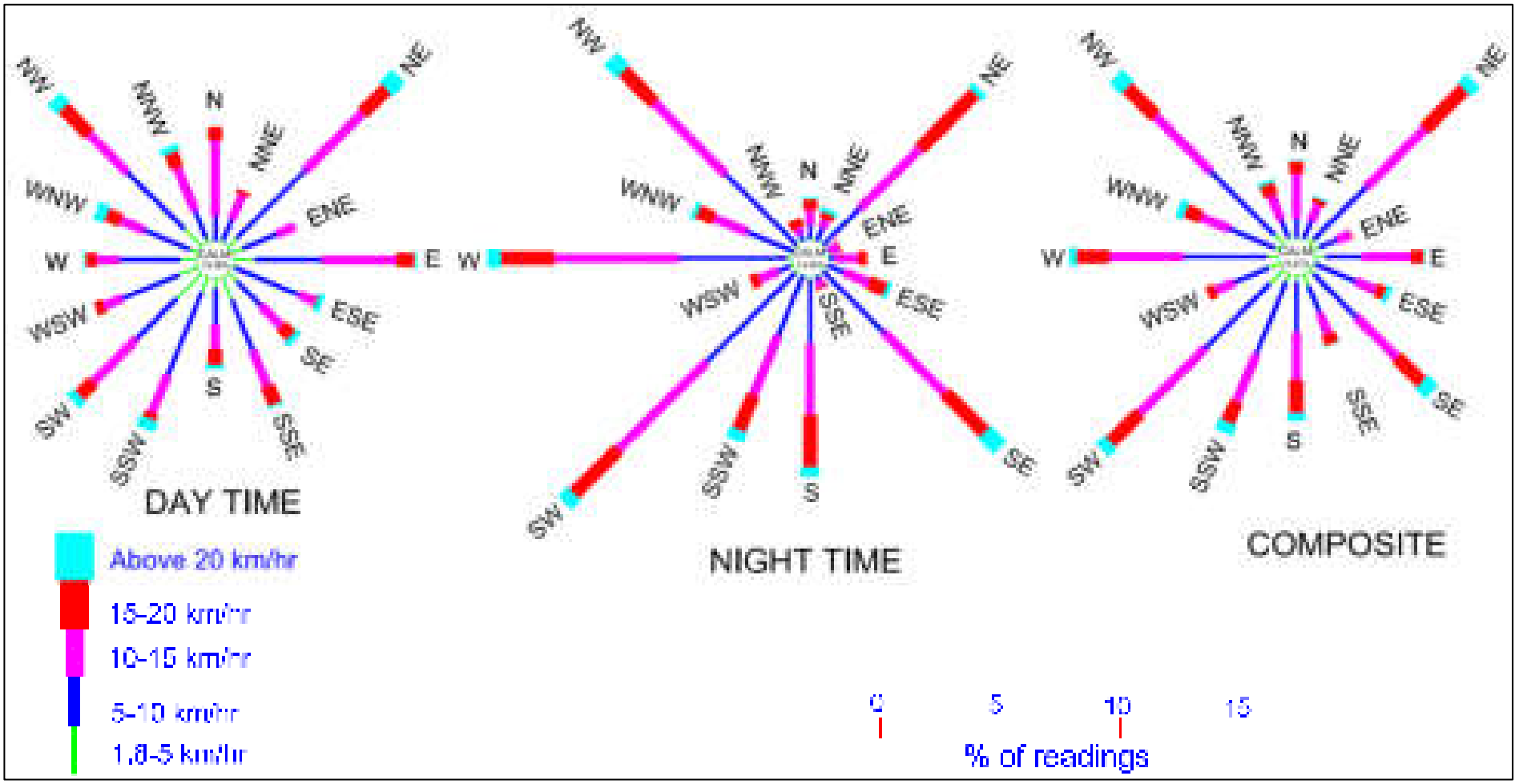
TABLE 3.4: WIND FREQUENCY TABLE OF MONITORED DATA (MARCH-MAY 2021)

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	0.28	0.84	2.81	3.09	0.75	0.09	7.86	7.58
ENE	0.28	0.47	1.50	0.84	0.00	0.00	3.09	2.81
NE	1.69	0.47	4.03	3.37	1.40	0.75	11.71	10.02
NNE	0.00	0.09	0.94	1.12	0.19	0.00	2.34	2.34
N	0.28	0.00	1.03	3.18	0.56	0.00	5.05	4.77
NNW	0.09	0.19	1.22	1.97	0.66	0.28	4.41	4.32
NW	1.40	1.03	3.37	2.25	1.50	0.56	10.11	8.71
WNW	0.75	0.37	2.06	1.03	0.66	0.47	5.34	4.59
W	1.50	0.66	2.53	0.94	0.47	0.09	6.19	4.69
WSW	1.50	0.84	2.53	0.84	0.37	0.00	6.08	4.58
SW	1.50	1.50	2.34	2.53	0.84	0.37	9.08	7.58
SSW	1.40	0.66	3.75	1.69	0.28	0.47	8.25	6.85
S	0.09	0.37	1.50	1.03	0.66	0.19	3.84	3.75

Direction from	Percent frequency (wind speed in km/h)							
	Calm	**1.8-5**	**5-10**	**10-15**	**15-20**	**>20**	**Total**	**Ex.Calm**
SSE	0.84	1.03	2.25	1.59	0.84	0.09	6.64	5.80
SE	1.31	0.47	1.40	1.22	0.56	0.28	5.24	3.93
ESE	0.75	0.09	2.90	0.66	0.09	0.28	4.77	4.02
TOTAL	**13.66**	**9.08**	**36.16**	**27.35**	**9.83**	**3.92**	**100.00**	**86.34**
	NIGHT TIME (18 hrs to 05 hrs)							
E	0	0	0.28	0.93	0.37	0	1.58	1.58
ENE	0	0	0.09	0.37	0.09	0	0.55	0.55
NE	0.65	0	2.14	3.53	3.25	0.28	9.85	9.2
NNE	0.09	0	0.56	0.37	0.28	0.19	1.49	1.4
N	0.19	0	0.56	0.65	0.46	0.09	1.95	1.76
NNW	0	0	0.28	0.28	0.37	0	0.93	0.93
NW	1.76	0	4.18	4.18	1.86	0.74	12.72	10.96
WNW	0.56	0	2.04	1.49	0.74	0.19	5.02	4.46
W	2.69	0.19	4.46	5.2	2.23	0.56	15.33	12.64
WSW	0.19	0.09	0.56	0.84	0.37	0	2.05	1.86
SW	2.14	0.09	5.2	5.2	2.6	0.56	15.79	13.65
SSW	1.39	0	2.69	2.69	1.58	0.46	8.81	7.42
S	0.56	0.09	2.69	2.97	2.14	0.46	8.91	8.35
SSE	0	0	0.19	0.28	0.09	0	0.56	0.56
SE	0.84	0	3.53	3.62	2.32	0.93	11.24	10.4
ESE	0.46	0	0.74	1.11	0.74	0.19	3.24	2.78
TOTAL	**11.52**	**0.46**	**30.19**	**33.71**	**19.49**	**4.65**	**100.02**	**88.5**
	COMPOSITE (Day + Night)							
E	0.14	0.42	1.54	2	0.56	0.05	4.71	4.57
ENE	0.14	0.23	0.79	0.61	0.05	0	1.82	1.68
NE	1.17	0.23	3.08	3.45	2.33	0.51	10.77	9.6
NNE	0.05	0.05	0.75	0.75	0.23	0.09	1.92	1.87
N	0.23	0	0.79	1.91	0.51	0.05	3.49	3.26
NNW	0.05	0.09	0.75	1.12	0.51	0.14	2.66	2.61
NW	1.59	0.51	3.78	3.22	1.68	0.65	11.43	9.84
WNW	0.65	0.19	2.05	1.26	0.7	0.33	5.18	4.53
W	2.1	0.42	3.5	3.08	1.35	0.33	10.78	8.68
WSW	0.84	0.47	1.54	0.84	0.37	0	4.06	3.22
SW	1.82	0.79	3.78	3.87	1.72	0.47	12.45	10.63
SSW	1.4	0.33	3.22	2.19	0.93	0.47	8.54	7.14
S	0.33	0.23	2.1	2	1.4	0.33	6.39	6.06
SSE	0.42	0.51	1.21	0.93	0.47	0.05	3.59	3.17
SE	1.07	0.23	2.47	2.42	1.45	0.61	8.25	7.18
ESE	0.61	0.05	1.82	0.89	0.42	0.23	4.02	3.41
TOTAL	12.61	4.75	33.17	30.54	14.68	4.31	100.06	87.45

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 (MARCH TO MAY 2021)



3.5 AMBIENT AIR QUALITY

3.5.1 Location of sampling stations

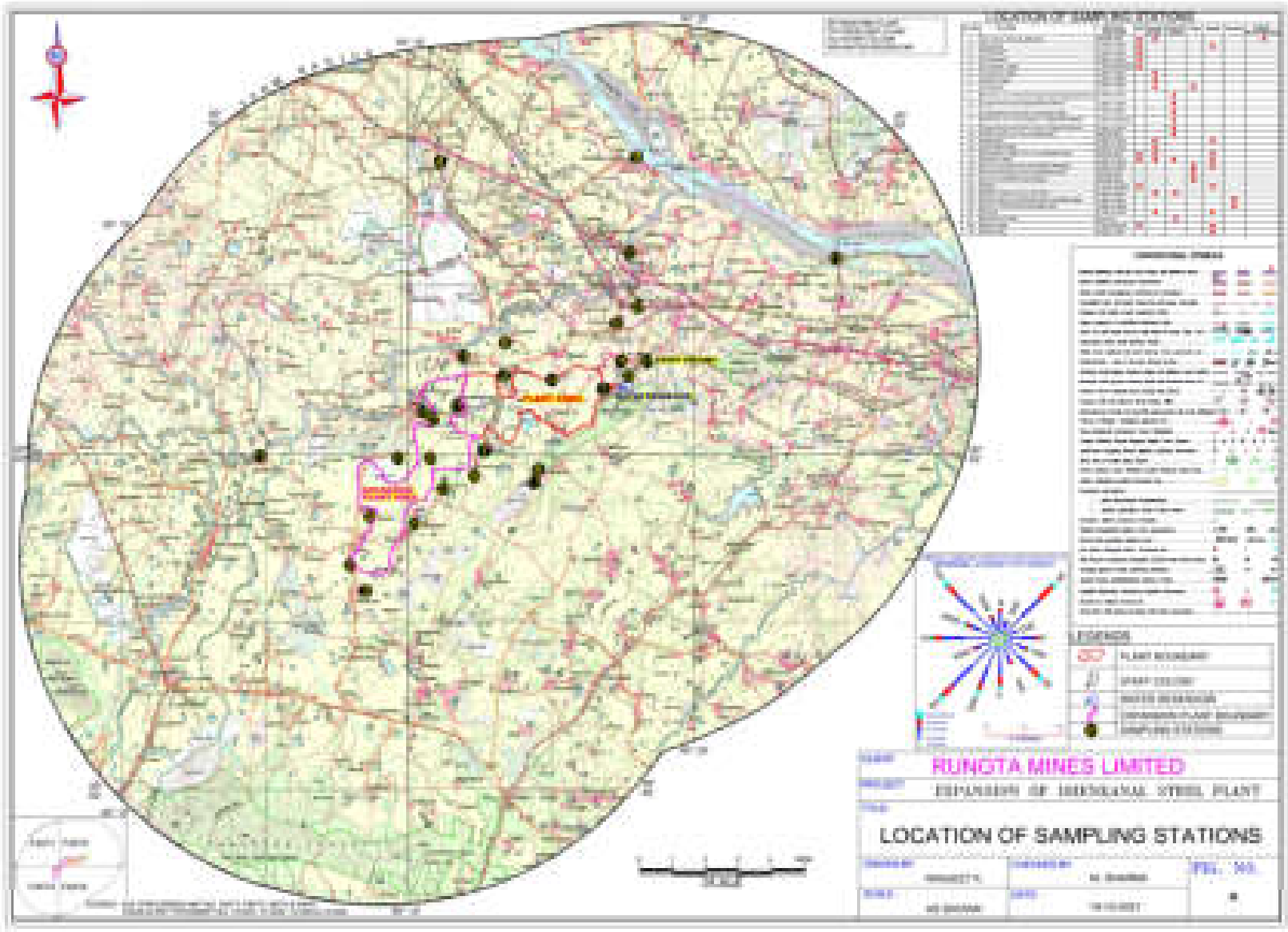
Ambient air quality monitoring was undertaken at 9 different stations within the study area during the summer season (March to May 2021). The ambient air sampling stations were established in the core and buffer zone to study the present ambient air quality. The sampling station locations are given in **Table 3.5** and the same are marked in **Fig 3.6**.

TABLE 3.5: LOCATION OF AIR SAMPLING STATIONS

Sl. No.	Station No. (Refer Fig 3.6)	Location	Distance & Direction from Plant boundary (wrt*)	Justification for location
1.	1	Core Zone(existing plant area)	Within (EP)	Plant site where industrial activities will take place
2.	2	Berunpal Village	0.2 km, E (EP)	Nearest habitation to existing plant and 1st predominant downwind direction w.r.t. expansion area
3.	3	Mahalunda Village	0.6 km, S (PP)	Nearest habitation to the south of expansion area & in the crosswind direction.
4.	4	Narendrapur Village	6.5 km, N (PP)	Crosswind direction.
5.	5	Nimabahali Village	1.1 km, NNW (SC)	1st predominant downwind direction w.r.t. existing plant and near the transportation road
6.	17	Benipathar village (core zone expansion area)	Within (PP)	Plant site where activities will take place
7.	18	Kankalu Village	0.5 km, N (PP)	Nearest habitation in north to both existing as well as expansion plant area & in the crosswind direction.
8.	22	Patala Village	0.1 km, SW (PP)	Nearest habitation to expansion area in the 1st predominant upwind direction.
9.	28	Barhamunda Village	0.3 km, SE (PP)	2nd predominant downwind direction and nearest habitation in SE of expansion area.

Abbreviations: *EP- Existing Plant, PP-Proposed Plant, WR-Water Reservoir, SC-Staff Colony

FIG 3.6: LOCATIONS OF SAMPLING STATIONS



3.5.2 Sampling schedule and parameters

The study was for 3 months with frequency of twice a week at each site. 24-hour average samples were collected from each station for respirable particulate matter (RPM or PM_{10}), fine particulate matter ($PM_{2.5}$), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and carbon monoxide (CO). Additionally, BaP, ammonia, benzene, nickel, arsenic and lead were monitored at the core zone for the monitoring period and for two samples at each of the sampling stations in buffer zone. These samples were analysed in laboratory by adopting the methods specified in National Ambient Air Quality Standards.

3.5.3 Methodology

Respirable Particulate Matter (PM_{10})

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

Fine Particulate Matter ($PM_{2.5}$)

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

Sulphur Dioxide

The sampling of ambient air for evaluating SO_2 concentrations was performed with a multigas sampler, using the vacuum created by the respirable dust sampler for drawing the air samples through the impingers. Air is drawn at a measured and controlled rate of 300 ml/min through a solution of sodium tetra-chloromercurate.

After completion of the sampling, the used absorbing reagent is treated with dilute solutions of sulfamic acid, formaldehyde and para rosaniline hydrochloride. The absorbance of the intensely coloured para rosaniline methyl sulphonic acid is measured and the amount of SO_2 in the sample is computed from graphs prepared with standard solutions.

The ambient SO_2 concentrations were computed from the amount of SO_2 collected and the volume of air sampled.

Nitrogen dioxide

The sampling of ambient air for evaluating NO_2 concentrations was performed with a multigas sampler, using the vacuum created by the respirable dust sampler for drawing the air samples through the impingers. Air is drawn at a measured and controlled rate of about 300 ml/minute through an orifice-tipped impinger containing solutions of sodium hydroxide and sodium arsenite. After completion of the sampling, an aliquot of the used absorbing solution was treated with solutions of H_2O_2, sulphanilamide and NEDA.

The nitrite ion present in the impinger was calculated from the absorbance of the resulting solution and from the graphs prepared with standard solutions. The ambient NO_2 concentrations were computed from the total nitrite ion present in the impingers, overall efficiency of the impinger and the procedure, and the volume of air sampled.

Carbon monoxide

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

Benzene

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

NH_3

The sampling of ambient air for evaluating NH_3 concentrations was performed by placing 10 ml of absorbing solution of 0.1 N H_2SO_4 in an impinger and sample for one hour at the flow rate of 1 to 2 L/min. After sampling, the volume of sample is measured and transferred to a sample storage bottle. The contents of the sample bottle are transferred to a 25 ml glass stopper graduated cylinder. All the solutions and sample are maintained at 25° C. 2 ml buffer and 5 ml working phenol solution is added, mixed, and filled to about 22 ml. 2.5 ml of working hypochlorite solution is added and rapidly mixed. It is then diluted to 25 ml, mixed and stored in the dark for 30 minutes to develop colour. The absorbance of the solution is measured at 630 nm on a spectrophotometer using 1 cm cells. The concentration of NH_3 in $\mu g/m^3$ is calculated from standard graph.

Benzo (a) pyrene

The sampling of ambient air is carried out using respirable dust sampler using EPM- 2000 glass fibre or equivalent filter. Filter paper is divided in two equal parts. Half portion of filter paper is used for the measurement of B(a)P. For extracting the sample, the collected filter papers are cut into strips using scissors and transferred to 250 ml beaker. These samples are extracted with about 50ml of toluene using ultra sonic bath for about 30 minutes. The procedure is repeated twice (50ml x 2 times) for complete extraction. The extracts are filtered into evaporative flask of 250 ml with the help of Whatman filter paper No. 20 or filter-disc. The extraction process is repeated twice and extractants combined. The toluene extract is evaporated using rotary evaporator with water bath as cool as possible (temperature not exceeding 40°C) taking care that it is not evaporated upto total dryness. It should be stopped at near dryness (less than 1 ml, visible). Then 2.0 ml of toluene is added to rinse the wall of evaporation flask and extract transferred into a beaker of 5 ml capacity. The extracted residue is diluted and made up to 0.5 ml or 1 ml. 1µl or 2 µl is injected into GC-FID for analysis. The resulting concentration is recorded.

Heavy metals (nickel, lead, arsenic)

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

A summary of the methodology is given in **Table 3.6.**

TABLE 3.6: SUMMARY OF PROCEDURES FOR DETERMINING VARIOUS AIR QUALITY PARAMETERS

Parameters	Testing Procedure
PM_{10}	IS:5182 (Part 23) using respirable dust sampler (RDS), gravimeteric analysis
$PM_{2.5}$	Adapted from CPCB guidelines using fine particulate sampler, gravimeteric analysis
SO_2	Absorption in sodium tetra chloro-mercurate followed by colorimetric estimation using P-rosaniline hydrochloride and formaldehyde (IS : 5182 Part. II. 1969)
NO_2	Absorption in dil. NaOH and then estimated through spectrophotometer with sulphanilamide and N(I-Nepthyle) Ethylene diamine Dihydrochloride and Hydrogen Peroxide (IS:5182 1975, Part VI)
CO	Electrochemical detection by portable CO detector
Benzene	Collection by organic vapour sampler followed by solvent extraction and GC analysis (IS:5182 (Part 11))

Parameters	Testing Procedure
NH_3	CPCB Guidelines- Absorption in 0.1 N H_2SO_4 followed by reaction with phenol and hypochlorite solution for colour development and spectrophotometric concetration determination
BaP	Collection on filter paper using respirable dust sampler followed by solvent extraction and GC analysis (IS:5182 (Part 12))
Arsenic, Nickel, Lead	Collection on filter paper using respirable dust sampler followed by digestion and ICP analysis (IS 3025 (Part 2))

Analysis results with respect to $PM_{2.5,}$ $PM_{10,}$ SO_2 and NO_2 are presented in **Annexure IX** and summarized in **Table 3.7**. They are also compared with the National Ambient Air Quality Standards dated 18th November 2009, which give the limits for industrial as well as residential & rural areas, copy given in **Annexure X**.

TABLE 3.7: SUMMARY OF AMBIENT AIR QUALITY MONITORING RESULTS

Pollutant		24 hourly average concentration in µg/m³ except CO in mg/m³									Permis-sible Limits, NAAQS 2009
		Core Zone (existing plant area)	Berunpal Village	Mahalunda Village	Narendra pur Village	Nima-bahali Village	Benipathar village (core zone expansion area)	Kankalu Village	Patala Village	Barhamunda Village	
PM_{10}	Min.	36.8	35.4	30.4	48.8	37.7	44.2	33.9	40.1	44.9	100
	Max	74.7	69.9	65	67.5	69.1	60.1	70.7	64.9	61.1	
	Avg	70.5	65.5	60.5	62.3	63.7	55.3	67.1	61	54.7	
	98th %tile	74.6	69.8	64.9	67.5	69.1	59.9	70.7	64.8	61.1	
$PM_{2.5}$	Min.	21.4	19.6	20.4	27.5	23.3	22.9	21.2	24.6	24.2	60
	Max	43.7	42	38.3	40	40.9	34.2	41.1	40.1	35.6	
	Avg	39.6	37.4	34.9	35.8	36.5	31.2	38.3	36.2	31.3	
	98th %tile	43.4	42	38.3	39.7	40.4	34	40.8	39.7	35.4	
SO_2	Min.	5.9	4.8	3.7	10.7	6.4	5.9	5.9	4.3	6.4	80
	Max	14.3	14.3	12.3	16.4	14.5	10.9	15	10.9	13.4	
	Avg	11.9	11.8	10.1	14.4	11.5	9.3	13	9	9.9	
	98th %tile	14.1	14.1	12.3	16.2	14.4	10.9	15	10.9	13.2	
NO_2	Min.	9.7	9.3	8.9	12.9	10.9	8.5	10.9	8.5	8.9	80
	Max	18.2	16.9	14.1	21.7	21.8	12.1	16.9	12.9	13.6	
	Avg	14.7	14.2	12.1	17.6	17.9	10.9	15	11.3	12.5	
	98th %tile	18	16.8	13.7	21.6	21.3	12.1	16.8	12.8	13.6	
CO	Min.	0.344	0.229	0.229	0.573	0.344	0.229	0.344	0.229	0.115	2
	Max	0.573	0.573	0.458	0.802	0.687	0.344	0.687	0.458	0.573	
	Avg	0.477	0.408	0.347	0.702	0.504	0.292	0.516	0.373	0.367	
	98th %tile	0.573	0.556	0.456	0.799	0.681	0.342	0.672	0.458	0.567	

TABLE 3.7 (Contd…)

Sl. No.	Date of Sampling	Location	NH_3 (µg/m³)	BaP (ng/m³)	C_6H_6 (µg/m³)	Pb (µg/m³)	As (ng/m³)	Ni (ng/m³)
1.	01/03/2021-29/05/2021	Core Zone (existing plant area)	BDL - 0.087	N.D.	N.D.	BDL	BDL	BDL - 1.081
2.	09-10/03/2021,	Berunpal Village	BDL	N.D	N.D	BDL	BDL	BDL

Sl. No.	Date of Sampling	Location	NH_3 ($\mu g/m^3$)	BaP (ng/m^3)	C_6H_6 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	As (ng/m^3)	Ni (ng/m^3)
	12-13/03/2021							
3.	09-10/03/2021, 12-13/03/2021	Mahalunda Village	BDL	N.D	N.D	BDL	BDL	BDL
4.	11-12/03/2021, 14-15/03/2021	Narendrapur Village	BDL	N.D	N.D	BDL	BDL	BDL
5.	10-11/03/2021, 13-14/03/2021	Nimabahali Village	BDL	N.D	N.D	BDL	BDL	BDL
6.	03/03/2021-31/05/2021	Benipathar village (core zone expansion area)	BDL	N.D	N.D	BDL	BDL	BDL
7.	10-11/03/2021, 13-14/03/2021	Kankalu Village	BDL	N.D	N.D	BDL	BDL	BDL
8.	10-11/03/2021, 13-14/03/2021	Patala Village	BDL	N.D	N.D	BDL	BDL	BDL
9	11-12/03/2021, 14-15/03/2021	Barhamunda Village	BDL	N.D	N.D	BDL	BDL	BDL
	Permissible Limits, NAAQS 2009		400 (24 hrs)	01 (annual)	05 (annual)	1.0 (24 hrs)	06 (annual)	20 (annual)

N.D: Not detected
Note: BDL (Below Detection Limit) of NH_3<1.0 $\mu g/m^3$; Pb<0.07 $\mu g/m^3$; As<0.6 ng/m^3; Ni<0.6 ng/m^3

Twenty four hour average PM_{10} level was found to range from 30.4 to 74.7 $\mu g/m^3$, $PM_{2.5}$ was found to vary from 19.6 to 43.7 $\mu g/m^3$, SO_2 from 3.7 to 16.4 $\mu g/m^3$ and NO_2 from 8.5 to 21.8 $\mu g/m^3$. All the values are on the lower that the permissible limits at all the locations. The concentrations of SO_2 and NO_2 are considerably low compared to the 80 $\mu g/m^3$ NAAQS permissible limit for residential, rural and other areas. The concentrations of $PM_{2.5}$ are within limits of 60 $\mu g/m^3$ as per National Ambient Air Quality Standard.

The CO level was observed between 0.115 to 0.802 mg/m^3 while the limits are 2 mg/m^3.

NH_3 level was observed BDL (<1 $\mu g/m^3$) in all the locations except in Core Zone (existing plant area) where it ranges from BDL-0.087 $\mu g/m^3$. The permissible limits for NH3 are prescribed as 400 $\mu g/m^3$.

BaP and C_6H_6 level were not detected in any locations in the study area.

Pb, As and Ni were also observed below detectable limits of 0.07$\mu g/m^3$, 0.6 ng/m^3, and 0.6 ng/m^3, respectively, which are much below the permissible limits of 1 $\mu g/m^3$, 6 ng/m^3 and 20 ng/m^3, respectively except for Nickel in Core Zone(existing plant area) where it ranges from BDL - 1.081 ng/m^3.

3.6 WATER ENVIRONMENT

3.6.1 Surface water resources

Core zone: As seen on toposheet, eight first order seasonal drains, one second order seasonal drain, one aqueduct and one reservoir overflow

stream originate in or pass through the plant boundary (existing & expansion). They flow out from the northern boundary. These drains originate from and connect multiple seasonal ponds before flowing into Nigra (Ligra) Nala and ultimately Brahmani River. There exist twenty eight rain fed ponds within the entire project site. Although the ponds are rain-fed, some of the ponds contain water all through out the year. One of the south-north seasonal streams flowing within the eastern side of the existing project site, also feeds two of the seasonal ponds. Similarly, one more seasonal stream originates near southwest boundary of expansion area, almost at middle portion, and after flowing through expansion & existing plant area it flows into Nigra Nala.

Buffer zone: River Brahmani and it's tributaries control the drainage of the area. The Brahmani is perennial in nature with a nominal flow during the summer season. It's important tributaries are Ramiala Nadi, Nigre Nadi, Purajhor Nadi etc. The smaller streams show dendritic pattern while the major river and it's tributaries show sub-parallel drainage, indicating structural control.
(Source: Ground water information booklet of Dhenkanal district, CGWB, South Eastern Region, Bhubaneswar May, 2013.)

In the buffer zone, there are several water bodies created due to the man made embankments. The nearest such water body is adjoining the south side of the project boundary of existing plant area. One of the largest man-made water bodies is near village Maniannali in the south east portion of the study area. 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, including the one on side of the existing plant boundary.

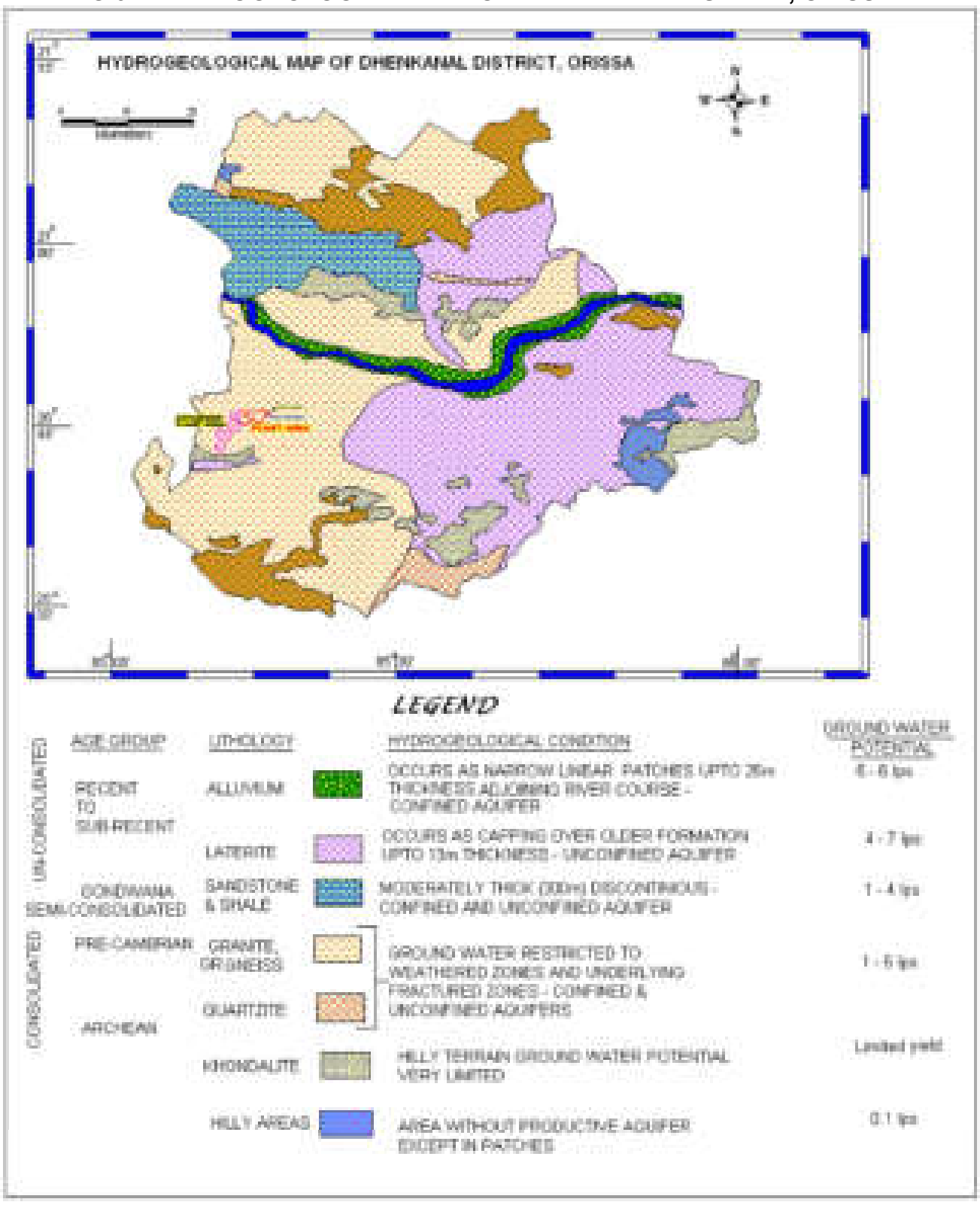
3.6.2 Ground water resources

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

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

Depth to water table: The water level in the borewell in Jharband is 8 m bgl in October 2021.

FIG 3.7: HYDROGEOLOGICAL MAP OF DHENKANAL DISTRICT, ORISSA



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

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

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

A. By rainfall infiltration method

Total study area (as per Census 2011)	-	616.07 Sq.km.
Area suitable for ground water recharge (as per Census 2011)	-	524.63 Sq.km
Annual Average Rainfall (IMD Angul 1981-2010)	-	1277.5 mm
Rainfall infiltration index (avg) as per GEC recommendation for Granite Acidic Rocks (Pegmatite, Granite, Syenite, Rhyolite etc.) - Weathered, Jointed	-	11%
Annual groundwater recharge	-	73.72 MCM

B. By water table fluctuation method

Total study area (as per Census 2011)	-	616.07 Sq.km
Area suitable for ground water recharge (as per Census 2011)	-	524.63 Sq.km
Average seasonal change of water table (as per as per India-WRIS (indiawris.gov.in) (pre monsoon value - monsoon value (6.53 m bgl - 2.26 m bgl) as assessed on 22.10.2021.	-	4.27 m
Specific yield as per GEC recommendation for Granite Acidic Rocks (Pegmatite, Granite, Syenite, Rhyolite etc.) - Weathered, Jointed		3.0%
Monsoon groundwater recharge	-	67.21 MCM

The difference between the two expressed as a percentage of the rainfall infiltration method is (-) 8.83%. Here, percentage difference is greater than -

20% and less than +20%, therefore, the rainfall recharge is to be taken as equal to the value estimated by water table fluctuation method as per the recommendations on ground water resource estimation methodology. Thus, 67.21 MCM per annum is the estimated annual ground water resource.

C. Return flow from surface irrigation

Total irrigated area (as per Census 2011)	-	6581.4 Ha.
Surface water irrigated area (as per Census 2011)	-	5364.63 Ha.
Applied water / Ha.	-	0.5 m/Ha.
Total applied water	-	26.82 MCM
Return seepage, Average 35%	-	9.39 MCM

Thus, annual ground recharge will be 67.21 + 9.39 = 76.6 MCM

D. Ground Water Use

There are three major consumers of ground water in the area (i) Domestic (ii) Irrigation (iii) Livestock. In addition, there are 26 industries in the study area, out of which 10 are operational. It is assumed that majority of the industries meet their requirement through surface water sources. Hence, the drinking water of industries has been considered as 100 KLD.

D.1 Domestic

Total population as per Census 2011	-	270396
Decadal growth rate (rural for Odisha)	-	14.05%
Present population (2020) estimated on basis of decadal growth rate	-	304588
Population dependent on Ground water	-	182753
Per capita domestic need	-	135 LPD
Total annual ground water use	-	9.01 MCM

D.2 Irrigation

As per Census 2011, the total irrigated area is 6581.40 ha. The major part of irrigation is done by surface water (canal- 4627.75 ha, tanks/ lakes- 736.88 ha and by others – 195.07 ha). Ground water is used for 1021.71 ha.

Total area irrigated by ground water	-	1021.71 Ha
Gross irrigation (50 cm/ha)	-	0.5 m/ha/annum
Annual Irrigation need	-	510.86 ha m = 5.11 MCM
Return seepage, average 35%	-	179 ha m = 1.79 MCM
Net water withdrawal	-	3.32 MCM

D.3 Livestock

The water consumption for livestock has been empirically considered as 5% of human consumption, which comes to 0.45 MCM.

D.4 Industrial use

The water consumption for industries has been empirically considered as 100 cum/day for 10 operational industries within the study area, which comes to 0.33 MCM.

D.5 Total annual ground water use

9.01 + 3.32 + 0.45 + 0.33 = 13.11 MCM

E. Ground water balance

Sl. No.	Particulars	Million Cubic Meter (MCM)
1.	Total annual replenishable recharge • By rainfall infiltration factor method (million m^3/year) • By groundwater table fluctuation method (million m^3/year)	 73.72 67.21
2.	Estimated annual ground water recharge including return seepage (million m^3/year)	76.6
3.	Estimate Annual draft (million m^3/year)	13.11
4.	Net annual ground water availability (million m^3/year)	63.49
5.	Stage of ground water development in %	17.11
6.	Category as per GEC	Safe

3.6.3 Water quality

To establish the baseline status of water quality in the study area, physico-chemical characteristics of water samples from surface water bodies and representative ground water sources were collected. The locations were chosen on the basis of proximity to the project site, the likely impact of the project on downstream and control samples taken in upstream.

Location of sampling stations

The location of ground and surface water sample sources is as given in **Table 3.8** and shown in **Fig 3.6**.

TABLE 3.8: LOCATION OF WATER SAMPLING STATIONS

Sl. No.	Station No. (Ref. Fig 3.6)	Source	Location	Distance and direction (facility from*)
I. Surface Water				
1.	9	River	Brahmani river near Kharhagaprasad village (Up Stream)	5.9 km, N (SC)
2.	10	River	Lingra Nadi near Motanga Village (Down Stream)	3.0 km, N (SC)
3.	11	Nala	Gandhijharan nala near Tarkaberhaa village	1.4 km, S (EP)
4.	12	River	Brahmani river near Dhalapur village (Down Stream)	6.3 km, ENE (SC)
5.	13	River	Lingara nadi near Shimilichhuin village (Up Stream)	3.0 km, W (PP)
6.	14	Reservoir	Water Reservoir area in existing plant	Within EP
7.	18	Pond	Kankalu village	0.5 km, N (PP)
8.	23	Pond	Kantimili Village	0.3 km, E (PP)
9.	27	Pond	Narharlpur (Pond)	Adjoining
II. Ground Water				
1.	1	Bore well	Core Zone(existing plant area)	Within (EP)
2.	6	Hand pump	Tarkaberha village	1.2 km, S (EP)
3.	7	Hand pump	Kadala village	0.40 km, S (EP)
4.	8	Hand pump	Gandijhara village	0.8 km, N (EP)
5.	15	Hand pump	Naraharipur village	0.3 km, W (PP)
6.	16	Hand pump	Jharbandh village	0.4 km, W (SC)
7.	17	Hand pump	Benipathar village (core zone expansion area)	Within (PP)
8.	18	Hand pump	Kankalu village	0.5 km, N (PP)
9.	23	Hand pump	Kantimili Village	0.3 km, E (PP)
10.	26	Hand pump	Sulanali village	0.1 km, W (PP)

** **Abbreviations: EP- Existing Plant, PP-Proposed Plant, WR-Water Reservoir, SC-Staff Colony***

Methodology

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

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

Analytical Results

The physico-chemical characteristics of ground and surface water samples are presented in **Annexure XI**. To facilitate comparison with drinking water standards, "Characteristics for Drinking Water" as per IS 10500:2012, has been included in the **Annexure XII.** Surface water test results have been summarised in **Table 3.9** and ground water test results are summarised in **Table 3.10**.

TABLE 3.9: SURFACE WATER TEST RESULTS

Sl. No.	Parameters	As per IS 10500:2012 & Amendment No. 1		Test Results (range)	Classification* as per CPCB's Water Quality Standards for Surface Water Sources
		Requirement (Acceptable Limits)	Permissible Limit in the absence of alternate source		
1.	Turbidity, NTU	1	5	BDL - 4.214	
2.	pH value	6.5 - 8.5	No relaxation	6.4 - 7.8	C & E
3.	Specific conductance, µS/cm	-	-	131.2 - 1037	
4.	Total Dissolved Solids, mg/l	500	2000	80 - 658	
5.	Total Suspended Solids, mg/l	-	-	4 - 32	
6.	Total Hardness as $CaCO_3$, mg/l	200	600	64 - 240	
7.	Alkalinity, mg/l	200	600	55 - 355	
8.	Sulphate as SO_4 mg/l	200	400	4 - 57	
9.	Phosphorous as P, mg/l	-	-	BDL - 0.081	
10.	Chloride as Cl, mg/l	250	1000	10 - 187	
11.	Calcium as Ca, mg/l	75	200	13 - 77	
12.	Dissolved oxygen, mg/l	-	-	6.8 - 7.4	A
13.	Biochemical Oxygen Demand (BOD), mg/l	-	-	2.4 - 9.6	Below C
14.	Chemical Oxygen Demand (COD), mg/l	-	-	7 - 26	
15.	Sodium as Na, mg/l	-	-	2.4 - 122.2	
16.	Potassium as K, mg/l	-	-	1 - 65	

Sl. No.	Parameters	As per IS 10500:2012 & Amendment No. 1		Test Results (range)	Classification* as per CPCB's Water Quality Standards for Surface Water Sources
		Requirement (Acceptable Limits)	Permissible Limit in the absence of alternate source		
17.	Magnesium as Mg, mg/l	30	100	8 - 15	
18.	Iron as Fe, mg/l	1	No relaxation	BDL - 0.48	
19.	Fluoride as F, mg/l	1	1.5	0.57 - 0.98	
20.	Oil & Grease, mg/l	-	-	BDL - 2	
21.	Silver as Ag, mg/l	0.1	No relaxation	BDL	
22.	Boron as B, mg/l	0.5	1	0.011 - 0.034	
23.	Cadmiun as Cd, mg/l	0.003	No relaxation	BDL	
24.	Chromium as Cr,mg/l	0.05	No relaxation	BDL	
25.	Copper as Cu, mg/l	0.05	1.5	BDL	
26.	Manganese as Mn, mg/l	0.1	0.3	BDL	
27.	Nickel as Ni, mg/l	0.02	No relaxation	BDL	
28.	Selenium as Se, mg/l	0.01	No relaxation	BDL	
29.	Arsenic as As, mg/l	0.01	No relaxation	BDL	
30.	Zinc as Zn, mg/l	5	15	BDL - 0.018	
31.	Acidity as $CaCO_3$,mg/l	-	-	15 - 35 at pH 8.3	
32.	Nitrate as NO_3, mg/l	45	No relaxation	BDL - 4.95	
33.	Hexavalent Chromium, mg/l	-	-	BDL	
34.	Total Coliform (MPN/100ml)	-	-	<1.8 - 4	A
35.	E. Coli	-	-	Absent-Present	-

**** Classification:***
A- Drinking Water Source, without conventional treatment but after disinfection
B- Outdoor Bathing (organized)
C- Drinking Water Source after conventional treatment and disinfection
D- Propagation of Wild Life and Fisheries
E- Irrigation, Industrial Cooling and Controlled waste disposal

Note : BDL(Below Detection Limit) of Turbidity (NTU) <1, TSS <10, P <0.1, Fe <0.1, O&G <5, Ag <0.01, Cr <0.01, Cu <0.01, Mn <0.01, Ni <0.01, Se <0.01, As <0.01, Zn <0.01, Cr^{6+} <0.1 mg/l
Source: Test report No. MMW/06-2021/47,48 dated 16/06/2021 by Min Mec R&D Laboratory, New Delhi

The analysis of surface water sample shows that all the parameters are within the permissible limits as per IS 10500:2012. As per CPCBs criteria for classification of surface waters, the waters are suitable for irrigation, industrial cooling and controlled waste disposal.

TABLE 3.10: GROUND WATER TEST RESULTS

Sl. No.	Parameters	As per IS 10500:2012 & Amendment No. 1		Test Results (range)
		Requirement (Acceptable Limits)	Permissible Limit in the absence of Alternate source	
1.	Turbidity, NTU	1	5	BDL - 2.001
2.	pH value	6.5 - 8.5	No relaxation	6.6 - 7.9
3.	Specific conductance, µS/cm	-	-	414 - 2550
4.	Total Dissolved Solids, mg/l	500	2000	274 - 1662
5.	Total Suspended Solids, mg/l	-	-	BDL - 32
6.	Total Hardness as CaCO3, mg/l	200	600	172 - 592
7.	Alkalinity, mg/l	200	600	190 - 560
8.	Sulphate as SO4 mg/l	200	400	8 - 184
9.	Phosphorous as P, mg/l	-	-	BDL
10.	Chloride as Cl, mg/l	250	1000	22 - 474
11.	Calcium as Ca, mg/l	75	200	48 - 176
12.	Sodium as Na, mg/l	-	-	13.7 - 327
13.	Potassium as K, mg/l	-	-	1.1 - 9.6
14.	Magnesium as Mg, mg/l	30	100	12 - 55
15.	Iron as Fe, mg/l	1	No relaxation	BDL - 0.21
16.	Fluoride as F, mg/l	1	1.5	0.45 - 0.96
17.	Silver as Ag, mg/l	0.1	No relaxation	BDL
18.	Boron as B, mg/l	0.5	1	BDL - 0.027
19.	Cadmium as Cd, mg/l	0.003	No relaxation	BDL
20.	Chromium as Cr,mg/l	0.05	No relaxation	BDL
21.	Copper as Cu, mg/l	0.05	1.5	BDL
22.	Manganese as Mn, mg/l	0.1	0.3	BDL - 0.274
23.	Nickel as Ni, mg/l	0.02	No relaxation	BDL
24.	Selenium as Se, mg/l	0.01	No relaxation	BDL
25.	Arsenic as As, mg/l	0.01	No relaxation	BDL
26.	Zinc as Zn, mg/l	5	15	BDL - 2.732
27.	Acidity as CaCO3,mg/l	-	-	22.5 - 55 at pH 8.3
28.	Nitrate as NO3, mg/l	45	No relaxation	2.26 - 31.15
29.	Hexavalent Chromium, mg/l	-	-	BDL

Note: BDL(Below Detection Limit) of Turbidity (NTU) <1, TSS <10, P <0.1, Fe <0.1, F <0.1, O&G <5, Ag <0.01, B <0.01, Cr <0.01, Cu <0.01, Mn <0.01, Ni <0.01, Se <0.01, As <0.01, Zn <0.01, Cr^{6+} <0.1 mg/l

Source: Test report No. MMW/06-2021/46 dated 16/06/2021 by Min Mec R&D Laboratory, New Delhi

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

3.7 NOISE LEVEL

3.7.1 Monitoring Locations

Nine 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 3.11**.

TABLE 3.11: LOCATION OF NOISE MONITORING STATIONS

Sl. No.	Station No. (Ref Fig 3.6)	Name of Monitoring Station	Distance (km) and Direction (from Plant facility*)
1	2	Beruanpal	0.2 km, E (EP)
2	15	Jharbandh village	0.4 km, W (SC)
3	17	Benipathar village (core zone expansion area)	Within (PP)
4	18	Kankalu village	0.5 km, N (PP)
5	19	Scrub land west side of expansion boundary	0.5 km, W (PP)
6	22	Patala	0.1 km, SW (PP)
7	26	Sulanali	0.1 km, W (PP)
8	28	Barhamunda	0.3 km, SE (PP)
9	29	Sanamunda	0.3 km, E (PP)

**** Abbreviations: EP- Existing Plant, PP-Proposed Plant, WR-Water Reservoir, SC-Staff Colony***

3.7.2 Methodology

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

3.7.3 Observations

Results of ambient noise measurements are presented in **Annexure XIII** and summarized in **Table 3.12**. The Ambient Air Quality Standards in respect of Noise and OSHA damage risk criteria are reproduced in **Annexure XIV**.

TABLE 3.12: AMBIENT NOISE LEVELS IN dB(A) (ALL VALUES IN LEQ)

Location	Noise levels in dB(A)			Permissible limits		Area
	Day	Night	Average	Day	Night	
Beruanpal	50.08	40.2	46.53	55	45	R
Naraharipur village	51.1	42.01	47.83	55	45	R
Benipathar village (core zone expansion area)	48.16	41.01	45.45	75	70	I
Kankalu village	52	43.22	48.88	55	45	R
Scrub land west side of expansion boundary	46.18	39.01	43.6	55	45	R
Patala	47.11	40.13	44.69	55	45	R
Sulanali	48.05	41.06	45.35	55	45	R
Barhamunda	49.21	42.18	46.75	55	45	R
Sanamunda	49.19	41.05	46.38	55	45	R

Abbreviation: I- Industrial, R- Residential

Source: Test report no. MMN/06-2021/51 dated 16/06/2021 by Min Mec R&D Laboratory, New Delhi

Noise Leq values observed during day time varies from 46.18 to 52 dB(A) and at night time it varies from 39.01 to 43.22 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 19-20/05/2021 on Angul to Dhenkanal road near Nimabahali village chowk at NH-55 and on 20-21/05/2021 at NH- 55 to plant road near proposed staff colony. The traffic monitoring station is shown in **Fig 3.6**.

3.8.2 Methodology

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

3.8.3 Observations

A summary of the traffic volume monitored at two locations during survey period is given in **Table 3.13** and details are given in **Annexure XV**.

TABLE 3.13: TRAFFIC VOLUME

Traffic vehicle	No. of vehicles per day	Equivalence Factor	Equivalent Passenger Car Unit
On Angul to Dhenkanal near Nimabahali village Chowk at NH-55			
H.M.V. (buses/ trucks)	7126	3	21378
L.M.V.	2972	1	2972
Two/three wheelers	1931	0.5	966
Cycles	531	0.5	266
Animal drawn	0	4	0
Others	0	4	0
Grand Total	**12560**		**25582**
on NH - 55 to Plant road near staff colony			
H.M.V.	260	3	780
L.M.V.	65	1	65
Two/three wheelers	175	0.5	88
Cycles	219	0.5	110
Animal drawn	0	4	0
Others	0	4	0
Grand Total	**719**		**1043**

It was observed that the movement of heavy motor vehicles (trucks) is uniform during the daytime and night times on NH55. These are mainly coal carrying trucks from the Talcher coalfield.

The national highway was having 7.0-7.5 m wide road earlier. The road is being widened to 4-lane road. The design service volume of the existing national highway (7.0-7.5 m wide) is 15000 PCUs/day (maximum capacity 30,000 PCU/day). However, it is undergoing widening to 18 m carriageway with with central median as well as side shoulders. The widening work is already in advance stage. Thus, the design service volume of this road will become 35000 PCU/day (maximum capacity 70000 PCU/day).

Similarly, the plant road was earlier 5 m wide which is also being widened to 4 lane (having 30 m right of way and 22 meter carriageway). The design service volume at this plant road will also become 35000 PCU/day (maximum capacity 70000 PCU/day).

The present traffic load is 85.27% of the existing maximum capacity on the NH-55 and 1.49% of the existing maximum capacity on plant road, as per IRC guidelines.

3.9 LAND ENVIRONMENT

3.9.1 Core zone

Existing project area is 1769 acres. Additional land requirement for expansion is 1800 acres. Thus, total land required for the project is 3569 acres.

The government land in the existing project area has 7.8 acres forest land, which has already received stage II forest clearance from MOEF&C vide Letter No. 5-ORB207/2014-BHU dated 02/07/2015.

Company has acquired & acquiring (under process at different levels) the existing 1769 acres (comprising 1477.738 acres private land + 291.262 acres Government land) and the same is being converted to industrial use on receiving possession. Out of 1800 acres of expansion area, 1609.8 acres is private land and 190.20 acres is government land. Land for proposed expansion area is yet to be acquired. The application for the same has been submitted to IDCO vide letter no. RML/DSP/21-22/270 dated 12.08.2021. 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. There is a 3.14 acre area in Jharbandh village also for residential accommodation, near entry gate. Further, land is being procured near New Bhagirathipur village for private railway siding.

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 3.14.**

TABLE 3.14: DISTRICTS/ SUB DISTRICT WISE VILLAGES IN STUDY AREA

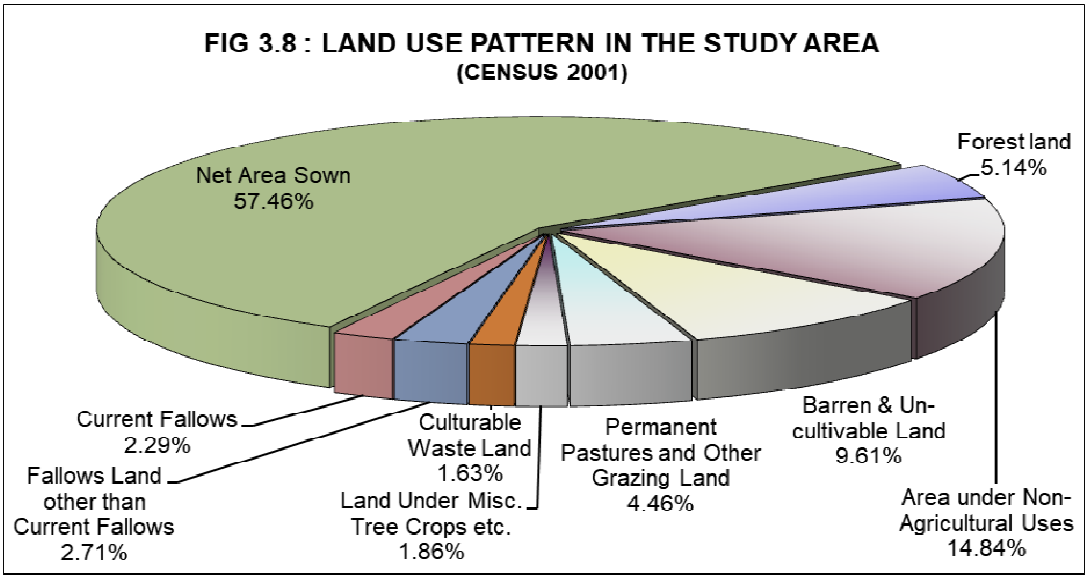
District	Sub District	No. of villages	Area (ha)
Dhenkanal	Parajang	14	3493
	Motunga	52	10063
	Bhushan Steel Ltd.	24	5374
	Balimi	45	11889
	Hindol	31	9881
	Rasol	12	6329
Anugul	Banarpal	44	12739.3
	Bhushan Steel Ltd.	2	249
	Anugul	12	1590
Forest Area			3163.99
Total		**236**	**61607.3**

Detailed break up of landuse pattern within study area is given in **Annexure XVI** and summarised in **Table 3.15**. The landuse pattern is graphically presented in **Fig 3.8.**

TABLE 3.15: LAND USE DETAILS OF STUDY AREA (AS PER CENSUS 2011)

Land use	Area (Ha.)	% of Total Area
Net area sown	35400.48	57.46
Current fallows	1408.06	2.29
Fallows land other than current fallows	1670.35	2.71

Land use	Area (Ha.)	% of Total Area
Culturable waste	1006.2	1.63
Land under misc tree crops	1146.15	1.86
Permanent pastures and other grazing land	2745.87	4.46
Barren land	5921.88	9.61
Area under non agricultural uses	9144.32	14.84
Forest land	3163.99	5.14
Total	**61607.3**	**100**



A perusal of above table shows that 5.14% of total area is forest land, 14.84% is area under non-agricultural uses, 57.46% is net area sown, 4.46% is permanent pastures and other grazing land, 2.29% is current fallows, 9.61% is barren and un-cultivable land, 2.71% is fallows land, 1.63% is culturable waste land and 1.86% land under miscellaneous tree crops.

3.9.3 Land use based on satellite imagery

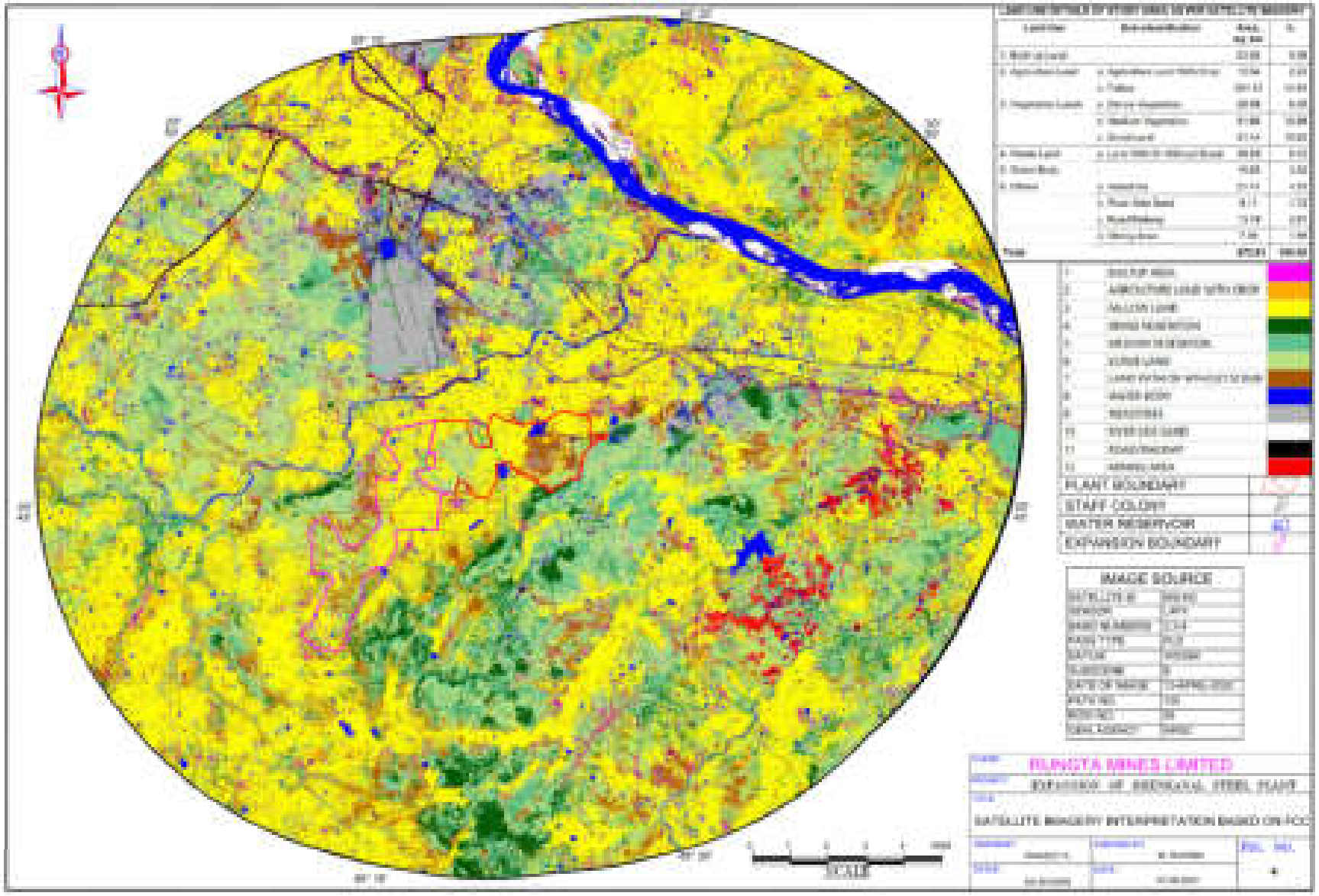
Land use/ land cover information relates to the status, spatial distribution & area extent of different land use categories.

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

Collateral Data : Survey of India Open Source map

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

FIG 3.9: STUDY AREA SATELLITE IMAGERY



3.10 SOIL QUALITY

Soil samples were collected from total four locations as given in **Table 3.16** and shown in **Fig 3.6**. Detail soil analysis result is given in **Table 3.17.**

TABLE 3.16: SOIL SAMPLING STATIONS

Sl. No.	Station No. (Ref. Fig 3.6)	Location	Distance, km & Direction	Distance from*	Soil use
1.	8	Gandijhara	0.8, N	EP	Agricultural
2.	19	Scrub land west side of expansion boundary	0.5, N	PP	Wild vegetated
3.	20	Proposed expansion area Agriculture land	Within	PP	Agricultural
4.	21	Core zone (staff colony existing)	Within	SC	Un-cultivated

* ***Abbreviations: EP- Existing Plant, PP-Proposed Plant, WR-Water Reservoir, SC-Staff Colony***

TABLE 3.17: SOIL TEST RESULT

Parameters	Protocol	Proposed Expansion area, Agricultural land		Scrub land west side of Expansion area		Staff Colony, Core Zone		Gandijhara Village	
Textural Classification	IS 1498:1970	Medium grained sand		Fine grained sand		Fine grained sand		Medium grained sand	
Grain size analysis	IS 2720 (P 4)	% retain	% finer	% retain	% finer	% retain	% finer	% retain	% finer
2.0 mm		32.34	67.66	24.54	75.46	22.28	77.72	39.2	60.8
425 µm		56.11	11.55	16.42	59.04	25.46	52.26	51.38	9.42
75 µm		9.33	2.22	53.23	5.81	44.89	7.37	8.21	1.21
<75 µm		2.22	-	5.81	-	7.37	-	1.21	-
Colour	-	Medium Brown		Reddish		Reddish		Dark Brown	
Organic Carbon (% by mass)	Method no. 9*	0.52		0.21		0.23		0.41	
Organic Matter (% by mass)	Method no. 9*	1.16		0.46		0.52		0.93	
Phosphorous (mg/kg)	Method no. 13*	4.05		2.67		2.84		2.19	

Parameters	Protocol	Proposed Expansion area, Agricultural land	Scrub land west side of Expansion area	Staff Colony, Core Zone	Gandijhara Village
Nitrate-Nitrogen (mg/kg)	Method no. 12*	1.6	0.53	1.96	0.3
Calcium2^+ me/100 gram Soil	Method no. 16.a*	13.7	0.9	1.0	18.7
Magnesium2^+ me/100 gram Soil	Method no. 16.b*	2.60	0.40	0.40	2.50
pH	IS 2720 (P26)	7.3	5.5	5.7	6.1
E.C. (mS/cm)	IS 14767:2000	0.237	0.0567	0.0695	0.0839
$CaCO_3$ (%by mass)	IS 2720 (P23)	5.0	2.5	2.5	5.5
Specific Gravity	IS : 2720 (P 3/Sec 1) -1980	2.32	2.50	2.29	2.54
Moisture (%by mass)	IS 2720 (P 2)	19.894	6.069	7.24	15.348
Sodium (Kg/ha)	Method no. 14*	1122.24	66.08	68.32	88.48
Potassium (Kg/ha)	Method no. 14*	145.0	71.0	58.0	48.0

Source: Test report no.* MMS/06-2021/49 and 50 *dated 16/06/2021 by Min Mec R&D Laboratory

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

Soil analysis results indicate the following:

- The soil is fine to medium grained sand having medium brown, reddish and dark brown colour with pH ranging from 5.5 to 7.3 which is strongly acidic to nearly neutral in nature.
- The EC for all the samples ranges from 0.0567 to 0.237 mS/cm denoting non saline alkali or sodic soils.
- Organic carbon is low except soil sample taken from proposed expansion area, agricultural land where it is found in the medium range.
- All the soil samples are low in Nitrogen and Phosphorous.
- Potassium is low in all soil samples except for the one taken from the proposed expansion area (agricultural land) where it is found to be in medium range.

3.11 ECOLOGY

A strategic balance between physical and biological environment is vital for human survival. Abiotic factors as air, water, soil, climate needs to be

maintained for having a vibrant environment. Imparity in any aspects of sustainable environment can lead to long term damages to the environment. To study floral and faunal species of the study area, a "Site Specific Conservation Plan" for Dhenkanal Integrated Steel Plant & Captive Power Plant has been prepared by Centre for Envotech and Management Consultancy Pvt. Ltd. It has been approved by The Principal Chief Conservator of Forests (Wildlife) & Chief Wildlife Warden, Odisha vide letter No. 10181/CWLW-FDWC-FD-0123-2021 dated 22.10.2021. Extract from the study has also been incorporated in this section. Conservation plan and approval letter is given in **Annexure XVII**.

3.11.1 Forests

Total forest land in the study area as per Census 2011 is 3163.99 ha. There are no National parks, Wildlife Sanctuary, Biospheres reserves within 10 km radius. The nearest sanctuary is Satkosia Gorge WLS at a distance of 18 km in SW direction from the proposed expansion project and nearest National Park is Simlipal National Park at a distance of 139 km, NE.

There are six protected and reserve forests present within 10 km radius of the project. They are listed in **Table 3.18** and their location are shown in **Fig 3.10**.

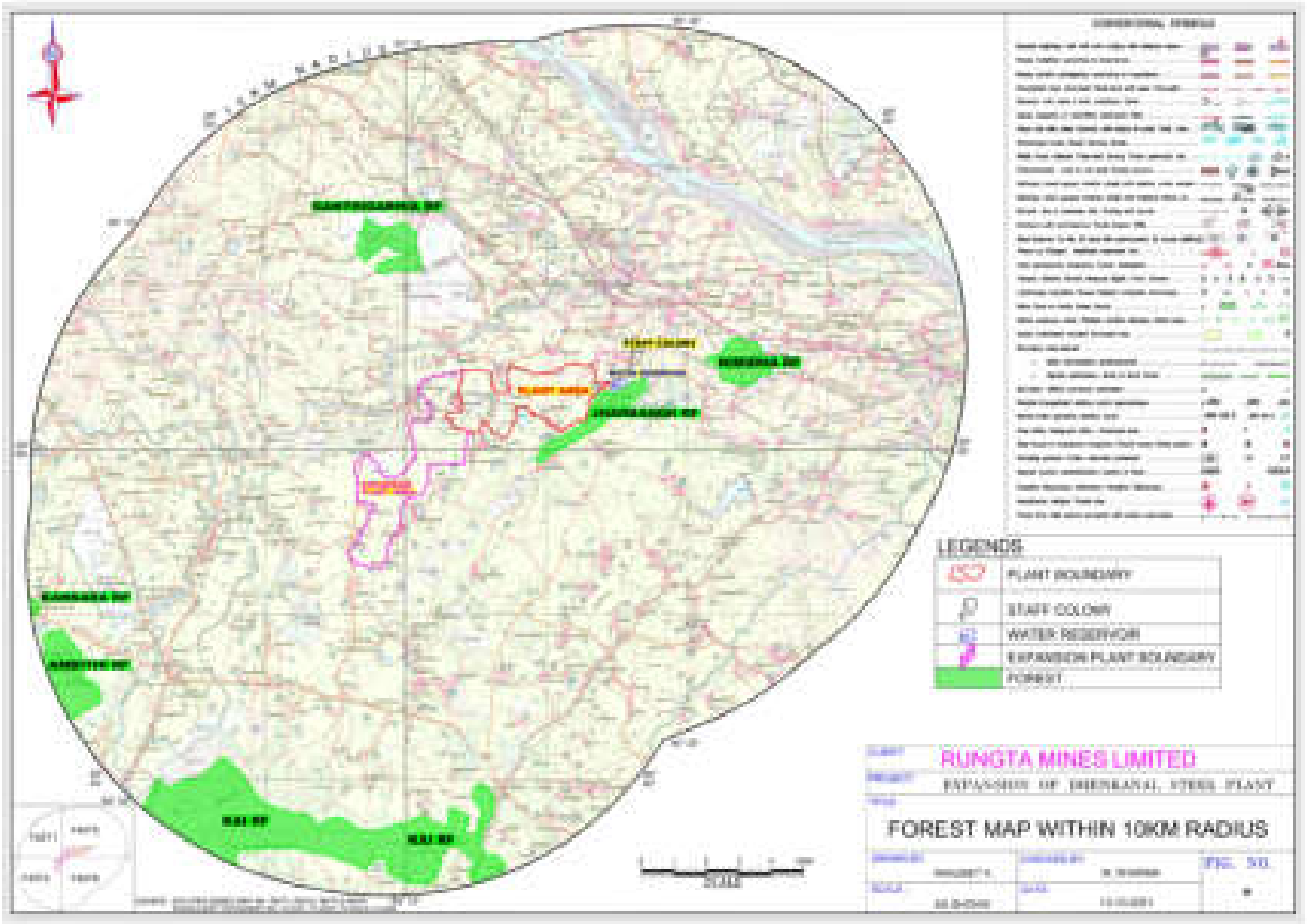
TABLE 3.18: LIST OF FORESTS IN 10 KM RADIUS OF THE PROJECT

Sl. No.	Name of forest	Distance (KM)	From *	Direction
1.	Jharbandh RF	Adjoining	EP	SE
2.	Ganthigarihia PF	3.3	PP	NW
3.	Nimidha RF	2.0	SC	E
4.	Kai R.F.	7.2	PP	S
5.	Kansara R.F.	9.7	PP	WSW
6.	Ambithi RF	8.9	PP	WSW

Abbreviations: EP- Existing Plant, PP-Proposed Expansion Plant, SC-Staff Colony

As per Champion and Seth's classification of the revised forest types of India, the forests of Dhenkanal and Angul Districts are Northern Tropical Moist Deciduous Forest (3C) and Northern Tropical Dry Deciduous Forest (5B) respectively. The dominant tree species in the forest of the study area is Sal. Other tree species present in the study area are Arjun, Mango, Kendu, Char, Neem, Palash, Teak etc.

FIG 3.10: LOCATION OF FORESTS



3.11.2 Flora

Core Zone: Trees, herbs, shrubs are found in the core zone. The survey conducted for enlisting the flora in the core zone indicates 16 species of trees, 7 species of shrubs, 6 of herbs, 4 species of grasses. Plantation has been done by the company in about 44 acres, out of the 584 acres green belt of the sanctioned EC. *S*ome of the trees found in the core zone are Babool, Mango, Neem, Jamun etc. while herbs, shrubs and climbers are Morning glory, Jatropha, Tulsi, Duba etc. List of flora found in core zone is given in page 15-17 of Conservation Plan in **Annexure XVII.** Approximately 18000 trees are present in the proposed expansion area. Even though the toposheet (**Fig 3.10**) shows a mango garden in north eastern corner, no such garden exists as on date.

Buffer Zone: Floral in buffer zone comprises 75 species. These include 43 species of trees, 16 species of shrubs, 8 species of herbs, 2 species each of climbers and bamboo and 4 species of grasses. Complete list of floral species are listed in page 19-22 of Conservation Plan given in **Annexure XVII.** Some of the species of trees are Babul, Char, Karanj, Mango, Neem, Palas, Teak, etc. Herbs, shrub, bamboo, grass and climbers found in study area include Kanta bas, Jatropha, Kaner, Tulsi, Ban Tulsi, Makal, Dhuba etc. The toposheet (**Fig 3.10**) also shows presence of dense jungle, mainly Sal on hillock near Naraharipur and scattered patches of open Sal in the study area. Various types of plant species, cropping pattern, plantation on roads etc. are discussed in subsequent paragraphs.

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 3.19.**

TABLE 3.19: AREA UNDER MAJOR FIELD CROP & HORTICULTURE IN DHENKANAL DISTRICT

Sl. No.	Particulars	Total Area (Ha)
Major Field Crop Cultivated		
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		
1.	Mango	8.4
2.	Citrus	0.9
3.	Cashew	1.7
4.	Coconut	1.1
5.	Banana	0.5

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

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

Plantation on roads: Plantation of species on the roadside are *Acacia nilotica, Albizia lebbek, Azardirachta indica, Butea monosperma, Cassia fistula, Dalbergia sisoo, Diospyros melanoxylon, Ficus benghalensis, Ficus glomereta, 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, Eucalyptus, and cashew plantations are also present in the study area, the location of which is visible on the toposheet (**Fig 3.10**).

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

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

3.11.3 Fauna

As discussed earlier, a “Site Specific Conservation Plan” for Dhenkanal Integrated Steel Plant & Captive Power Plant has been prepared and approved by Principal chief Conservator of Forests (Wildlife) & Chief Wildlife

Warden, Odisha. Copy of Conservation Plan and approval letter are enclosed as **Annexure XVII.**

Core zone: Fauna in the core area is less as compared to buffer area. 9 species of mammals, 8 species of reptiles, 16 species of birds are found from the core zone. Avifaunal species found are House Crow, Indian mynah, owl, Blue rock pigeon, Jungle crow, Grey partridge, parakeet etc. Mammals found are five stripped palm squirrel, common mongoose, Indian Hare, house rat etc. Reptiles reported are krait, garden lizard, chameleon, house gecko, rat snake etc. List of fauna found in core zone is given in page 17-18 of Conservation Plan in **Annexure XVII.**

Buffer zone: A total of 7 species of mammals, 8 species of reptiles and 7 species of birds from Dhenkanal Division. The mammalian species observed in the study area are mongoose, squirrel, elephant etc. Bird species observed are Indian myna, owl, pigeon, house crow etc. and reptiles are common krait, garden lizard, chameleon etc. List of fauna found in buffer zone is given in page 22-23 of Conservation Plan in **Annexure XVII.**

As per the field observation done while preparing conservation plan, there is no endemic species found either in the Core or in Buffer zone. As per conservation plan, Elephant, Sloth bear and Python are found in Dhenkanal and Angul Forest Division. Based upon the elephant census report 2017, there are 169 elephants present in the Dhenkanal Forest Division which includes 30 male, 94 female 15 unknown sex and 10 young and 45 number. in Angul Forest Division, which includes 13 male, 22 female and 10 young. Elephant movement has been noticed along the N.H. 55, railway line, water course mainly along the Rengali Right Canal and villages of paddy dominated area

Details of endangered, endemic and RET (Rare Endangered Threatened) species as per survey done by team of Centre for Envotech and Management Consultancy Pvt. Ltd. is given in **Table 3.20**.

TABLE 3.20: LIST OF RARE, ENDANGERED & THREATENED (RET) AND ENDEMIC SPECIES

Type	List of Species
Rare, endangered & threatened (RET) species	Sloth bear (*Melursus ursinus*) Indian Rock Python (*Python molurus*) Indian Elephant (*Elephas maximus*)
Endemic species	Nil

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 existing project boundary have been resettled in village Nimabahali and paid compensation. In the proposed expansion phase there are approximately 30 households with 126 persons in Benipathar and Chandrasekharpur villages. These households will be displaced and rehabilitated.

Buffer Zone: There are 236 inhabited villages in the buffer zone of the study area. The total population within the study area is 270396. The district and sub district wise population as per Census 2011 records is given in **Table 3.21**.

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

District	Sub District	No. of villages	No. of households	Total population	Males	Females
Dhenkanal	Parajang	14	3876	15080	7638	7442
	Motunga	52	12549	53075	27709	25366
	Bhushan Steel Ltd.	24	5,188	22301	12,030	10,271
	Balimi	45	12,057	47,592	24,376	23,216
	Hindol	31	7851	32164	16407	15757
	Rasol	12	5901	24412	12557	11855
Anugul	Banarpal	44	15184	66572	34418	32154
	Bhushan Steel Ltd.	2	272	1,098	558	540
	Anugul	12	1825	8102	4145	3957
Total		**236**	**64703**	**270396**	**139838**	**130558**

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 3.22**. The population of SC & ST and sex wise break-up of literacy levels are shown in **Fig 3.11** and **3.12** respectively.

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

Sl. No.	Description	Population	Percentage
1	**Total Population**	270396	100
1.1	Male Population	139838	51.72
1.2	Female Population	130558	48.28
1.3	Females/1000 males	934	-
2	**No. of households**	64703	-
2.1	Family size, persons/family	4-5	-
3	**Caste wise break up**		
3.1	Schedule caste	61431	22.72
3.2	Schedule Tribe	15196	5.62
4	**Literacy**		
4.1	Total literates	187896	69.49
4.2	Male literates	106561	39.41
4.3	Female literates	81335	30.08

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

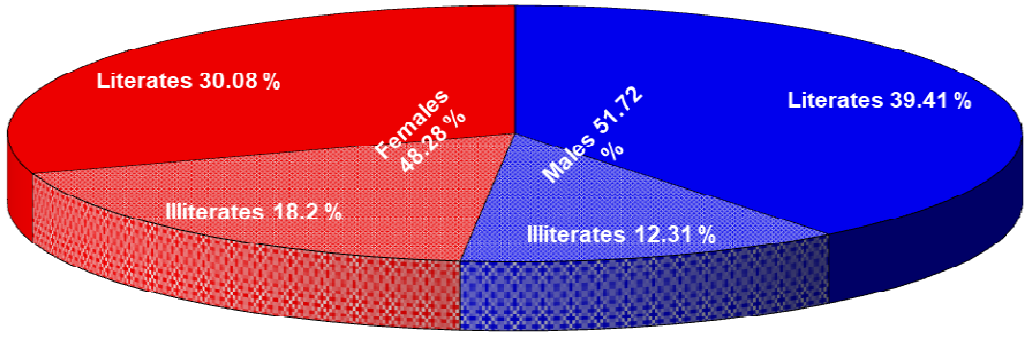
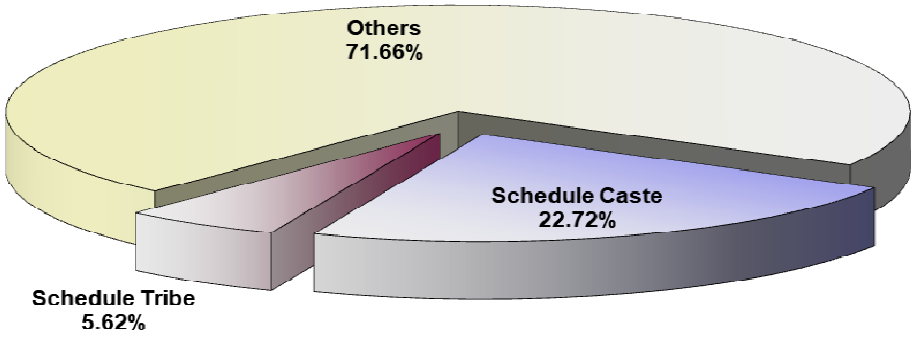


FIG 3.12 : BREAK UP OF SC & ST IN THE STUDY AREA
(CENSUS 2011)



Mostly the population is rural and the percentage of Scheduled Tribes is 5.62% and Schedule Castes is 22.72% of the total population. The male population exceeds female population. The average family size is 4-5 persons per family. The literacy level is approximately 69.49% and it is lower among females (30.08%) then males (39.41%). There are 934 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 3.23.**

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

Description	Numbers	%
Main workers	65124	24.08
Marginal workers	28179	10.42
Non workers	177094	65.49
Break-up of main workers		
Cultivators (%)	11650	17.89
Agricultural labours (%)	11249	17.27
Household industries (%)	3030	4.65
Other workers (%)	39193	60.18
Total	**65124**	**100**
Break-up of marginal workers		
Cultivators (%)	2408	8.55
Agricultural labours (%)	13495	47.89
Household industries (%)	1382	4.90
Other workers (%)	10894	38.66
Total	**28179**	**100**

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

FIG 3.13 : EMPLOYMENT PATTERN IN THE STUDY AREA
(CENSUS 2011)

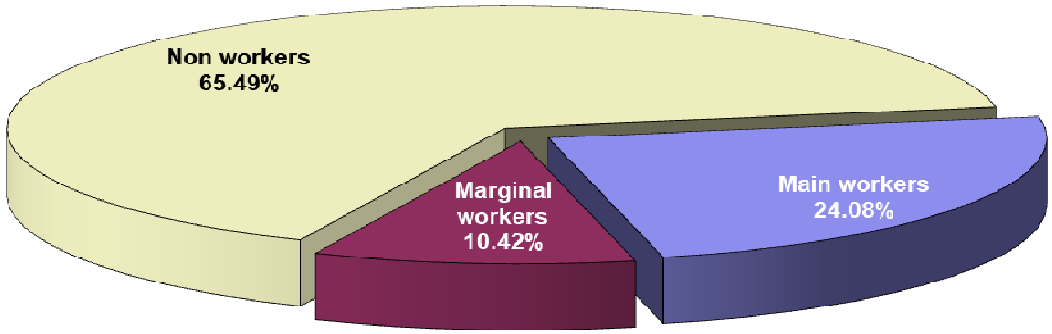


FIG 3.14 : BREAK UP OF MAIN WORKERS IN THE STUDY AREA
(CENSUS 2011)

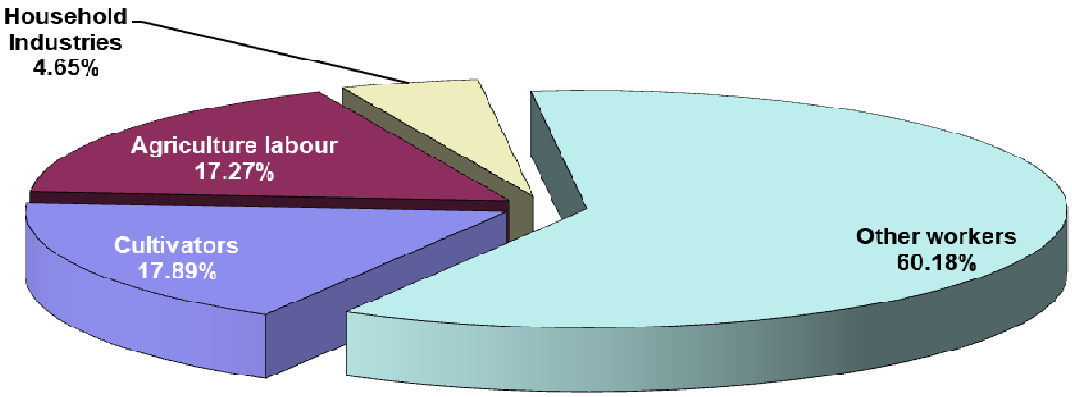
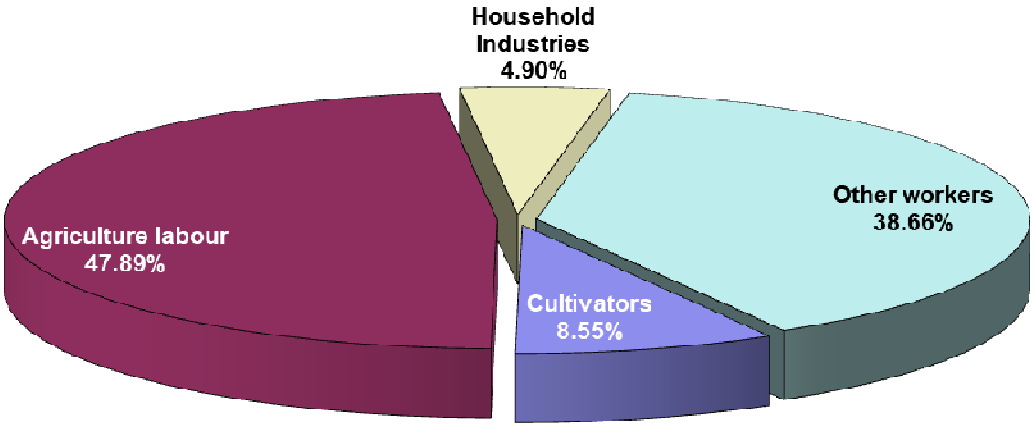


FIG 3.15 : BREAK UP OF MARGINAL WORKERS IN THE STUDY AREA
(CENSUS 2011)



3.12.3 Amenities

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

TABLE 3.24: AMENITIES AS PER CENSUS 2011

Education	Towns	Govt. Primary School (Nos.)	4
		Govt. Middle School (Nos.)	2
		Govt. Secondary School (Nos.)	2
		Govt.-Non Formal Education (Nos.))	12
	Villages	PPS (Pre-Primary School)	9
		PS (Primary school)	304
		MS (Middle school)	154
		SS (Secondary school)	77
		SSS (Sr. Sec. School)	21
		DCAS (Deg. College Arts & Science only)	10
		EC (Engg. College)	3
		MC (Medicine College)	2
		MI (Management Institute)	3
		P (Polytechnic)	4
		VTS/ITI (Vocational Training School/ITI)	13
	Towns	Dispensary/Health Centre (Nos.)	2
		Maternity Home Nearest facility Distance (in kms.)	7
		Nursing Home (Nos.)	1
		Non-Government Medicine Shop (Nos.)	4
Medical and health care	Villages	PHC (Primary Health Centre)	1
		PHSC (Primary Health Sub-Centre)	28
		MCWC (Maternity And Child Welfare Centre)	11
		TBC (TB Clinic)	2
		HA (Hospital Allopathic)	5
		HAM (Hospital Alternative Medicine)	2
		D (Dispensary)	14
		VH (Veterinary Hospital)	9
		FWC (Family Welfare Centre)	6
		NGMF-OP (Non Govt. Med. facilities Out Patient)	2
		NGMF-MBBS (Non Govt. Med. facilities Medical Prctitioner with MBBS Degree)	8
		NGMF-OD (Non Govt. Med. facilities Medical Prctitioner with other Degree)	4
		NGMF-ND (Non Govt. Med. facilities Medical Practitioner with no Degree)	1
		NGMF-TPFH (Non Govt. Med. facilities Traditional Practitioner and Faith Healer)	1
		NGMF-MS (Non Govt. Med. facilities Medicine Shop)	86

		NGMF-O (Non Govt. Med. facilities Others)	1
Power Supply	Towns	Electricity-Domestic Connection (Nos.)	785
		Electricity-Industrial Connection (Nos.)	4
		Electricity-Commercial Connection (Nos.)	29
		Electricity-Road Lighting Connection (Nos.)	11
		Electricity-Others Connection (Nos.)	11
	Villages	PSDU (Power Supply For Domestic Use)	212
		PSIAU (Power Supply ForAgriculture Use)	88
		PSALL (Power Supply For All Users)	81
Communication System	Villages	PO (Post Office)	34
		SPO (Sub Post Office)	15
		P&T (Post & Telegraph office)	11
		PIN (Village PIN code)	233
		T (Telephone (landline))	149
		PCO (Public Call Office/ Mobile PCO)	50
		MPC (Mobile phone coverage)	216
		IC/CSC (Internet Cafes/Common Service Centre)	7
		PCF (Private Courier Facility)	34
Transport System and Approach	Towns	Pucca Road Length (in kms.)	10.1
		Kutcha Road Length (in kms.)	10.6
	Villages	PBS (Public Bus Service)	46
		PvtBS (Private Bus Service)	76
		RS (Railway station)	16
		MA (Auto/Modified Autos)	103
		Taxi (Taxi)	65
		Van (Vans)	14
		T (Tractors)	112
		CPR-Man (Cycle-pulled Rickshaws (manual driven))	229
		CDA (Carts Drivens by Animals)	205
		S/R/FS (Sea/River/Ferry Service)	33
		Number Villages connected to :	
		NH (National Highway)	29
		SH (State Highway)	24
		MDR (Major District Road)	52
		ODR (Other District Road)	96
		BTPR (Black Topped (pucca) Road)	143
		GCR (Gravel (kuchha) Roads)	214
		WBM (Water Bounded Macadam)	32
		AWR (All Weather Road)	156
		NWR/C (Navigable Waterways (River/Canal))	36
		FP (Foot Path)	233
Drinking water,	Towns	Latrines-Pit (Nos.)	745
		Latrines-Flush/Pour Flush (Nos.)	922
		Latrines-Others (Nos.)	9
Water supply and Sanitation	Villages	TWUT (Tap Water Untreated)	20
		CW (Covered Well)	2
		UW (Uncovered Well)	216
		HP (Hand Pump)	228

		TW/ BW (Tube Wells/Borehole)	9
		S (Spring)	43
		R/C (River/Canal)	89
		T/P (Tank/Pond/Lake)	214
		WO (Others)	9
Banks and Commercial Societies	Towns	Nationalised Bank (Nos.)	1
		Agricultural Credit Society (Nos.)	2
	Villages	ATM (ATM)	3
		CB (Commercial bank)	3
		COB (Co-operative bank)	4
		ACS (Agricultural Crredit Societies)	6
		SHG (Self-Help Group (SHG))	216
		PDS (Public Distribution System (PDS))	151
		M/RM (Mandis/Regular Market)	29
		WH (Weekly Haat)	39
		AMS (Agricultural Marketing Society)	16
		NCICDS (Nutritional Centres-ICDS)	53
		NCAC (Nutritional Centres-Anganwadi Centre)	203
		NCO (Nutritional Centres-Others)	6
		ASHA (ASHA)	216
		CC-TV (Community Centre with/without TV)	90
Sports and Entertain-ment	Villages	SF (Sports Field)	110
		SC/RC (Sports Club/Recreation Centre)	91
		C/VH (Cinema/Video Hall)	1
		PL (Public Library)	18
		PRR (Public Reading Room)	18
		DNS (Daily Newspaper Supply)	215
		APS (Assembly Polling Station)	166
		BDRO (Birth and Death Registration Office)	6

3.13 INDUSTRIES

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

TABLE 3.25: LIST OF INDUSTRIES IN STUDY AREA

Sl. No.	List of industries and mines	Distance (km) /direction	Distance from*	Operational status
1.	MGM Steel's sponge iron unit & WHRB	1.8	SC	Operational
2.	Navbharat Ventures Ltd.'s Ferro-chrome plant and power plant	3.7	EP	Operational
3.	Tulsidiha Ferro-alloys plant, Mangilal Rungta Pvt. Ltd.	2.3	EP	Operational
4.	TATA steel BSL (earlier known as Bhushan	1.1	PP	Operational

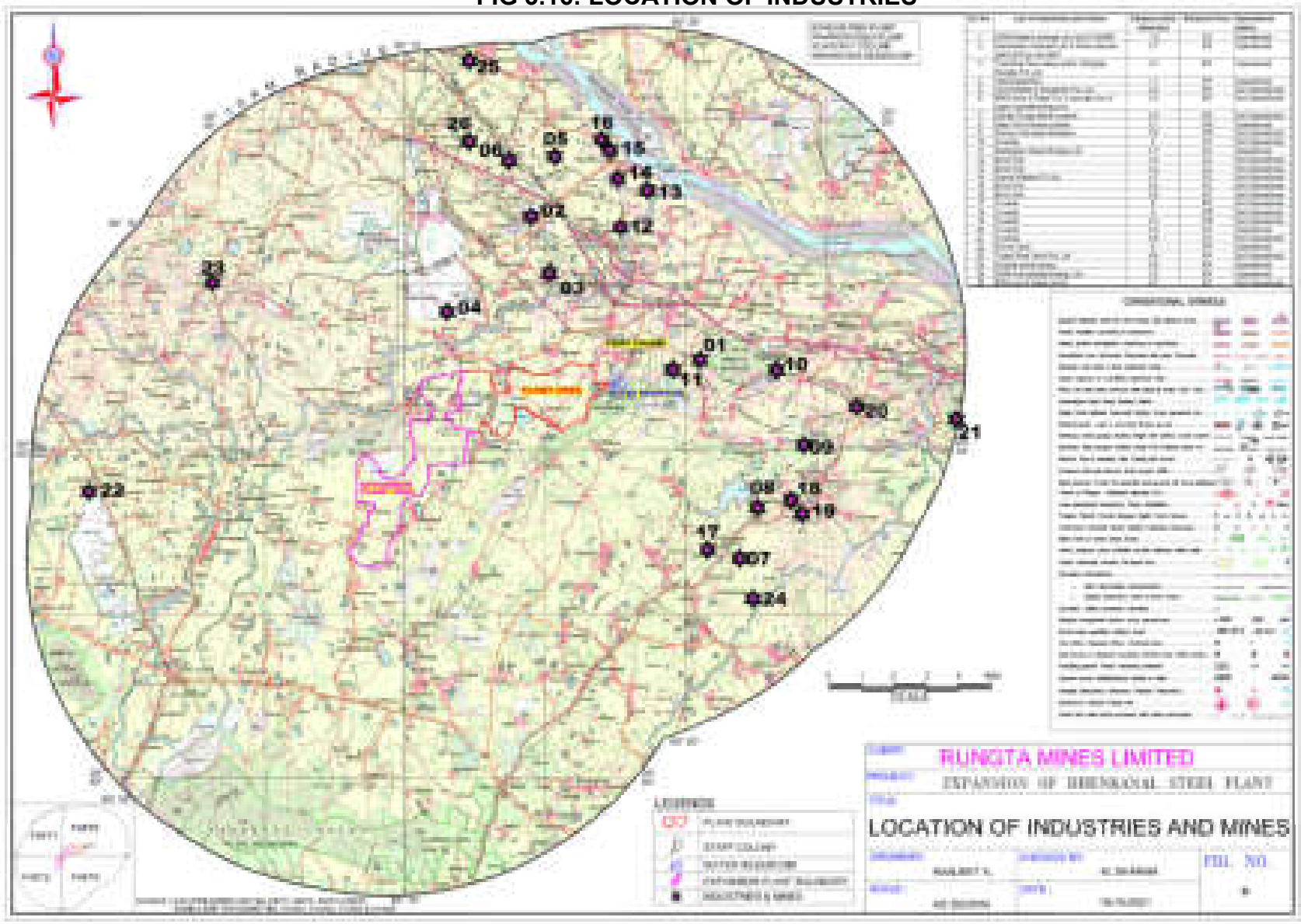
Sl. No.	List of industries and mines	Distance (km) /direction	Distance from*	Operational status
	Steel Limited)			
5.	Hind Metals & Industries Pvt. Ltd.	5.2	EP	Not Operational
6.	BRG Irons & Steel Co.'s sponge iron & ingot manufacturing unit	5.3	EP	Not Operational
7.	Kanak Durga stone crusher	5.6	EP	Not Operational
8.	Maa Torini stone crusher	5.1	WR	Operational
9.	Stone mine area Goplapur	5.6	WR	Not Operational
10.	Crusher	4	SC	Not Operational
11.	Salibahan Green Energy Ltd.	0.7	SC	Operational
12.	Brick Kiln	3.4	SC	Not Operational
13.	Brick Kiln	4.4	SC	Not Operational
14.	Samal Metals (P) Ltd.	4.7	SC	Not Operational
15.	Brick Kiln	5.5	SC	Not Operational
16.	Brick Kiln	5.9	SC	Not Operational
17.	Crusher	5	EP	Not Operational
18.	Crusher	6	WR	Not Operational
19.	Crusher	6.3	WR	Not Operational
20.	Crusher	6.5	SC	Operational
21.	Crusher	9.8	SC	Not Operational
22.	Power Grid	8	PP	Operational
23.	Tulasi Rice Tech Pvt. Ltd.	6.9	PP	Not Operational
24.	Granite stone quarry	6.9	EP	Operational
25.	GMR Kamalanga Energy Ltd.	9.2	EP	Operational
26	BRG Iron & Steel Unit-III	6.7	ET	Not Operational

Abbreviations: EP- Existing Plant, PP-Proposed Plant, WR-Water Reservoir, SC-Staff Colony

3.14 PLACES OF TOURISM/ RELIGIOUS/ HISTORICAL INTEREST

There is no important archaeological (ASI)/ historical place or other place of tourist or religious importance within the study area except village temples and mosques. Nearest monument is at Sulanali village at 80 m. Toposheet shows monuments near Garha Santri-Arahata village road, Pirhhasahi-Taltali road, Pirhhasahi-Ganthigarhia PF road, Angarabandha- Phulaparha road, Kankinali-Barasingha road, Barasingha - Purikie road, near Kalandapal village, durgaprasadpur village, Kansara village, Santarapur village, all at distance of 5.3 km and beyond.

FIG 3.16: LOCATION OF INDUSTRIES



3.15 SEISMICITY

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

3.16 RAW MATERIAL AND SLAG ANALYSIS

This is a proposed project. One D.R.I. (1X500 TPD), induction furnace (2X20T), caster and power plant unit is under operation in the existing plant. The raw materials such as iron ore and scrap have been analysed in other operational steel plant of the company, namely, Kamanda Steel Plant, Odisha and slag analysis have been analysed in operational steel plant of the company, namely Chaliyama Steel Plant, Jharkhand

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

TABLE 3.26: ANALYSIS OF RAW MATERIAL (CONCENTRATION IN µg/m^3)

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

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

TABLE 3.27: TCLP TEST RESULTS FOR SLAG

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

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

CHAPTER 4

ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 GENERAL ASPECTS

Environment Management Plan for expansion of Dhenkanal Steel Plant of M/s Rungta Mines Ltd. (RML) has been prepared for the proposed enhancement of production capacity from 3.55 to 7.53 MTPA steel by addition of various facilities. The proposed plant will be established within the existing sanctioned area (1769 acres) as well as in additional area adjacent to it (1800 acres). The plant will have an impact on land, air, water, noise, soil, ecology, socio-economics, etc.

The environment management plan includes the evaluation of total impacts after superimposing the predicted impacts over the base line data. This helps in incorporating suitable 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 volume
- Ecology
- Socio-economic environment
- Occupational health and safety
- Historical Monuments & any others

The beneficial impacts anticipated from an industrial project are usually the employment opportunities available and the activities carried out in the surrounding villages under corporate social responsibility/ social welfare.

4.2 TOPOGRAPHY AND DRAINAGE

4.2.1 Topography

Impact: The core zone represents almost flat but sloping land. The elevation of the existing as well as expansion plant area varies from 65 to 108 m amsl. The entire land is devoid of topographical features like hills but has portions of low lying areas. As in October 2021, 1X500 TPD DRI, 2x20T IF, 1x3 strand CCM and 25 MW CPP is under operation and 1X500 TPD DRI, 3x20T IF, 0.5 MTPA wire rod mill, 2.948 MTPA pellet plant and 25 MW CPP is under construction as per previous environmental clearances.

Change in topography will occur in core zone (existing & expansion areas) due to digging and filling, construction of the plant buildings, boundary walls, stock yards, water reservoir, roads, etc. A colony will also be constructed in 34 acres. The ground will be leveled, where required. There will be a permanent change in the topography due to construction activities. The construction once achieved will not be reversed.

There will be impact on topography of the buffer zone also, outside plant boundary, due to construction related to the steel plant. These construction will take place in an additional 3.14 acres land, in Jharbandh village, to meet the residential accommodation requirements of the plant personnel. 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.

Management: Some of the management measures, despite permanent change in topography, will be as follows:

- Utilisation of cutting material for filling to avoid generation of earth for disposal
- Utilisation of slags & ash from existing plants of the company in Odisha (e.g. Kamanda/ Karakolha/ Karakhendra steel plant) for leveling and raising plinth, thus, utilising solid waste and eliminating the need to bring earth from outside the plant area
- Utilisation of the stones found during ground levelling & construction activities by breaking into small size for use as aggregates
- Provision of storm water drains to prevent water logging due to change in topography
- Landscaping and tree plantation to protect against soil erosion and subsequent change in topography during heavy rains

4.2.2 Drainage-Impact & Mitigation

Existing plant - When the EC dated 11.09.2019 was obtained for 674.765 acres of project area, there were six seasonal ponds, of which four were within/ very near the earmarked green belt area. These four ponds were

proposed to be conserved and developed as water bodies. These would be connected to the proposed Raw Water Reservoir and will facilitate rain water harvesting. Subsequent to this, the plant was expanded to 1769 acres and EC obtained on 15.02.2021. A perusal of the toposheet shows that in this plant area, five first order seasonal streams, one second order stream, one stream emanating from reservoir project near Tarkabeda, one aqueduct, seventeen ponds and the sheet flow of rain water are being and shall get affected within the core zone due to installation of buildings. Although the ponds are rain-fed, some of the ponds contain water all through out the year. Construction has been partly carried out, partly is ongoing and partly will be done in future as per construction plan. Storm water drains have been planned and getting constructed along the roads and rain water will harvested through these and stored in raw water reservoir.

Proposed expansion - In the 1800 ha expansion area, there exist three first order drains between the villages Naraharipur and Kantimili, who join into join together into a second order stream near Benipathar and flow into the existing plant area, finally meeting Lingara Nadi (also known as Nigra Nadi). These first order drains will get disturbed in plant area and the evacuation of rain water shall occur through storm water drains planned along northern side of the facilities. There exist 11 ponds in the expansion area as seen in google earth accessed on 16.10.2021. Although the ponds are rain-fed, some of the ponds contain water all throughout the year. Out of these, 6 ponds shall get removed and 5 ponds can be preserved as part of the greenbelt area. Storm water drains have been planned along the roads and rain water will harvested through these and stored in raw water reservoir or recharged through rain water harvesting structures. Excess rain water shall be released to Lingara Nala after settlement and monitoring of pH. In areas where there are raw material stock yards, storm water drains will be constructed around them, garlanding them. This water will be led to a separate settlement tank with water quality monitoring facility before the water is sent further for storage in raw water reservoir or discharge to Lingara Nala.

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 will become 3569 acres (1444.35 ha) and rainfall in the area is 1277.5 mm. Thus, maximum possible runoff volume getting affected can be 1.11 MCM/ annum (refer Table 4.11 later) of which 93% occurs in June-October.

The seasonal drains flow into Lingra Nala, which joins Brahmani river. Brahmani river flow was estimated as 145.39 cum/s on 14.07.2010 as per “Report on Discharge Measurement Survey of River Brahmani in and around Dhenkanal, Orissa” by Geosolution Pro Services Pvt. Ltd. As per the website https://indiawris.gov.in/wris/#/RiverMonitoring (accessed 16.10.2021) and the “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 1.11 MCM, which is 0.008% of the likely flow in Brahmani river with 50% dependability. Thus, the impact shall be negligible on the flow of Brahmani river.

Buffer zone: Impact on the drainage in the buffer zone is not anticipated as no drainage feature will be disturbed due to construction for residential requirement (3.14 acres) and approach road (12.9 acres).

4.3 CLIMATE AND METEOROLOGY- IMPACT AND MITIGATION

a) Construction phase

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

b) Operation phase

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

The stack emissions are associated with thermal pollution. The thermal pollution will be restricted to a smaller area around the stacks till the air cools naturally.

Due to concrete buildings heat island phenomenon will occur which will be localized and manifest itself in the premises of the plant. Due to reservoir and greenbelt, cooling effect will also be there. Therefore, low magnitude impact on micro-climate shall be there, which can be nullified to some extent through greenbelt and water reservoir.

The regional 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 for climate management.

Further, carbon dioxide (green house gas) contributing fossil fuels will be in the form of diesel and auxiliary oil shall be used to operate trucks, vehicles and rolling mill, start up firing of boilers, etc which will be a necessity. 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, blast furnace, pellet plant, sinter plant and coke oven, to some extent. The CO_2 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:

TABLE 4.1: LIKELY CARBON DIOXIDE EMISSIONS FROM THE 7.0185 MTPA PLANT

Raw material	Quantity, TPA	Fixed carbon content %		Quantity of CO_2 likely to be released, TPA/annum**
Coal & coal fines*	9914827	35.09		1,27,56,747
Coking coal	4152500	40		6090333
Coke	2143120	80-86 (consider 83)		6522229
Coke breeze & fines	1109627			3376965
Diesel/ other oil	153300	85		477785
		Mol. weight		
		Material	CO_2	
Dolomite $[CaMg(CO_3)_2]$	2248868	184	44	537773
Limestone $[CaCO_3]$	10873534	100	44	4784355
Total				**34546186**

Note :

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

** ***It is assumed that entire carbon from fuels by forming CO_2 and one CO_2 molecule from limestone & dolomite will be released***

In order to sequester CO_2, plantation is a suitable and sustainable method. Hence, 33% of the plant area shall be under greenbelt.

4.4 AIR QUALITY

4.4.1 Impact on air quality

a) Construction phase

The construction and erection of proposed plant and equipment will generate dust resulting in higher SPM levels in surrounding area. Further due to deployment of various mechanical equipment and transport vehicle, enhanced SO_2 and NO_2 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 3569 acres (1444.35 ha) but the construction activity will occur only in a part according to the implementation plan given in Table 2.50 of Chapter 2. Even in the existing plant area of 1769 acres, the construction has taken place for only 1X500 TPD DRI kiln, 2X20 T IF and 25 MW power plant and additional construction is underway for 2.948 MTPA pellet plant, 1X500 TPD DRI kiln, 3X20 T IF and 25 MW power plant is taking place in part of the land. Balance facilities are going to be established as per plan. Similarly, in expansion area also, facilities will be established gradually. The duration of the construction activity will last as long as it has been scheduled.

The likely impacts on air quality during the construction phase are comparatively low and reversible, and manageable through periodic maintenance and efficient operation of construction/erection equipment as well as periodic sprinkling.

b) Operation phase

During operation phase, the operation of various units would discharge particulates and gaseous pollutants, which must be controlled before discharge into atmosphere. Generation and discharge of pollutants have been considered as follows:

(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.

(III) Emissions from exhaust and airborne dust from roads due to plying of vehicles for transportation of raw materials, solid waste and products

4.4.1.1 Stack emissions

The details of stacks and stack emissions after installation of air pollution control measures (bag filter, ESP, scrubbers, etc) for existing (operational, under construction and to be constructed as per EC dated 15.02.2021) and proposed units (for expansion to 7.53 MTPA) are summarized in **Table 4.2**. The stacks S001 to S011, S053, S086 and S094 are part of the existing

operation as per the CTO dated 06.05.2021. Stacks S001 to S097 are part of the sanctioned 3.55 MTPA plant, out of which only the aforementioned stacks (and the units they are attached to) have become operational fully/ partially. Stacks S021, S026 and S027 are under construction for the pellet plant, 1X500 TPD DRI plant, 2X20 T IF, 0.5 MTPA wire rod mill, 2.948 MTPA pellet plant and 25 MW CPP. However, since the detailed designing is taking place progressively for the 3.55 MTPA sanctioned plant, hence, some stacks have had to undergo revision as follows:

- ✓ Since one 1x500 TPD Kiln has been established and another 1X500 TPD kiln is under construction, the stack height have been increased from 80 m to 85 m as per actual implementation. The other DRIs have also been revised accordingly, commensurate with their capacities.

- ✓ The configuration of the cement plant sanctioned in EC dated 15.02.2021 has been revised from 1X2600 TPD + 1X2300 TPD to 2X2500 TPD. Hence, the corresponding stack data has also been revised.

- ✓ Since one 125 TPH boiler has been established and another 125 TPH boiler is under construction, the stack data has been revised as per actual implementation

- ✓ The location of several of the units that are yet to be established has been revised within the layout sanctioned in EC dated 15.02.2021. Hence, the coordinates of the stacks have change and the previous model results do not hold good for the revised layout.

The balance stacks (S098 to S150) will be established in expansion phase for achievement of 7.53 MTPA production. In the expansion phase 5X900 TPD DRI kilns are proposed and same is given in TOR dated 13.08.2021. From the point of view of flexibility, the company is desirous of also considering an alternative of 6X650 TPD + 1x600 TPD DRI kiln configuration instead of 5X900 TPD but with no change in total production (2.156 MTPA) or raw material requirement. Hence, the stack data for 6X650 + 1x600 TPD kilns has also been considered and given in as Stack No. S151 to S154 at the end of the table.

TABLE 4.2: STACK DATA FOR PROPOSED 7.53 MTPA STEEL PLANT

Stack	Stack name	Height (m)	Dia (m)	Exit gas Volume (m^3/s)	Exit gas Velocity (m/s)	Temp (°C)	Emission rate (µg/s)			
							PM_{10}	$PM_{2.5}$	SO_2	NOx
A	**SANCTIONED UNITS IN EC DATED 15/02/2021 (FOR 3.55 MTPA PLANT)**									
1.0	**DRI PROCESS STACKS (2X500TPD, 3x600TPD & 2X900TPD)**									
1#	DRI-I: 2x500 TPD Kiln WHRB Stack	85	3.9	189.033	15.83	150	1372500	789188	15954376	79609
2#	Iron ore circuit	30	1	13.146	16.75	50	125000	71875	-	-
3#	Coal discharge House	30	1.2	19.719	17.44	50	187500	107813	-	-
4#	Day Bin -1	30	0.8	8.216	16.35	50	78125	44922	-	-

Stack	Stack name	Height (m)	Dia (m)	Exit gas Volume (m^3/s)	Exit gas Velocity (m/s)	Temp (°C)	Emission rate (µg/s)			
							PM_{10}	$PM_{2.5}$	SO_2	NOx
5#	Coal feed Injection	30	0.35	1.972	20.51	50	18750	10781	-	-
6#	Iron feed	30	0.35	1.972	20.51	50	18750	10781	-	-
7#	CD Building	30	1.35	24.649	17.23	50	234375	134766	-	-
8#	I bin	30	1.35	24.649	17.23	50	234375	134766	-	-
9#	Day bin-2	30	1	16.433	20.93	50	156250	89844	-	-
10#	Product storage building	30	1	16.433	20.93	50	156250	89844	-	-
11#	Coal screen house	30	1.55	32.865	2.34	50	312500	179688	-	-
12	DRI-II: 2x600 TPD Kiln WHRB Stack	90	4.0	226.840	18.06	150	1647000	947025	17582374	87733
13	DRI-II: 1x600 TPD Kiln WHRB Stack	90	3.0	113.420	16.05	150	823500	473513	8791187	43866
14	DRI-III: 2x900 TPD Kiln WHRB Stack	95	4.7	340.259	19.62	150	2470500	1420538	26373560	131599
	DRI KILNS–DE-DUSTING STACKS									
15	DRI-II: Plant Dedusting (RMHS)	35	2	39.438	12.56	50	375000	215625	-	-
16	DRI-II: Plant Dedusting (CDH)	30	1.8	24.669	9.70	100	203125	116797	-	-
17	DRI-II: Plant Dedusting (PSB)	35	2	39.438	12.56	50	375000	215625	-	-
18	DRI-III: Plant Dedusting (RMHS)	35	2.2	47.655	12.54	50	453125	260547	-	-
19	DRI-III: Plant Dedusting (CDH)	30	2	30.362	9.67	100	250000	143750	-	-
20	DRI-III: Plant Dedusting (PSB)	35	2.2	47.655	12.54	50	453125	260547	-	-
2.0	**PELLET PLANT (5X3.75 MTPA + 10X 1.0 MTPA)**									
21	(I) 3.75 MTPA Induration furnace	90	6.5	420.838	12.69	167	2937500	1689063	833801	266094
22	(II) 3.75 MTPA Induration furnace	90	6.5	420.838	12.69	167	2937500	1689063	833801	266094
23	(II) 3.75 MTPA Induration furnace	90	6.5	420.838	12.69	167	2937500	1689063	833801	266094
24	(II) 3.75 MTPA Induration furnace	90	6.5	420.838	12.69	167	2937500	1689063	833801	266094
25	(II) 3.75 MTPA Induration furnace	90	6.5	420.838	12.69	167	2937500	1689063	833801	266094
26	Raw Material Handling Stack	30	1.8	34.158	13.43	100	281250	161719	-	-
27	Finished Product Handling Stack	30	1.8	34.158	13.43	100	281250	161719	-	-
28	(II) 1.0 MTPA Induration furnace	60	4	194.250	15.47	167	1355887	779635	222347	70958
29	(II) 1.0 MTPA Induration furnace	60	4	194.250	15.47	167	1355887	779635	222347	70958
30	(II) 1.0 MTPA Induration furnace	60	4	194.250	15.47	167	1355887	779635	222347	70958
31	(II) 1.0 MTPA Induration furnace	60	4	194.250	15.47	167	1355887	779635	222347	70958
32	(II) 1.0 MTPA Induration furnace	60	4	194.250	15.47	167	1355887	779635	222347	70958
33	(II) 1.0 MTPA Induration furnace	60	4	194.250	15.47	167	1355887	779635	222347	70958
34	(II) 1.0 MTPA Induration furnace	60	4	194.250	15.47	167	1355887	779635	222347	70958
35	(II) 1.0 MTPA Induration furnace	60	4	194.250	15.47	167	1355887	779635	222347	70958
36	(II) 1.0 MTPA Induration furnace	60	4	194.250	15.47	167	1355887	779635	222347	70958
37	(II) 1.0 MTPA Induration furnace	60	4	194.250	15.47	167	1355887	779635	222347	70958
38	Raw Material Handling Stack	30	1.8	15.940	6.27	100	131250	75469	-	-
39	Finished Product Handling Stack	30	1.8	5.693	2.24	100	46875	26953	-	-
3.0	**COAL WASHERY (1X400TPH+1X235 TPH)***									
40	Coal Washery in-plant Dedusting (400 TPH)	30	1.7	29.579	13.04	50	-	-	-	-
41	Coal Washery in-plant Dedusting (235 TPH)	30	1.7	17.187	7.58	50	-	-	-	-

Stack	Stack name	Height (m)	Dia (m)	Exit gas Volume (m^3/s)	Exit gas Velocity (m/s)	Temp (°C)	Emission rate (µg/s)			
							PM_{10}	$PM_{2.5}$	SO_2	NOx
4.0	**BLAST FURNACE (1x600 cum + 2x450 cum)**									
42	MBF-I: Stove Stack (to WHRB 600 cum)	47	1.8	34.432	13.54	150	83333	47917	4444444	3333333
43	MBF-I: Stock House De-dusting	30	1.8	29.618	11.65	40	290625	167109	-	-
44	MBF-II: Stove Stack (to WHRB 2X450 cum)	47	2.2	60.256	15.86	150	145833	83854	7777778	5833333
45	MBF-II: Stock House De-dusting	30	2.2	51.912	13.66	40	509375	292891	-	-
5.0	**SINTER (2x80 m^2+1x110 m^2)**									
46	Sinter-I: Main Stack (2X80 m^2)	55	5	372.299	18.97	150	2703125	1554297	14343774	54457
47	Sinter-I: De-Dusting	45	2	50.956	16.23	40	500000	287500	-	-
48	Sinter-II: Main Stack (110 m^2)	80	6.5	509.597	15.36	150	3700000	2127500	10272234	38999
49	Sinter-II: De-Dusting	55	2.5	86.944	17.72	40	853125	490547	-	-
6.0	**COKE OVEN, 1.07 MTPA (6 Batteries x 0.07 MTPA + 1 Battery x 0.25 MTPA + 1 Battery x 0.4 MTPA)**									
50	Coke Oven 1x250000 TPA (to WHRB)	85	2.5	87.785	17.89	220	546875	314453	1214286	193139
51	Coke Oven 1x400000 TPA (to WHRB)	100	3.2	145.472	18.10	220	906250	521094	1942857	309022
52	Coke Oven 6x70000 TPA (to WHRB)	100	3.2	145.472	18.10	220	906250	521094	2040000	324473
7.0	**SMS–COMPLEX, 1.54 MTPA (IF 15X20T + LRF 4X25T + 3X45 T)**									
53#	2x20T IF DES + 25T LRF	30.5	2	47.441	15	100	130208	74870	-	-
54	2x20T IF DES + 25T LRF	30.5	2	47.441	15	100	130208	74870	-	-
55	2x20T IF DES + 25T LRF	30.5	2	47.441	15	100	130208	74870	-	-
56	1x20T IF DES	30.5	1.8	34.158	13	100	93750	53906	-	-
57	2x20T IF DES + 25T LRF	30.5	2	47.441	15	100	130208	74870	-	-
58	2x20T IF DES + 45T LRF	30.5	2	60.724	19	100	166667	95833	-	-
59	2x20T IF DES + 45T LRF	30.5	2	60.724	19	100	166667	95833	-	-
60	2x20T IF DES + 45T LRF	30.5	2	60.724	19	100	166667	95833	-	-
	SMS–COMPLEX 1.68 MTPA (1X90T EAF + 1X90T LRF and 1X110 T EAF + 1X110T LRF)									
61	90T EAF Fume Extraction+LRF Stack	60	4	257.103	20	130	653125	375547	-	-
62	110T EAF Fume Extraction+LRF Stack	70	5	314.101	16	130	797917	458802	-	-
8.0	**FLAT/ ROUND/ WIRE/ ROD/ STRUCTURAL/ TMT/ OTHERS MILL (2.55 MTPA)**									
63	Reheating Furnace Stack (0.2 MTPA)*	60	3	24.071	3.41	365	-	-	-	-
64	Reheating Furnace Stack (0.2 MTPA)*	60	3	24.071	3.41	365	-	-	-	-
65	Reheating Furnace Stack (0.3 MTPA)*	60	3	36.107	5.11	365	-	-	-	-
66	Reheating Furnace Stack (0.3 MTPA)*	60	3	36.107	5.11	365	-	-	-	-
67	Reheating Furnace Stack (0.3 MTPA)*	60	3	36.107	5.11	365	-	-	-	-
68	Reheating Furnace Stack (0.3 MTPA)*	60	3	36.107	5.11	365	-	-	-	-
69	Reheating Furnace Stack (0.45 MTPA)*	60	3.4	54.160	5.97	365	-	-	-	-
70	Reheating Furnace Stack (0.5 MTPA)	60	3.6	60.178	5.92	365	96563	55523	5996952	3541667
8.1	**STRIP MILL 0.5 MTPA (1 x 0.2 MTPA + 1 x 0.3 MTPA)**									

Stack	Stack name	Height (m)	Dia (m)	Exit gas Volume (m^3/s)	Exit gas Velocity (m/s)	Temp (°C)	Emission rate (µg/s)			
							PM_{10}	$PM_{2.5}$	SO_2	NOx
71	Reheating Furnace Stack (0.3 MTPA)	80	4	135.676	10.80	365	217708	125182	1175873	694444
72	Reheating Furnace Stack (0.2 MTPA)*	80	3.2	90.450	11.25	365	-	-	-	-
8.2	**DUCTILE PIPE MILL 0.5 MTPA (2X0.25 MTPA)**									
73	Reheating Furnace (0.25 MTPA)	60	3	36.107	5.11	365	57938	33314	1175873	694444
74	Reheating Furnace (0.25 MTPA)*	60	3	36.107	5.11	365	-	-	-	-
9.0	**PRODUCER GAS PLANT (5387 million Nm^3/annum)***									
75	Process Stack (20x3000 Nm^3/hr)*	30	2	19.906	6.34	100	-	-	-	-
76	Process Stack (32x12500 Nm^3/hr)*	30	4	132.707	10.57	100	-	-	-	-
77	Process Stack (28x7500 Nm^3/hr)*	30	3	69.671	9.86	100	-	-	-	-
10.0	**CEMENT PLANT 1.725 MTPA (2x2500 TPD)**									
78	Crushing and milling Section (2500 TPD)	30	1.5	25.400	14	45	245313	141055	-	-
79	Drying stack (2500 TPD)	45	1	7.998	10	120	62500	35938	8001	12801
80	Cement Plant Mill (2500 TPD)	60	3	162.393	23	63	1484375	853516	-	-
81	Bag Filling / Packing / Product Area	35	1	10.714	14	78	93750	53906	-	-
82	Crushing and milling Section (2500 TPD)	30	1.5	25.400	14	45	245313	141055	-	-
83	Drying stack (2500 TPD)	45	1	7.998	10	120	62500	35938	8001	12801
84	Cement Plant Mill (2500 TPD)	60	3	162.393	23	63	1484375	853516	-	-
85	Bag Filling / Packing / Product Area	35					-	-	-	-
11.0	**POWER PLANT-10X125TPH +1x130+3X250 TPH FBC**									
86#	2x125 TPH FBC boiler	85	2.3	97.917	23.58	150	710938	408789	5978695	6003472
87	2x125 TPH FBC boiler	85	2.3	97.917	23.58	150	710938	408789	6319444	6319444
88	2x125 TPH FBC boiler	85	2.3	97.917	23.58	150	710938	408789	6319444	6319444
89	2x125 TPH FBC boiler	85	2.3	97.917	23.58	150	710938	408789	6319444	6319444
90	2x125 TPH FBC boiler	85	2.3	97.917	23.58	150	710938	408789	6319444	6319444
91	130 TPH FBC boiler	90	2	50.917	16.22	150	369688	212570	3286111	3286111
92	2x250 TPH FBC boiler	110	3.8	195.833	17.28	150	1421875	817578	12638889	12638889
93	250 TPH FBC boiler	110	2.7	97.917	17.11	150	710938	408789	6319444	6319444
94#	Raw Material in-plant Dedusting	45	2.5	44.368	9.04	50	421875	242578	-	-
95	Raw Material in-plant Dedusting	45	2.5	44.368	9.04	50	421875	242578	-	-
96	Raw Material in-plant Dedusting	45	2.5	44.368	9.04	50	421875	242578	-	-
97	Raw Material in-plant Dedusting	45	2.5	44.368	9.04	50	421875	242578	-	-
B	**ADDITIONAL PROPOSED FOR EXPANSION UPTO 7.55 MTPA**									
1.0	**DRI PROCESS STACKS AFTER WHRB ESP (5X900TPD DRI Plant) (SCENARIO 1)**									
98	DRI-IV: 2x900 TPD Kiln WHRB Stack	95	4.7	340.259	19.62	150	2470500	1420538	26403609	131749
99	DRI-IV: 2x900 TPD Kiln WHRB Stack	95	4.7	340.259	19.62	150	2470500	1420538	26403609	131749
100	DRI-IV: 1x900 TPD Kiln WHRB Stack	95	3.4	170.130	18.75	150	1235250	710269	13201805	65874
	DRI KILNS–DE-DUSTING STACKS									
101	DRI-II: Plant Dedusting (RMHS)	35	2	39.438	12.56	50	375000	215625	-	-

Stack	Stack name	Height (m)	Dia (m)	Exit gas Volume (m^3/s)	Exit gas Velocity (m/s)	Temp (°C)	Emission rate (µg/s)			
							PM_{10}	$PM_{2.5}$	SO_2	NOx
102	DRI-II: Plant Dedusting (CDH)	30	1.8	24.669	9.70	100	203125	116797	-	-
103	DRI-II: Plant Dedusting (PSB)	35	2	39.438	12.56	50	375000	215625	-	-
2.0	**BLAST FURNACE (2x650 cum + 1x1250 cum)**									
104	MBF-III: Stove Stack (to WHRB 2X650 cum)	47	2.3	68.864	16.58	150	166667	95833	8888889	6666667
105	MBF-III: Stock House De-dusting	30	2.2	59.237	15.59	40	581250	334219	-	-
106	BF-IV: Stove Stack (to WHRB 1250 cum)	47	2.2	68.864	18.13	150	166667	95833	8888889	6666667
107	BF-IV: Stock House De-dusting	30	2.2	59.237	15.59	40	581250	334219	-	-
3.0	**SINTER (2x130 m^2+1x210 m^2)**									
108	Sinter-I: Plant-Main Stack (1x130 sqm)	80	5.5	516.484	21.74	150	3750000	2156250	12138059	46083
109	Sinter-I: Plant-De-Dusting	55	2.5	89.174	18.17	40	875000	503125	-	-
110	Sinter-I: Plant-Main Stack (1x130 sqm)	80	5.5	516.484	21.74	150	3750000	2156250	12138059	46083
111	Sinter-I: Plant-De-Dusting	55	2.5	89.174	18.17	40	875000	503125	-	-
112	Sinter-II: Plant-Main Stack (1x210 Sqm)	100	6	817.766	28.92	150	5937500	3414063	19607633	74442
113	Sinter-II: Plant-De-Dusting	55	3	143.315	20.27	40	1406250	808594	-	-
4.0	**COKE OVEN, 1.68 MTPA (12 Batteries x 70000 TPA + 2 Battery x 420000 TPA)**									
114	Coke Oven 12x70000 TPA (to WHRB)	100	4.5	305.491	19.22	220	1903125	1094297	2040000	324816
115	Coke Oven 2x420000 TPA (to WHRB)	100	4.5	305.491	19.22	220	1903125	1094297	2040000	324816
5.0	**SMS–COMPLEX, 1.12 MTPA (IF 20X20T + LRF 8X45T)**									
116	2x20T IF DES + 45T LRF	30.5	2	60.724	19	100	166667	95833	-	-
117	2x20T IF DES + 45T LRF	30.5	2	60.724	19	100	166667	95833	-	-
118	2x20T IF DES + 45T LRF	30.5	2	60.724	19	100	166667	95833	-	-
119	2x20T IF DES + 45T LRF	30.5	2	60.724	19	100	166667	95833	-	-
120	2x20T IF DES + 45T LRF	30.5	2	60.724	19	100	166667	95833	-	-
121	2x20T IF DES + 45T LRF	30.5	2	60.724	19	100	166667	95833	-	-
122	2x20T IF DES + 45T LRF	30.5	2	60.724	19	100	166667	95833	-	-
123	2x20T IF DES + 45T LRF	30.5	2	60.724	19	100	166667	95833	-	-
124	2x20T IF	30.5	1.5	34.158	19	100	93750	53906	-	-
125	2x20T IF	30.5	1.5	34.158	19	100	93750	53906	-	-
5.1	**SMS–COMPLEX, 3.069 MTPA (BOF/ NOF/ EOF/ EAF 20X20T + LRF 8X45T - VD/RH/AOD)**									
126	Steel melting via BOF/NOF/EOF/EAF-LF-VD/RH/AOD (2x65T + 2x65T LRF)	70	5.5	481.247	20	130	1222522	702950	-	-
127	Steel melting via BOF/NOF/EOF/EAF-LF-VD/RH/AOD (2x45T + 2x45T LRF)	70	5	333.171	17	130	846362	486658	-	-
128	Steel melting via BOF/NOF/EOF/EAF-LF-VD/RH/AOD (2x45T + 2x45T LRF)	70	5	333.171	17	130	846362	486658	-	-
6.0	**Rolling Mill 3.98 MTPA (2 x 0.55 MTPA + 4 x 0.42 MTPA + 1x1.2 MTPA)**									

Stack	Stack name	Height (m)	Dia (m)	Exit gas Volume (m^3/s)	Exit gas Velocity (m/s)	Temp (°C)	Emission rate (µg/s)			
							PM_{10}	$PM_{2.5}$	SO_2	NOx
129	Reheating Furnace Stack (0.55 MTPA)	60	3.6	66.215	6.51	365	106250	61094	9359949	5527778
130	Reheating Furnace Stack (0.55 MTPA)*	60	3.6	66.215	6.51	365	-	-	-	-
131	Reheating Furnace Stack (0.42 MTPA)*	60	3.4	50.635	5.58	365	-	-	-	-
132	Reheating Furnace Stack (0.42 MTPA)*	60	3.4	50.635	5.58	365	-	-	-	-
133	Reheating Furnace Stack (0.42 MTPA)*	60	3.4	50.635	5.58	365	-	-	-	-
134	Reheating Furnace Stack (0.42 MTPA)*	60	3.4	50.635	5.58	365	-	-	-	-
135	Reheating Furnace Stack (1.2 MTPA)*	60	5	144.115	7.34	365	-	-	-	-
7.0	**CEMENT PLANT (3X1500 TPD)**									
136	Crushing and milling Section (1500 TPD)	30	1.2	15.240	13.5	45	147188	84633	-	-
137	Drying stack (1500 TPD)	45	0.8	4.799	9.5	120	37500	21563	25666	41066
138	Cement Plant Mill (1500 TPD)	60	2.3	97.436	23.5	63	890625	512109	-	-
139	Bag Filling / Packing / Product Area	35	1.5	19.286	10.9	78	168750	97031	-	-
140	Crushing and milling Section (1500 TPD)	30	1.2	15.240	13.5	45	147188	84633	-	-
141	Drying stack (1500 TPD)	45	0.8	4.799	9.5	120	37500	21563	25666	41066
142	Cement Plant Mill (1500 TPD)	60	2.3	97.436	23.5	63	890625	512109	-	-
143	Crushing and milling Section (1500 TPD)	30	1.2	15.240	13.5	45	147188	84633	-	-
144	Drying stack (1500 TPD)	45	0.8	4.799	9.5	120	37500	21563	25666	41066
145	Cement Plant Mill (1500 TPD)	60	2.3	97.436	23.5	63	890625	512109	-	-
9.0	**POWER PLANT-2X260TPH +1x180TPH)**									
146	260 TPH FBC Boiler	110	2.1	101.833	29.42	150	739375	425141	6572222	6572222
147	260 TPH FBC Boiler	110	2.1	101.833	29.42	150	739375	425141	6572222	6572222
148	180 TPH FBC Boiler	110	2.1	70.500	20.36	150	511875	294328	4550000	4550000
149	Power Plant Raw Material in-plant Dedusting	45	2.5	44.368	9.04	50	421875	242578	-	-
150	Power Plant Raw Material in-plant Dedusting	45	2.5	44.368	9.04	50	421875	242578	-	-
C	**ALTERNATIVE OF 5X900 TPD TO 6X650 TPD AND 1X600 TPD KILNS (SCENARIO 2)**									
151	DRI-IV: 2x650 TPD Kiln- WHRB Stack	90	4.0	245.743	19.57	150	1784250	1025944	19069273	95152
152	DRI-IV: 2x650 TPD Kiln- WHRB Stack	90	4.0	245.743	19.57	150	1784250	1025944	19069273	95152
153	DRI-IV: 2x650 TPD Kiln- WHRB Stack	90	4.0	245.743	19.57	150	1784250	1025944	19069273	95152
154	DRI-II: 1x600 TPD Kiln- WHRB Stack	90	2.8	113.420	18.43	150	823500	473513	8801203	43916

operational stacks

The PM emissions have been considered as 30 mg/Nm^3 and the PM_{10} component has been considered as 37.5% of the same and $PM_{2.5}$ as 57.5% of PM_{10}. Only stacks attached to blast furnace, SMS and re-heating furnaces have PM emissions 10 mg/Nm^3. The gases coming out from the units shown above contain pollutants like particulate matter, SO_2 and NO_2. 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**.

From the above table, it may be noted that :

- There will be an estimated 97 major stacks in the 3.55 MTPA steel plant
- There will be an estimated 150 major stacks in the 7.53 MTPA steel plant
- Of the above 14 stacks are in operation, marked as '#'
- Of the stacks marked with "*" have not been taken into consideration for modelling to avoid duplicacy, for following reasons:
  - Reheating furnace stacks for rolling mill/ strip mill/ ductile pipe plant (S-63 to 69, 72, 74, 130 to 135) - since >80% direct hot charging is anticipated to rolling mills, reheating requirement will be low. This will reduce fuel & energy consumption, process time, associated costs and overall emissions into the atmosphere. For modelling, one reheating furnace with maximum capacity or most likely to be used is assumed operational at any given time.
  - Bag Filling/ Packing / Product Area (stacks S-85, S-139) of cement plant- there are common packing areas for the different units.
  - Coal Washery (stacks S-40 to S-41) – The coal washery will operate only if Indian coal will be used and the designing shall be done to conform to 30 mg/Nm^3 emission. The actual emissions will be negligible since sprinkling or fogging shall be used for dust suppression in plant prior to wetting of the coal in washing process. Hence, this stack has not been considered in modelling.
  - Producer gas plant process exit gases will be sent to the pellet plant where it will be consumed as fuel and the exit of the combustion products shall take place through the stacks of the pellet plant, after cleaning.

Table 4.3 lists the data for the pellet plant only in a scenario where in the control measures are not there or have failed. This calculation has been done to enable to work out a failure scenario (which is not business as usual) and to carry out a modelling for this failure scenario as well, results of which are summarised in **Table 4.7** later. Pellet plant has been considered for failure because the it has the stack with the maximum PM emissions, compared to all other stacks in the plant.

TABLE 4.3: STACK DATA FOR PELLET PLANT IN 7.55 MTPA ISP (WITHOUT CONTROL MEASURES)

Sl. No.	Stack name	Height (m)	Dia (m)	Exit gas Vol. (m^3/s)	Exit gas Vel. (m/s)	Temp (°C)	Emission rate (μg/s)	
							PM_{10}	$PM_{2.5}$
2	**PELLET PLANT (5X3.75 MTPA + 10X 1.0 MTPA)**							
21	(I) 3.75 MTPA Induration Furnace	90	6.5	420.838	12.69	167	5875000000	3378125000
22	(II) 3.75 MTPA Induration Furnace	90	6.5	420.838	12.69	167	5875000000	3378125000
23	(II) 3.75 MTPA Induration Furnace	90	6.5	420.838	12.69	167	5875000000	3378125000

Sl. No.	Stack name	Height (m)	Dia (m)	Exit gas Vol. (m^3/s)	Exit gas Vel. (m/s)	Temp (°C)	Emission rate (µg/s)	
							PM_{10}	$PM_{2.5}$
24	(II) 3.75 MTPA Induration Furnace	90	6.5	420.838	12.69	167	5875000000	3378125000
25	(II) 3.75 MTPA Induration Furnace	90	6.5	420.838	12.69	167	5875000000	3378125000
26	Raw Material Handling Stack	30	1.8	34.158	13.43	100	14062500	8085937.5
27	Finished Product Handling Stack	30	1.8	34.158	13.43	100	14062500	8085937.5
28	(II) 1.0 MTPA Induration Furnace	60	4	194.250	15.47	167	2711774148	1559270135
29	(II) 1.0 MTPA Induration Furnace	60	4	194.250	15.47	167	2711774148	1559270135
30	(II) 1.0 MTPA Induration Furnace	60	4	194.250	15.47	167	2711774148	1559270135
31	(II) 1.0 MTPA Induration Furnace	60	4	194.250	15.47	167	2711774148	1559270135
32	(II) 1.0 MTPA Induration Furnace	60	4	194.250	15.47	167	2711774148	1559270135
33	(II) 1.0 MTPA Induration Furnace	60	4	194.250	15.47	167	2711774148	1559270135
34	(II) 1.0 MTPA Induration Furnace	60	4	194.250	15.47	167	2711774148	1559270135
35	(II) 1.0 MTPA Induration Furnace	60	4	194.250	15.47	167	2711774148	1559270135
36	(II) 1.0 MTPA Induration Furnace	60	4	194.250	15.47	167	2711774148	1559270135
37	(II) 1.0 MTPA Induration Furnace	60	4	194.250	15.47	167	2711774148	1559270135
38	Raw Material Handling Stack	30	1.8	15.940	6.27	100	6562500	3773437.5
39	Finished Product Handling Stack	30	1.8	5.693	2.24	100	2343750	1347656.25

4.4.1.2 Fugitive emissions from storage areas and material handling

For the purpose of assessing fugitive emission from the plant after expansion to 7.53 MTPA, the sources of fugitive emission have been identified in **Table 4.4** along with its emission rates.

TABLE 4.4: 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
Raw material complex	13196	3436.57	632293	71133	40901
Iron ore stacker-1	10101	3019.89	632226	71125	40897
Iron ore stacker-2	10101	3019.89	96445	10850	6239
Slag storage	2034	178.00	2309	328	50
Fly Ash and other solid waste storage area	4102	341.81	150103	16887	4085
Parking area-1	20977		150103	16887	4085
Parking area-2	20977		632293	71133	40901

Since iron ore is the pre-dominant raw material, the fugitive emission factors have been calculated as per the formula of stock yard from research presented in “Emission rate formulae for surface iron ore mining activities by S. K. Chaulya, Environmental Modelling and Assessment, November 2006, on pages 361-370.

Emission rate (g/m2/s) =
{u(100-m)/m}^0.2*{s/(100-s)}^3.7*[{(cf/(76.7+14.5cf))+{ld/(6.7+3.3ld)}]

Where

m	Moisture content of material (%)
s	Silt content of materials (%)
u	Wind speed (m/s)
c	Capacity of unloader (t)
l	Size of loader (m3)
f	Frequency of unloading (No/Hr)
d	Frequency of loading (No/Hr)

Fly ash emission have been calculated with the formula given in "Fugitive Emissions from a Dry Coal Fly Ash Storage Pile by Stephen F. Mueller, Et. al. Presented in 2012 International Emission Inventory Conference[1] as given below:

$$E_{drop} = 0.0016\, k_{drop} \frac{(U/2.2)^{1.3}}{(M/2)^{1.4}}$$

Where K_{drop} is a dimensionless particle size fraction multiplier,
U is wind speed (m/sec)
M is material moisture content (%)

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 numerical simulation model & software packages, namely AERMOD which is an interface for the U.S. EPA ISCST3. This package was developed by Lakes Environmental, Canada. AERMOD is the next generation air dispersion model which can be considered as a comprehensive approach for computation of the ground level concentrations (GLCs) of a pollutant. 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 4.2.** For failure scenario, the pellet plant data from **Table 4.3** has been considered.

[1] Source : https://www3.epa.gov/ttnchie1/conference/ei20/session5/smueller.pdf accessed 20.10.2021

- 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 co-efficient.

- 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.

- Terrain (elevation) of sources and receptors has been taken as input into the model

- Atmospheric inversion has been input in the modelling in terms of mixing height as follows:

Hour	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
mixing height, m agl	80-90	100-110	275-350	510-615	800-935	1100-1300	1375-1500	1550-1800	1750-2050	1550-1850	1350-1700	1250-1500	950-1200	650-750	725-975

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

  - Stack and fugitive emissions from the entire project (7.53 MTPA) due to stacks & material handling in stock & solid waste yards (Refer **Annexure XXV(b)** for input and output data). In this, further two scenarios have been worked out for :

    - Additional 5X900 TPD DRI kilns

    - Alternate configuration of 6X650 + 1X600 TPD DRI kilns for same production of 2.156 MTPA with no change in raw material

  - Stack and fugitive emissions from stacks & material handling in stock & solid waste yards as approved in EC dated 15.02.2021 for 3.55 MTPA steel plant (Refer **Annexure XXV(a)** for input and output data). The stack data has been updated with respect to previous EIA since detailed designing has been carried out in some units, some units are under operation and some units are under construction.

Since the CTO has been obtained on 06.05.2021, by when 75% of the ambient air quality monitoring has been carried out, the impact of the

operational units are not considered to be reflected in the ambient air quality monitoring results. Hence, the re-modelling for the existing 3.55 MTPA steel plant has been carried out for the reasons explained earlier.

The maximum computed concentrations in the entire study area and on the ambient air quality stations is given in **Table 4.5** and on the ambient air quality stations is given in **Table 4.6**.

In addition to above, various scenarios of failure of air pollution control equipment of pellet plant have also been calculated and summarised in **Table 4.7**.

4.4.1.4 Resultant GLC due to stack emissions and fugitive emissions

The predicted incremental ground level concentration obtained due to stack emissions and fugitive emissions for 7.53 MTPA is given in **Table 4.5 & 4.6** for maximum values and for location of sampling stations. These are then superimposed on baseline concentration and compared with the National Ambient Air Quality Standards for Residential Areas as can be seen in **Table 4.5 and Table 4.6**. The increment of entire 7.53 MTPA ISP has been added to the baseline because only one 500 TPD and one 25 MW CPP is operational currently. They too commenced operation after 75% of the baseline monitoring was completed.

TABLE 4.5: CALCULATED MAXIMUM GROUND LEVEL CONCENTRATION FOR EXISTING EC (3.55 MTPA) AND PROPOSED EXPANSION OF PLANT TO 7.53 MTPA (ALL VALUES IN (µg/m^3) - WITH CONTROL MEASURES (SCENARIO 1)

Pollutant	Incremental GLC			Max. Baseline observed	Resultant due to 7.53 MTPA capacity	NAAQS 2009
	3.55 MTPA capacity	7.53 MTPA capacity	Increment due to expansion by 3.98 MTPA			
(a)	(b)	(c)	(d)=(b)-(c)	(e)	(f) = (c)+(e)	(g)
PM10	15.075	20.276	5.201	74.700	94.976	100
PM2.5	8.640	11.634	2.994	43.700	55.334	60
SO_2	19.792	21.182	1.390	16.400	37.582	80
NO_2	8.919	10.491	1.572	21.800	32.291	80
Refer	**Annexure XXV(a)**	**Annexure XXV(b)**				

The alternate scenario of installing 6X650+1X600 TPD DRI kilns (Scenario-2) instead of 5X900 TPD DRI kilns (Scenario-1) shows that the resultant incremental GLC values will decrease in the alternate Scenario 2 w.r.t. Scenario 1, as shown below:

TABLE 4.6: COMPARISON OF INCREMENTAL GLCS FOR SCENARIO 1 & 2 FOR 7.53 MTPA ISP (ALL VALUES IN (µg/m^3) – WITH CONTROL MEASURES

	Scenario-1 (5x900 TPD DRI kiln)	Scenario-2 (6x650 + 1x600 TPD DRI kilns)	Difference (Scenario 1 minus 2)
PM10	20.276	20.317	-0.041
PM2.5	11.634	11.657	-0.023
SO_2	21.182	21.281	-0.099
NO_2	10.491	10.493	-0.002

The details of the models can be seen in **Annexure XXV(b)**. It can be seen that instead of 5X900 TPD kilns, if 6X650 + 1 X 600 TPD kilns are installed, the change in resultant incremental values for 7.53 MTPA are -0.041, -0.023, -0.099, -0.002 µg/m^3 for PM_{10}, $PM_{2.5}$, SO_2 and NO_2, respectively.

To assess the impact of control measures, a comparison of the GLCs without control measures (in pellet plant, source data given in table 4.3 earlier) and that with control measures (in pellet plant, source data given in table 4.2 earlier) has been carried out and summarised in **Table 4.7.**

TABLE 4.7: COMPARISON OF MAXIMUM GROUND LEVEL CONCENTRATION FOR TOTAL PLANT TO 7.53 MTPA (ALL VALUES IN (µg/m^3) WHEN PELLET PLANT IS WITHOUT AND WITH CONTROL MEASURES

Pollutant	Max. Incremental GLC (Without Control) (µg/m^3)	Max. Incremental GLC (With Control) (µg/m^3)	Improvement (µg/m^3)
(a)	(b)	(c)	(d)
PM10	4775.15	20.276	4754.874
PM2.5	2745.70	11.634	2734.066

Use of control measures in just one unit like the pellet plant, causes an improvement in air quality parameters. There was improvement by 4754.874 µg/m^3 in PM_{10} and by 2734.066 µg/m^3 in $PM_{2.5}$ for the entire plant after expansion upto 7.53 MTPA.

4.4.1.5 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 7429 number of trucks per day (14858 to & fro), considering trucks of 10-30 T capacity (average 25 T). The various product and solid waste will be transported in the same trucks that bring in raw material. Hence, no additional trucks are anticipated for them.

For estimating the increase in the air pollutants due to transportation of raw material, solid waste and products CALINE4 model has been used. The

assumptions, input data and other details are given in **Annexure XXV(c)** and the results are summarised below. The resultant GLC at all the receptors of the air quality monitoring stations was found to be zero except at AQ4 PM_{10} is predicted as 0.09 µg/m^3 and $PM_{2.5}$ as 0.02 µg/m^3.

TABLE 4.8: HIGHEST VALUE FOR 24 HOUR AVERAGE INCREMENTAL GLCS DUE TO TRANSPORTATION OF RAW MATERIAL, PRODUCT & SOLID WASTE BY ROAD (µg/m^3)

Pollutant	Maximum incremental GLC (µg/m^3)		
	Incremental GLC (µg/m^3)	Receptor No.	Section
PM_{10}	2.56	14	S1
$PM_{2.5}$	0.65	14	S1
SO_2	0.28	14	S1
NO_X	1.12	14	S1

Although the modeling has been carried out for transportation of material for 7.53 MTPA ISP, the anticipated increments are not expected to be achieved because the railway siding is expected to become operational within 5-10 years. The project construction has been planned to get completed to full capacity by 7 years as per the implementation plan given in Table 2.50 of chapter 2. Thus, these incremental impacts can come after completion of project implementation only.

4.4.1.6 Resultant GLC cumulative due to stack, fugitive & traffic emission

The predicted ground level concentration obtained due to stack emissions, fugitive emissions and traffic movement, when superimposed on base line concentration is high, but within the National Ambient Air Quality Standards for Residential Areas as can be seen in **Table 4.9**.

TABLE 4.9: CUMULATIVE IMPACT DUE TO STACKS (SCENARIO-1), FUGITIVE EMISSIONS AND TRAFFIC ON AMBIENT AIR QUALITY STATIONS (µg/m^3) - WITH CONTROL MEASURES

Sl. No.	Station name	PM_{10}						$PM_{2.5}$					
		Present sanctioned 3.55 MTPA	*Future after expansion 7.53 MTPA*	*Difference (7.53 less 3.55 MTPA)*	*Impact of road transportation (7.53 MTPA)*	*Maximum Baseline value observed*	*Total resultant for 7.53 MTPA*	*Present sanctioned 3.55 MTPA*	*Future after expansion 7.53 MTPA*	*Difference (7.53 less 3.55 MTPA)*	*Impact of road transportation (7.53 MTPA)*	*Maximum Baseline value observed*	*Total resultant for 7.53 MTPA*
a	b	c	d	e=d-c	f	g	h=d+f+g	i	j	k=j-i	l	m	n=j+l+m
A1	Core zone (existing plant area)	7.962	8.681	0.719	0.000	74.700	83.381	3.955	4.482	0.527	0.000	43.700	48.182
A2	Beruanpal	4.793	4.966	0.173	0.000	69.900	74.866	2.755	2.761	0.006	0.000	42.000	44.761
A3	Mahalunda	1.869	2.828	0.959	0.000	65.000	67.828	1.073	1.620	0.547	0.000	38.300	39.920
A4	Narendrapur	0.708	1.346	0.638	0.090	67.500	68.936	0.406	0.763	0.357	0.020	40.000	40.783
A5	Nimabahali village	3.394	4.614	1.220	0.000	69.100	73.714	1.936	2.636	0.700	0.000	40.900	43.536

Sl. No.	Station name	PM_{10}						$PM_{2.5}$					
		Present sanctioned 3.55 MTPA	*Future after expansion 7.53 MTPA*	*Difference (7.53 less 3.55 MTPA)*	*Impact of road transportation (7.53 MTPA)*	*Maximum Baseline value observed*	*Total resultant for 7.53 MTPA*	*Present sanctioned 3.55 MTPA*	*Future after expansion 7.53 MTPA*	*Difference (7.53 less 3.55 MTPA)*	*Impact of road transportation (7.53 MTPA)*	*Maximum Baseline value observed*	*Total resultant for 7.53 MTPA*
a	**b**	**c**	**d**	**e=d-c**	**f**	**g**	**h=d+f+g**	**i**	**j**	**k=j-i**	**l**	**m**	**n=j+l+m**
A6	Benipathar village (Core zone expansion area)	3.983	5.007	1.024	0.000	60.100	65.107	2.289	2.854	0.565	0.000	34.200	37.054
A7	Kankalu village	2.698	3.905	1.207	0.000	70.700	74.605	1.550	2.242	0.692	0.000	41.100	43.342
A8	Patala	1.624	3.232	1.608	0.000	64.900	68.132	0.933	1.845	0.912	0.000	40.100	41.945
A9	Barhamunda	2.796	5.200	2.404	0.000	61.100	66.300	1.608	2.979	1.371	0.000	35.600	38.579
	NAAQS, 2009	**100**						**60**					
		SO_2						**NO_2**					
A1	Core zone (existing plant area)	10.931	11.408	0.477	0.000	14.300	25.708	6.873	6.993	0.120	0.000	18.200	25.193
A2	Beruanpal	7.489	12.850	5.361	0.000	14.300	27.150	4.079	5.553	1.474	0.000	16.900	22.453
A3	Mahalunda	3.540	5.519	1.979	0.000	12.300	17.819	1.651	2.219	0.568	0.000	14.100	16.319
A4	Narendrapur	1.570	3.004	1.434	0.000	16.400	19.404	0.803	1.238	0.435	0.000	21.700	22.938
A5	Nimabahali village	8.005	9.330	1.325	0.000	14.500	23.830	3.851	4.294	0.443	0.000	21.800	26.094
A6	Benipathar village (Core zone expansion area)	7.650	9.480	1.830	0.000	10.900	20.380	3.469	4.549	1.080	0.000	12.100	16.649
A7	Kankalu village	5.073	9.632	4.559	0.000	15.000	24.632	2.730	3.811	1.081	0.000	16.900	20.711
A8	Patala	3.420	6.543	3.123	0.000	10.900	17.443	1.599	2.364	0.765	0.000	12.900	15.264
A9	Barhamunda	4.910	8.128	3.218	0.000	13.400	21.528	2.278	3.601	1.323	0.000	13.600	17.201
	NAAQS, 2009	**80**						**80**					

Note : Refer Annexure XXV(a) and XXV(b) for input & output of model
The above are for scenario 1 i.e. 5X900 TPD kilns in expansion phase

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 X**). The highest resultant values at ambient air quality stations are likely to be 83.381 µg/m^3, 48.182 µg/m^3, 27.15 µg/m^3 and 26.094 µg/m^3 for PM_{10}, $PM_{2.5,}$ SO_2 and NO_2 respectively which will be well within the permissible limits for residential and rural areas after adding to the baseline values. (Standards for PM_{10} is 100 µg/m^3, $PM_{2.5}$ is 60 µg/m^3, SO_2 80 µg/m^3 and NO_2 80 µg/m^3 as per CPCB).

4.4.1.7 Cumulative impact due industries in study area

Cumulative impact assessment for industries within 2 km is usually carried out in general practice. Within 2 km radius there is a steel and power plant of M/s TATA steel BSL (formerly known as Bhushan Steel Limited), located at 1.1 km north w.r.t. proposed expansion plant boundary. The plant is operational with capacity 5.6 MTPA, for which the plant has been accorded EC vide letter no. J-11011/829/2008-IA.II(I) dated 20th July 2012. Plant has CTO from OSPCB vide letter no. 3093/IND-I-CON-5440 dated 27.03.2019. After perusal of the plant configuration listed in CTO letter and the units/

production approved in EC, it can be seen that the entire 5.6 MTPA plant is in operation. Thus, the impact of the emission from the said plant are reflected in monitored baseline air quality data from the study area. Therefore, no cumulative impact assessment has been carried out with the proposed expansion of the Dhenkanal ISP project.

4.4.2 Management of air quality

The likely impacts on air quality during the construction phase are comparatively low. It requires preventive maintenance of all trucks, earthmovers and construction equipment, spraying of water on disturbed areas, water spraying during loading and unloading operations and transportation to be carried out in covered trucks. Temporary wind breaks and cloth barriers will be installed to prevent spread of fugitive dust during construction.

However, during operation phase, the various operations would discharge huge quantities of particulates and gaseous pollutants, which must be controlled before discharge into atmosphere.

Following mitigation measures are underway in the under construction plant (sanctioned vide EC dated 15.02.2021 & previous ECs) and shall be taken for expansion phase also:

a) Construction phase

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

The mitigation measures will apply both on plant buildings and colony construction. As per AP-42 of US EPA, the recommended measures for various activities during construction phase are summarised in **Table 4.10**.

TABLE 4.10: 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 94.976 µg/m^3, 55.334 µg/m^3, 37.582 µg/m^3 and 32.291 µg/m^3 for PM10, $PM_{2.5,}$ SO_2 and NO_2. These resultant concentrations are within the required standards.

b.1) Following general control measures shall be adopted for controlling air pollution:

- Use of After Burning Chamber in the DRI units for combustion of CO. Bag filters shall be provided at different places, such as kiln inlet area, crushing unit, cooling outlet area

- Use of high efficiency electrostatic precipitators in case of DRI kilns, pellet plant, sinter plant and power plants. In other units, PTFE based high volume bag filters with 25% extra capacity shall be there.

- Keeping stack heights as per CPCB norms wherein the sulphur emissions from the stack are used to calculate the stack height ($Q=14H^{0.3}$ where H is sulphur dioxide emissions in kg/hr and H is stack height in metres).

- PM from level below 30 mg/Nm^3 will be released from all stacks in the plant. 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. As per actual practice and observations, the PM emissions will be even lower for Induction Furnaces & Ladle Refining Furnaces.

- When the reheating furnace at the rolling mill will be in use, bag filters shall be made operational to exhaust PM level below 30 mg/Nm^3. Even though the permissible limit for PM emissions is 250 mg/Nm^3 for rolling mills, the emissions are not expected to go that high in view of the fuels proposed to be used. Furthermore, the reheating furnaces will be operational for about 20% of the time since hot charging is envisaged for 80% of the time. Hence, only one reheating furnace at a time is expected to be operating.
- Dry gas cleaning plant will be incorporated in the blast furnace.
- 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 SO_2 emissions significantly.
- Controlled combustion air supply, controlled combustion temperature and use of low NOx burners will control NO_2 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 / hoods connected with bag filters.
- Waste heat recovery boiler to utilize waste heat from exit DRI gases, coke oven gas, MBF gas and exit clinker kiln gases for generation of steam and subsequently power. Top pressure shall also be recovered from blast furnace to generate 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
- Regular monitoring and awareness among workers is being/ will help in controlling air pollution
- All fugitive emissions are being/ will be minimized as described in subsequent paragraph.

The colony is not anticipated to have any significant emissions during operation since only people will be living there. The fuel that they will consume will be in cooking or driving. It will be ensure that only cylinder gas is used for cooking and vehicles in the premises have ‘Pollution Under Check” Certificate. At the most, the DG set will operate in during power failure, for essential services.

b.2) Fugitive emissions control applicable on various units of the ISP

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

1. Hoods/ fume extraction systems, with bag filters will be provisioned at all transfer points and crushing/ grinding operations. Dust laden air will be drawn through ID Fans, and passed through bag filters to bring down the dust content below 30 mg/Nm^3. The clean air will be discharged into the atmosphere.

2. Conveyors and transfers points will be covered/ provided with enclosures

3. Raw materials and product are stored in covered sheds.

4. Tarpaulin cover will be used whenever and wherever necessary in case temporary storage of raw material is required in open

5. Water sprinkling will be done regularly over all open storage dumps of solid wastes and raw materials.

6. Water sprinkling on roads within the plant as well on the road from plant to Highway is carried out periodically and shall be carried out in future also.

7. In order to prevent the spread of fugitive dust, green belt of adequate width is being developed in existing plant and will be developed all along the expansion plant boundary also.

4.4.3 Control of emissions from various sub-units

4.4.3.1 Emissions from Beneficiation Plant

During operation phase, only the initial stages of the process where the raw material handling and preparation is taking place, will be a source of emissions into air. The raw material will be dry when incoming and undergoing sieving and crushing, if required. At these stages dust will be generated, which will be sucked through hoods and ID fans and passed through bag filters. The emissions after passing through the bag filters shall be <30 mg/Nm^3. After these stages, the raw material gets wet and will not generate dust. Since there are no combustion processes nor fuel consumption in the process, there will be no emission of SO_2 or NOx.

4.4.3.2 Emissions from Pelletisation Plant

During operation phase, following control measures shall be followed:

1. Use of high efficiency electrostatic precipitators with indurating furnace to limit PM level below 30 mg/Nm^3.

2. Keeping appropriate stack height as per CPCB norms.

3. ESPs with =/>99.9% efficiency and and bag filters with =/>99.5% efficiency shall be provided at different places and stack emission will be below 30 mg/Nm^3 as follows:

Sub-unit of pellet plant	Air Pollution Control Measure
1. Raw material Handling	Bag Filter
2. Traveling Grate	ESP
3. Finished product Handling	Bag Filter

4. Fugitive dust due to handling of coal and iron ore and other raw materials etc. will be controlled by sprinkling and bag filters.
5. Leakage from the equipment, ducts and transfer points shall be regularly checked and stopped.
6. Use of low NOx burners in indurating furnace

4.4.3.3 Emissions from Coal washery

The material after crushing and screening, will become wet and not generate any dust. However, following control measures will be adopted to mitigate the impacts from the proposed washery on the environment:

1. Transportation of the coal within washery will be through completely enclosed conveyors to avoid fugitive emissions. The unloading point, receiving hopper and 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.

4.4.3.4 Emissions from DRI plant

- The flue gas coming out from the rotary kiln passes through a dust settling chamber, in which the heavier dust is settled down. The bottom of the dust settling chamber is immersed in the wet scrapper water which is working as the sealing to avoid the gas leakage and false air entry.

- Then the gas passes through the After Burning Chamber (A.B.C.) in which the carbon monoxide and un-burnt carbon are burnt completely and converted into CO_2. At this stage, the phenolic water from

producer gas plant shall also be combusted as per CPCB's SOP for the same.

- The flue gas is taken to the Waste Heat Recovery Boiler (WHRB), where the recoverable heat is utilized for generation of high pressure steam.

- The flue gas is next passed through an electro static precipitator (ESP), where the particulate matter concentration is reduced to less than 30 mg/Nm^3.

- Control of SO_2 is achieved by provision of adequate height to the stack. The heights of the stacks have been determined by estimated 'S' contents in coal and CPCB guideline. About 90-95% sulphur from coal can be absorbed by the limestone. For the purpose of air quality prediction modelling, only 85% has been assumed as worst case scenario.

The process of flow of gases shall be as follows:

DRI → Dust Settling Chamber → After burning chamber → WHRB → ESP → stack → emissions (30 mg/Nm^3)

4.4.3.5 Emissions from blast furnace

- ***Gas Cleaning Plant:***

The major source of pollution in the blast furnace is top gas. The top gas from the furnace will flow through four off-takes and a single down-comer into the dust catcher for primary cleaning. Here, major portion of the dust in the gas is separated. The bottom of the dust catcher is fitted with a pug mill for withdrawing the dust and loading it on to self-dumping type trucks. The semi-clean gas is further cleaned in a high energy dry scrubber gas cleaning unit in two stages. The scrubber controls the furnace top pressure. The scrubber outlet gas will have a maximum dust content of 30 mg/Nm^3. The dust from the gas-cleaning unit will be reused in the sinter plant.

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

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

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

4.4.3.6 Emissions from Sinter plant

- ***Plant dedusting system*** - 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.

- ***ESP -*** Electrostatic precipitators of suitable capacity will be used for de-dusting of waste gases before entering the main exhausters. The unit will have high efficiency ESP to ensure less than 30 mg/Nm^3 of dust in the outgoing gases from the stack. Double cone dust valves and drag link chain conveyors will be provided for discharge of dust from ESP hoppers without air leakage. The dust from ESP will be transported to ESP dustbin of proportioning building by pneumatic transportation system and recycled in the sinter making process. Cleaned gas from ESP will be exhausted by means of exhausters. Waste gas will be let out to atmosphere through an RCC stack. Exhaust fans will be equipped with inlet and outlet dampers.

- ***Waste gas system -*** Waste gas main of sinter machine of adequate diameter and length fitted with expansion joints, wind box connection, down legs for dust discharge and sliding supports will be provided. Automatic double cone valves will be provided.

- ***Waste Gas Fan -*** One waste gas fan with electric motor, silencer and heat and sound insulation will be provided. A metallic / concrete self supported stack, lined with acid proof brick lining will be provided.

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 and sizing of coal, and screening, crushing, storing, and unloading of coke. 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.

Also, as the Coke Oven Gas is completely combusted inside the battery, organic pollutants like PAH are fully broken down.

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 with outlet connected to a stack.

For pushing emission control system, land based pushing emission control system shall be provided for the coke oven battery. This system shall consist of suction hood in the guide car and moving with the car, stationary dust collecting trunk pipe in the coke side equipped with fixed joint valve and finally waste gas purification centre consisting of ground piping, accumulator cooler, pulse bag dust collector, silencer, ventilation unit, stack, etc.

The huge amount of coke dust filled high temperature fumes produced during pushing shall be collected under the effect of hot float fan in the suction hood of the guide car and shall enter the dust collection trunk pipe through the special exchange device joint flap valve. It shall be dissipated into atmosphere after purification by the pulse dust collector after cooled by the accumulator cooler.

The coke dust collected by dust collector shall be delivered by the chain conveyor 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 exhaust fan shall be adjusted with the hydraulic coupling.

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.

4.4.3.8 Emissions from steel melting shop

Induction Furnace: In order to control the air pollution in the induction furnace, fume extraction system will be installed. It will consist of a suction hood and a bag filter. The suction hood will be mounted on the head of

furnace and the flue gases will be sucked through the hood, move along the pipe to the filter. The clean air will be exhausted through the Air Vent with dust concentration within 30 mg/Nm^3.

Electric Arc furnace: EAF roof shall have side fourth hole meant exclusively for the generated fumes to be sucked out. A movable elbow, a combustion chamber and a system of ducts will take the fumes away to the baghouse. Over the cranes above the EAF bay shed, there shall be a canopy which will also pick up fugitive fumes and send to the bag house. This as well as the ducts will also be cooled. Thus, the emissions from the EAF shall be limited within norms.

Basic Oxygen Furnace & New Oxygen furnaces : the particulate matter emissions from basic oxygen furnaces shall be collected and ducted to bag filter during charging, refining, tapping, hot metal transfer, hot metal desulfurization and ladle lancing. This shall be carried out during the entire cycle as follows:

Process	Air pollutant emissions	Control methods in use
Charging and tapping	Particulate matter	Fume extraction system & Bag Filter
Hot metal transfer	Graphite and iron oxide particulate matter	Fume extraction system and bag filter
Furnace waste gases	Particulate matter	Bag filter
	Carbon monoxide	Flare

In order to ensure CREP compliance, the cast house will have arrangement of de-dusting at tap holes, runners, skimmers ladle and charging points.

4.4.3.9 Emissions from Rolling mills

(a) Rolling mill

Reheating furnace exit gases shall be passes through a bag filter and treated to permitted norms prior (30 mg/Nm^3) to release into the atmosphere

(b) Strip mill with pickling & galvanising line

Steel pickling typically relies on large quantities of chemicals such as HCl acid and sulphuric acid, creating fumes that need to be vented properly. Acid mist during pickling will be contained through enclosed system or using hoods over tanks. Acid laden air will be water washed before release.

When the item to be galvanized is dipped into the tank, the liquid in the galvanizing bath volatilizes and escapes into the air as smoke. This smoke is primarily ammonium chloride, but it also contains zinc oxide. Zinc vapour

has been known to cause metal fume fever. Symptoms of metal fume fever include fatigue, chills, muscle pain, fever, cough, and shortness of breath. Scrubbing system shall be provided for treatment of fumes.

(c) Ductile pipe plant

1. Provision of Bag filter and ID fan.
2. **Annealing Furnace** - scrubber and ID fan (when heating will be done by burning of Furnace Oil).
3. Air Pollution from **Magnesium Converter, Zinc Coating units** will be taken care of by installing Bag filter and ID Fan.
4. Air Pollution from **Bitumin/ Epoxy Painting unit** shall be taken care by installing flue air duct connected to a chimney via scrubber and ID fan.
5. Fugitive emissions control from various transfer points/ storage areas, etc. by bag filters, suction hoods, dust collector systems and dust suppression systems.
6. Regular maintenance of plant/ machinery will reduce noise and keep it under 70 db(A)
7. Ear pugs to be given to workers in the ductile pipe plant area.

4.4.3.10 Emissions from Producer Gas plant:

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

The raw producer gas is cleaned to remove Tar containing phenols, toluenes and other aromatic hydrocarbons through wet scrubbing technique. During detailed engineering, the final technology for wet scrubbing shall be opted out of spray tower, venturi scrubber, vortex scrubber or combinations of two scrubbers or with cyclonic demisters. Tar collected in the producer gas plant can be easily sold in open market.

Phenolic water shall be combusted in DRI after burning chamber as per the "Standard Operating Procedure and Checklist of Minimal Requisite Facilities for utilisation of hazardous waste under Rule 9 of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 - Utilization of Phenolic Wastewater generated from Coal Gassifier condensate water" by Central Pollution Control Board in January 2017.

4.4.3.11 Emissions from Cement Plant

- For dedusting of Kiln/ Raw Mill gases, RABH has been envisaged which shall keep the dust content in exhaust gases below 30 mg/Nm^3. The

main exhaust stack of the kiln will be kept sufficiently high to enable the dispersion over a larger area.

- For drying of coal in the drying-cum-grinding operation of coal, kiln exhaust gases shall be used.
- All other dust sources are considered as secondary sources as these are not process implied. These will have -
    - Dust suppression systems on the hopper to suppress the dust generated during unloading of trucks in dump hoppers.
    - Nuisance bag filters on raw material transport section, corrective material transport section, raw material grinding section, raw meal silo section, clinker handling section, clinker transport section, additive material handling section, cement mill hopper section, cement mill section and cement silo section.

4.4.3.12 Emissions from power plant - WHRB and FBC boilers

- High efficiency electrostatic precipitator has been provided for separation of dust from the flue gas. The ESP would bring down the concentration of particulate matter to less than 30 mg/Nm^3 level. Overall efficiency of ESP will be around 99.9%.The process flow shall be as follows:

  FBC boiler → ESP → Stack → Emissions < 30 mg/Nm^3

- For control of SO_2, a stack of adequate height shall be provided. Stoichiometric lime dosing shall be done to absorb the sulphur dioxide generated during the combustion process. Hence, the final dosing requirement will be stoichiometrically calculated as per sulphur content of incoming fuel.
- Low Nox burners shall be used to minimise NOx generation. The other measures for minimising NOx generation will be to maintain furnace temperature of 880-890 deg C throughout the furnace to ensure no or minimal thermal NOx generation takes place and stage combustion will be ensured by providing secondary air at two levels, which will further ensure reduction in NOx generation.
- The boiler bottom hoppers and ESP 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.

4.4.3.13 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 4.11**.

TABLE 4.11: SUMMARY OF AIR POLLUTION CONTROL SYSTEMS

Sl. No.	Proposed Plant facilities	Component	Air Pollution Control Device	% Efficiency (approx)
1	Raw Material handling systems in the plant for various units	Transfer points, storage bins, silos, etc	Bag filters	99.5
2	Beneficiation Plant	Unloading bag, crusher, sieving	Bag filter	99.5
3	Pelletisation Plant	Ball mill	Bag filter	99.5
		Drier	Bag filter	99.5
		Material handling & storage	Bag filter	99.5
		Process	ESP	99.9
4	Coal Washery	Crushing & grinding	Bag filter	99.5
5	DRI Plant	Kiln	ESP after WHRB	99.9
		Dedusting	bag filter	99.5
6	Mini Blast Furnace	Hot Stove	Dry gas cleaning plant	99
		Cast house & Stock house	Bag filters	99.5
7	Sinter Plant	Dedusting & cooling system	Bag filter	99.5
		Sinter machine	ESP	99.9
8	Coke Oven Plant	Process, to WHRB	ESP	99.9
		Dedusting	Bag filter	99.5
		Quenching	Grit arrestor	95
		Sulphur removal in combusted flue gas	Lime Scrubber	95
9	Steel Melting Shop			
9.1	Steel Melting via Induction Furnace Route	IF & LRFs	FES and Bag Filters	99.5
9.2	Steel Melting via Electric Arc Furnace-Vacuum Degassing/ Argon Oxygen Decarburization/ RH Route	Fourth hole	FES, canopy/ hood and Bag Filters	99.5
9.3	Basic Oxygen Furnace/ New Oxygen furnaces/ EOF-Vacuum Degassing/ Argon Oxygen Decarburization/ RH Route	Charging, tapping, hot metal transfer, furnace waste gases	FES, Bagfilters & flare (for CO containing gas)	99.5
9.4	Continuous Casting Machine (Billets/ Bloom Caster/ Slab)	Process	Steam exhaust systems, Cut fumes exhaust system	NA
10	Finished Product Facilities			
10.1	Rolling Mill (TMT/ Flat/ Round/ Wire Rod/ Structural	Reheating furnace	Bag filters	99.5
		Pickling line	Acid mist scrubber	95

Sl. No.	Proposed Plant facilities	Component	Air Pollution Control Device	% Efficiency (approx)
	Mill/ Hot Rolled/HRC/ /Structural Mill/Plate/ Pipe& Tube Products/ Tin Plate/ Electrical Steel/ CRGO/ others) followed by one or more in series of pickling, cold rolling, annealing, galvanizing	Annealing Furnace	Scrubber	95
		Galvanising line	Scrubber	95
		Colour coating	Hoods with filters, thermal afterburners in case of hydrocarbon fumes	
10.2	Strip Mill/ Sheet/ Coil/ Wire & Bar Mill/ Wire Rope	Reheating furnace,	Bag filters	99.5
		Pickling line	Acid mist scrubber	95
		Galvanising line	Scrubber	95
10.3	Ductile Pipe Plant	magnesium converter, zinc coating units	Bag filters	99.5
		Annealing Furnace	Scrubber	95
		Bitumin/ Epoxy Painting unit	Scrubber	95
11	Producer Gas Plant	Process gas to pellet plant	Wet scrubber for gas cleaning	95
11	Oxygen Plant		nil	
12	Lime Plant	Kiln	Bag filters	99.5
13	Cement Plant	Kilns, mills, product house, RMHS	RABH, Bag filters	99.5
14	Captive Power Plant			
14.1	Waste Heat Recovery Boiler (WHRB)	Exit gases of WHRB	ESP	99.9
14.2	AFBC/CFBC	Boiler	ESP	99.9
15	Colony	DG set	Stack height in DG as per CPCB norms	For SO_2 dispersal

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

Hence, the overall quality of the ambient air are being / will be maintained within the limits prescribed by CPCB, MOEF&CC and SPCB.

4.5 LAND ENVIRONMENT

4.5.1 Impact on Land & its Management

Construction phase: Part of the existing plant area is already constructed and part being constructed as per previous environmental clearances (in 1769 ha). The balance area remaining for construction in the existing plant will also experience the same impacts due to construction in proposed expansion area (1800 ha).

In the expansion area, the possible impact on landform of the area will occur due to land grading, digging, filling, excavation of earthworks, making roads, boundary wall, reservoir and plant related civil construction activity. Exact volume of excavated earthworks is difficult to estimate at this preliminary stage without detailed surveys and designing. 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 leveling 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 land and when it is being acquired will be changed to industrial land use. The existing plant area is spread over 1769 acres land. Additional area required for expansion is 1800 acres. Total area of the project, therefore, will be 3569 acres. During construction phase, parts of the project area will be converted into plant facilities, stock yards, raw material/ solid waste storage areas, internal roads, water reservoir, buildings, green belt and plantation, etc. The features of the plot will undergo changes due to construction.

The land use sanctioned in EC dated 15.02.2021 is also proposed to be revised and the revised existing as well as proposed additional landuse break up for the entire plant is shown in **Table 4.12**.

TABLE 4.12: BREAK UP OF PLOT AREA (ACRES)

Sl. No.	Description	As per EC dt. 15.02.2021		Revised existing		Proposed Additional	Total After Expansion	
		Area	%	Area	%	Area	Area	%
1	Plants, facilities, colony	750.4	42.42	776.4	43.89	953.6	1730	48.47
2	Stock yards, raw material complex, railway siding	128	7.24	128	7.24	50	178	4.99
3	Area for solid waste	116	6.56	116	6.56	60	176	4.93
4	Green belt & plantation	584	33.01	584	33.01	595	1179	33.03

Sl. No.	Description	As per EC dt. 15.02.2021		Revised existing		Proposed Additional	Total After Expansion	
		Area	%	Area	%	Area	Area	%
5	Administration & other buildings	30	1.7	30	1.7	5	35	0.98
6	Water reservoir	60	3.39	34	1.92	46	80	2.24
7	Roads	100.6	5.69	100.6	5.69	90.4	191	5.35
	Total	**1769**	**100**	**1769**	**100**	**1800**	**3569**	**100**

It may noted that compared to the layout and land use sanctioned vide EC dated 15.02.2021, the water reservoir area has been exchanged with the colony area. Thus, the water reservoir area has reduced from 60 acres to 34 acres and the colony area will increase from 34 acres to 60 acres.

An additional 3.14 acres land has been purchased outside the plant boundary, in Jharbandh village, to meet the residential accommodation requirements of the plant personnel. 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. Further, land is being procured near New Bhagirathipur village for private railway siding.

Three tier greenbelt (atleast 10 m wide) is being and 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: Part of the existing plant area is already constructed and part being constructed as per previous environmental clearances (in 1769 ha). The balance area remaining for construction in the existing plant will also experience the same impacts due to construction & operation in proposed expansion area (1800 ha).

During expansion phase, soil quality might change during construction phase due to handling of construction material. Soil quality may also change during operation due to open yard storage of raw materials like iron ore, coal and limestone. Further, temporary storage of solid wastes like char, slags, fly ash, tailings, washery reject, etc in solid waste storage yard would also deteriorate soil quality, if appropriate control and mitigation measures are not implemented.

Management: During construction, the topsoil generated is being as per existing EC) and will be (in proposed expansion phase) preserved and spread over the area identified for development of green belt and plantation. The waste disposal areas and raw material yards are being and shall be lined with stable liners.

During operation, the run off and leachates from the raw materials stack yard and solid waste disposal yard, respectively is and shall not be allowed to mix with storm water drainage. Runoff is and will be collected in a garland drain around the stock yard, settled and treated. In the existing phase, a 1000 KLD ETP is being constructed, and the water will be treated in it prior to reuse in sprinkling or horticulture. Excess runoff is being and shall be released to the natural drain after monitoring and ensuring that the quality is within permissible limits.

4.6 WATER ENVIRONMENT

4.6.1 Water consumption

Total fresh water requirement for the operation of the plant is estimated as follows:

TABLE 4.13: WATER REQUIREMENT OF THE PROJECT

Project Stage	Water requirement			
	KLH	KLD	Cumec	Cusecs
Existing - 3.55 MTPA	3752	90048	1.042	36.806
Proposed expansion- 3.98 MTPA	2750	66000	0.764	26.976
Total - 7.53 MTPA	6502	156048	1.806	63.782

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.

Drawl of 6502 cum/hr water from Brahmani river will have an impact on the availability of water of others, as the lowest ever lean season flow rate has been observed as 23.7 cumecs, as determined from https://indiawris.gov.in/wris/#/RiverMonitoring (accessed 16.10.2021). The water withdrawal for 7.53 MTPA plant shall be 7.6% of the lean season flow. However, with respect to the annual 50% dependable flow of 14041 MCM/annum, the plant water withdrawal will be 0.013%, which is negligible.

The company does not propose to use ground water for any industrial purpose during operation of the plant. Ground water may be used for drinking water/ domestic purposes, with due permission from the Central Ground Water Authority.

4.6.2 Waste water generation from various sources

The waste water generation from various sources is given in **Table 4.14**.

TABLE 4.14: WASTE WATER GENERATION FROM VARIOUS SOURCES FOR ENTIRE PLANT (7.53 MTPA ISP)

Plant facilities	Waste Water generated			Reused			Waste water utilisation
	3.55 MTPA	Additional	7.53 MTPA	3.55 MTPA	Additional	7.53 MTPA	
Beneficiation	120	0	120	120	0	120	100% reused in beneficiation plant after decantation in tanks
Coal Washery	74	0	74	74	0	74	100% treated & recirculated in 5 stage treatment system
Pellet Plant	177	0	177	177	0	177	100% water treated in individual unit-based ETPs, where proposed. Treated waste water sent to common monitoring basin from where it will be utilized for ash quenching, fly ash brick making, green belt watering and dust suppression
Mini Blast Furnace	73	115	188	73	115	188	
Sinter plant	8	13	21	8	13	21	
Steel Melt Shop	5	6	11	5	6	11	
Flat/Round/Wire/Rod/ Structural Mill	5	0	5	5	0	5	
Strip Mill/Sheet/Coil/ Wire & Bar Mill/Wire Rope	1	0	1	1	0	1	
Color coated/ Galvanized/ pipe	0	17	17		17	17	
Producer Gas Plant	154	0	154	154	0	154	
Power Plant	138	118	256	138	118	256	
Drinking Water and Sanitary	10	68	78	10	68	78	100% treated in STP & used in green belt
Grand Total	**765**	**337**	**1102**	**765**	**337**	**1102**	

There are separate treatment plants for different units, as seen above, according to their specification. For example, the washery will have its five stage treatment system next to it and the water will be 100% recycled back into the system. Such units are detailed in subsequent section. Water from all the other will be sent to neutralization pit and after treatment will be directed to the common monitoring basin from where it will be utilized for ash quenching, fly ash brick making, green belt watering and dust suppression, as can be seen in **Fig 2.17**, the water balance diagram. The waste water from domestic sources, after treatment in STP shall be utilized for horticulture.

4.6.3 Plant wise effluent treatment systems

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

1. **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.

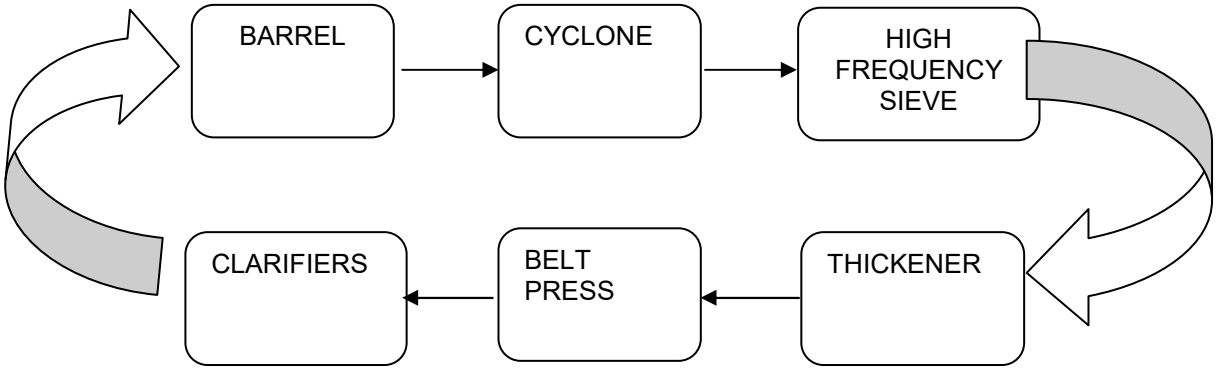
2. **Water treatment Plant-** In the water treatment plant, acidic and alkaline effluents are generated during the generation of cation /anion and the mixed bed exchangers. The effluents from the water treatment plant will be led to a properly sized impervious, neutralization pit. Normally these effluents 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. The neutralized effluents will be sent to common monitoring basin before reuse.

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. They will be routed through catch pits of sufficient volume to settle out suspended solids present in the storm water runoff. Batch type ETP shall be provided to treat the run off, if required, prior to reuse of the water.

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 decantation tank wherefrom the overflow will be recirculated back to the iron ore beneficiation plant. 100% reuse is anticipated.

6. **Sewage from plant buildings & colony**- Sewage from the toilets, washrooms, canteen and colony will be treated in STP & soak pit systems. A sequential MBBR technology is planned to be installed with the capacity of 600 m^3/day. The treated water from the STP will be utilised in green belt development.

7. **Maintenance, workshop & plant cleaning:** Oil & grease during repair and maintenance of machinery 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 or sent to kiln for combustion.

8. **DI Pipe plant:** In DI pipe plant water is required mainly for cooling the casting machines. This water will be recirculate back to systems. The water from the cement slurry section will also be recycled.

4.6.4 Summary of effluent sources and their control systems

The list of water pollution control systems envisaged are summarised in **Table 4.15**.

TABLE 4.15: LIST OF WATER POLLUTION CONTROL SYSTEMS ENVISAGED

Sl. No.	Source	Pollutants	Control systems
1	Raw materials handling yards	Suspended Solids	Garland drains, Catch pits and settling tanks Multiple desilting chambers & settling tanks of 5 X2 X 1.5 m size
2	DM water plant	pH	Neutralising pit (700 m^3), send to Common Monitoring Basin (CMB) and reuse in dust suppression/ ash quenching
3	Cooling tower blow down, Boiler blow down and effluent from various sub-units i.e. pellet, sinter, DRI, SMS, RM, CPP, oxygen etc.	Temperature, Suspended Solids, Dissolved solids, pH	Treatment in neutralisation pit or individual treatment plants (as detailed against each), as applicable, and thereafter sent to Common monitoring basin (800 m^3) and reuse in dust suppression, ash management, fly ash brick manufacturing & horticulture
4	Washery	Suspended Solids	Five stage treatment system (700 m^3) and 100% recirculation of water back to process
5	Coke Oven Plant	Suspended coke particles	Settled & recycled in sinter making
6	Producer Gas Plant	Phenols, Tar	Tar separation from PGP flue using wet scrubbing technique followed by burning of phenolic

Sl. No.	Source	Pollutants	Control systems
			water in after burning chamber of DRI kiln; 200 m^3 capacity
7	Beneficiation plant	Suspended Solids	Tailing decantation tank (1,000,000 m^3) for settlement of solids and recirculation of decanted water to process
8	Cooling system of various furnaces in SMS	Dissolved Solids	Settling tanks
9	Slab caster, Boom caster and Billet caster	Suspended Solids	Settling tanks
10	Workshop	Oil & Grease, SS	OWS of 0.2 m^3 & settling tank
11	Canteens, toilets	BOD, Suspended Solids	STP
12	Storm water drains	Suspended solids	Desilting chamber prior to storage in rain water harvesting ponds and raw water reservoir all along internal roads & interceptor drain on south & eastern edges of plant leading to north

4.6.5 Ground water pollution and management plan

As such the plant working has been planned on zero discharge basis therefore no polluted water discharge is anticipated on account of industrial activity. As no effluent will be released, contamination of surface or underground water will not occur.

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

4.6.6 Rain water harvesting

Rain water harvesting is planned in the main block of plot area as well as the water reservoir area proposed at Jharbandh. It is proposed to collect the rain water in the surface water reservoir in addition to ground water recharge from green belt and roof top of administrative and residential buildings. The water that shall get collected in the surface water reservoir and can be recharged to ground is calculated in **Table 4.16**.

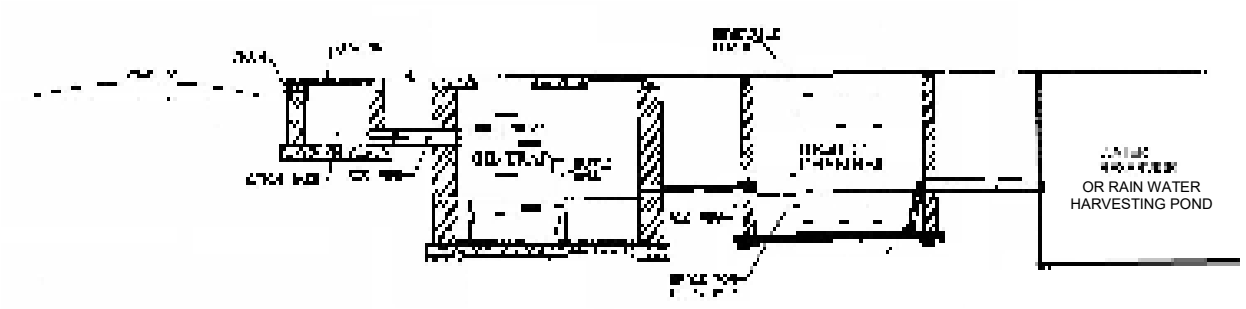
TABLE 4.16: RAIN WATER HARVESTING PROPOSAL FOR PROJECT SITE

Sl. No.	Facility	Area (acre)	Area (ha)	Runoff co-efficient	Rainfall Average (m/ annum)	Run off harvested, cum/ year	Remark
1	Plants, facilities	1730	700.12	0.8	1.2775	715524	To rain water harvesting pond(s)
2	Stock yards, raw material complex & railway siding	178	72.04	0.5	1.2775	46013	To settling tank & then rain water harvesting pond(s)
3	Area for solid waste	176	71.23	0.5	1.2775	45496	To settling tank & then rain water harvesting pond(s)
4	Green belt & plantation	1179	477.13	0.3	1.2775	182862	To Rain water harvesting trenches
5	Administration & other buildings	35	14.16	0.8	1.2775	14476	To Rain water harvesting pits
6	Water reservoir	80	32.38	1	1.2775	41360	Directly into Raw water reservoir
7	Roads	191	77.30	0.7	1.2775	69123	To settling tank & then rain water harvesting pond(s)
	Total	**3569.0**	**1444.35**			**1114853**	
	Reused for plant (1)+(2)+(3)+(6)+ (7)					917515	82.3
	Recharged to ground (4)+(5)					197338	17.7

Assuming 50% losses, it can be seen that water harvesting shall help meet 7 days water requirement of the plant and, therefore, reduce equivalent withdrawal from the river.

The surface run off water shall be passing through settling chambers before reaching the reservoir/ 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 m, 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



Rain water harvesting and ground water recharge shall be carried out through trenches in green belt area while it shall be carried out through rain water harvesting pits from roof top of administrative and residential buildings.

4.7 SOLID WASTE

4.7.1 Solid waste generation and impact

A. Construction phase:

During the Construction phase, the generation of solid waste is low and comprises of rejected and waste construction material and predominantly of used packaging material.

B. Operation phase:

The characteristics of some of the solid waste generated is given in the **Table 4.17**. The likely solid waste generated from entire plant facilities is given in **Table 4.18**.

TABLE 4.17: LIKELY SOLID WASTE CHARACTERISTICS

Sl. No.	Source	Characteristics
	DRI Plant	
1	Char	Ash 60%, C 32%, H_2O 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_2O_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_2O_3 3-4%, Fe_2O_3 60-70%, SiO_2 5-7%, Al_2O_3 1-2%, CaO 5-7%, MgO 3-4%, C 10-12%
7	GCP Sludge	Fe_2O_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_2O_3 5-7%
	Power Plant	
9	Fly Ash	SiO_2 55-60%, Al_2O_3 25-30%, CaO 2-5%
	Coal Washery	
10	Middlings	Ash : 45%, Carbon : 24%, and S : 0.5%

TABLE 4.18: LIKELY SOLID WASTE GENERATION (TPA)

Sl. No.	Unit	Solid Waste	As per EC dated 15.02.2021 (3.55 MTPA ISP)	Proposed Additional	Total After Expansion (7.53 MTPA ISP)
1	Beneficiation Plant	Tailing	2,155,971	0	2,155,971
2	Pellet Plant	Dust (Iron Ore, Coke, Coal Fines)	2,348,097	0	2,348,097
3	Coal Washery	Middlings	2,137,410	0	2,137,410
		Reject	377,190	0	377,190
4	DRI	Char	414,347	395,948	810,295
		ESP, bag filter dust	141,447	135,991	277,438
		Kiln Accretion	40,414	38,854	79,268
5	MBF	BF Slag	582,750	912,450	1,495,200
		Dust (Iron Ore, Coke, Sinter Fines)	97,125	152,075	249,200
6	Sinter Plant	Sinter Return Fines	424,116	697,950	1,122,066
7	Coke Oven Plant	Bag Filter Dust	48,471	75,279	123,750
8.1	SMS-IF	BF dust and losses	37,496	26,344	63,840
		Slag	297,287	216,093	513,380
	SMS-IF-CCM	Mill Scale	30,800	22,400	53,200
8.2	SMS-EAF/EOF/NOF/BOF	BF dust	38,094	71,133	109,227
		Slag	430,206	785,538	1,215,744
	SMS-EAF/EOF/NOF/BOF-CCM	Mill scale	33,600	61,380	94,980
9.1	Rolling Mill	Reject	35,490	0	35,490
		Mill Scale	43,376	0	43,376
9.2	Strip Mill	Reject	4,592	0	4,592
		Mill Scale	5,612	0	5,612
9.3	DPP	Reject	4,592	0	4,592
		Mill Scale	5,612	0	5,612
9.4	Color coated/ Galvanized/ pipe	Reject	70,875	0	70,875
		Mill Scale	70,875	0	70,875
10	PGP	Coal Ash	359,120	0	359,120
		Coal Tar	65,295	0	65,295
11	Power Plant	Ash	2,022,411	473,628	2,496,039
	Total		**12,322,671**	**4,065,063**	**16,387,734**

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.
- Garbage 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 local recyclers.
- 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 waste produced by any steel plant is slag, scrap, scale and dust. The dust from dust catcher of DRI unit and dust collected in bag filters and ESPs of various other sections will be recycled in the plant itself for pellet making or sinter making. Slag from Blast furnace will be granulated and reused in own proposed cement plant for manufacturing slag cement. Mill scale and scrap from SMS, casters and rolling mills will be recycled in the steel plant to the plant. These are sellable also.

The integrated steel plant is designed such that the products and solid wastes of one unit are the raw material of other units. Thus, minimising the solid waste that needs to be disposed outside the complex. The estimated outhouse disposal/ reuse required in the proposed 7.53 MTPA steel plant is 7.5% of the total outhouse raw material requirement. The outhouse reuse will be in land leveling, backfilling and manufacture of road making aggregates, ceramic tiles and sand substitute in construction.

The FBC power plant will generate fly ash which will be used for cement, paver block, fly ash brick making and land filling. The ash will be collected through ESP, economiser and hopper. The ash will then be conveyed to silo through dense phase system and it will be mixed with water to make it moist

in ash conditioners and finally loaded into tipper for disposal/ reuse. The quantum of solid waste generation from the different units of proposed plant of 7.53 MTPA along with their reuse and disposal is given in **Table 4.19**.

TABLE 4.19: SOLID WASTE GENERATION & MANAGEMENT FOR 7.53 MTPA ISP

Sl. No.	Unit	Solid Waste	Total After Expansion to 7.53 MTPA	Inhouse reuse	Outhouse reuse/ disposal	Remarks
1	Beneficiation Plant	Tailing	2,155,971	0	2,155,971	Collected in small tailing decantation tank, dewatered and dredged for 100% reutilisation as sand substitute in infrastructure/ fine concrete aggregate/ cement manufacture
2	Pellet Plant	Dust (Iron Ore, Coke, Coal Fines)	2,348,097	2,348,097	0	100% reused in sinter making or recirculated to mixing bin of the pellet plant
3	Coal Washery	Middlings	2,137,410	2,137,410	0	100% reused in captive power plant
		Reject	377,190		377,190	100% temporarily stored in solid waste disposal area within project site till sent for backfilling in mine or used for road making/ filling of low lying area.
4	DRI	Char	810,295	810,295	0	100% reused in CFBC boiler within project
		ESP, bag filter dust	277,438	277,438	0	100% reused in sinter making within project
		Kiln Accretion	79,268	0	79,268	100% stored in in land fill temporarily till reused in road sub-base
		Refractories	Variable, periodic	√ (part)	√ (part)	Reusable portion of salvaged refractories are recycled, preparation of mortar
5	MBF	BF Slag	1,495,200	1,495,200	0	100% Slag will be granulated, used for cement making in own proposed cement plant.
		Dust (Iron Ore, Coke, Sinter Fines)	249,200	249,200	0	100% dust will be reused in Sinter Plant.
6	Sinter Plant	Sinter Return Fines	1,122,066	1,122,066	0	100% dust will be used in Sinter Plant within project
7	Coke Oven	Bag Filter Dust	123,750	123,750	0	100% dust will be used in

Sl. No.	Unit	Solid Waste	Total After Expansion to 7.53 MTPA	Inhouse reuse	Outhouse reuse/ disposal	Remarks
	Plant					Sinter Plant
8.1	SMS-IF	BF dust and losses	63,840	63,840	0	100% dust will be used in Sinter Plant within project
		Slag	513,380	51,338	462,042	100% slag will be given for metal recovery, converted to aggregates (special balls) and used in road making within and outside plant
	SMS-Caster	Mill Scale	53,200	53,200	0	100% reuse/ sale in own/ other cement plant, usable in pellet making & sinter plant, LRF dephosphorisation process, as secondary coolant-replacement of iron ore after briquetting
8.2	SMS-EAF/ EOF/ NOF/ BOF	BF dust	109,227	109,227	0	100% reused in sinter making or pellet plant within project
		Slag	1,215,744	0	1,215,744	100% reused through various methods such as slag atomisation/ granulation to make Precious Slag balls (spherical, 0.1-4.5 mm) which can be used as blasting abrasive, casting sand, filter media etc; use as rail ballast, road & pavement material, filling material, cement making, brick/ ceramic tiles making, soil conditioner, tiles
	SMS-Caster	Mill scale	94,980	94,980	0	100% reused in Sinter Plant or clinker plant, also saleable
9.1	Rolling Mill	Reject	35,490	35,490	0	100% reused in SMS
		Mill Scale	43,376	43,376	0	100% reused in Sinter Plant or clinker plant, also saleable
9.2	Strip Mill	Reject	4,592	4,592	0	100% reused in SMS
		Mill Scale	5,612	5,612	0	100% reused in Sinter Plant or clinker plant, also saleable
9.3	Ductile Pipe Plant	Reject	4,592	4,592	0	100% reused in SMS

Sl. No.	Unit	Solid Waste	Total After Expansion to 7.53 MTPA	Inhouse reuse	Outhouse reuse/ disposal	Remarks
		Mill Scale	5,612	5,612	0	100% reused in Sinter Plant or clinker plant, also saleable
		Zinc recovered	Not separately estimated		√	100% sale to paint manufacturer
		Cement slurry	Not separately estimated	√		100% recover water & manufacture brick/ cement tiles
		Core sand (in casting area & annealing furnace)	Not separately estimated	√ (part)	√ (part)	100% used for land leveling
9.4	Color coated/ Galvanized pipe	Reject	70,875	70,875	0	100% reused in SMS
		Mill Scale	70,875	70,875	0	100% reused in sinter plant or clinker plant, also saleable
10	Producer Gas Plant	Coal Ash	359,120	0	359,120	100% reused as per Fly Ash Utilisation Notification 1999 and its amendments of 2003, 2009, 2016. Used in cement making, brick making, block making, aggregate making, and road making.
		Coal Tar	65,295	0	65,295	Saleable, reuseable in coke oven plant over charge coal
11	Captive Power Plant	Bottom ash and fly ash from Char, middlings, coal fines & coal	2,496,039	2,151,902	344,138	100% reused as per Fly Ash Utilisation Notification 1999 and its amendments of 2003, 2009, 2016. Used in own cement plant and rest sent to others cement making, brick making, block making, aggregate making, and road making.
	Total		**16,387,734**	**1,13,28,967**	**50,58,768**	

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.

- Use of Brokk machine will aid in reduction in specific generation rate of kiln accretion

- 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 or used for making bricks.

- Blast furnace 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 is used for cement making.

- While hot, the sulphur in the blast furnace slag reacts with air to release SO_2. When water is added, H_2S 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 and pavers.

- Reject from washery, which is proposed to be stored in the solid waste storage area initially will be later on sent back to the mine for backfilling. This will not only reduce land for waste storage in plant site but also take care of extra void space at the mine end.

- Mg & Zn Dust, Zn dross (containing about 96% Zn), Zinc ash/ skimming (containing 65-80% Zn) generated from ductile pipe making process will be sold in market to paint manufacturer or used in sinter plant, within premises

- There will be solid waste from ETP, water treatment plant, scrubbers, pickling units, etc which will be partially

- The minimisation of solid waste generation in steel melting shop shall be carried out through following steps:

TABLE 4.20: MINIMISATION OF SOLID WASTE IN SMS

Sl.	Process	Type of Waste	Waste Minimization measures
1	EAF	EAF dust	▪ Improvement in process, operation and maintenance such as, continuous charging (Con-steel process, Conti-arc process, Finger shaft furnace; estimated reduction 40%). ▪ Lime addition as a part of the bucket charge contrary to addition by pneumatic injection. ▪ Adoption of foamy slag practice to the optimum extent. ▪ Minimization of carbon blowing by maintaining not so high carbon opening in the bath. ▪ Providing adjustable speed drives bag house fan to reduce dust emission by 2 to 3% over the whole tap-to-tap cycle. ▪ Provision of computerized process control. ▪ Use of UHP in all solid charge operation to reduce tap to tap time.
		EAF slag	▪ Improved charge-mix preparation, cost-effective optimization of charge-mix, maintaining minimum basicity by controlling low opening of S & P in the bath through optimized charge-mix, betterment of flux quality.
2	BOF	BOF dust/ BOF sludge	Avoidance of over blown metal, minimization of fines in flux-mix, avoidance of late addition of fluxes, elimination of zinc-coated scrap in the burden, use of optimum top blowing rate, pressure and time in conjunction with bottom blowing rate and time, use of low Si hot metal, use of low SiO2 lime.
		BOF Slag	Use of low SiO_2, high reactivity and low LOI lime, use of low-silicon and low sulphur hot metal, if necessary, through hot metal pre-treatment, computerized charge balance or process control.
3	Continuous caster	Caster scale	Air mist cooling

Source: Utilization of Solid Waste from Steel Melting Shop by D. K. Ambasta, Bikas Pandey, Nabarun Saha, MECON Limited, Ranchi

4.7.2.1 Hazardous wastes:

Hazardous waste management as per Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 shall be done as given in **Table 4.21.**

TABLE 4.21: HAZARDOUS WASTE MANAGEMENT

Sl. No.	Process	Category in Schedule I of Rules	Hazardous Waste description	Quantity (annual)	Mode of disposal
1	Industrial operations using mineral or synthetic oil as lubricant in hydraulic systems or other applications	5.1	Used/ spent oil	400 KL	Storage in containers over impervious floor in leak proof containers, under well ventilated covered shed followed by disposal through captive use/ authorised TSDF facility
		5.2	Waste/ residues containing oil	500 KL	In addition to above, other option is to send for co-processing in authorised/ own clinker kiln
2	Industrial use of zinc	6.2	Zinc ash/ skimming	0.5 T	100% sent to authorised recycler for conversion to Zinc sulphate for subsequent use as micronutrient in agriculture, raw material for Zinc Chloride manufacturing or melted into zinc ingots/ slabs for further use in galvanising
		6.4	Flue gas dust and other particulates	0.50 T	100% sent to authorised recyclers
3	Metal surface treatment-galvanizing	12.1	Acidic and alkaline residues	80 T	Neutralized in ETP of cold rolling mill. Storage in impervious pit / containers under well ventilated covered shed followed by final disposal in Authorized HW incinerator
		12.2	Spent acid and alkali	40 T	Storage in impervious pit / containers under well ventilated covered shed followed by final disposal in Authorized HW incinerator
		12.8	Plating metal sludge (Zinc Dross)	0.50 T	100% sent to authorised recycler for conversion to zinc oxide, which is used in rubber, medicine, ceramics, glass, etc. or melted into zinc ingots/ slabs for further use in galvanizing
4	Production of iron and steel (finishing mills)	13.1	Spent pickling liquor	2000000 KL	100% sent to authorized recycler after treatment
		13.2	Sludge from acid recovery unit	80 T	Storage in impervious pit / containers under well ventilated covered shed followed by final disposal in

Sl. No.	Process	Category in Schedule I of Rules	Hazardous Waste description	Quantity (annual)	Mode of disposal
					Authorized HW incinerator and land filling
5	Coke oven plant	13.5	Tar	150000 T	Storage in impervious pit in leak proof containers under well ventilated covered shed followed by disposal to TSDF/ co-processing in authorised/ own DRI kiln/ charged with coking coal for coke making or sent to other authorised users
5	Handling of hazardous chemicals and wastes	33.1	Discarded barrels/ containers contaminated by Hazardous chemicals	50 T	Storage on impervious floor under well ventilated covered shed followed by captive use/ disposal through original supplier/ disposal through authorised TSDF facility
6	Gas scrubbing system	35.1	Gas cleaning residue	0.50 T	Storage in impervious pit / containers under well ventilated covered shed followed by final disposal in Authorized HW incinerator / co processing in cement plant kiln/ CHWTSDF
4	Effluent treatment plant, water treatment plant	35.2	Spent ion exchange resin containing toxic metals	0.50 T	Storage in impervious pit / containers under well ventilated covered shed followed by final disposal in Authorized HW incinerator and land filling
		35.3	Chemical sludge from waste water treatment	160 T	Storage in impervious pit in leak proof containers under well ventilated covered shed followed by disposal to TSDF
		35.4	Oil and grease skimming	29 T	Storage in impervious pit in leak proof containers under well ventilated covered shed followed by co-processing in authorised cement kiln

The nearest TSDF facilities are at village Kanchichuan, District Jajpur (100 km by road) authorised by OSPCB. Till disposal, the hazardous waste storage within the plant will follow CPCB's "Guidelines for Storage of Incinerable Hazardous Wastes by the Operators of Common Hazardous Waste Treatment, Storage and Disposal Facilities and Captive HW Incinerators". Following points will be taken care of:

a) Storage in Shed for incinerable hazardous wastes

b) Separate sheds for non compatible waste

c) Impervious floor, raised plinth level (150 mm)

d) Barrel storage pattern to be such as to leave 1 m space for inspection and 4 m between blocks of stacked drums as fire break

e) Automatic smoke, heat detection system should be provided in the sheds.

f) Flame proof electrical fittings

g) Spark arrester on materials handling vehicles

h) Prevent entry of runoff into the storage area

i) Secondary containment such as proper slopes as well as collection pit so as to collect wash water and the leakages/spills etc.

j) Proper peripheral drainage

k) System connected with the sump so as to collect any accidental spills in roads or within the storage yards as well as accidental flow due to fire fighting.

4.7.2.2 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
- The municipal solid waste (domestic) will be segregated. The biodegradable component will be composted 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-biodegradable component will be disposed in designated sanitary landfill site on weekly basis. Solid Waste Management Rules, 2016 will be followed The manpower is expect to generate a maximum of 150 gms/capita/day of solid waste.
- Biomedical waste from dispensary shall be given to nearest CPCB/ SPCB authorised biomedical waste management agency. Waste management shall be as per Biomedical Waste (Management & Handling) Rules, 2016
- Additional Waste management will be done under following applicable rules :
  - Plastic Waste Management Rules, 2016
  - Batteries (Management and Handling) Rules, 2001

4.7.2.3 Details of Temporary solid waste storage area

Company has earmarked 176 acres for solid waste disposal within the Integrated steel plant. The temporary solid waste storage 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 lines/ pitched. Vertical baffle walls will be constructed at suitable intervals 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 water quality will be assessed prior to discharge and sent for treatment to the ETP, if required, prior to discharge.

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. All stock piles will be on top of a stable liner to avoid leaching of materials to ground water.

4.7.2.4 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. Ideally the char will be directly transferred to the captive power plant
- Water sprinkling arrangement - to minimize fugitive dust.
- Dumping site- roads with appropriate slopes, good construction & safe measures will be constructed. 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 shall be carried out to avoid air pollution problem due to airborne dust
- Maintaining the transport vehicles (tippers) shall be carried out to avoid break downs & road blockages.
- Maintenance of road and strengthening the stability of slope road at the deposition point.

4.7.2.5 Fly ash utilisation plan

Fly ash will be provided with an area in the solid waste disposal area for emergency storage. The mound system shall be followed for the storage of ash. At any point of time when the utilization of fly ash increases, the stored ash will be utilized to meet the demand.

A tentative ash utilisation scheme as per the MOEF&CC guidelines is given in **Table 4.22**.

TABLE 4.22: ASH UTILISATION PLAN

Total Ash Generation	**Total**
1) Fly ash generation from CPP	19,96,831
2) Bottom ash generation from CPP	4,99,208
3) Ash from PGP	3,59,120
Ash utilisation	
1) Fly ash to own brick plant	54,067
2) Fly ash to other brick/ paver plants	2,70,336
3) Fly ash for road making, leveling, etc	21,86,618
4) Fly ash to own Cement plant	3,44,138

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

- The company will establish total 4000 bricks/ hour brick plant(s)
- Based on the current consumption of fly ash by other brick/ paver manufacturers in the region, it is estimated that fly ash required to manufacture nearly 40000 bricks/ hour will also get consumed
- The utilisation in proposed cement plant in the project site will be commensurate with the clinker production facilities
- Balance portion will be used for fly ash for road making and land levelling

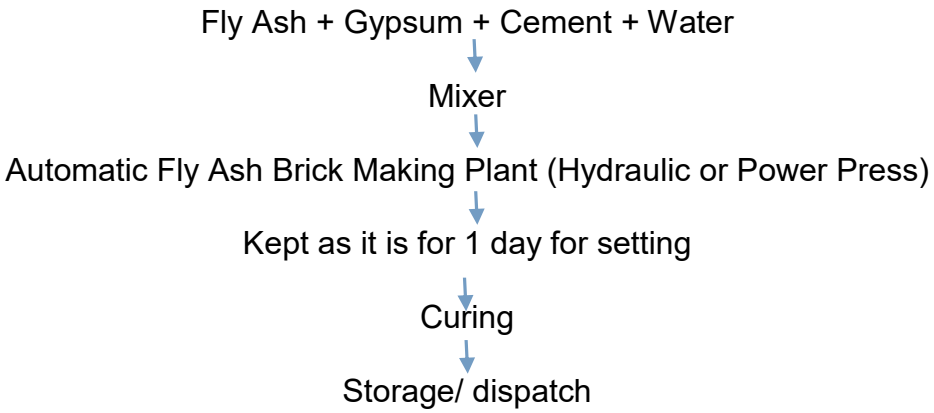
4.7.2.6 Fly Ash Brick plant

The company will install total 4000 bricks/hr plant(s) to manufactured brick to utilise in house generated fly ash.

Fly Ash, cement, finely ground gypsum in requisite proportions will be manually fed into pan mixer where water is also added. The mixing proportion will generally be as follows:

- Fly Ash 90-92%
- Cement 1-2%
- Gypsum 5-6% Water 2-3%

After mixing, the mixture will be allowed to belt conveyor through feed in to automatic brick making machine where the bricks will be pressed automatically. The bricks will then be withdrawn from the molding machine and air dried under sun for a day and then water cured for 7 days. The final products will be sorted out and inspected for quality and stacked. The manufacturing process is diagramaticaly represented below:



4.8 NOISE

4.8.1 Impact due to noise

Construction phase: During construction phase, the equipment used for construction will be the main noise sources which will have temporary and reversible impact on the noise level of the area. The movement of vehicles bringing construction material and plant components for installation will also generate noise. Construction activities such as cutting, welding, use of vibration machines, etc shall also generate noise. The workers in the vicinity of construction activities, construction machinery, vehicles, etc will be exposed to noise during working hours.

Operation phase: In the proposed set up, boilers, turbine generators, DRI Kilns, Continuous Casting Machines, etc will be the major noise sources. The entry gate area will be the traffic-affected and hence, a noise prone area. After the establishment of the proposed plant, noise sources & traffic affected area will become a major noise concerned areas. The sources of noise generation during operation phase will be as follows:

- Operation of the kilns, furnaces and other sub-units
- Material handling operations, crushers
- ID Fans, motors, pumps
- Trucks, dumpers, loaders, scrappers and earth-movers
- Operation of turbines, etc.

Operation of plant equipments will continuously generate noise, which will have adverse impact on the ambient noise levels. However, the adverse impact is anticipated to be limited to the plant area and its immediate surroundings.

The adverse impact can be more within the project area, and may cause hearing loss and other related problems to the workmen, if mitigation through protective measures are not taken.

Noise propagation through mathematical model and impacts of noise with distance from source has been studied and brought out below.

As the equipment generate noise generally in the range of 100 dB(A) at source it can be safely assumed that the ambient noise levels on any point of boundary line of plant are not higher than 100 dB(A). It has, also been assumed that the area within the units within an imaginary line running at a distance of 3-5 m (say) from noise generating machines will be termed as point noise source to avoid complication in the absence of availability of exact location of various noise generating units, their arrangements and shapes. Taking extreme case of two machines each generating 100 dB(A) working at a point will add upto 103 dB(A) overall noise level. Such source noise level has been considered here for anticipating the impacts.

Noise attenuation with distance in all directions over flat open bare ground is given by

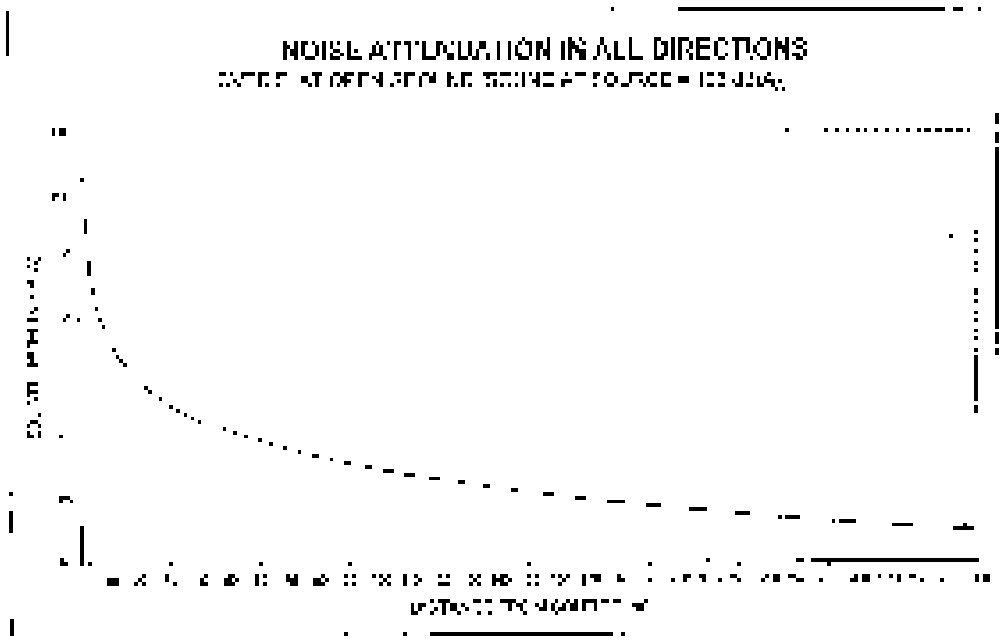
Sound level dB(A) = $Lw - 20 \log_{10} R - 8$

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 4.23**.

TABLE 4.23: 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

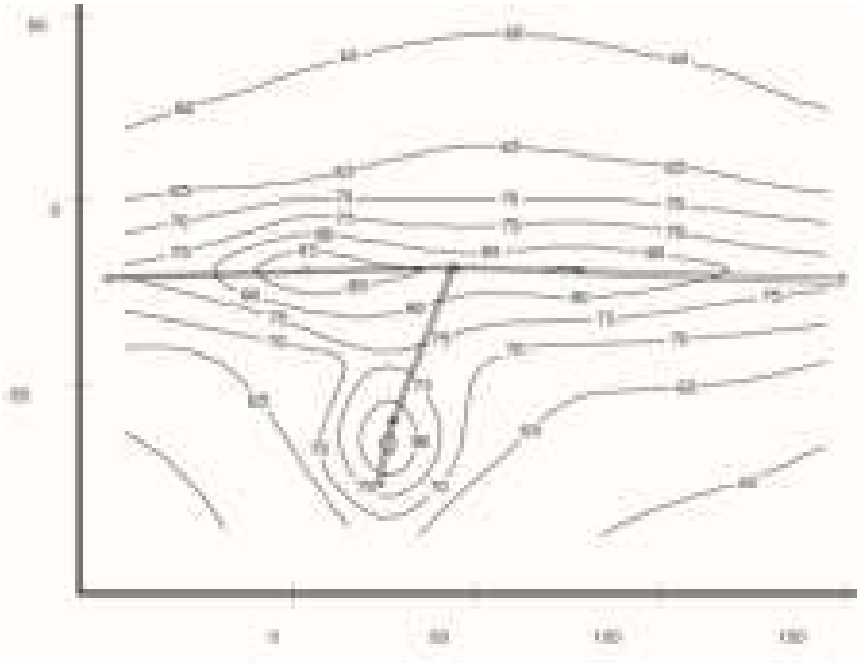
It means that, with green belt, after distance of about 60 m, the machine noise will attenuate to the permissible noise level in the day time (55 dB(A) for residential areas) and between 100-150 m in night time (45 dB(A) for residential areas).

The noise level is prescribed by “Noise Pollution (Regulation and Control) Rules, 2000” (**Annexure XIII**). Some of the habitation of Sulaneli and Mahalunda are adjoining to the project boundary. However, main habitation of the villages are away from boundary.

The project proponent will develop a thick peripheral greenbelt which will act as a noise absorbing medium. Thus, the impact of noise will not be felt on these habitation.

Noise will be generated due to movement of traffic as well. Prediction modelling for traffic noise which will arise due to movement of trucks, has also been done through Federal Highway Administration - Traffic Noise Model (FHWA TNM) model. FHWA TNM model is a state-of-the art computerized model used for predicting noise impacts in the vicinity of highways. Modelling has been done by considering daily maximum one way movement of 7429 truck on common road, 2869 trucks on road towards Talcher coalfields I.e. Route-1 and 4560 trucks on road towards Bhubaneshwar side i.e. Route-2, without any barrier, houses or trees adjoining road. The noise contour predicted through FHWA TNM is presented in **Fig 4.4**.

FIG 4.4: NOISE LEVEL CONTOURS DUE TO TRAFFIC ON ROAD (PLANT TO NH)



The noise level data recorded at various places in the study area is well within the desired limit. But, the future establishment of noise due to the proposed project activity may pose some problem, if project management will not adopt appropriate control measures.

4.8.2 Noise pollution control measures

Construction phase: Modern and well maintained machinery will be used for construction activities such that noise levels will be minimized at source itself. The equipment will be kept in good condition to keep noise level well below limits at work place. The onsite workers exposed to high noise equipment and noisy area will be provided with protective devices like ear muffs/plugs. Also traffic will be monitored, vehicles will have PUC certificates and the heavy vehicles carrying construction material will not be allowed during peak traffic hours. Noise and fugitive dust curtains/ barriers will be erected around the areas under construction.

Operation phase: The following measures will be taken up to keep the noise levels within permissible limits:

- Provision and maintenance of green belt to prevent propagation of noise generated within the plant from spreading beyond the plant boundary.
- Periodic maintenance of noise generating machinery including transportation vehicles shall be ensured.
- 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 and their maintenance to modulate the noise generated by the machines/ equipments/ vehicles
- Noise from safety valves, start up vents, steam jet ejectors of condenser etc. will be reduced by providing silencers at the outlet of down steam piping.
- All the workers engaged at and around high noise generating sources will be provided with ear protection devices like ear mufflers/plugs. Their place of work will be changed regularly so as to reduce their exposure duration to high levels. They will be regularly subjected to medical check-up for detecting any adverse impact on the ears.
- Noise level is being and would be monitored inside and around the plant on a regular basis
- The damage risk criteria as enforced by The Factories Act to reduce hearing loss, stipulates the noise levels up to 85 dB(A) as acceptable limits for 8 hour working shift per day, is being complied. The same shall be complied with in expansion phase. 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 permissible exposure in cases of continuous noise and impulsive or impact noise are reproduced in **Annexure XIII**.

4.8.3 Vibration

The industrial machinery generates vibrations, for the management of which the company has installed vibration dampners and maintains the moving as well the stationary parts to reduce vibrations. The same management steps shall be followed in the expansion phase also. The company shall comply with the Part “B” of the Schedule XXIII of Model Rules Under The Factories Act, 1948 (refer **Annexure XIII**).

4.9 TRANSPORTATION

4.9.1 Impact of transportation

It may be noted that transportation shall take place through the following likely routes (Refer **Fig 4.5**):

Route 1 - From west i.e. Rourkela and Talcher coal field side to plant

Route 2 - From east i.e. Paradeep port or Bhubaneswar side to plant. Part of this route (8.1 km), will be used to approach the proposed private railway siding at New Bhagirathipur.

Both routes come together at Nimabahali on the NH 55 and move southwards towards the plant. Traffic for the over all quantity of raw material and products have been calculated for the 7.53 MTPA plant and given in **Table 4.24.**

FIG 4.5: TRANSPORTATION ROUTE

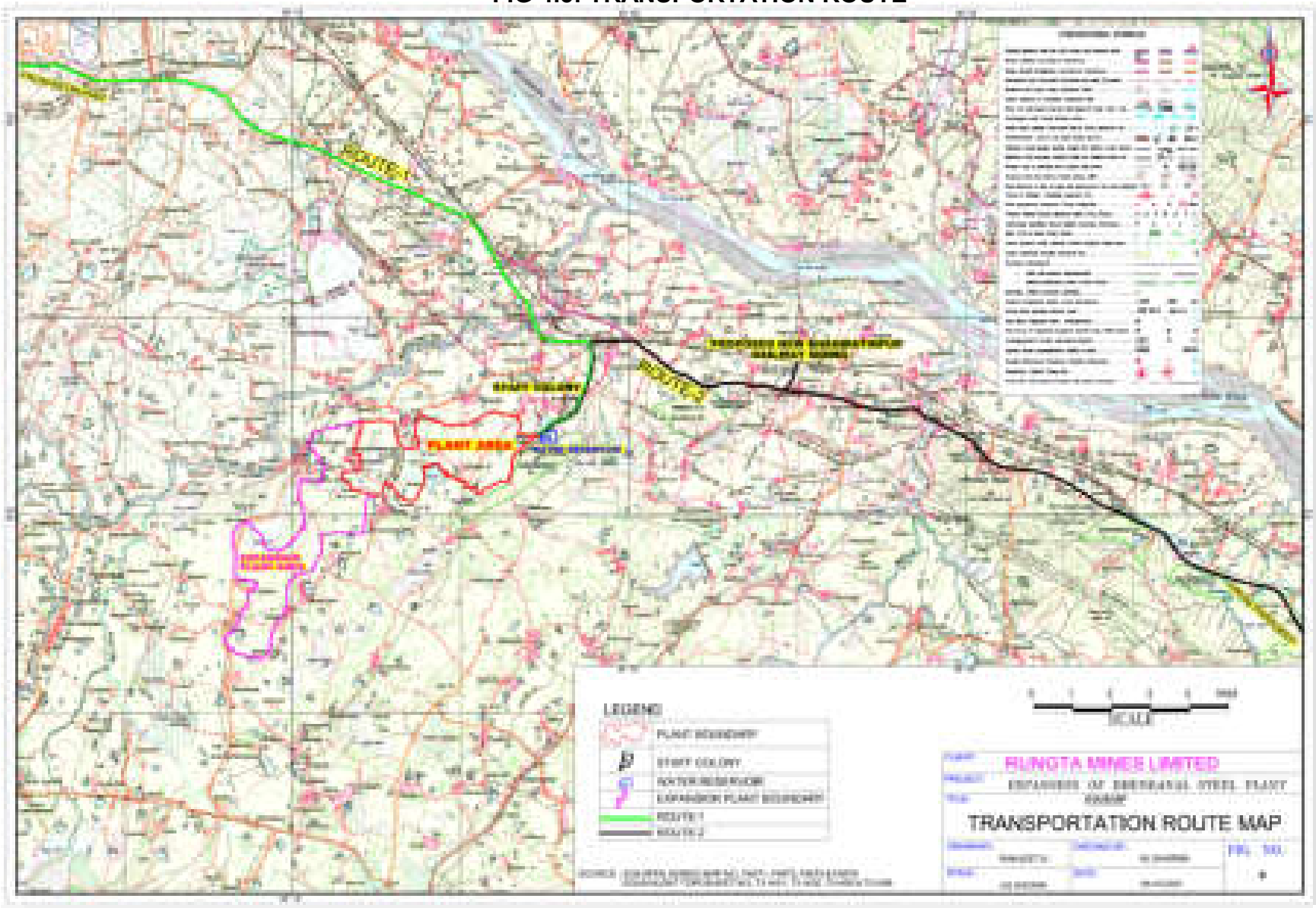


TABLE 4.24: NUMBER OF TRUCKS REQUIRED FOR RAW MATERIAL, PRODUCT AND SOLID WASTE TRANSPORTATION

Description	Raw Material (outside purchase)	Product (sale)	Solid waste (reused/ disposed out side)	Total
7.53 MTPA				
Quantity, TPA	6,77,87,683	3,76,21,228	50,58,768	11,04,67,679
Quantity, TPD	1,85,720	1,03,072	13,860	3,02,651
Size of trucks	20-30	20-30	20-30	20-30
No. of trucks per day	7,429	4,123	555	12,107
To-fro traffic, trucks/day	14,858	8,246	1,110	24,214
3.55 MTPA				
Quantity, TPA	5,13,66,056	3,27,84,700	57,97,064	8,99,47,820
Quantity, TPD	1,53,271	97,085	17,054	2,67,410
Size of trucks (avg.)	25	25	25	25
No. of trucks per day	6,131	3,884	683	10,698
To-fro traffic, trucks/day	12,262	7,768	1,366	21,396
Increment wrt 3.55 MTPA				
Quantity, TPA	1,64,21,627	48,36,528	Less (7,38,296)	2,05,19,859
Quantity, TPD	32,449	5,987	Less (3,194)	35,241
Size of trucks	20-30	20-30	20-30	20-30
No. of trucks per day	1,298	239	Less (128)	1,409
To-fro traffic, trucks/day	2,596	478	Less (256)	2,818

It can be seen that the traffic movement (to&fro) due to solid waste disposal will reduce from 1,366 trucks/day to 1,110 trucks/day. The decrease is 256 trucks/day. This is due to increase in in-house reuse of solid waste as follows:

1. All the mill scales were earlier being sold outside, which is now proposed for reuse in pellet making (1,03,955 TPA)
2. Fly ash consumption will increase by 14,23,220 TPA (in proposed cement plant, fly ash brick plant, etc)
3. The entire BF slag will be reused in cement making as compared to earlier in 3.55 MTPA plant, when 2,00,000 TPA was being sold
4. There will be an increase in solid waste disposal quantities of Kiln accretion from DRI kiln (38,854 TPA), IF slag (164,755 TPA), EAF slag (785,538 TPA)
5. No change in solid waste quantities of producer gas plant, coal washery and beneficiation plant
6. Overall there is reduction in solid waste for outside despatch

The truck movement has been assumed for 25 T trucks on an average for raw material, product and for solid waste. Usually a combination of trucks

varying in sizes from 10 to 30 T shall ply. In addition there will be 10-25 KL fuel tankers containing LSHS/ FO.

For transportation of the materials given in Table 4.17, the maximum increase in traffic is 12,107 trucks/day (24,214 to & fro trucks/day) or 505 trucks/hour (1,010 to & fro trucks/hour). Reducing the number of trucks is the first priority. In practice, trucks bringing in raw material (7,429 trucks) shall take away the products (which will require 4,123 trucks) and solid waste (which will require 555 trucks). Thus, the overall traffic will get restricted to 7,429 trucks instead of the 12,107 trucks. The equivalent passenger car units (PCU's) (1 truck=3 PCU's) will be 22,287 /day.

Out of total daily movement of 7,429 trucks (22,287 PCUs) on common road (plant road), 2,869 trucks (8,607 PCUs) will be plying on road towards/ from Talcher coalfields i.e. Route-1 and 4,560 trucks (13,680 PCUs) on road towards/ from Bhubaneshwar/ Paradeep port side i.e. Route-2.

As seen in section 3.8 of Chapter 3, the traffic survey was conducted as per IRC: 9-1972 at two locations in the up and down directions. The existing road network is likely to experience the additional traffic. Therefore, the adequacy of the road to support the additional traffic, its maximum capacity and the percentage utilization of the maximum capacity has been calculated and given in **Table 4.25.**

TABLE 4.25: OBSERVED EXISTING AND ADDITIONAL TRAFFIC AND THEIR % UTILISATION OF MAXIMUM CAPACITY OF THE ROAD

Sl. No.	Location	Route	Public Traffic (May, 2021), PCU/ Day	Additional RML's trucks nos./ day	Additional RML's trucks, PCUs/ Day	Total resultant traffic in immediate future, PCU/ day	Width of road (ex-divider), m	DSV#, PCU/ day	Maximum capacity, PCU/ day	% utilised of Maximum capacity	
										Existing public traffic	In future, on full 7.53 MTPA operation
a	b	c	d	e	f	g=d+f	h	i	j	k=d/j%	l=g/j%
1	Near Nimabahali village (NH-55)	Route-1									
1.1	On existing road		25582	2869	8607	34189	7 -7.5	15000	30000	85.27	113.96
1.2	After completion of widening		25582	2869	8607	34189	18	35000	70000	36.55	48.84
2	Near Nimabahali village (NH-55)	Route-2									
2.1	On existing road		25582	4560	13680	39262	7 -7.5	15000	30000	85.27	130.87
2.2	After completion of widening		25582	4560	13680	39262	18	35000	70000	36.55	56.09
3	Plant road near staff colony	Common for Route-1 & 2	1043	7429	22287	23330	24	35000	70000	1.49	33.33

The national highway 55 was having 7-7.5 m wide road earlier. The road is being widened to 4-lane road. The design service volume of the existing national highway (7-7.5 m wide) is 15000 PCUs/day (maximum capacity 30,000 PCU/day). However, it is getting widened to 18 m carriageway with additional median and shoulders, the work of which is already underway and in advance stage. Till the time proposed expansion project becomes

fully operational the highway will have sufficient capacity to accommodate the proposed additional traffic as the design service volume of widened highway will become 35,000 PCUs (maximum capacity 70,000 PCU/day).

Similarly, the plant road was earlier 5 m wide which is also being widened to 4 lane (having 30 m right of way and 22 meter carriageway). The widening works at plant road is in advance stage and likely be completed soon. It too will have the design service volume of 35,000 PCUs (maximum capacity 70,000 PCU/day).

It can be seen in the above table that the maximum resultant traffic utilization of maximum capacity of widened road at NH-55 will be 48.84% on Route-1, 56.09% on Route-2 and 33.33% on widened plant road. Thus it can be said that the traffic utilization, current as well as proposed, will be well within the maximum capacity of the road after widening.

However, the transportation is not expected to reach these volumes because it is planned to establish a railway siding in next 5-10 years or till the plant becomes fully operational, whichever is earlier. Till such time the railway siding gets completed, transportation will take place by road and may achieve about half the above mentioned values. Furthermore, about 125 trucks per day (250 to & fro Trucks/ day), carrying materials for RML, are already plying on the road. Thus, during proposed expansion period the additional traffic will be reduced by 125 trucks and will become 7304 trucks per day or 21912 PCU/ day.

4.9.2 Mitigation

Vehicular pollution control and management plan:

- Reducing the number of trucks is the first priority. Hence, the policy shall be to encourage the trucks bringing in raw material to take away the products and solid waste. Thus, the overall traffic will get reduced.
- All trucks used for transportation of raw material and product will be covered with tarpaulin, maintained, optimally loaded and have PUC certificates.
- Maintenance shall be as per the periodicity and procedure specified by the manufacturer
- Trucks will be weighed at the weigh bridge to ensure optimal loading, which in turn optimizes emissions
- Annual statutory Fitness certification for commercial vehicles will be ensured.
- Pollution Under Control (PUC) certificates will be obtained every three months for all categories of vehicles. In case of petrol vehicles idling CO measurements will be taken and in case of diesel vehicles, free acceleration smoke will be measured.

- Vehicles will be Euro-IV compliant, as applicable. Old vehicles will be phased out to ensure lower emissions by newer vehicles
- Water sprinkling on roads and parking area within plant
- Speed bumps and caution signs along roads
- Training and sensitisation of drivers as part of safety week awareness programs
- Tyre washing for trucks
- In order to reduce the road transportation, the company proposes to also utilise the proposed private railway siding at New Bhagirathipur. In principle approval has been received for the private railway siding from East Coast Railway, Bhubaneswar vide letter no. COM/Plg./BBS/Rungta Mines/ NBT/224/Pt-I dated 04.05.2020 and its DPR approved vide letter dated 01.01.2021. The land acquisition is under process for an area of 69.324 acres for which 10% charges have already been deposited. The road that shall be used for the transportation from project site to the private railway siding is shown in **Fig 4.6** below.

FIG 4.6: MAP SHOWING ROAD CONNECTIVITY FROM PLANT TO PROPOSED PRIVATE SIDING



- The material transportation will be preferred through railways, once the private siding becomes operational.
- It is proposed to eventually establish a railway siding within plant as seen in layout plan in Fig 2.1, which would be taking off from

Nayabhagirathipur station. The detailing of the plan, approvals, land allotment etc is yet to take place.

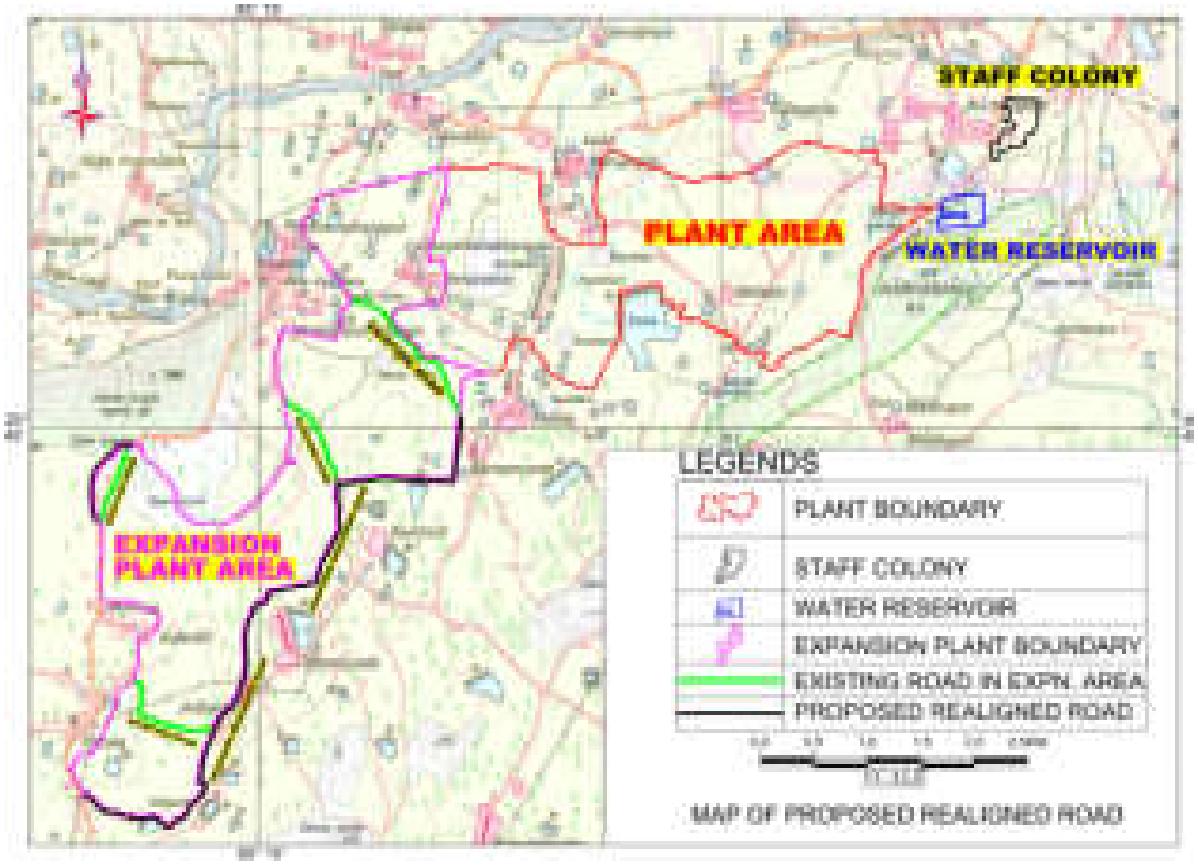
- Railway siding will be constructed within 5-10 years or before the plant becomes fully operational, whichever is earlier.

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. The existing national highway (7.0-7.5 m wide) will get widened to 9 m either side road with median, the work of which is already underway. An access road (30 m right of way/ 24 m carriageway) to the plant is being 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.

4.9.3 Road diversion

Four roads are passing through the expansion area, namely, (i) Jharbela to Sulanali and Patala Village (1.3 km), (ii) Kantimili to Narahari Village (1.1 km), (iii) Brahamunda to Narahari Village (1.6 km) and (iv) Village Connecting Road (0.7 km) will need to be realigned in consultation with Public Woks Department and black topped along the proposed expansion boundary so that villagers do not have any in-convenience in going from one village to another. The proposed realigned road is shown in **Fig 4.7**.

FIG 4.7: PROPOSED ROAD DIVERSION



4.10 ECOLOGY

4.10.1 Impact on ecology

Construction Phase: Total area of the plant as sanctioned in EC dated 15.02.2021 is 1769 acres. Presently 1x500 TPD DRI, 2x20 T IF and 25 MW CPP is operational and another 1X 2.948 MTPA pelletisation plant, 1x500 TPD DRI, 3x20 T IF, 1x0.20 MTPA TMT and 1x0.30 MTPA wire rod under construction and 25 MW power plant is under construction in the sanctioned area. Additionally, 1800 acres land will be required for expansion phase, totaling 3569 acres. To undertake the construction in the balance area, top soil will be disturbed and rehandled. Vegetation over this area will also be disturbed. Most of the trees in the project area exist along the boundary of the fields and it is estimated that about 18000 trees are falling in 1800 acres of expansion area. Vegetation that will be up-rooted (~10,500 nos. tress), will be preferably transplanted or compensated through future plantation within the plant premises as well as outside. 1179 acres (33%) of the above mentioned area is proposed for green belt and plantation. Hence, impact anticipated on the flora in the project area can be managed.

The buffer area has commonly found flora 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 was present within the project area of 1769 acres sanctioned environmental clearance dated 15.02.2021. Stage II forest clearance has been obtained from MOEF&C vide letter no. 5-ORB207/2014-BHU dated 02.07.2015 for the same.

There are six forests within 10 km namely Jharbandh RF, Ganthigarhia PF, Nimidha RF, Kai RF, Kansara RF and Ambithi 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 pollutants will occur during construction phase. Although, it will be reversible and temporary, adequate control measures in the management plan are required.

Availability of water and food wastes during the day will attract some birds and animals towards the site. During construction phase, impact on terrestrial eco-system comprising birds and animals is envisaged as they will shift away from construction site due to noise, pollution and loss of micro habitats (trees, shrubs). Lights on masts can cause confusion to birds and animals. On the other hand, with progressive growth of greenery, terrestrial micro-habitats will be developed in the long run.

Operation Phase: Company has done plantation along periphery and just outside of existing plant premises in 44 acres (18 ha), out of the 584 acres

(236.34 ha.) green belt of the sanctioned EC dated 15.02.2021**.** 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 resultant concentration shall remain within the limits prescribed in National Ambient Air Quality Standards 2009. However deposition of small amount of pollutants may also affect the surrounding ecosystem and forests. The outcome of the air quality prediction modelling shows that the most affected forest area will be Jharbandh RF (adjoining the existing plant boundary). It will experience an increment of 7.626, 4.372, 21.182 & 9.315 $\mu g/m^3$ of PM10, PM2.5, SO_2 & NOx respectively due to operation of 7.53 MTPA steel plant. 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 bag filters). Water sprinkling / dry fog type system will be used at to suppress the generation of fugitive dust, where necessary.

USEPA air quality criteria for SO_2 stipulates 0.2 ppm (524 $\mu g/m^3$) level when visible injury to sensitive vegetation in humid regions after 3 hours exposure is observed. In another case, 0.5 ppm SO_2 level (1310 $\mu g/m^3$) for 1 hour exposure results in visible injury to sensitive vegetation in humid regions. At higher SO_2 concentration of 10 ppm (26214 $\mu g/m^3$), visible injury to vegetation in arid regions is observed. Such high ambient air concentration of sulphur dioxide, is not likely to occur in the area.

USEPA air quality criteria for NO_2 stipulates 2 ppm (3760 $\mu g/m^3$) level when foliar injury to vegetation at 4 hours exposure is observed. At a lower NO_2 concentration of 0.25 ppm (470 $\mu g/m^3$) 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 is being and will be stored and laid back on the area identified for further plantation. Any tree or plant removed is and will be compensated manifold.

For trees that are and will have to be removed as per the proposed layout, the endeavour is and will be to transplant them to the extent possible. For tree that need to be cut, due permission will be sought from the concerned authority and compensatory plantation carried out.

There was small resident fauna in the undeveloped area, who will get displaced during construction. However, with development of proposed green belt, the new plantation will provide food and habitat for them to re-inhabit. Under the proposed green belt and plantation programme, 1179 acres of land within premises (about 33% area) shall be provided with green cover in the form of green belt and plantation.

Operation phase: During the previous years, the company has carried out tree plantation & greenbelt development within the plant. Till date, the company planted 44,000 trees covering 44 acres (18 ha) land comprising of Babool (*Acacia*), Siris (*Albizzia lebbeck*), Neem (*Azadirachta indica*), Mango (*Mangifera indica*) and Peepal (*Ficus religiosa*)**.** The main consideration during development of green belt and plantation are effective trapping of fugitive emission, act as sink for stack emissions, sequester carbon, noise control, balancing ecology, waste water reuse and aesthetics.

Plants act as natural sink for a variety of pollutants as well as replenish air with fresh oxygen. The plant species would be fast growing, evergreen having large crown. As a single plant does not have all the qualities, a mixture of several varieties of plants will be chosen. Native trees will be preferred. The widths of the belt will be as per the availability all along the boundary, the criterion for selection of area/ location for green belt would be along pre dominant wind direction, along plant boundary and roadside avenue plantation and around administrative building.

Three-tier green belt comprising of shrubs and trees is proposed. The species suggested for plantation shall be chosen from the native species. Ber (*Zizyphus*), Gulmohar (*Delonix regia*) (as a bio-indicator), Babool (*Acacia*), Siris (*Albizzia lebbeck*), Neem (*Azadirachta indica*), Mango (*Mangifera indica*), Guava (*Psidium guajava*) and Peepal (*Ficus religiosa*) etc are suggested trees for plantation. Shrubs such as Kaner (*Nerium*), Hibiscus (Hibiscus rosa-sinensis), Jatropha (Jatropha podagrica), Begunia (Vitex negundo), Tulsi (*Ocimum sanctum*), etc are suggested for the lower tiers in the greenbelt. Native species will be preferred.

The plantation programme has been proposed as given in **Table 4.26**. A total of 11,79,000 trees will be planted by the time of project becomes fully operational.

TABLE 4.26: PLANTATION PROGRAMME

Year	Area in acres	Trees (Nos)
past	44	44,000
2021-2022	225	2,25,000
2022-2023	225	2,25,000
2023-2024	225	2,25,000
2024-2025	225	2,25,000
2025-2026	235	2,35,000
Total	**1179**	**11,79,000**

4.10.3 Wildlife Conservation Plan

Stray elephant sometimes come in the study area. To protect the flora and fauna of the study area, a “Site Specific Conservation Plan” for Dhenkanal Integrated Steel Plant & Captive Power Plant has been prepared by Centre for Envotech and Management Consultancy Pvt. Ltd. It has been approved by The Principal Chief Conservator of Forests (Wildlife) & Chief Wildlife

Warden, Odisha vide letter No. 10181/CWLW-FDWC-FD-0123-2021 dated 22.10.2021 (copy given in **Annexure XVII**). 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 for core and buffer zone are given below:

Core zone

1. Company will create awareness among the Industry Executive, staff and workers and sensitize them to maintain cleanness of the project premises and to protect any type of wildlife including snakes, if noticed in the project area. Drivers of heavy earth moving vehicles will be told to keep the noise levels to the barest minimum, take all precaution against fire, damage to trees etc.

2. As the cattle of the area adjoining to the plant, graze in the forest (ZoI) by tradition and come in contact with wild herbivores; any cattle borne epidemic may contaminate wild animals. Hence, the cattle population shall be immunized at regular intervals (once in a year) with the technical co-operation of local Veterinary Assistant Surgeon.

3. Provision to install solar street lights around plant area where elephant movement is seen.

Buffer zone

1 Provision of seed ball plantation method to enhance bamboo percentage in Kandhar RF, which will reduce ever rising human-elephant conflict in the locality. This will be done @10,000 seed balls per year for a period of 5 years.

2 Water holes will be irregularly distributed in the forest which will be filled with tankers during peak period of summer i.e., March, April & May in RFs Kandhra, Hitinda, Nandinia, Koi and Nimida.

3 To counteract professional poachers, it has been proposed to station one anti-poaching squad of 10 nos. equipped with arms.

4 One fire fighting squad including 10 persons will be engaged for a period of 5 months (February to June) annually. They will be equipped with one hired vehicle, fire blowers, mobile phones and other communicating devices for instant contact with the forest officials along with logistic support.

5 Maintenance of fire line, will help prevention and controlling of fire hazards.

6 To send back the wild elephants from village area to the nearby forest, it has been proposed to provide early warning system with IR sensors and SMS alert service in sensitive villages at Hindol Range along with maintenance for 10 years.

7 Identifying 2 villages which are prone to wildlife depredation, outpost will be constructed at the extreme end of the villages or entry point of wildlife's to prevent elephant entry and causing damage to human and property.

8 Provision to install solar streetlights, most preferably at strategic locations around the elephant affected village areas and in Dhenkanal Forest Division

9 Gaja Sathi are engaged particularly to alert the villagers about wild elephants approach to villagers and shall be provided with uniforms, umbrella, torch light, note book, mobile phones with monthly recharge facility, haver sack, Khukuri, hat etc.

10 An incentive (secretly granted) will be awarded to the VSS members who will inform the forest field executives about the persons involved in illicit felling, poaching, collection of wild animal trophies, hide (un-tanned skin of wild animal), tusk, Pangolin scales, thorns of Porcupine, bile of sloth bear etc. for commercial or medicinal purpose, feeding monkeys on the road side, doing snake show in road side etc.

11 To promote coexistence with wildlife and to make people aware. Good quality sign boards with display of wildlife features shall be placed along the project premises, road etc. Fluorescent Sign Boards with good write ups about movement of wild animals will be provided in order to make aware the passers-by about occurrence of accident, if they confront with wildlife.

12 Execution of soil moisture conservation activities. i.e., cement concrete check dams, other check dams with spill way, gully plugging, contour trenching, contour bonding, siltation pond etc. in Kandhal RF in Talcher Range of Angul Forest Division shall be carried out.

13 Adequate provision for food, water and cover shall be there to mitigate any of the adverse impacts on elephant.

Budgetary provision has been made by the Company for execution of the wildlife conservation in consultation with the DFO. The total cost of the conservation plan will be Rs.706.332 Lakhs (Rs. 643.548 lakhs for Dhenkanal Forest Division and Rs.62.784 lakhs for Angul Forest Division) including cost escalation @ 20%, for a period of 10 years. The entire amount will be deposited by the company in Compensatory Afforestation Fund Management and Planning Authority (CAMPA).

4.11 SOCIO-ECONOMICS - IMPACT AND MANAGEMENT

a. Land losers and displacees

Past displacement: There were 54 families within the sanctioned project boundary (674.765 acres) at the time the project was conceived prior to the year 2010. After the environmental clearance on 02.08.2010, these families have been resettled & rehabilitated in village Nimabahali at an aerial

distance of 2.4 km. As per the directions of Land Acquisition Officer, District Office, Dhenkanal a compensation of Rs. 7 lakhs per family has also been paid. Furthermore, management has already given employment to 119 land losers for the land purchased in the existing plant in addition to contracts.

Proposed displacement: In the current expansion, there is addition of 1800 acres to the existing 1769 acres sanctioned in EC dated 15.02.2021. In this 1800 acres, approximately 30 families are residing in two villages of Benipathar and Chandrasekharpur. They are having approximately 126 displacees. The displacees shall be paid compensation as per Odisha Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2016 by IDCO. Those land losers opting for job in the company will be trained and absorbed.

Land losers: In addition, there will also be approximately 2100 land losers and land will be acquired through IDCO. Land losers will be given preference in employment with priority to marginal land loser. 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. Since the additional land (1800 acres) for expansion is being acquired through IDCO Government of Odisha, the compensation for fixed assets in land will be paid as per IDCO rules.

The village wise proposed land losers are summarised in **Table 4.27.**

TABLE 4.27: VILLAGE WISE PROPOSED LAND LOSERS, PRIVATE LAND AND GOVERNMENT LAND TO BE ACQUIRED

Sl. No.	Name of Village	No. of land loser families	Pvt. Land (Acres) involved	Govt. Land (Acres) involved	Total Area (Acres) Involved
1.	Badamunda	284	233.904	29.89	263.794
2.	Benipathar	32	11.2	5.67	16.87
3.	Chandrashekharpur	49	74.604	8.32	82.924
4.	Jhanhamunda	153	191.77	13.5	205.27
5.	Jharabeda	119	83.14	15.35	98.49
6.	Kaliakoli	90	117.49	10.79	128.28
7.	Kankalu	153	73.72	12.12	85.84
8.	Kantimili	86	35.432	4.15	39.582
9.	Naraharipur	53	42.55	2.12	44.67
10.	Nuapada	208	124.459	4.66	129.119
11.	Paika Purunakote	181	115.01	14.96	129.97
12.	Patala	214	107.563	16.35	123.913
13.	Sanamunda	279	264.44	28.38	292.82
14.	Sulanali	175	134.518	23.94	158.458
	Total	**2076**	**1609.8**	**190.2**	**1800**

b. Employment and economy

During operation phase, total direct manpower requirement for 7.53 MTPA plant at full capacity will be 6650 persons for various activities like operation, loading, unloading, handling, transportation, general cleaning, maintenance, horticulture and other works inside the Plant. 4850 was the requirement as per environmental clearance dated 15.02.2021 and additional 1800 persons shall be required. In expansion phase. Three shifts working for 355 days is planned for most sub-units. Many more persons will be indirectly engaged either on contract basis or in transportation of materials in provision of different services associated with the project.

The above stated direct and indirect job opportunities will benefit this rural and under-developed area. Therefore, the project can have significant positive impact on local employment and local economy. 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.

As stated earlier, 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.

c. Demography

As majority of unskilled and semi-skilled persons will be from the surrounding villages, the net in-migration on account of the job opportunities will be for the highly skilled and supervisory/managerial level posts. Therefore, marginal impact on demographic profile is foreseen. A colony will be built near plant to accommodate the non-native employees.

d. Amenities and health

With the commencement of operation, amenities for communication, education, health, entertainment, eateries, etc will get developed in and around the project area as a part of the CSR activities as well as due to the domino effect of development. These amenities will be available to local people as well as those directly associated with the plant.

e. Agriculture

Part of the land acquired for the project was low yield agricultural land without irrigation facilities. This is 1.8% of total agricultural land falling in study area; hence, the adverse impact on the total agriculture of the study area will be low. For the land losers or tenants on the agricultural land, it will be complete loss of livelihood when the land being acquired is 100% of their holding.

f. Village specific mitigation plan

Village settlements are located around the expansion area within a distance from 0 upto 216 m. The villages falling around the project along with the distances of their nearest habitation from the boundary are Kadala (160 m), Barhamunda (29 m), Kantimili (216 m), Sanamunda (84 m), Mahalunda (Adjoining), Patala (55 m), Sulaneli (within boundary), Settlement near open jungle in the west (within boundary), Paika Purnakot (198 m) Phakiramohanpur (55 m), Beruanpal (19 m) Galaparha (162 m), Jharhabandh (45 m). Specific mitigation plan for these villages within a distance of 50 m from the boundary is given as follows:

TABLE 4.28: VILLAGE SPECIFIC MITIGATION PLAN

Aspect	Action plan to address impact
Health	▪ Currently two nos. first aid centers equipped with necessary facilities and manned by competent person such as MBBS doctor, compounder and assistant are appointed to run the centre. A separate entrance will be provided for villagers also for treatment and supply of medicine free of cost. ▪ In future a 4 bedded OHS centre inside the plant premises is proposed, which too will have requisite competent manpower and requisite equipment ▪ Company is already carrying out and shall continue in future also mobile health /medical camps for villagers. ▪ Data about the health of the villagers is being and will be collected periodically and a periodic monitoring program similar to that for the employees is being and shall be followed for the vulnerable population in the villages.
Green belt	▪ Green Belt of 10-400 mtrs comprising 3-tiers of trees and shrubs shall be established within the plant boundary, adjacent to villages. ▪ Different villages have different width of green belt as follows. They vary from 50 - 415 m in Kadala, 50 m in Barhamunda, 50 m in Kantimili, 50- 400 m in Sanamunda, upto 250 m in Mahalunda, upto 200m in Patala, 50-180 m in Sulaneli, 120-140 m in the settlement near open jungle to the west, upto 190 m in Paika Purnakot, upto 800 m in Phakiramohanpur, upto 110 m in Beruanpal, upto 165 m in Galaparha and upto 90 m in Jharbandh.
Noise	▪ Green Belt will also increase the noise absorption and obstruct noise propagation. ▪ Landscaping will be done in such a way that surface area is increased thus absorbing the noise pollution. ▪ The boundary wall will also act as a noise barrier ▪ Maintenance of the equipment and providing acoustic enclosures to contain the noise at the source.
Traffic	▪ Road diversions are already underway for the existing plant

Aspect	Action plan to address impact
	▪ For expansion area, three road will need to be diverted as planned in section 4.9.3 earlier. ▪ Construction and maintenance of roads shall be done in the adjoining & nearby villages in phased manner in collaboration with local Panchayat and Govt. schemes. ▪ Provision of tyre washing facility will be there in the plant. The same is under construction as in Oct 2021 in existing plant. All outbound trucks will pass through this wheel washing facility, thus, mitigating the dust pollution on the roads. ▪ Road sweeping machine will be used for maintenance of roads. ▪ Dedicated parking space will be provided within the plant premises. The same has already been provided in the existing plant.
Environment	▪ All process gas cleaning systems are designed in such a way that PM emissions will be within 30 milligram/Nm^3 ▪ Fixed water sprinkling system will be provided at suitable points inside the plant to reduce fugitive dust emission. ▪ All incoming & outgoing trucks will be ensured with covered Tarpaulin. The same is being ensured in the existing plant for the units that have become operational. ▪ Fruit bearing saplings will be distributed to villagers every year for planting on their land.

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.

There are 25 safety guidelines that have to be followed by steel plants, which have been detailed by The Ministry of Steel in 2019 as available at https://steel.gov.in/sites/default/files/Framework%20Document%20for%20Safety%20Guidelines.pdf (accessed 28.09.2021).

The mandatory facilities shall be established for safety as per Factories Act 1948 and its amendments & Orissa Factories Rule 1950 and its amendments.

4.12.1 Occupational & Safety Hazards

The proposed plant is an integrated 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 b) Falling/Moving Objects c) Lifting & Overload **Injury Types** d) Arms and Hands e) Legs and Feet f) Back Injuries	a) Housekeeping, clear designated walkways b) Guards on Machines and elevated areas c) Manual Handling Training d) Proper use of PPE e) Proper use of PPE f) Lifting gear, forklifts

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, asthama 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 air pollution control devices and / or regular water sprinkling, as applicable. 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.

n) 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).

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, they will be replaced immediately. Also the earth resistance value will be checked at regular intervals.

Display of Safety Posters/ Slogans/ Warnings – They 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 them, and should produced them when asked. The speed limit inside the premises will be 20 km/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 Facilities and activities

An OHS centre shall be constructed in the plant. Currently two first aid centers equipped and manned by competent persons, qualified MBBS doctor and assistant. Presently pre-induction and periodical medical test prescribed under Rule 62 J are being carried out by Max Diagnostic Private Limited, Dhenkanal. The formats being used and the findings of the tests of the employees of the company have been given in **Annexure XXI** and **XXII**, respectively.

The following tests are being conducted through outside lab and will be conducted at the proposed OHS centre after it is established, along with technical support from private clinical laboratory, for the project:

- **Pre-employment medical examination:** A detail history with through 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 1948 and its amendments & Orissa Factories Rule 1950 and its amendments.

- **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/ Manager 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/Manager. Job related safety precautionary measures, good safety practices, case studies etc. will be discussed.

- ***Site Safety Inspection*** – Safety Officer/ Manager appointed by Rungta Mines Limited (Dhenkanal Steel Plant) & 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/ manager, area engineer, workmen etc. and the unsafe points observed will be sent to the concerned site in-charge in the prescribed format for an early compliance. Follow-up will be made by safety manager for timely compliance.

- ***Reporting of incidents/ near miss case*** – It will be mandatory to report all the incidents & near miss cases in the prescribed format by the safety officer 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 safety officer 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 Safety Officer/ Manager.

- ***Fire & Safety Training*** – Site based safety training programs will be arranged time to time for the staffs and workmen to educate and make conscious. Best safety practices, case studies on incidents and root causes will also be discussed to make them aware. Demonstrations like rescue, effective use of PPEs will also be organized by various PPEs and safety gadget suppliers for their optimum use.

- ***Penalty* system**– Company will have a penalty system for those who violate safety norms repeatedly after various instruction verbally and written. The amount will be debited from the Running Bill of the concerned contractor.

- ***Good House Keeping***- Company is/ will maintain good house keeping and will reward the contractors who maintain the best house keeping.

- ***Self Containing Breathing Apparatus (SCBA)*** – Company will procure the SCBA for emergency use.

- ***Safety Reward Scheme*** – Company will plan to award the best safety performing contractors' quarterly/yearly.

- ***Safety Officer :*** There will be a safety officer who will be the Manager (Safety). His role and responsibility is described in Section 10.2, Chapter 10.

4.12.6 Occupational health data

Since some of the units of the plant are under construction as per environmental clearance dated 15.02.2021 and some of the units have become operational as per CTO dated 06.05.2021, some workers have been inducted and their OHS related data is presented below:

Parameter	Details
OHS facility	Out side
OHS agency	Max Diagnostic Pvt. Ltd., Dhenkanal
First air centres	2 nos.

<table>
<tr><th>Parameter</th><th>Details</th></tr>
<tr><td></td><td> 
  </td></tr>
<tr><td>Pre-Employment / Periodical monitoring frequency as per Factory Act</td><td>Periodic medical, Pre employment & annual as per Form no. 31 A and 30 (Sample given in Annexure XXI)</td></tr>
<tr><td>Records available</td><td>Yes, in plant premises (summary given in Annexure XXII)</td></tr>
<tr><td>Tests carried out / records Periodical Medical Examination (PME) & Initial Medical Examination (IME)</td><td>
<table>
<tr><th>Sl. No.</th><th>Parameters for Medical Examination</th></tr>
<tr><td>1</td><td>Age</td></tr>
<tr><td>2</td><td>Height</td></tr>
<tr><td>3</td><td>Weight</td></tr>
<tr><td>4</td><td>Body Mass Index (BMI)</td></tr>
<tr><td>5</td><td>Blood Group</td></tr>
<tr><td>6</td><td>Eye Vision (LT/RT)</td></tr>
<tr><td>7</td><td>Heart Sound</td></tr>
<tr><td>8</td><td>Respiratory systems</td></tr>
<tr><td>9</td><td>Cardivascular systems</td></tr>
<tr><td>10</td><td>Abdomen Tenderness (Yes/No</td></tr>
<tr><td>11</td><td>Nervous System (Fits/Epilepsy)</td></tr>
<tr><td>12</td><td>Locomotors System</td></tr>
<tr><td>13</td><td>Skin</td></tr>
<tr><td>14</td><td>Harnia</td></tr>
<tr><td>15</td><td>Hydrocele</td></tr>
</table>
</td></tr>
<tr><td>OHS budget (for total 7.53 MTPA)</td><td>Capital cost = Rs. 230 lakhs
Recurring cost = Rs. 164.1 lakhs</td></tr>
<tr><td>Safety measures in plant</td><td>• Safety Manager/ Officer appointed to look after the safety aspect</td></tr>
</table>

Parameter	Details
	• Provision of rest shelter in plant premises with amenities like canteen, drinking water etc. are under construction • Provision to use of safety appliances, display board, safety slogan etc. • PPE to workers • Training to workers for safe handling of material and machines • Safety awareness week, few photographs are shown below: 
	

CHAPTER 5

ANALYSIS OF ALTERNATIVES

5.1 SITE ALTERNATIVES

The existing and expansion phase of the Integrated Steel Plant is located in Jharbandh, Galpada, Tarkabeda, Kothalu, Beruanpal, Kankalu, Benipathar, Kadala, Badamunda, Paik Purana Kote, Naraharipur, Chandrasekharpur, Sanamunda, Kaliakoli, Kantimili, Sulanali, Janhamunda, Patala and Nuapada villages, district Dhenkanal in Odisha. The proposed expansion of integrated steel plant from 3.55 MTPA to 7.53 MTPA will be by expansion of existing unit's capacities and by addition of new facilities as well as expansion in area. Since this is an operational plant, no site alternatives have been considered and the intent was to procure land adjoining or as near as possible to the existing project. Hence, 1800 acres additional area adjacent to the existing plant site is in the process of acquisition.

The site for the integrated steel plant expansion has the following advantages:

- Rungta Mines Limited has a strong base in the state of Odisha and therefore, the expansion of the existing plant was a natural choice.
- The expansion proposed in the integrated steel plant will be located in the plot adjoining/ near to the existing plant, thereby allowing utilisation of common infrastructure and storage facilities.
- Water requirement for the existing plant is being sourced from Brahmani river is located nearby (distance of river is 4.9 km in NE). The same arrangement shall be augmented to meet the additional water requirement.
- Source of power will be captive power plant of the company.
- Raw materials like iron ore, coal, coke, etc is available in close vicinity or imported through nearest port. Access through road and rail is convenient.
- Railway siding can be constructed at site.
- Availability of labour from nearby village is there
- Environmental aspects such as distance from national parks, sanctuaries, forests, environmentally sensitive areas, etc. are favourable. National Parks/ sanctuaries are absent within 10 km radius.

5.2 TECHNOLOGY SELECTED AFTER ASSESSING ALTERNATIVES

Various units have been assessed for alternatives as given in subsequent paragraphs.

5.2.1 Beneficiation Plant

The EC has been obtained for 5.4 MTPA Beneficiation plant and there will be no change in it. 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

	Wet grinding	Dry grinding
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

Wet beneficiation process has been chosen for this project.

5.2.2 Pelletisation plant

There are two established processes for pelletisation of iron-ore as follows:-

i. **Straight Grate Process**- Developed by M/s Lurgi (now Outokumpu) of Germany. In this process, drying, preheating, induration & cooling of pellets take place on the same strand.

ii. **Grate Kiln Process**- Developed by M/s Allis Chalmers (now Metso Minerals) of USA. In this process pellets are dried & preheated on a grate, indurated in a rotary kiln and cooled in a circular cooler.

However, based on the techno-economic analysis and operating experience of existing pellet plants, straight travelling grate kiln process has been selected for this project.

5.2.3 Coal Washery

A coal washery will consist of a coal crushing, screening station and a gravity separation method.

Different types of crushers available are:

- Rotary Breakers
- Single – Roll Crusher
- Double – Roll Crusher
- Hammer Mills
- Ring Crushers

Screens Used in Coal Preparation are:

- Scalping screen – for separating refuse and fines prior to size reduction
- Raw coal sizing screen- for separating the raw coal into coarse and fine size for further processing
- Pre-wet screen- to remove fines prior to mechanical cleaning
- Heavy media recovery screens- for recovery and reuse of magnetite
- Desliming screens- to remove extreme fines; and
- Dewatering screens- to remove water

Various gravity based separation methods are given in **Table 5.2.**

TABLE 5.2: COMPARISON OF DIFFERENT METHODS

Methods	Jigs	Dense-medium separators	Hydro cyclones
State of technology	Commercial	Commercial	Commercial
Advantages	Large capacity 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 Poor dewatering characteristics	Not for difficult to clean coal
Cost	Inexpensive	Expensive	Lower than wet processes
Suitability	Used for fine coal containing a great deal of pyrite. Specific gravity >1.5, Size: 0.0-15 mm	Used for fines. Mainly used for metallurgical coals Size: <0.5mm	Requires easy coal, Size: >100mm Rough Separation for coal tending to form slimes in west processes

Source: Environmental Impact Assessment Guidance Manual for coal washeries by Administrative Staff College of India, Hyderabad, February 2010

Chosen technology: The coal washery will consist of a coal crushing and screening station. It will be a three-product coal washery (Dense Media Cyclone) with following outputs:

a. Clean Coal (50 %) – 2.51 MTPA with 27% ash

b. Middlings (42.5%) – 2.13 MTPA with 56% ash (For Power Plant)

c. Rejects (7.5 %) – 0.38 MTPA with 80% ash

5.2.4 Coke oven plant

Types of oven: There are three proven processes for the manufacture of metallurgical coke. These are (i) beehive coke ovens, (ii) by-product coke ovens, and (iii) non recovery coke ovens. When the heat energy of flue gases is recovered in the form of steam then the non recovery coke ovens are known as heat recovery or energy recovery coke ovens. In all the three processes, ovens are usually built in rows, one oven beside another with common walls between neighboring ovens. Such a row of ovens is termed a battery. A battery usually consists of many ovens, sometimes hundreds, in a row.

Beehive ovens are simple firebrick chamber built with an arched roof. They are now obsolete process because of low manufacturing capacity and high pollution.

In a ***by-product coke oven*** battery, coal is carbonized in absence of air since these batteries are operated with positive pressure in the ovens. The off gas is collected and sent to the by-product plant for recovery of by-products.

In the ***non recovery ovens***, volatiles evolved during coal carbonization are not recovered as by-products. They are combusted in the oven itself in the presence of controlled quantity of air and the heat of the volatiles of evolving gases is utilized for coking of the coal mass into coke. Thus, no external heating is required. The higher level of heat is used to break up the potentially polluting hydro-carbons into the constituent combustible compounds and to burn them, thus, avoiding the potentially hazardous pollution. The heat consequent to combustion is only partially utilized during the process and the balance heat in the waste flue gas is recovered for energy generation.[1]

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

[1] Source : https://www.ispatguru.com/non-recovery-coke-ovens-battery/ accessed 08.10.2021

combination of bottom and top quenching methods, providing extremely short cooling time[2].

Chosen technology: 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 and low cost per tonne of coke / conversion.
- High coke yield; and improved coke strength due to slow heating at higher temperatures and longer soak time causing consistent crystal growth.
- Need lesser space when compared with coke oven and by-product plant, plant can be constructed with modular construction.
- 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 net waste water discharge since all the waste water is used in coke quenching. Hence, no waste water treatment plant is needed.
- Extensive flue system ensures complete combustion of all hydrocarbons, thus, clean stack gas leaves with parameters within permissible limit.
- Since non recovery ovens work under negative pressure, it results into ambient air being pulled into coke oven at any available intake point and thus eliminates any fugitive emissions.
- There are lesser numbers of process control points.

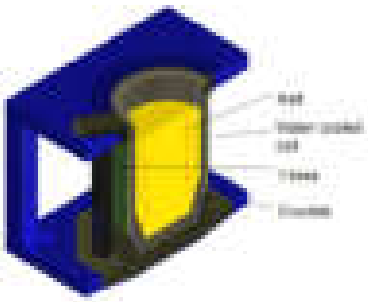
5.2.5 Steel melting

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:

[2] Source: Technical EIA Guidance Manual for Coke Oven Plants by IL&FS Ecosmart Limited, Hyderabad, August 2010

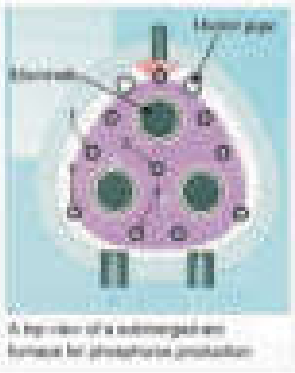
Induction furnace *:* An induction furnace is an electrical furnace in which the heat is applied by induction heating of metal. The advantage of the induction furnace is a clean, energy-efficient and well-controllable melting process compared to most other means of metal melting. Most modern foundries 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[3].



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[4].



Submerged Arc Furnaces: The Submerged-arc furnace is a particular sub-type of electric arc furnace. 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, and arcing occurs through the slag, between the matte and the electrode[5].



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.

[3] Source : https://en.wikipedia.org/wiki/Induction_furnace accessed 25.09.2021

[4] Source: https://en.wikipedia.org/wiki/Electric_arc_furnace accessed 25.09.2021

[5] Source : https://en.wikipedia.org/wiki/Submerged-arc_furnace_for_phosphorus_production accessed 25.09.2021

- **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[6].

Chosen technology: The technology adopted in this plant will be induction furnace and electric arc furnace for steel melt shop.

5.2.6 Captive Power Plant[7]

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 NOx) 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.

[6] Source: Commentary on Submerged Arc Furnaces published by The EPRI Centre for Materials Production at https://p2infohouse.org/ref/10/09042.pdf accessed 25.09.2021

[7] Adapted from Technical EIA Guidance Manual for Thermal Power Plants by IL&FS, September 2009

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. (Source: Adapted from Technical EIA Guidance Manual for Thermal Power Plants by IL&FS, September 2009).

The principle of the various types of boilers are diagrammatically seen in **Fig 5.1**.

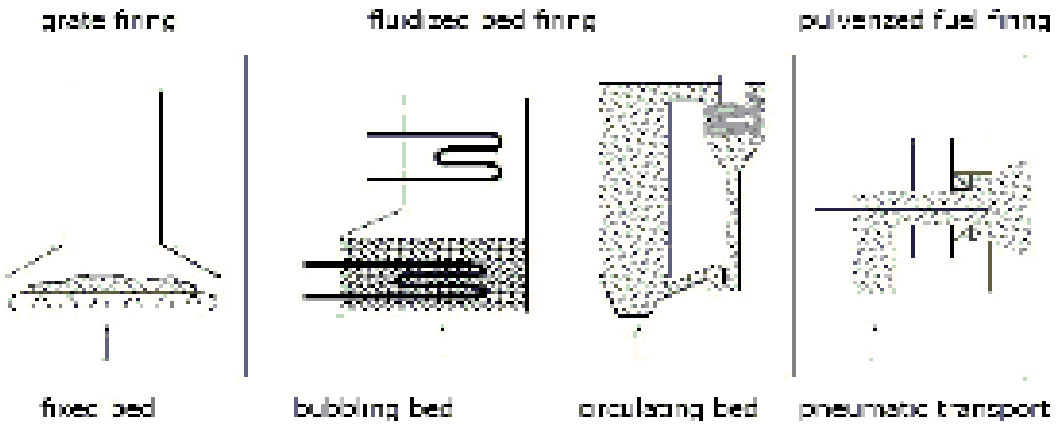


FIG 5.1: COMBUSTION SYSTEMS FOR SOLID FUELS

***1) CFBC (Circulating Fluidized Bed Combustion)[8]*:** 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)[9] : 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)[10]: 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

[8] Source: https://en.wikipedia.org/wiki/Circulating_fluidized_bed accessed 25.09.2021

[9] Source ; https://en.wikipedia.org/wiki/Fluidized_bed_combustion accessed 25.09.2021

[10] Source: https://en.wikipedia.org/wiki/Fluidized_bed_combustion accessed 25.09.2021

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)[11] : is a technology that uses a high pressure gasifier to turn coal and other carbon based fuels into pressurized gas-synthesis gas (syngas). IGCC plants are advantageous in comparison to conventional coal power plants due to their high thermal efficiency, low non-carbon greenhouse gas emissions and capability to process low grade coal. The key disadvantage is the amount of CO_2 released without pre-combustion capture.

Chosen technology: AFBC and CFBC boilers have been selected for proposed plant expansion.

(ii) WHRB Power Generation Unit

Sponge Iron is produced by heating Iron with coal and other additives under controlled conditions in Rotary Kiln. The outlet gases are mixed with air and burnt to convert CO into CO_2. Similarly, the outlet gases from coke oven, clinker kiln and MBF can be utilised for power generation due to their heat content. In addition to the WHRB in MBF, a TRT is also proposed for turbine operation in. 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 88 kg/cm^2 pressure. The steam is carried to super heater system where the temperature is maintained at 515°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.

5.2.7 Cement Plant

There are four main process routes for the manufacture of cement[12]:

1. Dry Process — The raw materials are ground and dried to raw meal in the form of a flowable powder. The dry raw meal is fed to the pre-heater or precalciner kiln or, more rarely, to a long dry kiln.

[11] Source: https://en.wikipedia.org/wiki/Integrated_gasification_combined_cycle accessed 25.09.2021

[12] Source: Technical EIA guidance manual for cement industry by IL&FS Ecosmart Limited, Hyderabad, September 2009

2. Semi-Dry Process — Dry raw meal is pelletized with water and fed into a grate preheater before the kiln or to a long kiln equipped with crosses.

3. Semi-Wet Process — the slurry (see wet process below) is first dewatered in filter presses. The filter cake is extruded into pellets and fed either to a grate preheater or directly to a filter cake drier for raw meal production.

4. Wet Process — The raw materials (often with high moisture content) are ground in water to form a pumpable slurry. The slurry is either fed directly into the kiln or first to slurry drier.

Dry process of cement manufacturing has been chosen as it 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.

CHAPTER 6

ENVIRONMENTAL MONITORING PROGRAM

This chapter deals with the technical aspects of monitoring the effectiveness of mitigation measures. It gives the measurement methodologies, frequency, location, data analysis, reporting schedules, emergency procedures, detailed budget & procurement schedules.

6.1 INTRODUCTION

Success of any environmental management programme depends upon the efficiency of the organizational 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. The organizational arrangement for the implementation of environmental management and monitoring plan are discussed in subsequent sections.

6.2 PROPOSED ORGANIZATIONAL SET-UP

Since this is an operational plant, an environmental management team is already in place to monitor and implement the environmental management programme. The same team shall be responsible for the plant after expansion. The organizational chart has been presented in Fig 10.1 in Chapter 10 along with its roles and responsibilities.

The monitoring for various parameters of air, water, noise, soil, waste water stack, etc. are carried out by an MOEF&CC / NABL recognized lab as per the monitoring schedule. The samples are collected from the plant and taken to be analyzed in their laboratory. Within the plant, various online monitoring equipment are installed in the stack for monitoring various parameters. Online ambient air quality stations are also installed within the project.

6.3 MONITORING SCHEDULE AND PARAMETERS

Pollution control equipments are an integral part of the production units. They are maintained like any other equipment of production units. Expenses are made every year in the operation and maintenance of such equipment and the performance is evaluated by external agency periodically.

To evaluate the effectiveness of environment management programme, regular monitoring of the important environmental parameters is being done and will be continued in future also to ascertain the following:

a. Pollution control status within the plant area.

b. Generate data for predictive or corrective purpose in respect of pollution.

c. Effectiveness of pollution control measures and control facilities.

d. To assess environmental impacts.

e. To follow the trend of parameters which have been identified as critical.

f. Ensure compliances to the conditions of the environmental clearances, consent to operate and consent to establish.

g. Submit periodical compliance reports to MOEF&CC, SPCB and submission of various returns under Water Cess, Hazardous waste, etc.

The schedule, duration and parameters for post monitoring are being / will have been proposed as given in **Table 6.1**.

TABLE 6.1: MONITORING SCHEDULE AND PARAMETERS

Sl. No.	Description of parameters	Methodology	Monitoring locations	Frequency and duration of monitoring	Reporting schedule
1.	Air Quality Monitoring: Parameters: (1) PM10, $PM_{2.5}$, SO_2, NO_2, (2) CO, Ozone, Lead, Ammonia, Benzene, BaP, Arsenic and Nickel (As per NAAQS 2009)	IS:5182 (Parts 2, 6, 11, 12, 23), CPCB guidelines, IS 3025 (Part 2) ICP Method	Plant premises - four locations	Online continuous air quality monitoring stations are already installed to monitor PM10, PM2.5, SO_2 and NOx	Continuously data is transmitted to the SPCB/ CPCB
			Plant premises & in nearby three villages/ residential areas, namely, Nimabahali, Kadala and Tarkabeda*.	One 24 hourly sample every two months or as per the MoEF&CC/ CPCB/ SPCB guidelines, whichever are most stringent.	Submitted with every 6 monthly EC compliance
2.	Stack Emission Monitoring: PM, SO_2, NO_2	IS:11255 (Part 1) & flue gas analyser manual	At all major process stacks (where combustion/ reaction is taking place)	• Online continuous monitoring system is in place as per SPCB directions for applicable existing stacks and the same shall be installed in future also. • Per season, manual monitoring will be carried out for process & non-process stacks every 4 months.	• Continuously data is transmitted to the SPCB/ CPCB • Submitted with every 6 monthly EC compliance
3.	Fugitive Emission Monitoring	IS:5182 (Part 4)	Major sources of fugitive dust	One 8 hourly sample per quarter or as per the MoEF&CC/ CPCB/ SPCB guidelines, whichever are most stringent.	Submitted with every 6 monthly EC compliance

Sl. No.	Description of parameters	Methodology	Monitoring locations	Frequency and duration of monitoring	Reporting schedule
4.	Water Quality/effluents Water quality of surface and ground as per IS : 10500 except radioactivity & pesticides	Various parts of IS 3025 for sampling & analysis, APHA	Ground water- within plant, adjoining villages (three) and from one from study area	Ground water - once in two months	Submitted with every 6 monthly EC compliance
			Surface water- Brahmani River, Gandhijhara Nala and Lingra Nala*	Surface water- once in two months	Submitted with every 6 monthly EC compliance
			ETP- inlet and outlet	• Continuous online system will be installed on outlet • Periodic sampling - quarterly for inlet & outlet	• Continuously data will be transmitted to the SPCB/ CPCB • Submitted with every 6 monthly EC compliance
5.	Ambient noise level	CPCB guidelines	• Within plant • Villages near plant (3 locations)	Once in two months	Submitted with every 6 monthly EC compliance
6.	Inventory of flora (Tree plantation, survival etc.)	Counting	Green belt	Once in a year within the green belt	To plant head, annually
7.	Health checkup	Approved medical procedures	The project staff - monitored in plant as well medical centre	Medical checkups prior to induction & periodically as per rules; consultation on need basis	Six monthly to SPCB & CPCB
8.	Inventory of hazardous waste	Form 3 & Form 4 of Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016	Within plant	Annually	Annual returns filed to SPCB
9.	Inventory of solid waste (char, ash, slag, etc)	Environmental statement	Within plant	Quarterly & monthly	• Char & slag- quarterly information to SPCB with CTO compliance • All- Environmental statement filed annually
10.	Water consumption	Water meter	Intake point	Continuous monitoring, reading recorded every day	Annual returns filed to SPCB

**** as per current practice. May get modified in future according to circumstances (wind directions, SPSCB discussion, status of operation/ construction, site conditions, etc)***

For the purpose of monitoring, the plant has and will have the following on operational and proposed units:

(1) Online ambient air monitoring stations

(2) Online stack monitoring systems

The company carries out in house controls and checks to ensure that the air pollution control equipment are operational. Continuous stack monitoring equipment give an indication in case the emissions exceed limits, to enable the company to take immediate corrective action. Monthly or quarterly Environmental monitoring is being carried out by MOEF&CC/ NABL accredited laboratory for different environmental parameters. After study of the monitoring results, mid course corrections, modifications, improvements, etc. can be carried out in the Air Pollution Control systems and effluent treatment plant.

Within the premises of the existing plant, green belt plantation has been carried out, which prevents spread of pollution and helps keep the environment of the surrounding villages clean. In the expansion area, there will be additional greenbelt plantation. Continuous vigil and monitoring of green belt will be done for its performance and survival rate. The plantation is being and will be properly guarded by watch and ward personnel. Provision has been and will be made for fertilizers application and watering on schedule.

The company celebrates 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 online as well as through third party, is given in **Table 6.2**.

TABLE 6.2: CAPITAL INVESTMENT COST FOR ENVIRONMENTAL MONITORING (ALL COSTS IN RUPEES LAKHS)

Sl. No.	Particulars	As per EC for total 3.55 MTPA capacity			Additional	Total for 7.53 MTPA	
		No. of equip.	Unit cost	Total	Total	No. of equip.	Total
1	PM2.5 sampler	4	1.00	4.00	0	4	4.00
2	Respirable dust sampler	4	0.65	2.60	0	4	2.60
3	Micro-meteorological station (Automatic)	1	1.50	1.50	0	1	1.50
4	Laboratory for testing	LS	10.00	10.00	0	LS	10.00
5	Online stack sampling kits	13	15.00	420.00	17.00	38	437.00

Sl. No.	Particulars	As per EC for total 3.55 MTPA capacity			Additional	Total for 7.53 MTPA	
		No. of equip.	Unit cost	Total	Total	No. of equip.	Total
6	Continuous Ambient Air Quality Monitoring stations	4	15.00	60.00	0	4	60.00
7	Noise meter	2	0.50	1.00	0	2	1.00
	Total			**499.10**	**17.00**		**516.10**

**** Although the cost of four continuous ambient air quality stations has been mentioned in 7.53 MTPA, it has already been installed***

TABLE 6.3: RECURRING COST FOR ENVIRONMENTAL MONITORING (ALL COSTS IN RUPEES LAKHS)

Sl. No.	Particulars	Recurring cost (Rs. Lakhs)		
		As per EIA of 3.55 MTPA	Additional	Total for 7.55 MTPA
1	Third Party environmental monitoring	3.00	0	3.00
2	Testing/Chemicals etc.	2.50	0	2.50
3	Annual Depreciation	99.15	3.4	102.55
4	Power consumption	4.02	26.99	31.01
5	Repair & Maintenance including oils, lubricants	20.23	3.38	23.61
6	Manpower	8.28	0.75	9.03
	Total	**137.18**	**34.52**	**171.7**

The additional capital investment on environmental monitoring activities for expansion from 3.55 to 7.53 MTPA is envisaged as Rs. 17 lakhs. The total capital investment on environmental monitoring activities for entire 7.53 MTPA is calculated as Rs. 516.10 lakhs out of which capital cost has already been spent for 4 nos. continuous online ambient air quality monitoring stations and 2 nos. online stack sampling kits.

Procurement schedule for the monitoring equipment/ services is as follows:

1. ***Continuous stack monitoring systems*** - already procured and installed on operational units. The balance shall be installed along with the construction of the particular sub-unit so that the stack monitoring system commences operation along with operation of the unit.

2. ***Continuous ambient air quality monitoring stations***- already procured and installed on 4 nos. continuous ambient air quality stations. No additional stations are proposed. The locations of the existing stations may be changed, if required, on the directions of the SPCB/ CPCB.

3. ***Monitoring through third party*** - Once in two months for some parameters/ matrices and quarterly for the remaining as described in **Table 6.1**.

6.5 EMERGENCY PROCEDURES

The emergency plan at the plant level has been discussed in Chapter 7 and Hazard Identification and Risk Assessment (HIRA), Emergency Plan & Disaster Management Plan has been prepared by Prof. B. C. Meikap Department. of Chemical Engineering Indian Institute of Technology Kharagpur.

There are 25 safety guidelines that have to be followed by steel plants, which have been detailed by The Ministry of Steel in 2019 as available at https://steel.gov.in/sites/default/files/Framework%20Document%20for%20Safety%20Guidelines.pdf (accessed 28.09.2021).

This section deals in the emergency shut down of pollution control equipment and associated units:

Typical shutdown of ESP: When the boiler load drops and total quantity of ash reduces, the ESP fields are de-energised, starting with inlet field. The outlet field is de-energised on cessation of fuel flow and dropping of combustion air flow below 30% of rated flow. The rappers, ash removal system, hopper heaters and seal-air system are left operational. After a few hours (as prescribed by the manufacturer) after source shutdown, seal-air system and hopper heaters are de-energized. The ash removal system shall be secured. After another few hours (as specified by the manufacturer) the rappers are de-energized.

Emergency shutdown ESP: All the transformer/ rectifier sets are de-energised while the rappers, ash removal system, hopper heaters and seal-air system are left operational. As described above, after a few hours, seal-air system and hopper heaters are de-energized, ash removal system secured and after another few hours the rappers are de-energized.

Interlock systems : All the pollution control equipment like ESP and Bag filters at different locations in the plant are interlocked with material feeding system. This helps in controlling & maintaining pollution control norms. Whenever ID fan of ESP trips because of any reason, the feeding circuit to the kilns stops automatically. This has been electrically interlocked. This gives alert to control room operator and thereafter necessary action is being taken to restart the ID Fan & thereafter the material feeding system. Similarly functioning of ESP is also interlinked with ID fan running. The ID fans connected to bag filters located at different locations in the circuit is also interlinked with kiln feeding system. Non functioning of ID fan will lead to stoppage of total kiln feeding system. This enables the company to maintain clean environment in & around the plant premise.

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. The aspect of R&R has already been covered in section 4.11, Chapter 4. Public Hearing shall be held on the basis of draft EIA report and shall be added in this Chapter after it is held. The Corporate Social Responsibility (CSR) has been detailed in Chapter 9. Only the aspect of disaster management plan has been covered in this chapter.

This chapter deals with identification of hazards and disaster and preventive measures for disaster. Proposed Expansion of Dhenkanal Steel Plant may face certain types of hazards which can disrupt normal activities abruptly and lead to disaster like fires, inundation, failure of machinery, hot metal spill, electrocution to name a few. DRI plant, WHRB plant, etc. also pose fire, electrocution, spill and explosion hazards. Disaster management plan is formulated with an aim of taking precautionary steps to control the hazard propagation and avert disaster and also to take such action after the disaster which limits the damage to the minimum.

Definitions pertinent to this chapter are:

- “Hazard” is a source or a situation with the potential for harm in terms of human injury or ill-health, damage to property, damage to the environment, or a combination of these.

- “Risk” is defined as a likelihood of an undesired event (accident injury or death) occurring within a specified period or under specified circumstances. The level of risk reflects the likelihood of the unwanted event and the potential consequences of the unwanted event.

- “Incident” is a “work-related event(s) in which an injury or ill health (regardless of severity) or fatality occurred, or could have occurred.

- “Accident” is a particular type of incident in which an injury or illness actually occurs.

- “Emergency” is an unexpected occurrence requiring immediate action.

- “Disaster” is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community’s or society’s ability to cope using its own resources. Though often caused by nature, disasters can have human origin.

7.1 HAZARD IDENTIFICATION AND RISK ASSESSMENT

As a consequence of health and safety awareness many measures are being taken to ensure the security of an individual working in the industrial premises. Risk assessment follows an extensive hazard analysis. 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 risk assessment process includes:

1. Identification of a hazard and associated risk
2. Assessment of the risk, which includes the likelihood, the severity and assigning a priority for correction followed by control of the risk, which includes elimination, engineering a barrier, administration controls and personal protection equipment
3. Documentation of the process.
4. 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 coal handling areas where not only the danger due to failure of machinery but also inhalation of dust exists. In other areas where heat generating equipment such as boiler and steam conduits are there, the risks pertain to exposure to heat and 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 mineral wools and fibres;
(x) inhalable agents (gases, vapours, dusts and fumes);
(xi) skin contact with chemicals (irritants (acids, alkalis), solvents and sensitizers);
(xii) contact with hot metal;
(xiii) fire and explosion;
(xiv) extreme temperatures;
(xv) radiation (non-ionizing, ionizing);
(xvi) noise and vibration;

(xvii) electrical burns and electric shock;
(xviii) manual handling;
(xix) failures in automation
(xx) flammable liquids in the presence of ignition sources.
(xxi) poorly designed tools having the potential to cause injury.
(xxii) degraded and worn hand tools.
(xxiii) used/ waste oil on the floor, causing a slipping hazard

There can be hazards on the road while coming and going from duty, during transportation of material as follows:

- High concentration of traffic during duty hours
- Heterogenous traffic
- Violation of traffic rules/ speed limit
- Road Condition
- Condition of vehicle

In the existing plant & proposed expansion project, type of likely hazards and possible areas where this can occur are tabulated in **Table 7.1**.

TABLE 7.1: HAZARD IDENTIFICATION OF THE PROPOSED EXPANSION OF STEEL PLANT

Group	Item	Nature of Hazard	Hazard Potential
Raw materials handling	Coal for DRI, coking, CPP, etc	Fire	Moderate
Chemical handling	Water treatment Chemicals like acids/ alkalis	Toxic, corrosive	Major
	Lube oils/greases	Fire	Moderate
Production units			
- Iron making	Release of untreated DRI/ Blast furnace wastewater	Contaminated, can cause Pollution of surface water	Major
	Blast furnace reactor	Explosion, flying debris, spreading of hot material to surroundings, damage, fore, fatality, injury	Major
	Slag pipe & slag pit	Explosion, fire	Major
	Blast furnace gas	Fire, toxicity due to CO, asphyxiation	Major
	Dolochar/ hot metal & slag handling	Fire/ Heat radiation & injury	Major
- Steel making	Release of untreated furnaces wastewater	Contaminated, can cause water pollution	
	Hot liquid steel & slag Handling	Heat radiation, contact with hot metal, injury, fatality	Major

Group	Item	Nature of Hazard	Hazard Potential
	Electric Arc Furnaces, submerged arc furnaces, Basic oxygen Furnace & other furnaces	Explosions, fatality, injury, heat radiation, contact with hot metal	Major
- Rolling Mills	Gas firing/ fuel firing	Fire	Major
	Release of untreated wastewater	Contaminated, can cause water pollution	Major
- Annealing	Heating & cooling processes, core sanding	Heat radiation, injury	Moderate
- Pickling	Acid treatment effluents, fumes and sludges	Toxicity, Pollution of surface water, hazardous waste	Major
- Galvanizing	Electrolysis effluents and fumes, zinc skimmings, zinc dross, sludges etc	Toxicity, Pollution of surface water, hazardous waste	Major
- Coke Plant	Dusts and fumes	Asphyxiation, Air pollution	Moderate
	VOC emissions from battery	Toxicity	Moderate
	Coke oven gas	Fire & Toxicity	Major
- Agglomeration (Sintering, pelletisation)	Dusts	Respiratory issues, ambient air pollution	Moderate
- Captive Power Plant (CPP)	Coal, middlings	Fire	Major
Utilities			
- Fuel gas	Gas leaks	Fire & Toxic	Major
- Electric Power Supply	Electrical components, cables	Fire, shock, injury	Major
- Liquid fuel	Fuel handling & storage area	Fire & Toxicity	Major
- Hydraulic oil and lubricants	Accidental discharge of hydraulic oil under pressure	Fire & Toxicity, injury	Moderate

Accidents are more common in the older plants compared to those built with new technology and inbuilt safety features. Some, but not limited to these, known case studies of where the hazards converted into incidents and/ or accidents, which should be studied in detail by the company while operating the plant are as follows:

- 8 November 2001 - Blast Furnace no. 5 of Corus, Port Talbot where the ingress of cooling water into the blast furnace containing hot metal caused significant internal overpressure within the lower part of the furnace, causing an explosion.

- 13 November 2013 - Explosion in slag pit/ pipe due to reaction with water in blast furnace no. 2 of Bhushan's Steel Plant at Mermundali, Dhenkanal, Odisha.
- 15 August 2017 - Blast (explosion) occurred at a coke oven at Gerdau's plant in the center-south state of Minas Gerais, Brazil.
- 1 November 2017 - At Unchahar Thermal Power Station of NTPC, in a 500 MW boiler, ash buildup caused the unit to over-pressurize, which caused an explosion that released hot gas, killing several workers instantly.
- Explosions in Electric Arc furnace plants, is common enough that on an average, one accident comes light every year from various parts of the world. The most common cause is the explosion caused by water leak in cooling system.

7.1.2 Assessment of the risk and its control

Risk analysis follows an 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

The risk may be computed by the following formula:

$$FAR = \frac{108}{24*365*N} \sum_{i=1}^{n} (xi*fi)$$

Where:

FAR	=	Fatality accident rate
xi	=	Number of deaths from a particular accident
fi	=	Frequency of occurrence of the particular accident
n	=	Potential types of accidents
N	=	Total number of people at risk

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. In the present case of risk analysis in context, this formula is the best and appropriate to serve the practical purpose. The formula is based on actual historical record of the accident episodes reported in that particular type of environment.

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.

Light Diesel Oil (LDO), Furnace oil (FO) & High Speed Diesel (HSD) are/ will be required at existing, under construction as well as to be constructed steel plant and the same will be required after proposed expansion project and installation of additional facilities. For storage of auxiliary fuels, underground fabricated steel tanks have been installed in existing plant and shall be installed for expansion areas, which shall conform to the regulations. Since the tank(s) shall not be above ground, assessment of fire in tank and pool fire in dyke have not been carried out.

The fuel storage tanks shall be operated at ambient conditions. Fire hydrant points and fire extinguishers shall be provided at these locations. The characteristics of auxillary fuel based on IS 11489 -1985 (Reaffirmed in 2020) has been given in **Table 7.2**.

TABLE 7.2: FUELS CHARACTERISTICS

Sl. No.	Characteristics	Unit	Specifications		
			FO	HSD	LDO
1.	Density @ 15ºC,Max	gm/ml	0.991	0.845	0.909
2.	Flash Point COC Min	ºC	66	35	66
3.	Gross Cal Value, Min	Cal/gm	10000	10,500	10,400
4.	Pour Point, Max	ºC	15	3 (winter) & 15 (Summer)	+ 21

Sl. No.	Characteristics	Unit	Specifications		
			FO	HSD	LDO
5.	Sediment, Max	%/Wt.	0.25	0.05	0.10
6.	Sulphur Total Max	%/Wt.	4.0 %	350 mg/kg	1.5 %
7.	Water Content Max	%/Vol.	1.0	0.05	0.25
8.	Ash Percentage Max	%/Wt.	0.1	0.01	0.02

"Hazard Identification, Risk Assessment, Emergency Plan & Disaster Management Plan" has been prepared by Prof. B. C. Meikap, Department. of Chemical Engineering, Indian Institute of Technology, Kharagpur. The report has been prepared as follows:

- Unit wise hazard identification is done through steps like the discussion with the plant personnel and reviewing related literature. From the above-mentioned steps the system description, identification of hazardous energy sources, hazardous energy processes/events, human negative interaction for every section are identified.
- Based on the identified hazards a detailed questionnaire for each of the sections is prepared and distributed among the experts. After data collection from the experts, the fuzzy failure mode and effect analysis (FMEA) technique is conducted to provide the quantified values (risk values) of each of the hazard on a scale of 0-1. Then, the hazards are ranked based on the descending order of the risk values in every section.
- From risk values, it is also observed that the hazards of a particular section can be clustered in five different groups, namely hazards with very low risk, low risk, medium risk, high risk, and very high risk.
- Further, Pareto chat for every section is also provided to verify the critical hazards obtained from the clustering. In order to reduce the impact of the hazards or eliminate the hazards with higher rankings (critical hazards) in each section, certain actions must be taken and activities must be modified.
- Hence, based on the list of the critical hazards, obtained from the clustering and Pareto analysis, risk control systems are suggested for each of the section. These risk control systems are useful in preventing the hazards as well as mitigating the effect of the hazards.
- Finally, a risk control measure matrix including best practices around the world has been proposed for controlling and improving the safety of the entire organization.

The findings of the reports have been summarised in **Table 7.3**.

TABLE 7.3: UNIT WISE RISK ASSESSMENT AND CONTROL SYSTEMS

Sl. No.	Name of Unit	No. Of Hazards analysed	Highest Ranking Hazard	Hazards in very high risk ranking group	Risk Control Systems
1	Pelletisation Plant	67	Gas leakage	• Gas leakage • Fine dust deposition • Fire and explosion • Rotating machines	• Pressure sensors • Alarm system • Regular inspection and maintenance • Proper training and communication among the workers • Covering of the rotating machines • Standard operating procedures (SOP) for working near rotating machines • Permit to work near rotating machines
2	Coal Washery Plant	8	Coal handling and storage	• Coal handling and storage	• Open-mesh walkways/fencing in critical zones • SOPs for authorised entry • Proper communication with ground workers • Proper training on material handling • Dust extraction system • Permit to work in confined spaces • Regular inspection and maintenance
3	DRI Plant	46	electrical shock due to electrical panels	• Electrical shock • Fine hot dust • Fire hazard	• Proper PPEs • Permit to work • Proper covering of electrical panels • The competent authority for electrical work • Regular inspection and maintenance to control the fine hot dust deposition • Alarm system • Regular monitoring of DRI storage area • Temperature sensors in the storage area to detect overtemperature situation • Reroute the waterworks to avoid the water availability in close vicinity of the storage area • Proper drying of sponge iron before storing it

Sl. No.	Name of Unit	No. Of Hazards analysed	Highest Ranking Hazard	Hazards in very high risk ranking group	Risk Control Systems
4	Mini Blast furnace	44	Inhalable agents (gases, vapors, dust, and fumes)	• Inhalable agents (gases, vapors, dust, and fumes) • Handling hot liquid, dust, heat • Exposure to gas leakage • Slip/trip/fall & material falling from the height	• Proper PPEs(dust mask, safety goggles, safety gloves, footwear, and other leg protection guard) • SOPs for working near hot metal • Permit to work • Effective audible and visual communication devices. • Proper training for handling liquid metal • Provision of hand railing near pig casting machine (PCM) pouring end • Online Gas monitoring at strategic locations • Portable “CO” monitors to detect gas leakage • Proper and regular housekeeping • Fencing at critical zones
5	Sinter Plant	44	structural corrosion	• Structural corrosion • Dust, fine dust deposition • Noise • Fine hot dust • Hot flue gases • Rotating machinery/Rotating parts of the conveyor system	• Regular inspection, maintenance, and cleaning of structural components of the plant • Proper PPEs (dust mask, earplugs, fire retardant jacket, safety goggles, safety gloves, footwear, and other leg protection guard) • Dust extraction (DE)/De-dusting system (avoid manual cleaning) • Permit to work • Separate glass cabin for tanker staff • Signage in the high noise area • Proper training and communication among the workers • Covering of the rotating machines • Standard operating procedures (SOP) for working near rotating machines
6	Coke Oven Plant	18	gas off take system	• Gas off take system • Gas Leakage and backfire in cellar and gas pipelines	• Installation of oven positioning system to ensure the exact oven opening • Proper training of oven top man • Proper SOPs for staying away from the flue caps and charging holes

Sl. No.	Name of Unit	No. Of Hazards analysed	Highest Ranking Hazard	Hazards in very high risk ranking group	Risk Control Systems
					• Proper PPEs (dust mask, fire retardant jacket, safety goggles) • Pressure sensors • Auto opening system of the bleeder valve • SOP to avoid unauthorized entry • Online Gas monitoring at strategic locations • Portable "CO" monitors to detect gas leakage • Fire detector inside the cellar
7	SMS Electric Furnace	17	ladle cars	• Ladle cars • Rotating machinery	• The siren facility in cranes • Proper communication and coordination with shop floor movement • Installation of oven positioning system to ensure the exact oven opening • Effective audible and visual communication devices • Guarding to the rotating parts • Emergency switch availability • Proper PPEs during maintenance of rotating machinery
8	SMS Induction Furnace	11	pressurized vessels	• Pressurized vessels • Splashing slag	• Use of pressure sensors • Alarm system • Regular inspection and maintenance of pressure vessels, and calibration of switches • Ensure proper functioning of the auto drain valve • Proper communication and coordination with shop floor movement • Covering the splash exposed area • Wearing proper PPEs
9	Rolling Mill Long Product	26	gas cutting/ lancing (to remove cobble)	• Gas cutting/ Lancing (to remove cobble) • Falling of material • Gas poisoning due to leakage of gas • Loco movement • Slippage of tools	• Proper PPEs (Safety gloves, mask, fire retardant jacket, safety goggles) • SOPs for authorized access in the area • Cleaning of surroundings during gas cutting • Power backup for magnetic cranes • Effective audible and visual

Sl. No.	Name of Unit	No. Of Hazards analysed	Highest Ranking Hazard	Hazards in very high risk ranking group	Risk Control Systems
				• Trailer Movement	communication devices • VR based proper training to the operators • Fencing in critical zones • Provide open-mesh walkways wherever possible • Barricade on the sides of the track • Proper leveling of tracks • Clearly specify loading areas • Avoid over speeding inside the plant
10	Rolling mill flat product	21	major repair job in rolling mill (automatic)	• Major repair job in rolling mill (automatic) • Handling of heavy loads (mill gearbox, mill motors, blowers, etc.) • Fire/ Explosion hazards • Hazards due to material transfer trolley • Roller Table Change	• Proper PPEs (Safety gloves, mask, fire retardant jacket, safety goggles, footwear, and other leg protection guard) • Permit to work during the repair • SOPs for repair work (depressurize pipelines before dismantling, removing inflammable substance before welding to be carried out, earthing of electrical equipment, power shut down, prechecking tools) • Barricading to control the unwanted movement in the repair area and below the heavy loads • Providing correct lifting tackles • Proper insulation of electrical wires to avoid overheating • Cooling and maintenance of electrodes • Power backup for magnetic cranes • Guarding to the rotating parts • The competent person for repair work
11	Cement Plant	23	noise	• Noise • Fine hot dust • Falling of material • The explosion in the boiler area and turbine room • Fire • Collapse - dust emission and material spillage	• Proper PPEs (earplugs, dust masks, safety helmet, safety gloves, fire retardant jacket, safety goggles, footwear, and other leg protection guard) • Open-mesh walkways/fencing in critical zones • SOPs for authorized access • Regular inspection and maintenance of boiler and turbine area, and silo's structure

Sl. No.	Name of Unit	No. Of Hazards analysed	Highest Ranking Hazard	Hazards in very high risk ranking group	Risk Control Systems
					• Temperature sensors to detect over temperature situation • Signages for no smoking and no open flame • Barricading to control the unwanted movement in the repair area and below the heavy loads • The facility of lightning arresters at the top of the silos • Proper insulation of electrical wires to avoid overheating • Silo structure monitoring using sensors • Avoid overfilling of silos
12	Power Plant	18	failure of Safety Relief devices	Failure of safety relief devices	• Regular inspection and maintenance • Proper PPEs (earplugs, safety helmet, safety gloves) • Pressure sensors
13	Lime Plant	3	dust particles/ small particle of limestone	-	• Proper PPEs (dust mask, safety goggles, earplugs, safety helmet, safety gloves) • Dust extraction (DE) system • Preventing calcium oxide contact with moisture and water • Regular inspection near lime production
14	Oxygen plant	5	enormous release of heat	-	• Pressure sensors • Continuous lubrication to reduce the friction and heat generation • Provision to avoid chemical reactions • Improve the design of fins to optimize the heat release • The latest corrosion protection technique • Proper PPEs (earplugs, mask, safety helmet, safety gloves, fire retardant jacket) • Sensors to detect the leakage of oxygen • Provision of proper separation layers • Regular inspection and maintenance by a competent authority

Risk control has been further summarised in **Table 7.4**.

TABLE 7.4: RISK CONTROL SYSTEMS FOR ENTIRE ORGANISATION

Plants	Risk control systems							
	Inspection and maintenance	Staff competency	SOPs	Alarm	Communication	Permit to work	Plant design	Emergency arrangement
Palletization Plant	√	√	√	√		√		√
Coal washery plant	√	√	√		√	√		√
DRI	√	√	√	√		√		√
Mini blast furnace	√	√	√		√	√		√
Coke oven plant	√	√	√			√		√
SMS electric furnace	√	√	√	√	√	√		√
SMS induction furnace	√	√	√	√	√	√		√
Rolling mill long product	√	√	√	√	√	√		√
Rolling mill flat product	√	√	√	√	√	√		√
Cement plant	√	√	√			√		√
Power plant	√	√	√			√		√
Lime plant	√	√	√			√		√
Oxygen plant	√	√	√			√	√	√

The HIRA report further concludes and recommends the following based on the overall analysis, for the entire organisation:

- Standard operating procedures (SOPs) for every section and general works. A system for adherence to the SOPs is also required.
- Personal protective equipment (PPEs) such as dust masks, safety goggles, safety gloves, safety helmets, safety vest, fire retardant jacket, earplugs, etc. should be made compulsory. Workers without appropriate and required PPEs should not be allowed at the worksite.
- Smart PPEs (IIoT: Industrial Internet of Things) may be more useful in detecting the workers without PPEs and workers using PPEs inappropriately.
- Sensor-based real-time monitoring such as pressure sensors, temperature sensors, etc. at different locations may be useful in controlling several hazards
- Proper training, especially to handle the liquid molten metal and to transfer the material through electrical overhead cranes, is necessary. Virtual/Augmented reality-based training to the operators is recommended here.

- Regular inspection, maintenance, and housekeeping for every section of the entire organization need to be ensured.
- Only competent personnel should be allowed for electrical and maintenance work.
- Permit to work using different colored lock system should be made compulsory.
- Energy isolation before the maintenance should be made compulsory.
- Proper communication among workers is necessary. So, effective audible and visual communication devices must be available in working condition. Some smart communication techniques may be more useful here.
- Danger signages at the required places must be available.
- The alarm system in every section must be available for emergency situations.
- Dust/fume extraction system should be implemented at the required places.
- On-line gas leakage detectors at the required places should be installed.
- The use of hand railings while using staircases should bring in culture. The three-point contact concept should be implemented.
- A safety management team, including safety experts, should be formed. This team will conduct meetings with the supervisors of every section. These meetings will be helpful for supervisors in identifying the hazards at their site. Accordingly, they may report the management and corrective actions may be taken.

7.1.3 Emergency Plan & Disaster Management Plan

Risk can be controlled through emergency planning, which has two aspects - on site as well as off site planning, as discussed below:

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 which designated people at the site of the incident initiate supplementary action either inside or outside the workers at an appropriate time. An essential of the plan is the provision for making the affected unit safe, for example, by shutting it down. The plan also contains the full sequence of key personal to be called in from other sections or from off site.

This is further detailed in section 7.4.

Off site emergency plan

The off site emergency plan is an integral part of any major hazard control system. It should be based on those accidents identified by the works management, which could affect people and the environment outside the works. Thus, the off site emergency plan follows logically from the analysis that took place to provide the basis for the on site emergency plan and the two plans should therefore complement each other.

The key feature of a good off site emergency plan is flexibility in its application to emergencies other than those specifically included in the formation of the plan. The role of the various parties that may be involved in the implementation of an offsite plan are described in detail. The responsibility for the off site plan will be likely to rest either with the works management or with the local authority.

7.1.4 Monitoring and review of the process

For the effective implementation of the Onsite Emergency plan several measures are and will be taken. For example, Emergency Mock Drills are conducted at shop floor on regular basis as per the schedule. The findings of the mock drills are recorded in the prescribed format and actions are taken on the recommendations, if any. The Onsite Emergency Plan is also reviewed by Safety department in consultation with departments concerned. Revision is done in the onsite emergency plan if there is any major modification in plant or process and in case of any dangerous occurrence. These aforementioned activities shall be continued in the expansion phase also.

7.2 TYPE OF DISASTER AT INTEGRATED STEEL COMPLEX

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 area 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

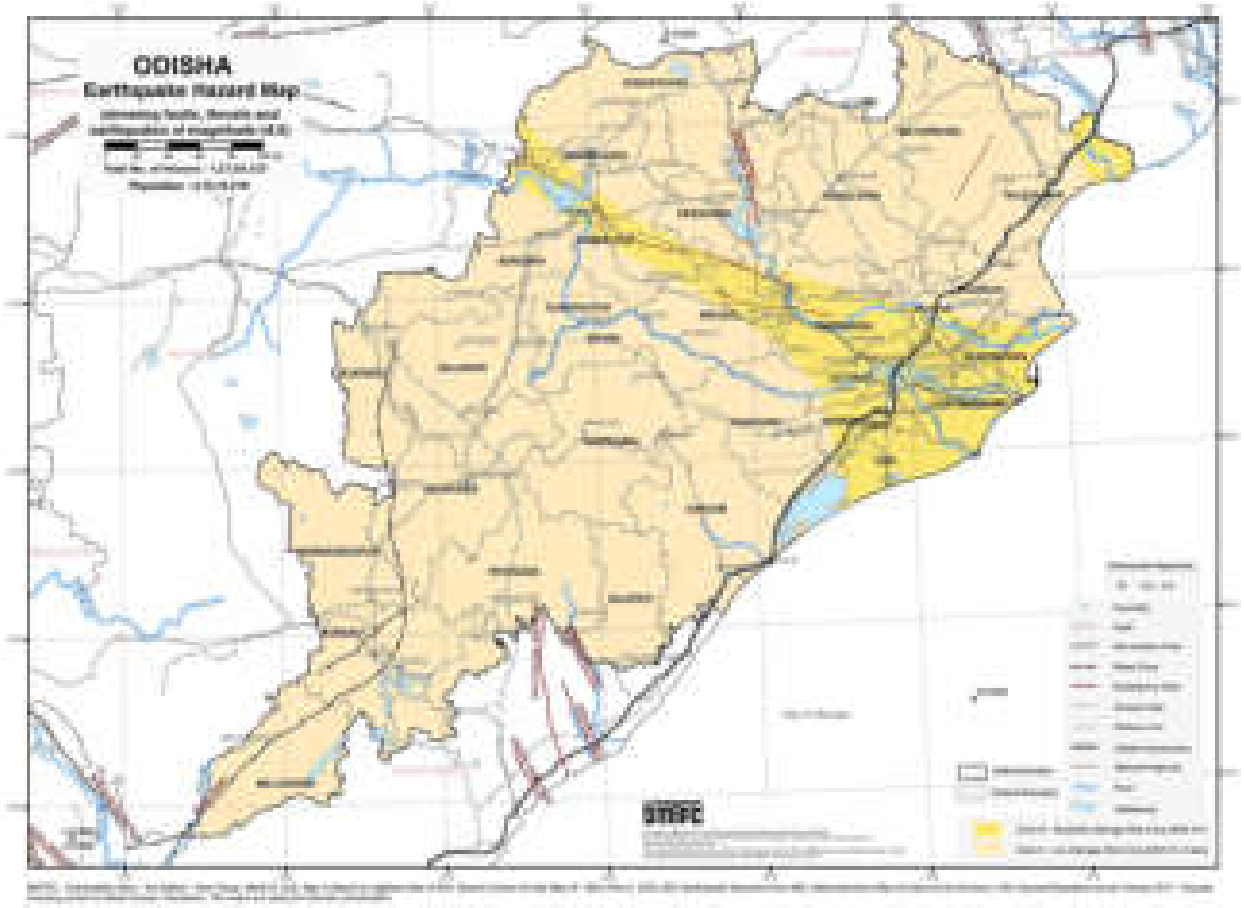
termed as technological disaster. Technological disasters shall be the results of failure of technology involving material, design, system or operational failures.

7.2.1 Natural disasters

7.2.1.1 Seismic & Earthquake risk management

Districts that lie in the Mahanadi river valley lie in Zone II, and within Odisha this zone stretches from Jharsuguda along the border with Chhatisgarh in a south-easterly direction towards the urban centres of Bhubaneswar and Cuttack on the Mahanadi Delta. The maximum intensity expected in these areas would be around MSK VII. Districts in the north and south-west of the state lie in Zone II[1]. The earthquake hazard map from BMTPC is given in **Fig 7.1**.

FIG 7.1: EARTHQUAKE HAZARD MAP



Source: https://bmtpc.org/DataFiles/CMS/file/VAI2019/eq-jh.html accessed 08.10.2021

Significant earthquakes in Odisha

No major earthquake has been noticed in Odisha state since 2002. However, details of the earthquakes in last 7 decades in Odisha, near the state boundary (with Jharkhand) and shoreline is given in **Table 7.5**.

[1] Source: ASC : Seismicity of Odisha (Orissa), India (asc-india.org) accessed 08.10.2021

TABLE 7.5: LIST OF EARTHQUAKES IN ODISHA & AROUND

Date	Description
08 May 1963	Bijakuli-Banei area, Odisha, Mb 5.2 (4) 21.700 N, 84.900 E, D=033.0 kms, OT=14:15:03 UTC (4)
05 August 1979	Dublabera-Majhgaon area, Jharkhand, Mb 4.7 (4). 22.100 N, 84.900 E, OT=01:18:37 UTC (4)
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

Acronyms used : D=Depth, OT=Origin Time, Mw=Moment Magnitude, Ms=Surface Wave magnitude, Mb=Body Wave Magnitude, ML=Local Magnitude, M?=Magnitude Type unknown
Source: Amateur Seismic Centre, http://asc-india.org/seismi/seis-orissa.htm, last accessed on 8.10.2021

After assessment of the website https://earthquaketrack.com/in-21-dhenkanal/recent (accessed 08.10.2021) 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 35 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. The construction of a reservoir is proposed at the foot hill for which due precautions will have to be considered.

Management Measures:

Things that need to be done shall be as follows:

- During construction of the various building byelaws and BIS codes will be followed.

- A common meeting point inside the plant site and a contact outside the plant will be identified and known to all employees and workers.
- List important telephone numbers and torch, water, transistor, first-aid kit and non-perishable food will be kept at a designated place. An emergency kit shall be ready at all times.
- Train workers in basic first aid. Teams for first-aid; search and rescue etc. has been formed in the area and preparedness drills are and will be conducted for what to do in case of an event.

In case of occurrence of an earthquake, every individual would have to follow the pointers below:

- Keep calm and help others to keep calm. Do not panic.
- If you shall be inside of a building: Protect yourself by ducking under sturdy table, and staying there until the shaking stops. Turn off electricity and gas.
- If you shall be on the road in a built up area: Immediately move away from buildings, slopes, streetlights, power lines, hoardings, fly-overs etc. into open spaces. Do not run or wander; keep the roads free for movement.
- If you shall be driving: Stop the vehicle away from the buildings, slopes and electric cables; come out of the vehicle, hold it and stay by its side
- Keep calm and expect aftershocks.
- Check if you or anyone else is hurt. Use first-aid and wait for medical help.
- Do not move seriously injured people.
- Do not turn-on electrical appliances and gas.
- Check your building for damages.
- Do not waste water and do not block telephone lines.
- Do not spread rumours and don’t panic.
- Volunteer to help.
- Keep the streets clear for emergency services.
- Do not use matches, lighters, camp stoves or electrical equipments, appliances until you can be sure there are no gas leaks. They may create a spark that could ignite leaking gas and cause an explosion and fire.
- Do not use your telephone except for a medical or fire emergency. It could tie up the lines needed for emergency response. If the phone doesn’t work send someone for help. Conserve mobile phone & laptop batteries for use in emergency as power may be cut for long.

For general structural safety, the following codes shall be followed:

- IS: 456:2000 (reaffirmed 2021) - “Plain and reinforced concrete - Code of practice (Fourth Revision)”
- IS: 800-2007 (reaffirmed 2017) - “General construction in steel - Code of practice (Third Revision)”
- IS: 801-1975 (reaffirmed 2021) - “Code of practice for use of cold - Formed light gauge steel structural members in general building construction (First Revision)”
- IS 875 (Part 2):1987 (reaffirmed 2018) - Code of practice for design loads (Other Than Earthquake) for buildings and structures: Part 2 imposed loads (Second Revision)
- IS 875 (Part 3):2015 (reaffirmed 2020) - “Design Loads (Other than Earthquake) for Buildings and Structures - Code of Practice Part 3 Wind Loads (Third Revision)”
- IS 875 (Part 5):1987 (reaffirmed 2018) - “Code of practice for design loads (Other Than Earthquake) for buildings and structures: Part 5 special loads and load combinations (Second Revision)”
- IS: 883:2016 - “Design of Structural Timber in Buildings - Code of Practice (Fifth Revision)”
- IS: 1904:1986 (reaffirmed 2020) - “Code of practice for design and construction of foundations in soils : general requirements (Third Revision)”
- IS1905:1987 (reaffirmed 2017) - “Code of practice for structural use of unreinforced masonry (Third Revision)”
- IS 2911-1-4:2010 (reaffirmed 2020) - “Design and construction of pile foundations - Code of practice: Part 1 concrete piles: Sec 4 precast concrete piles in prebored holes (First Revision)”

For Earthquake Protection, the following codes shall be followed:

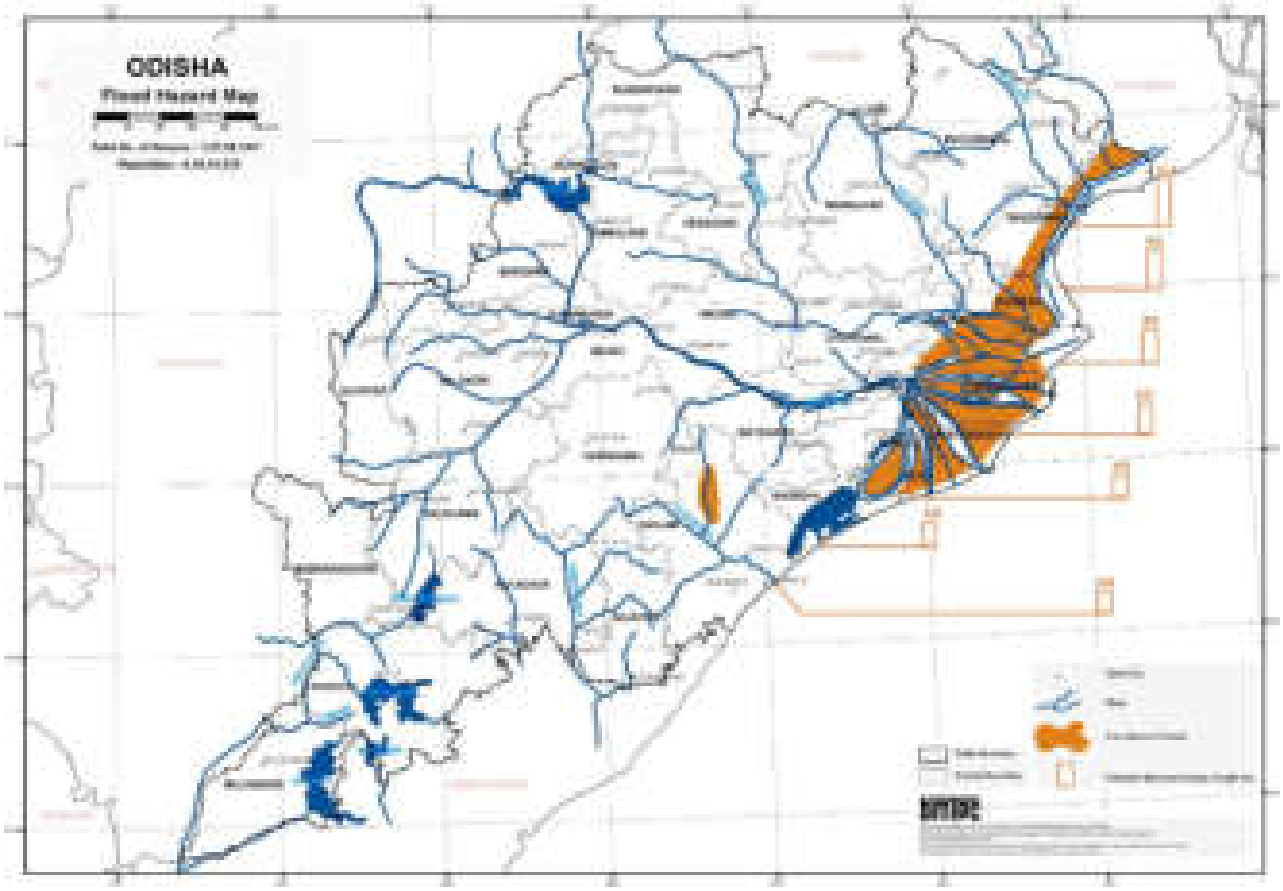
- IS: 1893:1984 (reaffirmed 2018) - “Criteria for earthquake resistant design of structures (Fourth Revision)”
- IS: 1893 (Part 1) : 2016 (reaffirmed 2021) - “Criteria for Earthquake Resistant Design of Structures - Part 1 : General Provisions and Buildings”
- IS: 1893 (Part 2) : 2014 (reaffirmed 2019) - “Criteria for Earthquake Resistant Design of Structures Part 2 Liquid Retaining Tanks”
- IS: 1893 (Part 3) : 2014 (reaffirmed 2019) - “Criteria for Earthquake Resistant Design of Structures Part 3 Bridges and Retaining Walls”

- IS: 1893 (Part 4) : 2015 (reaffirmed 2020) - “Criteria for Earthquake Resistant Design of Structures Part 4 Industrial Structures Including Stack - Like Structures (First Revision)”
- IS:13920-1993 (reaffirmed 2021) - “Ductile Design and Detailing of Reinforced Concrete Structures Subjected to Seismic Forces - Code of Practice (First Revision)
- IS:4326-2013 (reaffirmed 2018) - “Earthquake resistant design and construction of buildings - Code of practice
- IS:13828-1993 (reaffirmed 2018) - “Improving Earthquake Resistance Of Low Strength Masonary Buildings - Guidelines
- IS:13827-1993 (reaffirmed 2018) - “Improving Earthquake Resistance Of Earthen Buildings - Guidelines”
- IS:13935-2009 (reaffirmed 2019) - “Seismic Evaluation, Repair and Strengthening of Masonry Buildings - Guidelines”

7.2.1.2 Flood Hazard

A perusal of the flood hazard map of Odisha state given in **Fig 7.2** shows that the project area lies in the area of “no significant flooding”.

FIG 7.2: FLOOD HAZARD MAP



(Source : https://bmtpc.org/DataFiles/CMS/file/VAI2019/od.html accessed 08.10.2021)

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 are various activities or areas which pose substantial threat to the workers and hence hazardous in nature. The potential hazardous areas and the likely accidents with the concerned area have been listed in **Table 7.1** earlier.

7.3 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 are being and shall be adopted:

1. Design, manufacture and construction of all plant and machineries building are and 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 is and shall be kept.

3. Minimum two no. of gates for escape during disaster are and shall be provided.

4. Water spraying in coal storage area.

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 is and will be paved on the signal cable to separate from the power cable if they shall be laid together.

8. Steam fire extinguishers are and shall be adopted at all the dangerous places in the workshops and plant.

9. Heating 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).

12. **Fire prevention and fighting :**

The different type of fire extinguishers are present and have been proposed at strategic locations in the plant and given in **Table 7.6**.

TABLE 7.6: DIFFERENT FIRE EXTINGUISHERS AT DIFFERENT SITES

Name of Site	Type of Fire Extinguishers
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	Foam type
Bunkers, Silo, enclosed dust collector	CO_2 type, N_2 type, automatic sprinkler, fixed spray nozzle (unless water reactive)
Material	
Pet Coke	Use: Water fog, CO_2, Foam, Dry Chemical
Fuel Oil	Use: Water spray, foam, dry powder or carbon dioxide Do Not Use: water jet as an extinguisher, as this will spread the fire
HSD	Use: Foam, Carbon dioxide, Dry Chemical Powder. Water may be used to cool fire-exposed containers
LDO	Use: water fog, foam, dry chemical or carbon dioxide (CO_2) to extinguish flames
Metal dust	Use: Certified class D Extinguishing agent
Fly Ash, gypsum, laterite	Non-Flammable

Source: Table 3.2, 3.3 of Final Technical Report on Hazard Identification and Risk Assessment (HIRA), Emergency Plan & Disaster Management Plan of Dhenkanal Steel Plant by IIT Kharagpur, Dec 2020

13. **Personal Protective Equipments (PPE):** Personal protective equipment are and shall be given in **Table 7.7.**

TABLE 7.7: PERSONAL PROTECTIVE EQUIPMENT

Sl. No.	Objective	Hazard	Suggested PPEs
1.	Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation	a) Safety Goggles b) Eye wash taps c) Safety glasses with side-shields, protective shades

Sl. No.	Objective	Hazard	Suggested PPEs
2.	Head Protection	Falling objects, inadequate height clearance, and overhead power cords	Plastic helmets with top and side impact protection
3.	Hearing protection	Noise, Ultra sound	Hearing protectors (ear plugs or ear muffs)
4.	Foot protection	Failing or rolling objects, points objects. Corrosive or hot liquids	Safety shoes and boots for protection against moving and failing objects, liquids and chemicals
5.	Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures	Gloves made of rubber or synthetic material(Neoprene), leather, steel, insulation materials, etc.
6.	Respiratory protection	Dust, fogs, fumes, mists, gases, smokes, vapors	Face masks with appropriate filters for dust removal and air purification (chemical, mists, vapors and gases). Single or multi-gas personal monitors, if available
		Oxygen Deficiency	Portable or supplied air (fixed lines). Onsite rescue equipment
7.	Body / leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration	Insulating clothing, body suits, aprons etc. of appropriate materials

Source: Table 3.4 of Final Technical Report on Hazard Identification and Risk Assessment (HIRA), Emergency Plan & Disaster Management Plan of Dhenkanal Steel Plant by IIT Kharagpur, Dec 2020

Personnel protective equipment play vital role in reducing the losses in case of an accident. They provide protection to the workmen from injuries during the execution of job. The various protective equipment used in the plant and will continue to be used during expansion are:

- Self Breathing Apparatus with portable oxygen cylinders.
- Canister with Mask
- Hand gloves
- PVC apron and hood
- Gum Boot
- Safety Belt (General Purpose)
- Leather shoes and apron (each)

- Safety and chemical goggles
- Helmet

The above items are inspected and ensured serviceable by the concerned shift incharge of the location on regular intervals.

Fitting dress and use of personnel protective equipment recommended for respective job should be adhered to by everyone.

14. **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 are present for the existing and have been planned for proposed expansion plant. Important provisions are and 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.
    - CO detection and prevention : to install carbon monoxide detector/ alarm to detect the presence of carbon monoxide (CO) and sounds an alarm to alert personnel in case there is CO leakage

    Plant uses a wide variety of specialized equipments and methods for handling raw materials. These 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 these 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.

15. There are 25 safety guidelines that are being and have to be followed by steel plants, which have been detailed by The Ministry of Steel in 2019 as available at https://steel.gov.in/sites/default/files/Framework%20Document%20for%20Safety%20Guidelines.pdf (accessed 28.09.2021).

7.4 ON SITE EMERGENCY PLAN

7.4.1 Site emergency control room

In order to control the disaster more effectively, a Site Emergency Control Room (SECR) has been established at the plant site. The facilities present and proposed to be provided are given in following sections:

- Plant Layout
- Plant Layout with inventories and locations of fuel oil, storage tanks, coal storage etc.
- Hazard identification chart, maximum number of people working at a time, assembly points 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
- 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.

The emergency control center is the place from which the operations to handle the emergency will be directed and coordinated. It will be manned by the site work main controller, key personnel and the senior officers of the fire and police services.

7.4.2 Safety department

Safety department is manned by experienced engineers and other supporting staff who shall bring safety consciousness amongst the work force of plant. The safety department conducts regular safety awareness courses by organizing seminars and training of personnel among the various working levels.

The management have formed a “Safety Committee” consisting of equal number of representative of workers and management. The tenure of the committee is of 2 years and the worker’s representative of committee are elected by the workers. As per the Onsite Emergency Plan, the committee meets quarterly and most of the safety activities and workers complaints and suggestions are implemented through this committee. The same practice shall continue to be followed during proposed expansion phase.

7.4.3 Contingency plan for management of emergency

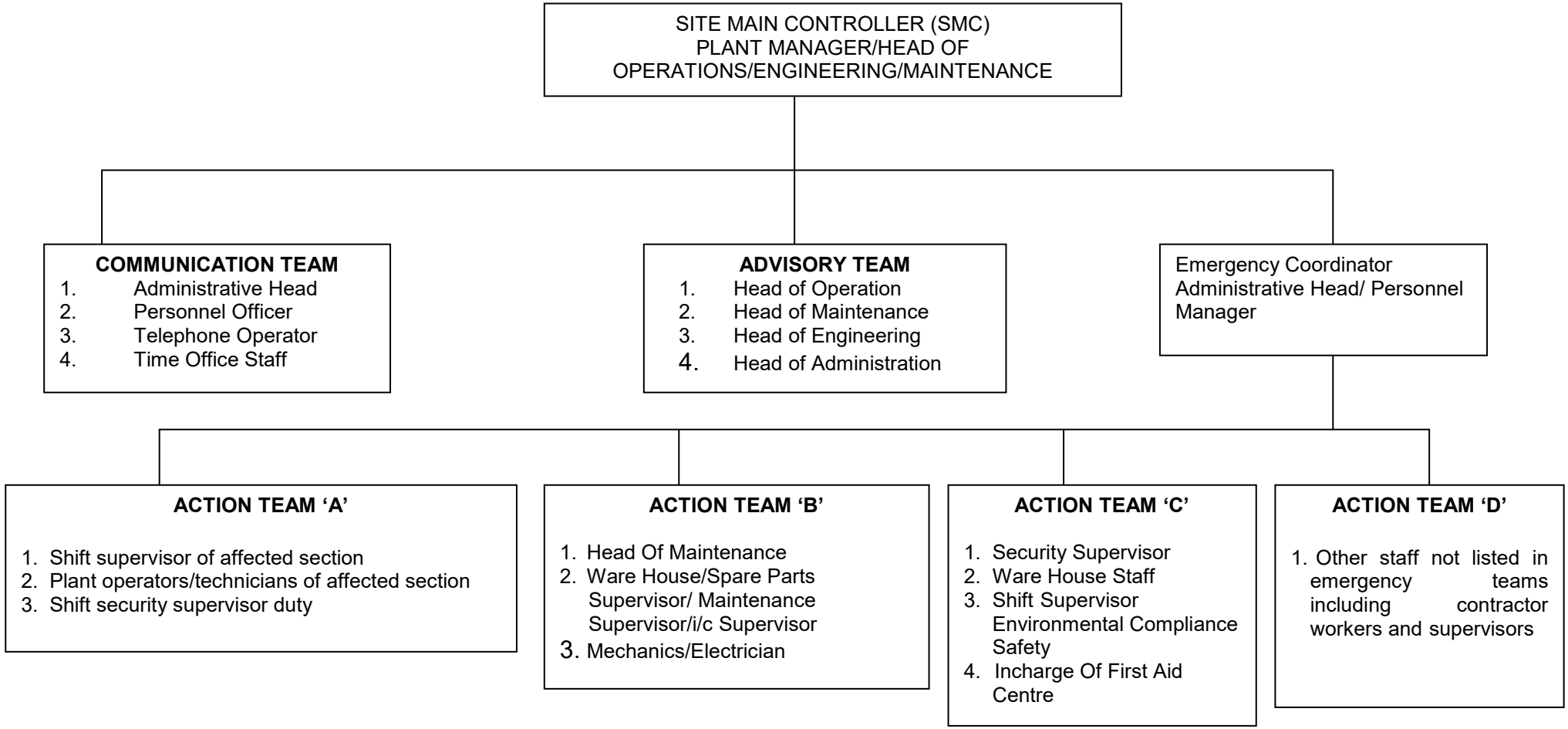
To tackle the situation, a disaster control room will be set up having links with all control rooms of the plant. An up to date communication facility will be provided to control rooms. In case of disaster, emergency meeting of all concerned sectional heads will be convened to decide control measures and ensure it's implementation. The emergency organisation shall be headed by emergency leader called Site Main Controller (SMC) who will be plant manager. In his absence senior most person available at plant shall be emergency leader till arrival of plant manager.

Besides the top officials described above, rest of the employees shall be divided into three action teams namely A, B, C, and a Non-action Group D. Action team 'A' will consist of staff of section in which accident has occurred. Action team ‘B’, will consist of staff of non-affected sections and maintenance department. Action team 'C' will consist of supporting staff i.e. Security supervisor, Ware house 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**.

FIG 7.3: GENERAL COORDINATION AMONG ON SITE EMERGENCY TEAM MEMBERS



7.4.4 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 are 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 5 km around plant site

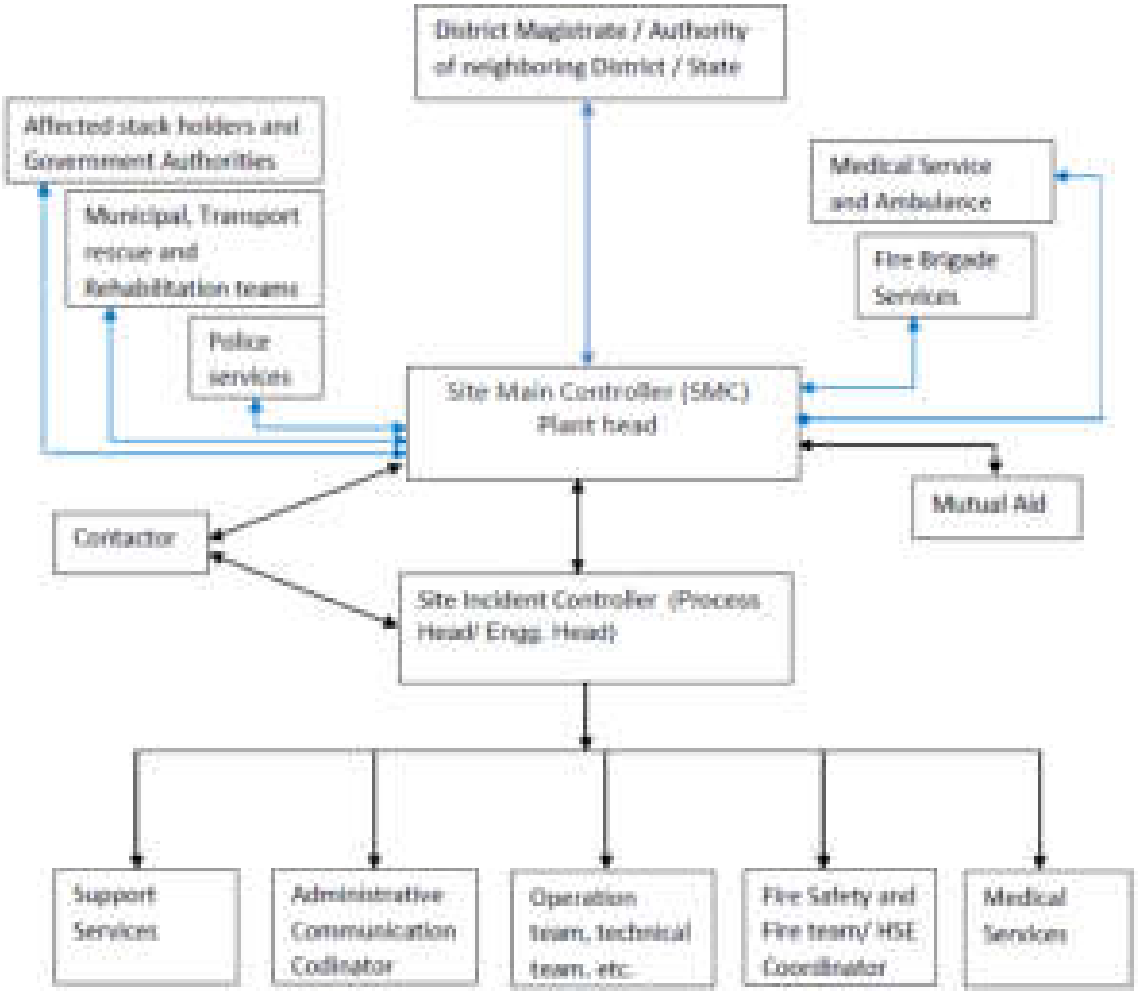
(g) Local Community Resources

- Regional Transport officer
- Divisional Engineer Telephones

The outside organisations are being and shall directly interact with district magistrate who in consultation with SMC shall direct to interact with plant authorities to control the emergencies.

The interaction with the outside as well internally will occur as shown in **Fig 7.4.**

FIG 7.4: EMERGENCY RESPONSE STRUCTURE



7.4.5 Hazard emergency control procedure

The onset of emergency will in all probability, commence with a major fire or explosion. 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 following disparate 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 are to 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.

7.4.6 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.

7.4.7 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.
- Residents of township will remain alert.

7.4.8 Safety devices/equipment

In order to make the services more effective the workers and rescue team have and will be provided with the safety equipment and items like gas mask respirators, fire entry suits, fire blankets, rubber shoes or industrial shoes, rubber glove, ladders, ropes, petromax lamp torches etc.

7.4.9 Casualty services

The casualty services section will be headed by a medical officer who is responsible for immediate medical aid and first aid. The section will be fully equipped with all first aid medical facilities. An ambulance will be provided on duty round the clock to tackle any 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.

7.4.10 Specific Treatment

Specific treatment / preventive measures for injuries and hazards will be provided in the Medical Centre. Eye and body showers are present and 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 specialty hospitals.

7.5 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 (MOEF&CC). 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

The project at full capacity of 7.53 MTPA will give approximately 6,650 persons direct employment after enhancement. This includes 1800 persons of expansion phase (from 3.55 to 7.53 MTPA). In addition to this, there will be manifold indirect deployment in the project. Many more persons will also get employment in the ancillary & other services connected with this project. Unskilled and semi skilled (after training) will be hired from displacees, land loses and local villagers in and around the plant while skilled, engineers, managerial staff and technical experts will have to be hired from outside.

8.2 IMPROVEMENT IN SOCIAL AND PHYSICAL INFRASTRUCTURE

8.2.1 Past Activities under Corporate Social Responsibility (CSR)

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.

Various development activities are being and shall continue to be done as part of Corporate Social Responsibility (CSR). Various facilities that are and will be provided in the surrounding villages are given in the **Table 8.1.**

TABLE 8.1: SOME OF THE CSR ACTIVITIES CARRIED OUT IN THE PAST

Sector	CSR Activities carried out in the past
1. Roads	➢ Construction of RCC Road from village Jharbandh to Nimabahali ➢ Repair and maintenance of road within villages
2. Drinking Water	➢ Open well is provided as per choice of the people in village Galapada. ➢ Deep bore-wells have been installed in Jharbandh, Tarkabeda, Galapada villages. ➢ Drinking water supply is made available through water tankers in acute summer months of May and June. ➢ Drinking water supply is provided through pipe lines and overhead tanks in village Jharbandh. ➢ Company has excavated and renovated derelict ponds and created big water bodies in the three project affected villages.

Sector	CSR Activities carried out in the past
	➢ Bathing ghats have also been provided in each pond as civic amenities for public convenience and utility. ➢ Supply of drinking through RO plant in several villages
3. Market access and local livelihood means	➢ Local people were given financial and social support in education and training in sustainable livelihood opportunities to increase their source of income.
4. Education	➢ 132 unemployed youths have been/ are undergoing training 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). ➢ Construction of Boundary wall Renovation, Repair, Painting of office buildings
5. Health Care	➢ Financial aid to poor persons with chronic disease ➢ Construction of Boundary wall Renovation, Repair, Painting of Hindol hospital building
6. Sports, Entertainment and Culture	➢ Financial assistance for promotion of cultural activities and community festivals in peripheral villages ➢ Supply of Sankirtan Instruments ➢ Renovation of Kothaghar ➢ Maintenance, miscellaneous civil works of cultural mandap, temple.
7. Others	➢ Providing relief facilities in affected village ➢ Renovation,Repair & Maintenance of all CSR projects undertaken previously ➢ Construction of Boundary wall Renovation, Repair, Painting of office buildings ➢ Construction of Rest Room

A sum total of Rs. 22.7 lakhs has been spent in the financial year 2021-22 till September 2021 in the above activities in villages Jharband, Beruanpal, Chintapokhar, Taladanga, Balmi, Motogon, Bido, Nimabahali, Charadagadia and Hindol.

Company believes in growth with a human face and in pursuing people-centered development. Company is an environment and socially committed organization. It attaches great importance to discharging its overall environment and social responsibilities to the community and the society at large where its project is located. People of the surrounding localities are directly and indirectly associated with the Company. The Company is primarily focused for the development of the resident of these localities under various thematic areas and specific outcomes as given in **Table 8.1.** Photographs of the some activities done by the company under CSR are given in **Fig 8.1**.

FIG 8.1: SOME PHOTOGRAPHS OF SOME OF THE CSR ACTIVITIES CONDUCTED BY THE COMPANY

INFRASTRUCTURE	
	
Construction of RCC Road from village Jharbandh to Nimabahali	Concrete road construction at village Beruanpal
	
Construction of canal at village Beruanpal - Galpada	
DRINKING WATER	
	
RO Plant at village Jharbandh	RO Plant at village Tarkabeda

SOCIAL INFRASTRUCTURE	
	
Aganwari centre in village Jharbandh	Aganwari centre in village Galpada
	
Aganwari at Village Jharbandh	Construction of Mausi Maa Mandir at village Charadagadia
	
Construction of Sankirtanya Bhawan at village Tarkabeda	Mandap, Tarkabeda

	
Infrastructure and furniture provided to schools	Renovation of Jatiababa Temple, Kantimili, Tarkabeda under CSR 2019-20
OTHERS	
	
Musical instrument provided to Mahima Sankirtanya Mandali, Kothalu	Medicinal Plantation 5400 numbers at MGAA, Sogar.

8.2.2 Need Assessment

The need assessment for infrastructure and/ or facilities has been carried out for the villages near to the expansion areas. These villages include Kaliakoli, Paikpurunakot, Bankidi, Patala, Jharabeda, Solanali, Sanamunda and Kantimili villages. Village level observations of amenities were made in 10 km radius as per Census 2011 to identify deficiencies and needs. As per Census 2011 data, some facilities are available in the villages while many are deficient.

The field observations and data analysis indicate that the villages have concerns related to safe drinking water & proper water supply system, drainage, sanitation, ponds and roads at some locations. The focus is more on developing community buildings and social infrastructure currently. The summary of the sector wise findings, their present status, identified deficiency and proposed intervention are discussed in **Table 8.2.**

The stated activities will be carried out in consultation with the vilagers, government authorities and the agencies incharge of the respective infrastructure in the areas of interest. The identified deficiencies are the driving force behind the planning of future CSR activities.

TABLE 8.2: PRESENT PHYSICAL & SOCIAL INFRASTRUCTURE, NEED ASSESSMENT AND PROPOSED INTERVENTIONS

Sector	Status as per Census 2011	Present status	Identified Deficiencies	Proposed intervention
1. Roads	➢ Paikpurunakot and Kantimili are the only village on the road that has direct access to private buses. Remaining four villages, have to traverse a distance of 1.7 km to 4.5 km to reach the main road and catch a bus. ➢ Autos/ modified autos are present in Kantimili, Sanamunda, Bankidi, Patala and Jharabeda villages, whereas Taxi service is available only in Kantimili, Sanamunda, and Jharabeda villages. Tractors are present in Paikpurunakot, Kantimili, Sanamunda, Patala and Jharabeda villages. ➢ All villages except Kaliakoli have manual driven cycle pulled rickshaws and cart driven by animals. ➢ Paikpurunakot, Solanali, Bankidi and Patala villages have access to approach road from other district roads. ➢ Roads in the villages include,	➢ The approach road to the villages are mostly black topped and concrete (pucca) roads. Other kinds of roads within the villages include all weather roads, gravel kuchha roads etc. ➢ Apart from the above, internal street roads needs maintenance. ➢ Repair work has been carried out in Nimabahali village specifically for the self-relocated families	➢ People are facing problem due to absence of black topped road ➢ Air borne dust is high due to condition of roads ➢ Safety is an issue due to condition of roads	➢ Maintenance of roads, where required in phased manner in collaboration with local Panchayat and Govt. schemes. ➢ Construction of new roads. The new roads proposed to be constructed in the nxt few months are listed in Table 8.3. ➢ Solar based street lights

Sector	Status as per Census 2011	Present status	Identified Deficiencies	Proposed intervention
	black topped pucca roads in Paikpurunakot, Kantimili, Solanali and Patala villages, gravel kuchha roads in all villages except Kaliakoli village, all weather road in all villages except Paikpurunakot and Kaliakoli and footpaths are present in all the villages. ➢ Navigable waterways (river/canal) is available in Paikpurunakot village.			
2. Drainage	Information not available	➢ Drainage system is available but not everywhere. ➢ Where drainage is present, they are mostly 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	Information not available	➢ Toilets are available in the villages but their coverage is not hundred percentage. ➢ Dustbins are not there at public places. ➢ System of solid waste management not observed. The waste such as plastics are collected and burned by	➢ Open urination and defecation in public places causes spread of diseases. Completion of toilets in all 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	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

Sector	Status as per Census 2011	Present status	Identified Deficiencies	Proposed intervention
		the households.	substances along with food from waste, which results in many diseases and ultimately death of these animals. ➢ System for solid waste management would be required. ➢ Dustbins shall be put at various public places	➢ Purchase of dustbins for garbage collection for solid waste disposal as well as provision of staff for management. ➢ 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.
4. Drinking Water & other water	➢ Pipeline water supply systems are not available in the villages except Paikpurunakot village where untreated tap water is available. The drinking water needs of all the villages are met by water from uncovered wells, hand pumps and tanks/ ponds/ lake in all villages except Kaliakoli. Paikpurunakot village also depend on spring and river/ canal for their drinking water needs.	➢ Villages withdraw water from hand pumps and open dug wells for drinking & cooking. ➢ Pipeline water supply systems are not available in most of the the villages. ➢ Rungta Mines Ltd. has undertaken construction of water supply in village Jharband. Deep borewells have been made in Jharbandh, Tarkabeda, Galapada villages. Open well has also been constructed in Galapada. ➢ Adequate safe drinking water source are not available in villages.	➢ Water supply systems can be installed along with deep borewells in villages lacking the same. ➢ Water treatment plants for drinking water are absent where the water availability is through existing sources ➢ Bathing ghats are absent on most existing ponds ➢ Ponds are silted	Activities to be carried out in other villages than those already covered : ➢ 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.

Sector	Status as per Census 2011	Present status	Identified Deficiencies	Proposed intervention
				➢ Construction of pond for Rain Water Harvesting. ➢ Deepening and cleaning of existing ponds ➢ Water supply through pipeline ➢ Water treatment units where water quality is not potable
5. Market access and local livelihood means	Information not available	➢ 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. ➢ local people were given financial and social support in education and training in sustainable livelihood opportunities to increase their source of income	➢ 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	➢ Company will establish a 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 will also establish its own Industrial Training Centre in the locality for providing training on skill development and employment. ➢ Training to people for improvement of agriculture ➢ Excavation of canal for agricultural works
6. Education	➢ Primary schools are available in all villages except Kaliakoli.	➢ Primary schools are available in	➢ Existing schools require repair, maintenance, renovation and	➢ Maintenance & expansion of existing of schools as per

Sector	Status as per Census 2011	Present status	Identified Deficiencies	Proposed intervention
	Whereas, middle schools and secondary schools are available only in Paikpurunakot, Kantimili, Patala and Bankidi villages. Pre-primary school and senior secondary school are found only in Paikpurunakot village.	almost all villages. ➢ Middle schools and Secondary schools are available in some of the villages. Paikpurunakot, Kantimili, Patala and Bankidi villages are some of it. ➢ For higher education such as graduation and masters level, institutes are available at Dhenkanal and Angul at distance of 34.9 km and 11.5 km respectively from the project.	additions ➢ Absence of adequate primary and middle schools ➢ Absence of measures for encouraging students to excel in studies	requirement ➢ Construction of schools in consultation with statutory regulatory bodies/ government scheme. ➢ Scholarship to meritorious students as 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	➢ All villages do not have any medical facilities except for primary health sub centre and non governmental medical facilities - medical shop in Paikpurunakot and Patala villages. Paikpurunakot village also has a dispensary and a veterinary hospital.	➢ Lack of adequate health facilities such as medicine, testing, diagnostic and ambulance facilities in the area. ➢ Primary Health subcentre is available only at Paikpurunakot and Patala, as per Census 2011. ➢ Under nourishment/ malnourishment in children ➢ The company has provided assistance	➢ 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.	➢ Purchase of ambulance. ➢ Post the contact number for the ambulance at Panchayat house/ community centre in the villages ➢ Provide free consultation and medicines to project affected villagers in health camps, existing first aid centres and at proposed 4 bedded OHS centre

Sector	Status as per Census 2011	Present status	Identified Deficiencies	Proposed intervention
		to the Hospital at Hindol ➢ Company is also giving financial help to critical medical cases		of the company. ➢ Conducting mobile health/ awareness camp for protection against prevalent common diseases/ cataract/ family planning camp (Doctor, para-medical staff and free supply of medicines) ➢ Financial help to critical medical cases
8. Sports, culture and entertainment	➢ Sports field is available in all the villages except Kaliakoli and Solanali. Sports club or recreational centre is available in Paikpurunakot, Kantimili, Patala and Bankidi villages. ➢ Daily newspaper supply is available in all villages except Kaliakoli. ➢ Assembly Polling Station is available in all villages except Kaliakoli and Solanali. and Birth and Death Registration Office is available in all villages except Kaliakoli.	➢ Most of the villages have small or big grounds designated for sports. ➢ The company has provided Sankirtan halls in villages under CSR ➢ Renovation and repair of temples has been carried out ➢ Community buildings of several villages have been repaired, renovated/ enhanced/ constructed. ➢ There is adequate focus on development of community buildings	➢ 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. ➢ Providing Sankirtan instruments

8.2.3 Corporate social responsibility (CSR) budget for future

The CSR Budget shall be as per the Companies Act 2013 which states that two percent (2%) of the average net profit of the company for last 3 (three) financial years as per the Annual Report of the company has to be allocated for CSR.

Company has constituted a 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.

The Corporate Social Responsibility (CSR) budget proposed for the year 2021-2022 is **Rs. 679.25 lakhs**, the activities of which area listed in **Table 8.3**.

TABLE 8.3: CORPORATE SOCIAL RESPONSIBILITY (CSR) BUDGET PROPOSED FOR THE FY 2021-2022

Sl. No.	Proposed activity	Proposed location
	DRINKING WATER & RELATED	
1.	Provision of drinking water through borewell and R.O plant operation & maintenance charges	Tarkabeda, Jharbandh, Chintapokhari, Meramandali
2.	Provision of drinking water in village through R.O plant from deep borewell including Sinking of borewell, construction of R.O plant room and laying of pipeline	Galapada
3.	Construction of 1 no. of bathing ghat	Beruanpal
4.	Supply of drinking through RO plant	Bido
5.	Supply of drinking water to extension of the existing pipeline	Jharbandh Harijan Sahi
6.	Provision of borewell	SSVM, Nimabahal; colony Sahi Meramandali
7.	Construction of over head tank for provision of drinking water (Pipe line, electrification & stand-post)	Kothalu-Galapada
8.	Provision of drinking water, borewell, excavation of pond	Dhanukhala, Tarkabeda
9.	Bore-well with drinking water facility at Range Office	Hindol
10.	Construction/development work in lieu of allotment of Jallasya & Adi land (Ac.2.95) under CSR initiative	Galapada
11.	Construction and renovation of retaining wall on the embankment of Sana bandha & Bada bandha.	Jharbandh
12.	Excavation of Majhi Bandha in village Galapada.	Galapada
13.	Boundary Wall of RO plant.	Galapada
14.	Renovation and beautification of pond at district Head quarters.	Dhenkanal
15.	Construction of 2 nos. bathing ghat in village pond	Taladanga
	SPORTS, CULTURAL ACTIVITIES	
16.	Promotion of cultural activities and community festivals	Jharbandh, Galapada, Bido, Nimabahali, Meramandali, Tarkabeda &

Sl. No.	Proposed activity	Proposed location
		other peripheral villages
17.	Promotion of sports among boys and girls.	Peripheral villages
18.	Supply of Sankirtan Instruments	Peripheral villages
19.	Renovation of Kothaghar	Chintapokhari, Nimabahali
20.	Construction of Kotha Ghar.	Dhenkanal
21.	Maintenance of cultural mandap	Taladanga
22.	Construction of Boundary wall of cultural mandap and Entrance Gate of Jagannath Temple	Hindol
23.	Completion of ongoing Construction of Maa Katamasuni gate and boundary wall of cultural mandap	Jharbandh
24.	Construction of Sankirtan recreation center	Tarkabeda
25.	Construction of Community Center at Jharbandh Purunashi for Harijan people	Jharbandh
26.	Construction of Community Center at Katamasuni Temple Campus for Galapada Harijan Sahi	Galapada
27.	Construction of cultural mandap	Charadagadia
28.	Renovation and development of Bhagabata ghar cum community centre in Majhisahi	Jharbandh
29.	Construction of cultural mandap, Katamasuni in lieu of resettlement of place of worship at the forest land inside the project	Jharbandh
30.	Construction of C.C Platform for Harijan people near Laxmi mandap	Jharbandh
31.	Construction of cultural mandap (Maa Mangala) near Katamasuni Temple	Jharbandh
32.	Development of Sidheswar playground for development of sports	Galapada
33.	Construction of Community Center for Chhatrasangha	Tarkabeda
34.	Promotion of cultural activities and community festivals	Chintapokhari
35.	Construction of Cultural Center	Meramandali
36.	Construction of community center/ Mandap colony Sahi	Meramandali
37.	Construction of Community Center	Goudapasi, Beruanpal, Rangasinga
38.	Construction & Improvement of existing Satsang Community Center	Tarkabeda
39.	Financial assistance for culture/ tradition of Harijan People Nuasahi, Jharbandha.	Jharbandh
40.	Providing 6 nos. of street light in Katamasuni temple	Jharbandh
41.	Renovation and Completion of Yagyan Mandap of Katamasuni mandap	Jharbandh
42.	Construction of a children’s park and play ground for the children	Jharbandh
43.	Construction of boundary and mandap in Harijansahi	Jharbandh
44.	Cultural mandap in Sidheswar temple, Brahmanidebi temple and Bhairabi mandir	Galapada
45.	Renovation of Sankirtan house	Galapada
46.	Renovation and development of Sani mandir	Kothalu-Galapada
47.	Development of play ground	Tarkabeda
48.	Financial assistance for Dola festival	Beruanpal

Sl. No.	Proposed activity	Proposed location
49.	Financial assistance for Magha Purnima festival	Goudapasi
50.	Construction of boundary wall in Maa Mangala Mandir	Meramandali
51.	Financial assistance for Culture/ tradition of colony Sahi	Meramandali
52.	Construction of Mandap of Maa Mangala Mandir	Taladanga
53.	Construction of Gate, Boundary wall and Drinking water provision in Saraswati vidya Mandir	Nimabahali
54.	Construction of Bharavi Mandap in Self relocated displaced families	Nimabahali
	ROAD INFRASTRUCTURE	
55.	Repair and Improvement of roads	Jharbandh,Tarkabeda, Bido, Goudapasi, Nimabahali
56.	Construction & Development of Road CC road from Nelibandha to Bramhani Devi	Galapada
57.	Construction of C.C. Road from PWD road to Pump house for Harijan People in village Galapada	Galapada
58.	Construction of alternative CC Road(1400mx4.5m) from Tarkabeda village to project boundary wall	Tarkabeda
59.	Improvement of Road Harijan Sahi Kothaghar to Kendu Sahi -500 Mtr.	Tarkabeda
60.	Construction of CC road and drain from Puruna Sahi to RD Road.(1Km approx).	Jharbandh
61.	Extension of road from Ramalila Sahi to Ragada sahi	Jharbandh
62.	Construction of connecting road from Bhairabi Mandir to Katamasuni temple.	Jharbandh
63.	Construction of CC platform and shed inside Katamasuni temple	Jharbandh
64.	Construction of a C.C Road in front of school connecting to Ramlila Sahi	Jharbandh
65.	Construction of 200 m CC road and drain in village Kothalu	Kothalu-Galapada
66.	Construction of 200 m CC road along with Guard wall in Beruanpal-Galapada village road	Beruanpal
67.	Construction of 200 m CC road from PWD road to Badadanda Sahi	Beruanpal
68.	Construction of 200m CC road in self relocated displaced families	Nimabahali
69.	Providing solar lights (5 nos.)	Bido
70.	Street light (4nos) with pole in colony sahi, Meramandali.	Meramandali
	HEALTH	
71.	Financial assistance for medical treatment to poor families	Peripheral villages
72.	Organization of quarterly health camps	Peripheral villages
73.	Construction of boundary wall renovation, repair, painting of Hindol SD Hospital	Hindol
74.	Maintenance of medicinal plantation at MGAA, Sogar	Dhenkanal
75.	Construction of a dispensary for project affected villagers	Peripheral villages
	LIVELIHOOD	
76.	Excavation of canal for agricultural proposed in Galapada-Beruanpal village	Galapada

Sl. No.	Proposed activity	Proposed location
	EDUCATION	
77.	Construction of one class room and boundary wall at Swami Vivekananda high school	Bido
78.	Provision of one class room over the ground floor building for primary School	Tarkabeda
79.	Construction of internal C.C approach road and toilet block in U.P. School	Tarkabeda
80.	Construction of T.K.High school Hostel Building	Tarkabeda
81.	Additional class room, boundary wall and other renovation works of nodal U.P. school	Jharbandh
82.	Office room flooring work at G.B high school	Galapada
83.	Construction of class room	Gohirachada village, Dhenkanal
	OTHERS	
84.	Providing relief for flood, fire and other natural calamities (Relief assistance)	Jharband, other peripheral villages
85.	Renovation,repair & maintenance of all CSR projects undertaken previously.	Peripheral villages
86.	Construction of boundary wall renovation,repair, painting of office buildings.	Hindol
87.	Construction toilet block, boundary, gate at S.S.V.M.	Nimabahali
88.	Repair & improvement of retaining wall for the self relocated displaced families	Nimabahali
89.	Construction of 70 m Retaining wall at Baida Bandha in village Galapada	Galapada
90.	Construction of boundary wall, rest shed at cremation ground	Jharbandh
91.	Provision of R.C.C drain work 120m length near Katamasuni temple	Jharbandh
92.	Renovation and excavation of village / G.P. tank, (Bahalabandha)(Bathing Ghat)	Kothalu-Galapada
93.	Development/construction work for Indira Social Welfare organization, as per request of dist.administration	Dhenkanal
94.	Construction of library room for Harijan people	Tarkabeda
95.	Renovation of office and boundary wall of Kantimili G.P. Office	Tarkabeda
96.	Construction of 100 m retaining wall in Harijan sahi	Kothalu-Galapada
97.	Boundary Wall of Alekha Mahima Tungi in Harijan Sahi	Kothalu-Galapada
98.	Furniture for Bar Association of Court (For the use of public)	Hindol/Dhenkanal
99.	Furniture for sub-registeration office (For the use of public)	Hindol
100.	Improvement of conference hall and infrastructure support including furniture at Block office	Hindol
101.	Construction of Boundary wall in Jatra Padia	Meramandali
102.	Construction of boundary wall renovation, repair, painting of P.S.	Hindol
103.	Construction of rest room for public at Motogan P.S.	Motogaon

CHAPTER 9

ENVIRONMENTAL COST BENEFIT ANALYSIS

The scope of the EIA/EMP has been prescribed vide the Standard Terms of References (TOR) issued by MoEF&CC, New Delhi vide letter no. J-11011/309/2018-IA.II(I) dated 13.08.2021 (**Annexure I**).

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

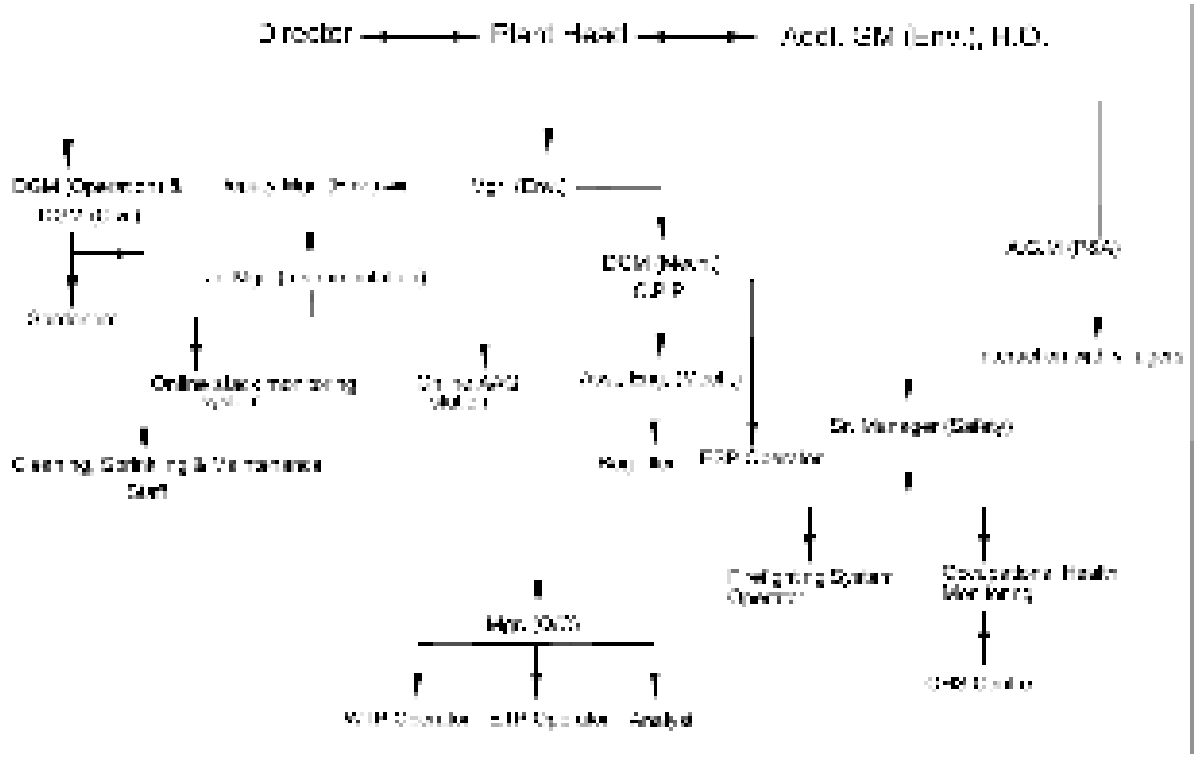
ENVIRONMENT MANAGEMENT PLAN

This chapter contains description of the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored, after approval of the EIA. **Table 10.1** given the monitoring parameters/ measurement methodologies, frequency, location and reporting schedules. Section 10.1 & 10.2 gives the structure and administrative responsibilities of EMP execution team. Section 10.4 gives the plan for implementation of CREP guidelines for steel plant. Section 10.5 gives the Corporate Environmental Policy of the company along with the hierarchic system for to deal with the environmental issues and for ensuring compliance. The detailed budget for environment management plan is given in **Table 10.4** and **10.5** covering capital costs and recurring costs.

10.1 ORGANIZATIONAL SET-UP

Since this is an operational plant, an environmental management team is already in place to monitor and implement the environmental management programme. The same team shall be responsible for the plant after expansion. It will function in conjunction with the Environment Department at Head office in Chaibasa. The organizational chart has been presented in **Fig 10.1.**

FIG 10.1: ORGANIZATIONAL CHART FOR ENVIRONMENTAL MANAGEMENT



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. Through accredited/ recognised laboratory.
- Implementing and monitoring the progress of implementation of the control measures, protection measures and mitigation measures related to air pollution management, waste water management and solid waste disposal.
- 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.

10.2 STRUCTURE AND ADMINISTRATIVE RESPONSIBILITIES OF EMP EXECUTION TEAM

Rungta Mines Ltd. is an existing company having qualified and experienced personnel in environmental management and pollution control. The company has existing environmental monitoring team for environmental monitoring and legal compliances. EMP execution team for existing plant is already in place and the same shall be used for the proposed expansion project.

As can be seen in **Fig 10.1**, the overall responsibility of the EMP execution lies with the Plant Head. However, actual responsibility for execution of environmental mitigation measures will be with Deputy General Manager (Environment), Sr Manager (Safety), Deputy General Manager (Operations), Deputy General Manager (Civil), Deputy General Manager (Mechanical) and their subordinates. The responsibility of interaction with villagers and for CSR implementation rests with the Assistant General Manager (P&A).

The responsibilities of various positions are given below:

Plant Head: This post already exists and duties are being carried out. For expansion phase also, he will co-ordinate the various control measures required during construction phase and operation. He will be assisted by his subordinates or other departments.

Manager (Environment): This post already exists and duties carried out. It will continue for expansion phase also. He will work very closely with Addl GM (Environment) in Head Office. Both persons are responsible for legal compliances of the company related to MOEF&CC, CPCB & OSPCB. They will arrange regular monitoring of the proposed pollution control system. They will arrange evaluation environmental performance of the systems and

ensure that the stipulated measures are being satisfactorily implemented and operated. Manager (Env) will ensure that there shall not be any adverse impact on air, water, noise and land environment due to construction & operation of existing and 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 be assisted by Deputy Manager (Environment) and Junior Manager (Instrumentation), who will also oversee the operation of the online stack monitoring system and online continuous AAQ stations.

The DGM (Mechanical) will help of an Assistant Engineer (Mechanical) for supervising the staff and equipments such as bag filters, ESPs, Scrubbers, fume extraction systems, gas cleaning plant and any other air pollution control devices. A manager (quality check) will oversee the operators and water pollution control equipment.

Sr Manager (Safety): This post already exists and duties carried out and will continue for expansion phase also. He will develop, implement and monitor occupational health and safety policy, programs and procedures. He will assist the management in complying with current health and safety legislation and/or regulations with the objective of ensuring that all reasonable and proper measures are to be taken to protect the safety and health of workers staff and visitors. He will organise the occupational health monitoring through OHS centre (internal & external) and oversee the fire fighting systems as well. He will be assisted by fire fighting system operators.

DGM (Operation) and DGM (Civil) : These posts already exist and duties carried out and will continue for expansion phase also. They will 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. They will be responsible for good housekeeping in the plant through his team of housekeeping staff. Water sprinkling will be part of the housekeeping and drivers with mobile sprinklers will be deployed by them.

Assistant GM (P&A): This post already exists and duties carried out. It will continue for expansion phase also. He will co-ordinate all the social activities such as finding out the social needs of the study area, collection of statistics of social requirements, budgeting the social needs, plan the activities as per CSR budget, approve the needs from management, execute the activities, look after their successful completion. He will be responsible for interaction with the villagers.

10.3 ENVIRONMENTAL MANAGEMENT PLAN WITH ADMINISTRATIVE ASPECTS

Environmental Management Plan (EMP) is required to minimize adverse environmental impacts by implementing mitigation measures with implementation and responsibilities during the project under construction and operation. Proposed management measures for pollution control and environmental management in the proposed area are given in **Table 10.1**. The administrative roles of the personnel involved is detailed in Section 10.2.

TABLE 10.1: ENVIRONMENT MANAGEMENT MEASURES WITH ADMINISTRATIVE ASPECT

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters/ measurement methodologies	Monitoring Frequency	Location	Reporting schedule
			Implementation	Monitoring				
During Construction Phase								
Topography	➢ Change in topography over 1800 acres (728.45 ha) due to due to digging and filling, construction of the plant buildings, boundary walls, stock yards, water reservoir, roads, etc. ➢ impact on topography, outside plant boundary, due to construction related to the steel plant i.e. residential accommodation (3 + 60 acres), water	➢ Use of cutting/ dug out material for filling during leveling and landscaping soil ➢ Use of fly ash and solid wastes from nearby plants ➢ Utilisation of slags & ash from existing plants of the the company in Odisha for leveling and raising plinth ➢ The roads will be diverted & realigned in consultation with Public Woks Department. Villagers will be provided alternate access paths outside the plant boundary	Civil contractor	DGM (Civil)	● Quantity of cutting (in cum) ● Quantity of filling (in cum)	Everyday when the cutting/ filling is taking place	Within plant premises	Weekly by contractor to Plant Head

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters/ measurement methodologies	Monitoring Frequency	Location	Reporting schedule
			Implementation	Monitoring				
	reservoir (36 acres), approach roads (12.9 acres) ➢ Diversion of three public roads in expansion area							
Drainage	➢ Disturbance to sheet flow due to construction in the expansion area ➢ In the expansion area, disturbance to three first order drains and part of one second order drain passing through the expansion area ➢ Out of 11 rain fed ponds in the 1800 acres expansion area, 6 shall get removed	➢ Storm water drains have been planned along the roads ➢ Rain water will be harvested through drains and stored in raw water reservoir or recharged through rain water harvesting structures. ➢ The path of streams will be realigned within plant to ensure free flow of rainwater through it & from its catchment to Lingra Nala.	Civil Contractor	DGM (Civil)	a. Review and approval of proposal for storm water drainage after detail designing	a. One time	a. Project site	a. Once
					b. Verification of construction of surface reservoir & drains against specifications designed	b. Daily visit by DGM (Civil)	b.Where the construction is taking place in the site	b. Monthly by DGM (Civil) to plant head
Water quality	➢ Suspended solids in run-off due to loose soil at construction site during heavy precipitation. ➢ Loose soil at construction site.	➢ 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	➢ Manager (Environment)	a. Design review and approval of settling tank & STP	a. Once	a. Project site	a. Once
					b. Verification of settling tank & STP construction as per design	b. During construction	b. Where the construction is taking place in the	b. Monthly by DGM(Civil) to plant head

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters/ measurement methodologies	Monitoring Frequency	Location	Reporting schedule
			Implementation	Monitoring				
	➢ Domestic waste water (sewage) from construction workers.	➢ Domestic waste water shall be treated in mobile toilets or connected to existing STP.					site	
					c. Water quality reports from water reservoir & STP	c. On commencement of operation	c. Water reservoir & STP	c. Water reservoir- During rainy days; STP - online systems & manually every quarter
Air quality	Increase in dust (Particulate Matter) concentration due to construction activities of plant, 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. Proper maintenance of vehicles shall be done. ➢ Covering material carrying vehicles ➢ Restricting vehicles' speed on construction roads and ensuring that vehicles use only dedicated construction roads and access points. ➢ Visually monitor particulate emissions from diesel vehicles and carryout regular maintenance on all plant and equipment.	➢ Civil contractor ➢ Deputy General Manager (Civil)	➢ Manager (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	Daily site inspections and weekly verification of records	Within construction zone	Monthly by DGM (Civil) to plant head with copy to Deputy General Manager (Environment)

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters/ measurement methodologies	Monitoring Frequency	Location	Reporting schedule
			Implementation	Monitoring				
Noise	Increase in noise level due to construction equipment.	➢ Equipment to be kept in maintained condition to keep the source noise level within 90-110 dB(A), depending on the equipment type. ➢ Develop and implement a construction noise management plan. ➢ Limit hours of construction where practical. ➢ Workers to be provided with necessary protective equipment e.g. earplug, earmuffs.	Civil contractor	➢ Manager (Environment)	➢ Noise levels at site ➢ Verification of PPE of workers through surprise checks	Daily site inspections and weekly verification of records	Within construction zone	Monthly by DGM (Env) to plant head
Terrestrial ecology	➢ Clearing of vegetation prior to construction ➢ Removal of trees where plant buildings and facilities will come up (approximately - 18000 trees are expected to be removed)	➢ Green belt plantation to be initiated prior to commencement of construction ➢ Transplantation shall be preferred and maximised ➢ Compensatory plantation shall be carried out in lieu of cut trees	➢ Civil contractor ➢ Horticulture staff	➢ DGM (Civil) ➢ Manager (Environment)	➢ Verification of tree cutting permission ➢ Verification of tree count ➢ Records of transplantation & compensatory plantation ➢ Records of green belt plantation	➢ At time of tree survey ➢ At time of tree cutting ➢ At time of compensatory plantation ➢ At time of green belt plantation	Within plant area	After each activity or monthly, whichever is earlier.
Excavated soil	Loss of excavated top soil	The top soil shall be properly stored in designated space and	➢ Civil contractor ➢ Horticulture staff	➢ DGM (Civil) ➢ Manager (Environment)	➢ Verification of top soil quantity records	All weekly	Within plant area	All monthly

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters/ measurement methodologies	Monitoring Frequency	Location	Reporting schedule
			Implementation	Monitoring				
		reused in green belt and areas to be landscaped			(removal & reuse), ➢ Observation of storage area, ➢ Observation of green belt area			
During Operation Phase								
Air quality	➢ PM, SO_2, NO_2 and other pollutant levels in ambient air due to stack emissions ➢ Fugitive dust emission due to material handling ➢ Emission due to traffic ➢ Increase in ground level concentration of pollutants in buffer zone	➢ Installation of pollution control equipment for control of stack emissions in steel plant as summarised in para 4.4.3.13. Stack heights shall be as per CPCB norms. ➢ Compliance to stack emissions below 30 mg/Nm^3 for PM and NAAQS 2009 for ambient air quality. ➢ Fugitive emissions control through extraction-filteration/ suppression systems at transfer points, Dust suppression by sprinkling water in yards, roads, etc, covering of selected stock yards, good housekeeping within plant and compliance to standards	➢ Jr. Manager (Instrumentation) ➢ DGM (Mechanical) ➢ Asst. Engg (Mechanical) ➢ Housekeeping staff ➢ Water sprinkler drivers ➢ Instruments' Operators/ Technicians of pollution control & monitoring equipment	➢ Manager (Env) & ➢ Addl GM (Environment)	➢ Online monitoring in stack for PM, SO_2 and NO_2 ➢ Third party periodical ambient air quality monitoring for PM2.5, PM10, SO_2, NO_2 & other parameters as per NAAQS 2009 ➢ Maintenance record of ESP & Bag Filters ➢ Verification of cover of trucks, dust suppression measures & plantation	➢ Continuous for online systems ➢ Quarterly for manual monitoring ➢ Monthly verification of records	➢ Air pollution control equipment within plant premises ➢ Surrounding three villages as per monitoring program	➢ Continuous online systems (stack & Ambient air) are connected to SPCB/CPCB in real time ➢ Quarterly ambient air monitoring & stack monitoring results are submitted with EC compliance reports every six months.

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters/ measurement methodologies	Monitoring Frequency	Location	Reporting schedule
			Implementation	Monitoring				
		➢ Transportation of raw materials through covered trucks ➢ Green belt/ green cover development programs will be undertaken around the plant in the available area.						
Terrestrial ecology	➢ Air and noise pollution due to emissions from stack, stock yards, transfer points, vehicles, etc and noise levels due to the equipment, vehicles, etc. ➢ Planting trees within premises ➢ Impact on fauna and flora	➢ Control and disperse emission after treating through ESPs/ Bag filters and appropriate stack heights. As ambient air quality will be within limits, no active injury to the vegetation is expected ➢ Tree plantation has been started and will be carried out and any tree cut will get transplanted preferably and compensated as per rules. Treated waste water will be reused for watering ➢ Boundary wall has been developed around the existing plant so that there is no interaction with the fauna of the surrounding except birds and small mammals who	➢ Gardeners ➢ Housekeeping staff	➢ DGM (Civil)	➢ Inventory of trees planted with species and survival rate ➢ Area under plantation ➢ Height and girth to be annually measured ➢ Inspection of boundary wall ➢ Waste water reuse log books	Annually	➢ Plant species within the project area and ➢ Green belt area	Annually to plant head

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters/ measurement methodologies	Monitoring Frequency	Location	Reporting schedule
			Implementation	Monitoring				
		make their way into the planted areas of the plant. The boundary wall for expansion area will be constructed in due course.						
Noise	Noise levels in the plant area due to equipment in main plant and auxiliaries, and movement of vehicles.	➢ Equipment will be designed to conform to noise levels prescribed by regulatory agencies. Where necessary, high noise generating equipment will be acoustically treated or housed. ➢ Provision of green belt and plantation would further help in attenuating noise. ➢ Employees working in high noise areas are and will be provided with ear plugs/ ear muffs as protective device. ➢ Maintenance of all equipment, moving parts of machinery, and vehicles shall be carried out as per schedule ➢ Maintenance of roads	➢ Engineers & Staff of Maintenance departments of respective units ➢ Dy Manager (Env) ➢ Housekeeping staff	➢ Manager (Env) ➢ Sr Manager (Safety)	➢ Noise level ➢ Vibration level ➢ Tree inventory as in earlier point ➢ Verification of PPE ➢ Condition of roads, vibration dampers and acoustic enclosures	➢ Quarterly monitoring	➢ All working areas with stationary and mobile machinery ➢ roads	Noise reports submitted to MoEF&CC Regional Office every six months with EC compliance report by Addl. GM (Environment)
Traffic	Impact on road infrastructure and	➢ Provision of proper parking yard and	Dy Manager (Env)	Manager	Verification by	Regular weekly & ad hoc	Within and around plant	monthly to Addl GM (Environment)

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters/ measurement methodologies	Monitoring Frequency	Location	Reporting schedule
			Implementation	Monitoring				
impacts	impact on air quality and noise due to vehicular movement	maintenance of roads and transportation vehicles. ➢ Use of covered trucks for transportation of raw materials, finished products and solid waste to prevent spillage. ➢ Development of railway siding		(Environment)	observation	surprise visits	site wherever trucks may be moving/ parked	& plant head
Demography and socio-economics	30 families will be displaced from the core zone and company is in the process of acquiring additional land for expansion. Therefore, impact on demographic profile of the area is foreseen. Displacees and land losers shall be there who will be compensated by IDCO. There will be influx of operating personnel and colony will be established.	➢ Plant will generate direct employment for 6650 persons. ➢ Preference will be given to displacees, land losers and local population for employment in the semi-skilled and unskilled category. ➢ Indirect employment will be created by the plant for supply of daily domestic goods. Additional facilities will be developed by the project proponent in surrounding villages as part of CSR activities.	AGM (P&A)	Plant Head	➢ Employment and domicile records ➢ Homestead loser & displacee records ➢ Contracts ➢ CSR activities' records	Six monthly	Plant premises	Annually to the Director(s)
Fire and Safety	Accidents/ disasters related to fire and	➢ Prepare and implement Emergency	Fire fighting system operator	Sr. Manager (Safety)	➢ Verification of approvals from factory	➢ Once ➢ Once	Permissions from regulators	Six monthly to plant head

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters/ measurement methodologies	Monitoring Frequency	Location	Reporting schedule
			Implementation	Monitoring				
	safety	Management Plan. ➢ A well-laid fire fighting system and fire extinguishers is there in existing plant and will be installed in expansion phase as per fire safety norms. ➢ Regular fire safety training and mock drills will be conducted.			inspector ➢ Fire fighting approvals ➢ Training and mock drill records	➢ monthly	and training within project boundary	
Solid Waste	➢ Pollution of air due to ash and solid waste handling ➢ Municipal solid waste due to everyday sweeping, canteen and domestic activities ➢ Sludge from water and waste water treatment systems ➢ Miscellaneous wastes from plant	➢ Fly ash generated will be used as raw material in brick making units both in-house & outside, in cement making in-house & out house, in road making, low lying area leveling etc. ➢ Municipal solid waste will be segregated. Organic component composted and used as manure. Paper, plastic, biodegradable and non biodegradable but incinerable components can be burnt in the kiln, subject to technical approval from manufacturer ➢ The sludge from water	➢ Deputy Manager (Env) ➢ Engineers & Staff of Maintenance departments of respective units ➢ House keeping staff	➢ Manager (Environment)	➢ Log of fly ash generation and transfer ➢ Log of solid waste handling and disposal ➢ Log books of STP, WTP, ETPs ➢ Surprise checks ➢ Verification by observation	Weekly	Within plant	Monthly to plant head & Addl GM (Environment)

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters/ measurement methodologies	Monitoring Frequency	Location	Reporting schedule
			Implementation	Monitoring				
		and sewage 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 and in Colony. ➢ Sludge from other ETPs shall be reutilised back in process or disposed in designated area with full precaution ➢ Metal recovery plant and use of reject slag for brick making ➢ Blast furnace slag to be used for making cementatious material in house or by other manufacturers ➢ DRI's Char used for power generation ➢ Rejects, bag filter/ ESP dusts, sinter returns, etc to be recycled back into the process ➢ Washery reject to be sent for backfilling or leveling land						
Thermal	Heating of receiving	Since a re-circulating	➢ Junior	➢ Manager	➢ Periodic	➢ Weekly	➢ Within	➢ Monthly to

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters/ measurement methodologies	Monitoring Frequency	Location	Reporting schedule
			Implementation	Monitoring				
pollution	waters and air from boiler blow down, cooling tower blow down and stack emissions.	cooling system with cooling tower shall be adopted, low thermal pollution is anticipated. "Common Monitoring Basin" shall be there to receive and cool the water prior to use in horticulture, etc	manager (Instrumentation) ➢ Asst. Engg. (Mechanical) ➢ Manager Q/C ➢ Technicians of pollution control & monitoring equipment	(Environment) ➢ DGM (Mechanical) ➢ Dy Manager (Environment)	verification of "Common Monitoring Basin" for maintained conditizons ➢ Analysis of cooling tower data ➢ Stack monitoring	➢ Stack emissions are & will be monitored through continuous monitoring systems	plant	plant head & Addl GM (Environment)
Liquid Effluent	Pollution of surface and ground water, propagation of vectors, creation of odour due to effluents from cooling tower blow down, boiler blow down, water treatment systems, waste water treatment systems, domestic sewage, etc	➢ Treated Effluent from various units will be either directly collected in "common monitoring basin" or after treatment in the respective units' ETPs. Thereafter, it will be reused in sprinkling, watering, dust suppression, irrigation of green belt, horticulture, brick making, ash quenching, etc. ➢ Washery & beneficiation plant will recirculate their water after treatment into same plant. ➢ As all waste water is reused, there shall be no net discharge from	➢ Manager (Q/C) ➢ Treatment plant operators	➢ Manager (Environment)	➢ Quality parameters ➢ Log books ➢ Inspection	Continuous Online monitoring systems. Log books are/ will be examined and inspections carried out monthly	Within plant, at ETP, STP	Continuous online systems are connected to SPCB/ CPCB. Six monthly reports submitted with EC compliance by Addl GM (Environment).

Discipline	Potential impacts and Source	Mitigation measures	Administrative Aspect		Monitoring Parameters/ measurement methodologies	Monitoring Frequency	Location	Reporting schedule
			Implementation	Monitoring				
		the industrial activities of the plant except during monsoons ➢ Domestic waste water from plant and colony shall be treated in STP & 100% reused						
Health and Safety	➢ Injury ➢ Occupational disease ➢ Fatality	➢ Working as per approved plans and protocols. ➢ Periodical Medical Examination. ➢ Extensive publicity and propaganda related to safety.	➢ Dy. Manager (safety)	➢ Sr Manager (Safety)	➢ Existence of SOPs ➢ Examination of medical records ➢ Verification of public displays ➢ Presence of safety equipment	➢ Once ➢ Annual ➢ Monthly ➢ Daily & before use	Within plant premises	Annually to Plant Head and regulatory authority

10.4 PLAN FOR IMPLEMENTATION OF CREP GUIDELINES FOR STEEL PLANT

The CREP guidelines for steel plant and the plant for implementation of the same for Expansion of the Steel Plant is 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.)	● SMS (2X20 T) are under operation. Fume extraction system (FES) with bag filter has been installed to control 100% of the fugitive emissions. ● SMS (3X20 T) is under construction and the FES with the bag filter will also be installed in this ● Future furnace installations (sanctioned & proposed) in SMS will also have control measures
3.	**Blast Furnace** Direct inject of reducing agents 55% by June 2013.	Blast furnace will be installed ensuring that direct injection of reducing agents meets the norms
4.	**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%	The slag from the induction furnace wil be utilised through slag separation plant for recovery of metal. The recovered metal is reutilised in the IF while 100% of the reject will be used for brick/ paver block manufacturing in house/ outside. Blast Furnace has not yet been installed. When it will be installed, 100% of the blast furnace slag will be utilisable for cementatious material manufacturing.
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.	• The specific water requirement for rolling mill output will be <5 m^3/t considering the water requirement of all sub-units except power plant, Iron

Sl. No.	Recommendation	Plan for Implementation
	To operate CO-BP effluent treatment plant efficiently to achieve the notified effluent discharge standards- by July 2020.	ore Beneficiation Plant, Coal Washery and drinking. • The plant works on zero discharge principle and all the treated effluent is re-circulated and re-used in the plant. Since the coke oven will recovery type, hence CO-BP effluent treatment plant will not be required.
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.	Online Ambient Air Quality monitoring systems has been installed at 4 locations within the project boundary for PM10, PM2.5, SO_2 & NOx & online data connected through the Real Time Data Transmission to State Pollution Control Board as well as Central Pollution Control Board, New Delhi. Online stack monitoring facilities have been provided in the all major process stacks connected to DRI Kiln as well as Power Plant to monitor PM & SO_2 (DRI) & PM, SO_2& NOx (Power Plant) and online system is connected to SPCB and CPCB Online servers.
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 have already been installed and efficient operation and regular record is being maintained in operational units. The same shall be done in the units to be installed as per EC and in proposed expansion. The records are and will be submitted to the SPCB/ Regional Office MOEF&CC, when required.
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.	An 10 MW top pressure recovery turbine (TRT) has been sanctioned in the EC dated 18.02.2021 while additional 20 MW is proposed in the expansion phase.
	➢ Use of Tar-free runner linings.	Fire clay bricks are in use for the runners and the same shall be used for expansion phase in runners
	➢ De-dusting of Cast House at tap holes, runners, skimmers ladle and charging	Hood with bag filters shall be operational at various locations in cast house

Sl. No.	Recommendation	Plan for Implementation
	points.	
	➢ Suppression of fugitive emissions using nitrogen gas or other inert gas.	This shall be carried out in the applicable equipment
	➢ To study the possibility of slag and fly ash transportation back to the abandoned mines, to fill up the cavities through empty railway wagons while they return back to the mines and its implementation.	The reject from the slag separation plant will be 100% used in the manufacture of bricks/ paver block in the brick manufacturing plant installed in the project premises or by other brick manufacturers. Ash will be also utilised in the manufacturing of bricks using own brick plant as well as other brick manufacturers. Some ash is also used in land filling of cavities/ low lying areas as requested by land owners. Thus, the entire ash is reutilised and the need to send back to abandoned mines is not anticipated.
	➢ Processing of the waste containing flux & ferrous wastes through waste recycling plant.	Slag separation plant is used for recovery of metal. The recovered metal is reutilised in the induction furnace.
	➢ To implement rainwater harvesting.	Rainwater harvesting scheme is proposed for the plant and will be implemented progressively with the progress in construction of the plant sanction in EC earlier as well after approval of expansion.
	➢ Reduction of Green House Gases by: 1. Reduction in power consumption 2. 3. Use of by-products gases for power generation 4. Promotion of Energy Optimisation Technology including energy audit	1. The power use will be reduced through energy conservation measures on commencement of operation 2. DRI exhaust (300 MW), blast furnace gas (105 MW), coke oven gas (195 MW), clinker kiln exit gas (25 MW) and top pressure from BF (30 MW) will be used 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	The plant is setting up an Environmental Laboratory for collection of samples and analysis for ambient air quality, water quality, noise monitoring and stack

Sl. No.	Recommendation	Plan for Implementation
	realistic data is obtained in the environmental monitoring laboratories.	monitoring. Quarterly Environmental Monitoring is being carried out by M/s Min Mec R& D laboratory, NABL/ MOEF accredited Laboratory. Training is organised for staff periodically from competent organisations.
	➢ To Improve overall housekeeping.	Good housekeeping is being carried out and shall be maintained in future also
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, bag filters, etc) will be installed and it will be ensured that they are working efficiently to control emissions within the permissible limits.

10.5 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 given in **Fig 10.2**.

Since the plant is operational, specific activities in the project, functions and role of the employees have already been defined.

Standard operating process / procedures to address deviation/ non-compliances/ violation

Environmental Manual shall be prepared, either stand alone or as part of the Environmental Management System such as ISO 9001,14001 and 45001 and implement it. The Manual shall be prepared to comply the Corporate Environmental Policy covering the following aspects:

1) Environment clearance conditions/ stipulations/ norms
2) Consent to establish conditions / stipulations / norms
3) Consent to operate conditions / stipulations / norms
4) Monitoring mechanism for compliance through periodic audits
5) Reporting of the audit results to Board of Directors
6) Corrective and Preventive Actions to be taken
7) Self improvement measures

Hierarchical systems to deal with the environmental issues and for ensuring compliance

The Company has established an environmental cell which will be responsible for the compliance of the environmental conditions in present as well as expansion plant. Environment Department will operate under the Plant Head, who will report to the Board of Directors.

FIG 10.2: CORPORATE ENVIRONMENTAL POLICY



Rungta Mines Limited

MAIN ROAD, BARBIL - 758 035, DIST. - KENDUJHAR, ODISHA, INDIA

CORPORATE ENVIRONMENTAL POLICY

The Board of Directors of the Company in their meeting held on 10.12.2018 deliberated on the agenda regarding Corporate Environmental Policy of Dhenkanal Steel Plant of the Company in Odisha and passed the resolution that M/s Rungta Mines Limited shall strive to ensure that all aspects of the business could have the least harmful effect on the Environment by implementing an effective Environmental Management System to:

- Have full awareness of all Environmental and Factory legislation in India and to ensure that regulatory requirements are duly met with including the conditions/ stipulations/ norms of Environment Clearance.
- Monitor the implementation of the Policy by carrying out periodic audit of compliance with full reporting to the Board of Directors and to suggest necessary remedial measures, if required, thereto.
- Ensure that all Employees in the course of their duties act in accordance with the Environmental Policy. To encourage suppliers, Contractors and vendors to act in accordance with Company's Environmental Standards.
- Maintain transparency in matters of Environmental compliance.
- Selections of non polluting technology, waste minimization, reuse/recycling and the reduction of energy consumption will be particular areas of attention of the business man.
- The Company will also make a positive environmental contribution in the local community by encouraging open communication, general Environmental awareness and the promotion of CSR activities.

Place: BARBIL
Dated: 10.12.2018

For Rungta Mines Limited

M.D. SUSTAGI
Director
(DIN – 01219014)

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.

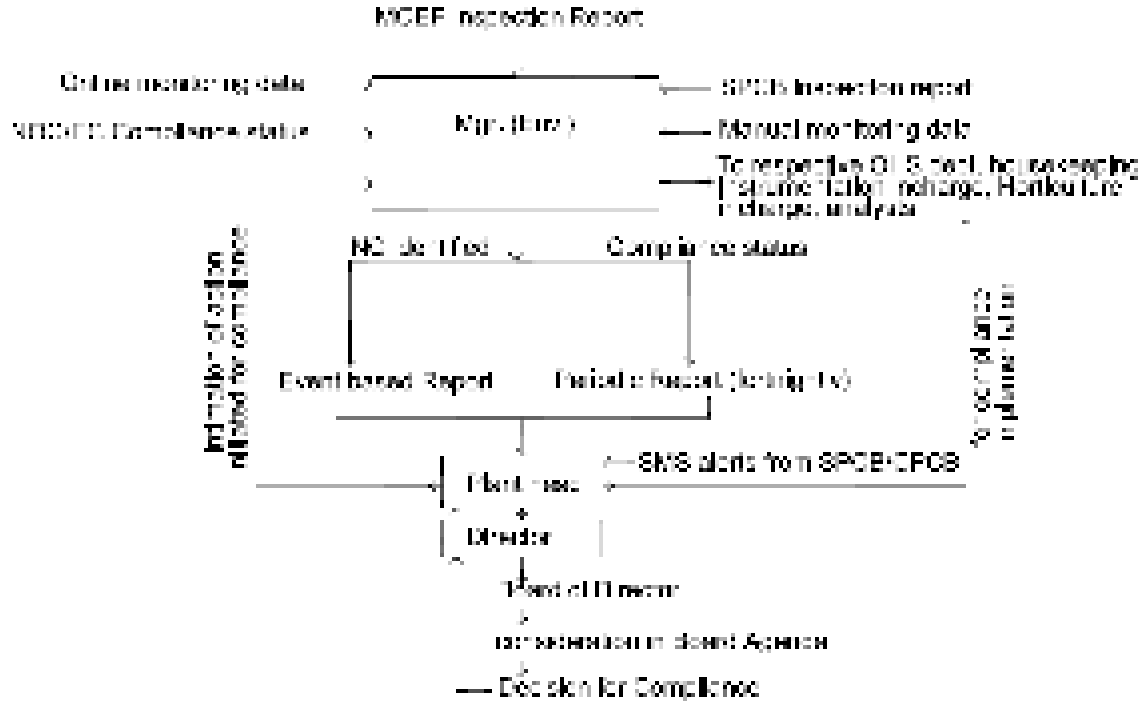
Systems of reporting of non compliances/ violations

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 (3.55 MTPA steel dated 15.02.2021) is being uploaded at Company's website regularly. Deviations from the policy and cases of violation of Environmental clearance conditions as well as Consent to operate as found by MoEF&CC and OSPCB or other public authority will be reported to Board of Directors and corrective as well as preventive action will be taken. The system of reporting non compliances/ violations is summarised below:

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	Manager (Environment) --> Plant head & Addl GM (Environment) at HO --> Director(s) --> 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 (in consultation with Addl GM (Environment) at HO) --> Plant head --> to relevant department 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 10.3**.

FIG 10.3: FLOW CHART OF THE SYSTEM OF REPORTING OF NON COMPLIANCES



10.6 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** and **10.4** give overall investment on the environmental safeguards and recurring expenditure for successful monitoring and implementation of control measures.

Assumptions for cost calculation:

- Manpower considered :

TABLE 10.3: MANPOWER UTILISATION FOR EMP IMPLEMENTATIONS

Grade	Designation	Utilisation in EMP related activities	Number of persons
Gr-I	Plant head	10%	1
Gr-II	Manager (Environment)	25% Air, 25% water, 10% noise, 40% monitoring	1
	Sr. Manager (Safety)	100%	1
	Dy Manager (Environment)	50% Air, 50% monitoring	1
	Manager (Q/C)	25%	1
	DGM (Mechanical) CPP	25%	1
	DGM (operation)	10%	1
	DGM (Civil)	10%	1

Grade	Designation	Utilisation in EMP related activities	Number of persons
Gr-III	Asst. Eng. (Mechanical)	25%	1
	Junior Manager (Instrumentation)	25%	1
Gr-IV	ESP, BF etc operators	100%	15
	Water sprinkler drivers	100%	6
	ETP/ STP operators	100%	5
	Lab assistants, monitoring assistants	100%	2
	Fire fighting system operator	100%	1

- 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. 12,000 pm
- Unit cost of electricity (Rs./kWh)- Rs. 5.5 (self generation), diesel Rs. 106/ litre, Petrol Rs. 110/ litre
- Number of shifts are three with annual 355 working days
- Debt: Equity ratio -zero since the plant will be self funded

Capital and recurring cost estimated for EMP is given in **Table 10.4**.

TABLE 10.4: CAPITAL COST FOR ENVIRONMENT MANAGEMENT (ALL FIGURES IN LAKHS)

Sl. No.	Particulars	As per EC dt. 15.02.2021 for 3.55 MTPA			Additional		Total for 7.55 MTPA		
		No. Of eqpt.	Unit cost	Capital cost	No. Of eqpt.	Capital cost	No. Of eqpt.	Unit cost	Capital cost
1	**AIR POLLUTION CONTROL**								
1.1	Electrostatic precipitator	42	160.00	6720.00	3	4960.00	38	160.00	6080.00
1.2	Lime Scrubber						7	800.00	5600.00
1.3	Bag filters with ID Fan & Chimney (chimney cost excluded in expansion phase)	57	106	6060.00	18	Less 810.00 (due to unit cost revision)	75	70.00	5250.00
1.4	Fume Extraction Systems with bag filters	-	-	-	23	1610.00	23	70.00	1610.00
1.5	Reverse air Bag Filters	-	-	-	5	350.00	5	70.00	350.00
1.6	Dry Gas Cleaning Plant	-	-	-	4	4000.00	4	1000.00	4000.00
1.7	Water sprayer (Stationary)	LS	20.00	20.00	-	20.00	LS	40.00	40.00
1.8	Water sprayer (Mobile)	5	35.00	175.00	1	35.00	6	35.00	210.00
	Total (air pollution control)			**12975.00**		10165.00			**23140.00**
2	**WATER POLLUTION CONTROL**								
2.1	Domestic Effluent Treatment Plant	-	-	-	-	50.00	LS	0.05	50.00
2.2	Septic tanks / Soak Pits	20	0.50	10.00	20	10.00	40	0.50	20.00
2.3	Neutralising pits, settling tanks, common monitoring basin etc	2	100.00	200.00	2	200.00	4	100.00	400.00
2.4	Industrial ETP	-	-	-	3	90.00	3	30.00	90.00
2.5	Workshop OWS & settling tank	1	0.50	0.50	0	0.00	1	0.50	0.50
2.6	Storm water drains	LS	144.00	144.00	-	144.00	LS	288.00	288.00
	Total (water pollution control)			**354.50**		**494.00**			**848.50**

Sl. No.	Particulars	As per EC dt. 15.02.2021 for 3.55 MTPA			Additional		Total for 7.55 MTPA		
		No. Of eqpt.	Unit cost	Capital cost	No. Of eqpt.	Capital cost	No. Of eqpt.	Unit cost	Capital cost
3	**NOISE POLLUTION CONTROL**								
3.1	Acoustics	LS	10.00	10.00	-	10.00	LS	20.00	20.00
3.2	Preventive maintenance	LS	0.50	In recurring	-	-	LS	5.00	In recurring
	Total (noise pollution control)			**10.00**		**10.00**			**20.00**
4	**ENVIRONMENT MONITORING AND MANAGEMENT**								
4.1	PM2.5 sampler	4	1.00	4.00	0	0	4	1.00	4.00
4.2	Respirable dust sampler	4	0.65	2.60	0	0	4	0.65	2.60
4.3	Micro-meteorological station (Auto)	1	1.50	1.50	0	0	1	1.50	1.50
4.4	Laboratory for testing	LS	10.00	10.00	-	0	LS	10.00	10.00
4.5	Online stack sampler	28	15.00	420.00	10	17.00	38	11.50	437.00
4.6	Continuous AAQM stations*	4	15.00	60.00	0	0	4	15.00	60.00
4.7	Third Party environmental monitoring	LS	3.00	In recurring	-	-	LS	3.00	In recurring
4.8	Testing/Chemicals etc.	LS	2.50	In recurring	-	-	LS	2.50	In recurring
4.9	Noise meter	2	0.50	1.00	0	0	2	0.50	1.00
	TOTAL (Environment monitoring & management)			**499.10**		**17.00**			**516.10**
5	**OCCUPATIONAL HEALTH**								
5.1	Fire fighting equipment (Portable)	800	0.10	80.00	0	0	800	0.10	80.00
5.2	Fire fighting equipment (Fixed)	LS	50.00	50.00	-	50.00	LS	100.00	100.00
5.3	Fire fighting equipment (mobile)	1	50.00	50.00	0	0	1	50.00	50.00
5.4	Personal Protective Equipment (PPE)	4850	0.02		1800	0	6650	0.02	
	TOTAL (occupational health)			**180.00**		**50.00**			**230.00**
6	**GREEN BELT (Ha)**	236.340	2.50	590.85	240.795	601.99	477.135	2.50	1192.84
	TOTAL			**590.85**	**0**	**601.99**			**1192.84**
7	**OTHERS**								
7.1	Jeep for environmental monitoring & management work	1	10.00	10.00	0	0	1	10.00	10.00
7.2	Expert advice from outside	1	5.00	In recurring	0	-	1	10.00	In recurring
	TOTAL			**10.00**		0			**10.00**
	GRAND TOTAL -1 (EMP)			**14619.45**		**11337.99**			**25957.44**
8	**PUBLIC HEARING ISSUES ADDRESSAL**								
8.1	To address issues raised in public hearing dated 20.12.2020 (for EC dt. 15.02.2021 for 3.55MTPA)	LS	-	235.84	**	**	**	**	**
	GRAND TOTAL -2 (EMP+PH)			**14855.29**		**11102.15**			**25957.44**

**** Although the cost of four continuous ambient air quality stations has been mentioned in 7.53 MTPA, they have already been installed***

***** The budget will be incorporated after conduct of public hearing of expansion phase***

Annual cost of monitoring and implementation of control measures and environment management plan is given in **Table 10.5**.

TABLE 10.5: RECURRING ANNUAL COST FOR ENVIRONMENT MANAGEMENT (RS. LAKHS)

Description	Capital cost			Recurring cost		
	Sanctioned as per EC dt. 15.02.2021	Additional	Total	Sanctioned as per EC dt. 15.02.2021	Additional	Total
Air pollution control	12975.00	10165.00	23140.00	2109.93	675.69	2785.62
Water pollution control	354.50	494.00	848.50	19.76	2645.68	2665.44
Noise pollution control	10.00	10.00	20.00	1.13	5.14	6.27
Env. Monitoring and management*	499.10	17.00	516.10	137.18	34.52	171.70
Occupational health	180.00	50.00	230.00	121.78	42.32	164.10
Green belt	590.85	601.99	1192.84	85.62	86.14	171.76
Others	10.00	0.00	10.00	7.91	5.00	12.91
Overheads (3% of dep., energy, R&M & interest)	0.00	0.00	0.00	62.21	101.89	164.10
To address issues raised in public hearing dated 20.12.2020 (for EC dt. 15.02.2021 for 3.55MTPA)	235.84	*	*	-	*	152.51
Total	**14855.29**	**11102.15**	**25957.44**	**2545.52**	**3584.79**	**6130.31**

* ***The budget will be incorporated after conduct of public hearing***

The additional capital investment on environmental protection work for 3.98 MTPA (from 3.55 to 7.53 MTPA) expansion is envisaged as Rs. 111.02 Crores and recurring expenditure during the Steel production is envisaged as Rs. 35.85 Crores/year.

The total capital investment on environmental protection work for entire 7.53 MTPA integrated steel plant is envisaged as Rs. 259.57 Crores and recurring expenditure during the Steel production is envisaged as Rs. 61.3 Crores/year.

The point no. 4 of both **Table 10.4** and **10.5** are also given in Table 6.2 of Chapter 6. The cost of wildlife conservation plan (Rs. 706.332 lakhs for 10 years) is separate and not included in the above.

CHAPTER 11

EXECUTIVE SUMMARY OF EIA/EMP

11.1 INTRODUCTION

11.1.1 General background

Rungta Mines Ltd. (R.M.L.) had received an environmental clearance for 3.55 million tonnes per annum (M.T.P.A.) steel and 695 mega watt power plant on 15.02.2021. Now R.M.L. proposes to enhance production capacity from 3.55 to 7.53 million tonnes per annum steel by enhancing capacity of its various sub-units such as D.R.I., M.B.F., S.M.S. (I.F., L.R.F., B.O.F./ N.O.F./ E.O.F./ E.A.F.-L.F.-V.D./ R.H./ A.O.D., C.C.M.), rolling mill, captive power plant, oxygen plant, lime plant, cement plant, sinter plant and coke oven plant. There will be no change in beneficiation plant, coal washery, producer gas plant and pelletization plant. The plant area will expand from 1769 to 3969 acres. Cost of expansion project will be Rs. 11,001 crores.

11.1.2 Location and communication

The existing and proposed plant area will fall in villages Jharbandh, Galpada, Tarkabeda, Kothalu, Beruanpal, Kankalu, Benipathar, Kadala, Badamunda, Paik Purana Kote, Naraharipur, Chandrasekharpur, Sanamunda, Kaliakoli, Kantimili, Sulanali, Janhamunda, Patala and Nuapada of district Dhenkanal in Odisha. The location of plant, water reservoir and colony area is given in **Fig 1.1 of Chapter 1.** The outermost coordinates of various corners of the proposed plant, water reservoir and colony based on google earth, are:

North most: 20°46’ 33’’ N, 85° 19’ 04” E
East most: 20° 46’ 32’’ N, 85° 19’ 13” E
South most: 20° 43’ 10’’ N, 85° 14’ 32” E
West most: 20° 43’ 26’’ N, 85° 13’ 58” E

The existing & proposed plant is accessible by all weather road from the district headquarter Dhenkanal (32 km) and town Angul (18.2 km). The site is located 1.33 km aerially from NH-55, which connects Bhubaneswar to Angul. The nearest railway station is Meramandali at a distance of 3.4 km. The nearest airport is at Bhubaneswar, which is approximately 77 km from the site.

11.2 PROJECT DESCRIPTION

11.2.1 Plant layout

The existing and proposed steel plant shall be constructed in 3969 acres. Out of this total land, 1730 acres shall be under plant, facilities & colony,

178 acres under stock yards, raw material complex & railway siding, 176 acres for solid waste management, 1179 acres for green belt & plantation, 35 acres for administration & other buildings, 80 acres for water reservoir, and 191 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 (5.4 M.T.P.A., no change): It mainly involves wet grinding of iron-ore fines and separation of gangue to improve the quality of iron ore. The product from the beneficiation unit shall be fed into the pellet plant. The rejects will be sent to temporary tailing storage area till further utilisation/ disposal.

Pelletization plant (28.75 M.T.P.A., no change): The pellet plant will produce oxide pellets suitable for use in D.R.I. and blast furnace. Pellets are heat hardened balls produced from concentrates and natural iron ores of different mineralogical and chemical composition. The pellets have improved properties for iron making. Pelletization process involves feed preparation, green ball formation, pellet induration and product dispatch.

Coal washery (5.029 MTPA, no change): The raw coal needs crushing and washing to reduce the ash content before it can be used in D.R.I. kilns and producer gas plant. Therefore, a three product coal washery has been provided. It consists of a coal crusher, screening station and washing equipment. Raw coal will be fed to the washery. Washed coal recovered will be 50%, middlings will be 42.5% and rejects will be 7.5%.

Direct reduced iron (D.R.I.) plant (2.247 to 4.403 M.T.P.A.): Main raw materials - iron ore, coal and dolomite are fed to the ground hoppers with the help of pay loaders and tippers. They are carried away by belt conveyors to the crusher house and thereafter fed to kiln. Iron ore is reduced by heating with coal in the rotary kiln at a temperature of about 1000°C. After reduction, products are cooled in a drum type rotary cooler. Product is then separated into D.R.I. or sponge iron and char by magnetic separation. In rotary cooler, product is cooled by indirect water spray.

Mini blast furnace (1.943 to 4.984 M.T.P.A.): The purpose of a blast furnace is to chemically reduce and physically convert iron oxides into liquid iron called "hot metal". Iron ore, coke and limestone are fed into the top of the blast furnace. Preheated air is blown into the bottom. The raw materials descend to the bottom of the furnace where they become liquid iron (final product) and liquid slag (waste). These are drained from the furnace at regular intervals. The blast furnace flue gas will be passed through Waste Heat Recovery Boilers (W.H.R.B.) for power generation. Thereafter, the gas will be used as fuel in blast furnace stove and elsewhere after cleaning in Gas Cleaning Plant (G.C.P.). Unutilised gas will be flared. Power will also be generated by top pressure recovery turbine.

Steel melting shop (3.22 TO 7.409 M.T.P.A.) : Steel melting shop will have (1) 35X20 tonne induction furnaces (I.F.) with 4X25 + 11X45 tonne ladle refining furnaces (L.R.F.), (2) 1X90 + 1X110 tonne electric arc furnaces (E.A.F.) with 1X90 + 1X110 tonne L.R.F. in it and (3) 2X65 + 4X45 tonne B.O.F./ N.O.F./ E.O.F./ E.A.F.-L.F.-V.D./ R.H./ A.O.D. with 2X65 + 4X45 tonne L.R.F. Induction furnace works on the principle of induction melting of scrap/ sponge iron with the help of electric power. In the electric arc furnace, electric arc is generated between electrodes, which heats the metallic charge. In both furnaces, the melted contents separate into liquid metal and slag. The slag is removed and considered as waste. The liquid metal is sent to the continuous casting machine (C.C.M.) where semi-finished product is made.

Rolling mill (2.55 to 6.53 M.T.P.A.): Semi-finished product from the continuous casting machine of various furnaces as well as from outside purchase will be reheated and converted into finished products such as TMT, Flat, Round, Wire Rod, Structural and others products.

Strip Mill (0.5 M.T.P.A., No change): Semi finished product from the continuous casting machine of electric arc furnace shall be sent to the strip mill where it will be converted into finished products such as strip, sheet, coil, wire, bar and wire rope. Reheating furnace has also been provisioned at strip mill.

Ductile Pipe Plant (0.5 M.T.P.A., No Change): Ductile pipe plant will receive hot metal directly from the mini blast furnace and manufacture finished product comprising of ductile pipes. As a back up measure, provision of reheating furnace has also been made.

Sinter Plant (2.827 to 7.48 M.T.P.A.): Sintering is an agglomeration process of iron ore fines/ blue dust, coke breeze and fluxes. The iron ore dusts collected from other units and pollution control equipments will also be utilised as raw material for sinter. Thus, utilising maximum solid waste from within the plant. The sinter generated will be 100% utilised in mini blast furnace.

Coke oven plant (1.07 to 2.75 M.T.P.A.): Raw coal will be crushed in a crusher into powdered form and charged in the oven for carbonisation. The volatile matter in raw coal gets released in the form of gas and gets burnt in the oven as well as in the flues. After the completion of the carbonization process, raw coal get converted to coke within 36 to 38 hours. The coke is then pushed out from the oven and quenched by water. Coke will be utilised in mini blast furnace and sinter plant. Balance leftover shall be sold in the market.

Captive Power Plant (C.P.P.): (1) Waste Heat Recovery Boiler: 655 MW waste heat recovery boilers based power plant is proposed to utilize the heat from gases exiting DRI kilns, blast furnace, coke oven and clinker. **(2) AFBC/ CFBC:** 635 MW power plant based on coal, coal fines, washery middlings and char from DRI kilns has been proposed. The power

generated from the CPP will meet the requirement of the steel plant. Any excess will be sent to other plants of company.

Cement Plant (1.686 to 3.2775 M.T.P.A.): Limestone will be the primary raw material for clinker making. Along with coal, it will be fed into the clinker kiln and the manufactured clinker will be sent to cement mill. At cement mill, Portland Pozzolana Cement (P.P.C.) using fly ash and Portland Blast Furnace Slag Cement (P.B.F.S.) using blast furnace slag shall be manufactured and sold in the market.

Lime plant (0.3045 to 0.7665 M.T.P.A.): Environmental clearance for 1x390 TPD+1x480 TPD has been obtained but yet to be installed. In expansion phase, it is proposed to install 1x600 TPD and 2x400 TPD. 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. Lime and lime-based products are a cost-effective way of adjusting the mineral content.

Producer Gas Plant (No Change): A coal based producer gas plant will be installed. Its capacity will be of 5387 million Nm3/annum.

Oxygen Plant (0.294 MTPA to 1.134 MTPA): Oxygen Plant will be expanded from 0.294 to 1.134 million tonnes per annum.

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.

A stone crusher (2x40 TPH) shall also be established within project area for the duration of construction

11.2.3 Raw material, power and water

Major raw material and fuel requirement for project will be various grades of iron ore (from Odisha Mining Corporation/other private mines), non coking coal (domestic/Import) and coking coal (imported). Other raw material required is limestone, dolomite, bentonite, clay, silica component, flocculant, gypsum, quartz, silica, pig iron and semi finished products. Total raw material to be purchased from outside will be 67.78 million tonnes per annum. Fuels required in various units will be coking and non coking coal, coke breeze & fines, low sulphur heavy stock diesel oil/ furnace oil, coke oven gas and MBF gas.

Total power requirement of the plant for operating different facilities is estimated as 1290 MW. It shall be sourced from Captive Power Plant.

The total water requirement for the 7.53 million tonne per annum plant will be 6,502 m^3/hr. It shall be sourced from Brahmani River.

11.2.4 Manpower

The manpower requirement will be 6650 persons for various activities of the 7.53 million tonne plant like plant operation, loading, unloading, handling, transportation, general cleaning, horticulture and other miscellaneous works inside the plant. Three shifts working for 355 days is planned.

11.2.5 Site services

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

11.3 PRESENT ENVIRONMENTAL SCENARIO

The project area has been referred to as the “core zone” while the area upto 10 km radius of the project has been referred to as the “buffer zone”. Together they comprise the study area which can be seen **Fig 3.1 of Chapter 3**.

11.3.1 Topography and drainage

Topography: The project area has a comparatively flat terrain and elevation is approximately 65-114 m above mean sea level. The study area has a flat to gentle, undulating sloping topography with few scattered hillocks. The surface elevation in buffer zone varies from 60-312 m.

Drainage: The proposed project site is located 0.7 km south of Nigra Nadi (or Lingra Nadi) and 4.9 km south west of Brahmani River. As seen on toposheet, eight first order seasonal drains, one second order seasonal drain and one aquaduct originate from within plant boundary or from its immediate vicinity and flow out from the northern boundary. These drains originate from and connect multiple seasonal ponds before flowing into Nigra Nala. The drainage of the area is controlled by the south-easterly flowing Brahmani river, which is situated in the north-eastern part of the study area. The river is fed by various seasonal sub-parallel nalas like Nigra, Kisinda Jhor, Kusumdor Jhor, Bade Jhor etc.

11.3.2 Climate and micro-meteorology

The climate of region is mainly tropical type. Monthly average of minimum temperatures recorded at IMD station Angul from 1981-2010, ranges from 13.8°C to 25.5°C and maximum temperature ranges from 28.6°C to 39.9°C and total of average monthly rainfall is 1277.5 mm.

The micro meteorological data of the core zone has been recorded using an automatic weather station from 1st March to 31st May 2021. The temperature ranged between 20.4°C to 42.8°C and relative humidity ranged between 20.2% to 96.8% during the monitoring period. The wind speed varied between calm to 47.8 km/hr and the predominant wind direction was observed from south west with 12.45% of occurrences (including calm).

11.3.3 Ambient air quality

Ambient air quality study was monitored at 9 locations including one location in the core zone (expansion area) and one in core zone (existing plant). Seven locations in the buffer zone are near village Berunpal, Mahalunda, Narendrapur, Nimabahali, Kankalu, Patala and Barhamunda. Twenty four hour average PM10 level was found to range from 30.4 to 74.7 $\mu g/m^3$, PM 2.5 was found to vary from 19.6 to 43.7 $\mu g/m^3$, SO_2 from 3.7 to 16.4 $\mu g/m^3$ and NO_2 from 8.5 to 21.8 $\mu g/m^3$. The concentration of carbon monoxide, nickel, arsenic, lead, B(a)P and benzene were also measured.

11.3.4 Water resource and quality

Brahmani river and it's tributaries control the drainage of the study area. Brahmani is a perennial river. The drainage pattern is dendritic in nature. Brahamani River (4.9 km), Nigra Nadi (0.7 km), Kisinda Jhor (5.0 km), Kantei nala (2.2 km), Matilia Nadi (4.1 km), Bauli Nadi (3.9 km), Barha Jor (7.8 km), Kusumdor Jor (3.6 km), Agana Nadi (9.3 km), Bangurasingha Nala (8.3 km), Parjang branch canal (7.9 km), Ria Jor (5.9 km), Rengali right main canal (0.7 km), Barasinga Minor (9.6 km), Reservoir near Nua (4.2 km), Sarpa Canal (4.7 km) etc. are present within study area in addition to various ponds in villages.

The ground water level at project site was 8 m below ground level in October 2021. The ground water estimation of the study area shows that the stage of ground water development is within safe category.

Water samples were collected from 10 ground water sources. These are (1) core zone of existing plant area, (2) Benipathar village in core zone expansion area, (3) Tarkaberha, (4) Kadala, (5) Gandhijara, (6) Naraharipur, (7) Jharbandh, (8) Kankalu, (9) Kantimili and (10) Sulani 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 in absence of alternate source.

Water samples were collected from 9 surface water sources. These are (1) Brahmani river near Kharhagaprasad village (up stream) (2) Lingra Nadi near Motanga village (down stream), (3) Gandhijharan nala near Tarkabeda village, (4) Brahmani river near Dhalapur village (down stream),(5) Lingra nadi near Shimilichhuin village (down stream),(6) Water Reservoir area in existing plant, (7) Pond near Kankalu village, (8) Pond near Kantimili village and (9) Pond near Narharlpur. The analysis of surface water sample shows that all the parameters are within the permissible limits as per IS 10500:2012.

11.3.5 Land use pattern and soil quality

Existing project area is 1769 acres. Additional land requirement for expansion is 1800 acres. Thus, total land required for the project is 3569

acres. Out of 1800 acres, 1609.8 acres is private land and 190.20 acres is government land. Entire 1800 acres has to be acquired.

The study area has 236 villages and 3 census towns. Of total study area land, 5.14% is forest land, 14.84% is area under non-agricultural uses, 57.46% is net area sown, 4.46% is permanent pastures and other grazing land, 2.29% is current fallows, 9.61% is barren and un-cultivable land, 2.71% is fallows land, 1.63% is culturable waste land and 1.86% is land under miscellaneous tree crops, etc.

Top soil samples were collected and analyzed from 4 locations in and around plant premises. The results indicate that all the soil samples are fine and medium grained sand and have pH between 5.5-7.3. They are deficient in organic carbon except agricultural land within proposed expansion area.

11.3.6 Noise and traffic volume survey

Noise levels at nine stations (1 within the core area and eight within buffer area) were observed. Leq values observed during day time varied from 46.18 to 52.0 dB (A) and at night time varied from 39.01 to 43.22 dB (A). Traffic volume survey was conducted round the clock during 19-21/05/2021 at Angul to Dhenkanal near Nimabahali village (NH-55) and on NH - 55 to plant road near proposed staff colony. Total number of equivalent passenger car units were found as 25, 581 and 1042, respectively.

11.3.7 Ecology

No forest land is present in 1800 acres expansion area. 7.8 acres (3.156 ha) of forest land was present within the existing 1769 acres project area. Stage-II forest clearance for the same was received on 02.07.2015 from Ministry of Environment, Forest & Climate Change vide letter No. 5-ORB207/2014-BHU. Forests of the study area are Northern Tropical Semi-evergreen forests based on classification by Champion and Seth. Forest present in the study area, as per toposheet, are Jharbandh RF (adjoining), Ghanthigarhia PF (3.3 km), Nimidra RF (2.0 km), Kai RF (7.2 km), Kansara RF (9.7 km) and Ambithi RF (8.9 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 22 species comprising 7 species of mammals, 8 species of reptiles and 7 species of birds.

11.3.8 Socio-economic conditions

There is habitation within proposed expansion area. Approximately 30 households (approximately 126 persons) of Benipathar and Chandrasekharpur village will be displaced. There were 54 families previously in the existing plant area (1769 acres) who have been resettled in village Nimabahali and paid compensation. As per Census 2011, total

population within the study area is 270396 persons that include 139838 males and 130558 females.

The SC population is 22.72% and ST population is 5.62%. The average literacy rate is 69.49%.

The literacy amongst women is poorer at 30.08%. 24.08% of the total population are main workers, while 10.42% are marginal workers and the rest 65.49% 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. Nearest monument is at Sulanali village at 80 m. The toposheet shows monuments near Garha Santri-Arahata village road, Pirhhasahi-Taltali road, Pirhhasahi-Ganthigarhia PF road, Kankinali-Barasingha road, Angarabandha- Phulaparha road, Barasingha-Purikie road and near Kalandapal village, Durgaprasadpur village, Kansara village and Santarapur village all at distance of 5.3 km and beyond.

11.4 ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION

11.4.1 Topography and drainage

Impact: Since the 3.55 MTPA plant is already under construction, change in topography is occurring in core zone. This is due to cutting, filling and construction activities such as boundary walls, industrial units, buildings, stock yards, reservoir, roads, etc. The ground is being leveled, where required, due to ongoing construction. One D.R.I., induction furnace and power plant unit is under construction. One D.R.I. (1X500 TPD), induction furnace (2X20T), caster and power plant unit is under operation. Similarly, in additional 1800 acres expansion area, the topography will change permanently due to leveling and establishment of additional buildings. The construction once achieved will not be reversed. There will be no impact on topography of the buffer zone since no construction is proposed except widening and strengthening.

8 first order seasonal streams, 28 ponds, 1 second order stream, 1 stream from reservoir, 1 aqueduct and the sheet flow of rain water shall get affected within the core zone due to installation of buildings. Impact on the drainage in the buffer zone is not anticipated as no construction will be taking place outside plant boundary. However, the volume of water from the plant area going outside the plant will reduce during rainfall as the rainwater will be stored in raw water reservoir / rain water harvesting ponds.

Mitigation: The change in topography in the core zone will be permanent and irreversible. Excavated soil will be used in leveling, filling and landscaping to minimise the impact of change in topography. Changes in the sheet flow pattern of rain water will be managed through storm water

drains. The impact of the new construction will, therefore, be managed through mitigation measures. Stone crusher will be installed for re-utilisation of stones at site.

11.4.2 Air quality

Impact: During construction phase, sources of air pollution will be due to vehicle exhausts, excavation work, construction material handling (cement, sand and gravel), vehicle movement on unpaved roads and exhaust from non-mobile construction equipment like compressors. Primary impact will be high dust generation resulting into increased suspended particulate matter levels in the surrounding areas. The secondary impacts of air emissions, dust as well as other emission may affect the health of the labour force working in close vicinity and nearby villagers. During operation phase the air quality impact will be due to emissions from the stacks attached to various units, from stock yards and from transportation. Each of these has been evaluated for potential impact using mathematical models.

Mitigation: During construction, dust is anticipated due to leveling, construction and transportation activities. It will be controlled by sprinkling of water and using covers & wind breaks. Construction equipment and transport vehicle will be maintained periodically as per manufacturers norms. All trucks that will be used for transportation of construction material, raw material and finished product will be covered with tarpaulin, kept maintained, be optimally loaded, be spill proof and have Pollution-Under-Check (PUC) certificates. Various pollution control equipment like electrostatic precipitators (E.S.P.), bag filters, fume extraction systems, dry fog systems, gas cleaning plant, scrubber and sprinklers shall be installed as per the requirement of every unit. The air quality prediction exercise was carried out for stack emissions and fugitive dust from stock yards. The incremental ground level concentrations on expansion from 3.55 to 7.53 M.T.P.A. has been calculated as 5.202 $\mu g/m^3$ for PM10, 2.994 $\mu g/m^3$ for PM2.5, 1.39 $\mu g/m^3$ for SO_2 and 1.572 $\mu g/m^3$ for NO_2. The impact of the plant will remain within permissible limits.

11.4.3 Noise and traffic density

Impact: The noise level during construction will be due to construction machinery. It will be temporary and reversible in nature. The noise level at sources like plant machinery are anticipated to go as high as 90-110 dB(A). During operation, noise will be generated due to operation of various equipment, machinery, pumps, turbo generators, etc.

Mitigation: The equipment shall be provided with acoustic shields or enclosures to limit the sound level within the plant boundary. Vibration 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, the requirement of water will be for process and sourced from Brahmani river. The withdrawal of water from Bramhani River can also have an impact in absence of mitigation measures. 1,102 m^3/hour waste water will be generated after expansion from DM unit regeneration; water pre-treatment; discharges from various units like CPP, kilns, furnaces, etc.; plant washings; leakages and sewage from buildings. During monsoon there will be run off from stock yard, solid waste storage area, roads, open areas and roof tops.

Mitigation: During construction phase, the sewage from site office and labour camps will be treated in septic tank- soak pit system. During operation, waste water streams from various units, processes and services of the plant will be collected in neutralisation tank (if needed) and common monitoring basin. From common monitoring basin, it will be utilized for dust suppression, sprinkling, ash quenching, fly ash brick plant and green belt watering. The sewage from toilets, washrooms and canteen of plant and colony sewage shall be treated in de-centralised septic tanks and sewage treatment plant.

The rainwater falling within the entire project area will be routed to the raw water reservoir and/or intermediate rainwater harvesting ponds through storm water drains. This will reduce water demand from the Bramhani river. Rooftop rainwater will be recharged to the ground.

The run off from stock yards and solid waste storage areas will be guided to settling chambers prior to discharge into rainwater harvesting ponds or raw water reservoir.

11.4.5 Land use

Impact: The total plant area of proposed 7.53 million tonne steel plant will be spread over 3569 acres. The construction and development in the existing project area has or is taking place. It comprises of internal roads, water reservoir, buildings, green belt and plantation, etc. During expansion, additional buildings and sheds of the new units will come up along with facilities. The temporary storage of solid wastes like char, ESP & bag filter dusts, sludges, FES dust, various slags from various sub-units, fly ash and other solid wastes on land would also impact the land.

Mitigation: The topsoil generated during construction will be preserved and shall be spread over the area where plantation is proposed. Plantation will be carried out at earliest to minimise soil erosion. To prevent contamination of water and soil, the finished product stock yards will be covered. Raw

material stock yard and solid waste storage areas will have impervious flooring to prevent seepage of leaching due to rains. Runoff will be collected in a garland drain around the stock yard & solid waste storage areas, settled in settling pond and directed to rain water harvesting ponds or raw water reservoir.

11.4.6 Solid waste

Impact: During construction phase, due to work force deployed for construction, there will be development of temporary establishment of residential and commercial nature. These will generate garbage. In the integrated steel plant operation dust collected from dust collectors, empty barrels (metal and plastic), bags, fly ash, bed ash, dust from air pollution control equipment, dolochar, various furnace slags, mill scale, scrap, rejected billets, coal fines & rejects, M.B.F. slag, iron ore fines, sinter returns, effluent treatment sludges, sweepings and other biodegradable wastes from the canteen will be the solid wastes generated.

Mitigation: Sponge iron kilns' dolochar will be used as fuel in power plant. Various furnace slags will be given for metal recovery, converted into aggregates or precious slag balls and used for several purposes. M.B.F. slag will be used for cement manufacturing. Mill scales, coke fines, iron ore fines, sinter returns and various E.S.P. & bag filter dusts will be used for sinter. Some of these can also be sent to pre-mixing bin of pellet plant. Steel scraps and rejects will be recycled by melting. Fly and bottom ash from existing & proposed expansion of power plant shall be used for brick making in house and balance given to cement plants, brick plants, road projects & other users. All stock piles will be laid on top of a stable liner to avoid leaching of materials to ground water.

11.4.7 Ecology

Impact: During construction and operation phase, impact is anticipated on the flora in the project area due to tree cutting. There is 3.156 ha forest land in the existing plant area of 1769 acres. Stage II forest clearance has been obtained from MOEF&CC for the same on 02.07.2015. There is no forest land in the expansion area of 1800 acres. Low adverse impact of proposed project is anticipated on the fauna as the density is low in the area immediately surrounding the proposed project. The air quality modeling shows that low impact will be caused on the surrounding forests.

Mitigation: Under the proposed green belt and plantation programme after expansion, 1179 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 22.10.2021. Company proposes extensive plantation outside plant boundary also. The expenditure for plantation and wildlife conservation plan shall be met through separate funds.

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. In the current expansion, additional 1800 acres is to be acquired.

There are approximately 126 inhabitants within the plant boundary. Hence, there will be displacees for expansion of steel plant. There will also be approximately 2100 land losers and land will be acquired through IDCO.

Most of the work force required for construction and operation of the proposed project will be drawn from the surrounding areas. Once the plant will commence operation, amenities like education, school, health, medical, entertainment, canteen, etc. will get developed in and around the plant. These facilities will inevitably be available to local people also in addition to those directly associated with the plant. During operation phase, 6650 people will be employed at full capacity of 7.53 million tonne.

Mitigation: It is proposed to hire the manpower locally in the proposed plant, to the extent possible in order to have a positive socio-economic impact. For the purpose, training for capacity building shall be undertaken by the company. Displacees and land owners from whom land will be acquired, will be given preference in employment. Other than direct and indirect employment leading to economic growth, the major benefit to the community will be through Corporate Social Responsibility (C.S.R.).

11.5 ANALYSIS OF ALTERNATIVES

Dhenkanal Steel Plant already has an environmental clearance of 3.55 million tonne finished steel dated 15.02.2021. Its construction is underway. Therefore, no alternative site has been selected. It is intended to expand the plant into adjoining or nearby areas and share the resources and facilities of the sanctioned plant. For steel making, the Induction Furnace (I.F.), Electric Arc Furnace (E.A.F.), Basic Oxygen Furnace (B.O.F.), New Oxygen Furnace (N.O.F.) and Energy Optimisation Furnace (E.O.F) technologies have been selected.

The Non Recovery type Coke Oven plant has been proposed for use. For the captive power plant, waste heat recovery boiler & AFBC/ CFBC boiler is proposed. Based on the techno-economic analysis and operating experience of existing pellet plants, straight kiln process has been selected in which drying, preheating, induration & cooling of pellets take place on the same strand.

11.6 ENVIRONMENTAL CONTROL AND MONITORING ORGANISATION

Rungta Mines Ltd. already has an Environment Management Department at the headquarter and project level. It will also be responsible for ensuring the environmental monitoring of the proposed plant. Monitoring of stack emissions, ambient air quality, water quality, water levels, noise levels, soil quality, tree count, etc. shall be carried out periodically at plant level. An environment officer is appointed at the plant. He is/ will be responsible for the aforementioned plant level monitoring, developing greenbelt, ensuring good housekeeping, ensuring statutory compliances as well as imparting environmental training to work force.

The total capital investment on environmental protection work is envisaged as Rs. 111.02 Crores and recurring expenditure during operation will be Rs. 35.85 Crores/year for 7.53 MTPA project.

11.7 DISASTER MANAGEMENT PLAN

All types of industries face certain types of hazards which can disrupt normal activities abruptly. They can lead to disasters like fires, inundation, failure of machinery, explosion, oil spillage, acid spillage, electrocution and hazardous waste spillage/ exposure, etc. Disaster management plan is formulated with an aim of taking precautions to control hazard propagation and avert disaster. It also instructs to take action after the disaster to limit the damage to minimum. To tackle the situation, a disaster control room will be established having links with all control rooms of the plant. An up-to-date communication facility will be provided to control rooms. The disaster control room shall be headed by emergency leader called Site Main Controller, who will be the plant manager.

11.8 PROJECT BENEFIT

During operation phase, around 6650 persons will be under direct employment of the company, at full capacity. Many more persons will be indirectly engaged either on contract basis or in transportation of materials or in provision of different services associated with the project. As majority of unskilled and semi-skilled persons will be from the surrounding villages, social & infrastructural benefits will extend to the local population. Improvement is expected in education facilities, health care services, road infrastructure and drinking water facilities through proposed Corporate Social Responsibility (CSR). Company will spend 2% of the average annual profit of the previous three years on CSR.

11.9 DISCLOSURE OF CONSULTANTS

The consultants engaged for the preparation of the EIA/EMP of the project are Min Mec Consultancy Pvt. Ltd. It was registered in July 1983 with the Registrar of Companies, Delhi & Haryana, India. In 1994, Min Mec established a modern R&D Laboratory. Min Mec is ISO 9001: 2015 certified under ANZ-JAS. In June 2006, the laboratory received accreditation from

NABL (latest certificate no. TC-6337 valid upto 21.11.2021), which has been renewed as per procedure since. In 2012, lab had been recognized under Environment Protection Act (EPA) by Ministry of Environment, Forest & Climate Change, Government of India and has been renewed till 2024. On 25.02.2021, Min Mec Consultancy was accredited by QCI-NABET as Mine Plan Preparing Agency (MPPA). Min Mec has prepared the EIA/EMP based on the permission granted from Delhi High Court vide LPA 110/2014 and CM No. 2175/2014 (stay) and in W.P.(C) 3665/2016.

CHAPTER 12

DISCLOSURE OF CONSULTANTS ENGAGED

Min Mec Consultancy Pvt. Ltd. (MMCPL) 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/ CIDA/ JICA sponsored projects and of national standards of MoEF&CC.

Min Mec Consultancy Pvt. Ltd was registered in July 1983 with the Registrar of Companies, Delhi & Haryana, India. In 1994, Min Mec established a modern R & D laboratory. On 02.02.2003, Min Mec received ISO 9001 certification under ANZ-JAS which is renewed periodically. In June 2006, the laboratory received accreditation from NABL for compliance to ISO 17025. The laboratory is recognised by MoEF&CC (Gazette Notification No. S.O. 3744 (E) dated 17.10.2019) Copy of the latest valid certificates are given in **Annexure XXIII**. The laboratory also received ISO 14001 certification in the year 2011, which has been renewed regularly. In 2011, the laboratory had received its first OHSAS 18001 certification and now it is ISO 45001:2018 certified.

Services and expertise

Services are provided to the following sectors

- Mines-surface and under ground for all minerals and metals
- Infrastructure projects such as jetties, highways, water supply pipelines projects, power stations, canals, minor dams, etc.
- Industries such as cement plants, smelters, steel, chemicals, pharmaceuticals, petrochemicals, salt works, pesticides and other hazardous and polluting industries.

As on March 2021, the following projects have been executed or under way since the inception of the company:

Studies	Numbers
EIA/EMP, Environmental Studies, obtaining ECs & NOCs, EC amendments, validity extensions, EC/ NOC compliances, etc.	394
Mine Planning and Mine Closure Plans(Coal/non coal)	136
Hydro-geological, hydrological and Nala diversion studies	74
Pre-feasibility studies/Techno Economic Feasibility reports (coal blocks)	60
Feasibility studies (sponge iron & power plants)	40
Traffic Impact Assessment Studies	28

Studies	Numbers
Risk Analysis & Disaster Management Plan	17
Socio Economics surveys & studies	15
Due diligence for bank financing/ lenders consultant	18
Satellite Imagery Interpretation	12
Market surveys	8
Wildlife conservation plan	11
Detailed Project Reports for Water supply, drainage & sewage survey and design	4
EHS audits	4
Regional Studies	2
Others (due diligence, satellite imagery interpretation, softwares etc.)	6
Clearance from Airport Authority	3
Total	**832**

Personnel

Min Mec has a strong team of in-house experts in EIA, EMP, DMP, RA, EHS, mining, socio economics and software development. The team of experts is supported by a panel of experts in various fields with an average experience of over 30 years.

Declaration

I, Marisha Sharma, hereby, confirm that the below mentioned experts prepared the **EIA/EMP for Expansion of Integrated Steel Plant from 3.55 to 7.53 MTPA** at villages Jharbandh, Galpada, Tarkabeda, Kothalu, Beruanpal, Kankalu, Benipathar, Kadala, Badamunda, Paik Purana Kote, Naraharipur, Chandrasekharpur, Sanamunda, Kaliakoli, Kantimili, Sulanali, Janhamunda, Patala and Nuapada in Dhenkanal district of Odisha of M/s Rungta Mines Ltd.

I also confirm that the consultant organization shall be fully accountable for any mis-leading information mentioned in this statement.

It is certified that no unethical practice like 'copy and paste', and use of external data / text without proper acknowledgement has been done, while preparing this EIA report.

I, hereby, certify that I was a part of the EIA team in the capacity of EIA coordinator that developed the above EIA.



Date : 08.10.2021
Name: Marisha Sharma, Director (Technical), Min Mec Consultancy Pvt. Ltd.
Period of involvement: Various months (from February 2021 till date)
Contact information: 011-29532236, 29535891

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 XXIV)**.

Team engaged

The team involved in EIA preparation is given in **Table 12.1**.

TABLE 12.1: TEAM INVOLVED IN EIA PREPARATION AND THEIR ROLES

Expert Name	Qualifications	Experience
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.
	PG Certificate in participatory management of displacement, resettlement and rehabilitation	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, land use analysis, mathematical modelling of air, hydrogeological studies, impact on noise and air.
B. D. Sharma	M. Tech (Hons), B. Tech (Min.), PG Diploma (Env. & Ecology)	Since, 1973 active in mining sector and allied activities (washeries, beneficiation, pit head industries like cement, power, etc.) with 29 years in environmental impact assessment, management and planning with over 300 projects executed. Identifying and assessing quantum of emissions and guiding computer based modelling, impact on ground water, water budgeting, water balancing, identification of hazards and hazardous substances, risk analysis and preparation of on-site emergency preparedness plan.
Rajesh Kumar Chopra	B.Tech in Mining Engg (BHU-Varanasi).	Former Director (Technical), CMPDIL.
		Since 1977, practical field experience in underground and opencast mining along with mine planning, coal production planning, policy and regulations (for energy & mining), economic & financial analysis of mining projects and environmental impact and management.
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.
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.

Expert Name	Qualifications	Experience
Gaurav Yadav	M.Sc. (Env. Sc.), B.Sc. (Life sciences)	Since 2012, research in bioremediation of water pollutants, water & soil quality analysis, ecological studies, microbiology studies and impact of pollutants on environment
Pappu Kumar	B. Tech (with Hons.) in Env. Engineering	Since 2017, assisting in preparation of documentation for environmental clearance, water quality data analysis, air quality data analysis, air quality modeling, water resource calculations, coordination with laboratory, etc.
Dinesh Kumar Bansal	B.Sc. (PMC), B. Sc. (Chemical Technology), M.Sc. (Chemical Technology)	Since 1979, in quality control, procurement, manufacturing, in different sectors. Since 1991, conceptualisation, formulation of reports, documentation and obtaining statutory clearances (environment, forest, ropeway inspector, etc) for construction, operation & maintenance of passenger ropeways for various projects. Since 2020, involved in preparation of EIA's of other sectors such as mining, steel plants, cement plants, etc.

Laboratory:

Environmental monitoring and testing has been done by Min Mec R&D Laboratory, NABL accredited (Certificate No. TC-6337 valid till 20.11.2021, further extended for 1 year as per NABL policy dated 26.06.2020) and is recognised by MoEF&CC (Gazette Notification No. S.O. 3744 (E) dated 17.10.2019 valid for 5 years).

ANNEXURES

ANNEXURE : I

No.J-11011/309/2018-IA.II(I)

Goverment of India

Minister of Enviroment,Forest and Climate Change

Impact Assessment Division

***

Indira Paryavaran Bhavan,
Vayu Wing,3rd Floor,Aliganj,
Jor Bagh Road,New Delhi-110003
13 Aug 2021

To,

M/s RUNGTA MINES LTD
Rungta Mines Limited Sponge Iron Division,Main Road Barbil, Keonjhar Odisha,
Keonjhar-758035
Orissa

Tel.No.676-276081; Email:rml.forest@gmail.com

Sir/Madam,

This has reference to the proposal submitted in the Ministry of Environment, Forest and Climate Change to prescribe the Terms of Reference (TOR) for undertaking detailed EIA study for the purpose of obtaining Environmental Clearance in accordance with the provisions of the EIA Notification, 2006. For this purpose, the proponent had submitted online information in the prescribed format (Form-1) along with a Pre-feasibility Report. The details of the proposal are given below:

1. Proposal No.:	IA/OR/IND/224229/2021
2. Name of the Proposal:	Expansion of Dhenkanal Steel Plant from 3.55 to 7.53 MTPA finished steel
3. Category of the Proposal:	Industrial Projects - 1
4. Project/Activity applied for:	2(b) Mineral beneficiation 3(a) Metallurgical industries (ferrous & non ferrous) 3(b) Cement plants 4(b) Coke oven plants
5. Date of submission for TOR:	11 Aug 2021

In this regard, under the provisions of the EIA Notification 2006 as amended, the Standard TOR for the purpose of preparing environment impact assessment report and environment management plan for obtaining prior environment clearance is prescribed with public consultation as follows:

2(b):STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR MINERAL BENEFICIATION PROJECTS AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

1) The alternate sites considered, the relative merits and demerits and the reasons for selecting the proposed site for the Beneficiation Plant should be indicated.

2) Details of the technology and process involved for beneficiation should be given. .

3) Location of the proposed Plant w.r.t. the source of raw material and mode of transportations of the ore from mines to the beneficiation plant should be justified.

4) Treatment of run of mine (ROM) and or of the fines/waste dump should be spelt out.

5) Estimation of the fines going into the washings should be made and its management described.

6) Details of the equipment, settling pond etc. should be furnished.

7) Detailed material balance should be provided.

8) Sources of raw material and its transportation should be indicated. Steps proposed to be taken to protect the ore from getting air borne should be brought out.

9) Management and disposal of tailings and closure plan of the tailing pond, if any after the project is over, should be detailed in a quantified manner.

10) The water requirement for the project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the project should also be indicated.

11) A copy of the document in support of the fact that the Proponent is the rightful lessee of the unit should be given.

12) All documents including EIA and public hearing should be compatible with one another in terms of the production levels, waste generation and its management and technology and should be in the name of the lessee.

13) All corner coordinates of the Unit, superimposed on a High Resolution Imagery/Toposheet should be provided. Such an Imagery of the proposed Unit should clearly show the land use and other ecological features of the study area (core and buffer zone).

14) It should be clearly indicated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large,may also be detailed in the EIA Report.

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

15) Issues relating to Safety should be detailed. The proposed safeguard measures in each case should also be provided. Disaster management plan shall be prepared and included in the EIA/EMP Report.

16) The study area will comprise of 10 km zone around the Plant.

17) Cumulative impact study of both Beneficiation Plant with suggested mitigation measures as per the study should be described.

18) Location of Railway siding with its handling capacity and safety measures should be indicated.

19) Option to provide only silo for storage of minerals instead of open stacking to avoid fugitive dust should be explored and arrangements finalized justified.

20) Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.

21) Details of the land for any Over Burden Dumps outside the lease, such as extent of land area, distance from lease, its land use, R&R issues, if any, should be given.

22) A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the Project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.

23) Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.

24) Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.

25) The vegetation in the RF / PF areas in the study area, with necessary details, should be given.

26) A study shall be got done to ascertain the impact of the Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted.

27) Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly

indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.

28) A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan alongwith budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.

29) Proximity to Areas declared as 'Critically Polluted' shall also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB/CPCBshall be secured and furnished to the effect that the proposed activities could be considered.

30) Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the unit w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).

31) R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects, should be discussed in the report.

32) One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the unit in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.

33) Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.

34) The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.

35) Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be secured and copy furnished. .

36) Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.

37) Impact of the project on the water quality, both surface and groundwater should be assessed and necessary safeguard measures, if any required, should be provided.

38) Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.

39) A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the project. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to the pollution.

40) Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered.

41) Details of the onsite shelter and facilities to be provided to the workers should be included in the EIA report.

42) Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area should be be detailed.

43) Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.

44) Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.

45) Public hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.

46) Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the project should be given.

47) The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.

48) A brief background of the Project, its financial position, Group Companies and legal issues etc should be provided with past and current important litigations if any.

49) Benefits of the Project, if the project is implemented should be outlined. The benefits of the projects shall clearly indicate environmental, social, economic, employment potential, etc.

50) Besides the above, the below mentioned general points are also to be followed:-

a) All documents to be properly referenced with index and continuous page numbering.

b) Where data are presented in the report especially in Tables, the period in which the data were collected and the sources should be indicated.

c) Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the project.

d) Where the documents provided are in a language other than English, an English translation should be provided.

e) The Questionnaire for environmental appraisal of project as devised earlier by the Ministry shall also be filled and submitted.

f) While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should also be followed.

g) Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.

h) As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certifiedReport of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project by the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.

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STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

3(a):STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR METALLURGICAL INDUSTRIES (FERROUS & NON FERROUS) PROJECTS AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

A. STANDARD TERMS OF REFERENCE (TOR)

1) Executive Summary

2) Introduction

i. Details of the EIA Consultant including NABET accreditation

ii. Information about the project proponent

iii. Importance and benefits of the project

3) Project Description

i. Cost of project and time of completion.

ii. Products with capacities for the proposed project.

iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.

iv. List of raw materials required and their source along with mode of transportation.

v. Other chemicals and materials required with quantities and storage capacities

vi. Details of Emission, effluents, hazardous waste generation and their management.

vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)

viii. Process description along with major equipments and machineries, process flow sheet (quantative) from raw material to products to be provided

ix. Hazard identification and details of proposed safety systems.

x. Expansion/modernization proposals:

a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing Iexisting operation of the project from SPCB shall be attached with the EIA-EMP report.

b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

4) Site Details

i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.

ii. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)

iii. Details w.r.t. option analysis for selection of site

iv. Co-ordinates (lat-long) of all four corners of the site.

v. Google map-Earth downloaded of the project site.

vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.

vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.

viii. Landuse break-up of total land of the project site (identified and acquired), government/ private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)

ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area

x. Geological features and Geo-hydrological status of the study area shall be included.

xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)

xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.

xiii. R&R details in respect of land in line with state Government policy

5) Forest and wildlife related issues (if applicable):

i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)

ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.

iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon

v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area

vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife

6) Environmental Status

i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.

ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.

iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.

iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.

v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.

vi. Ground water monitoring at minimum at 8 locations shall be included.

vii. Noise levels monitoring at 8 locations within the study area.

viii. Soil Characteristic as per CPCB guidelines.

ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.

x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.

xi. Socio-economic status of the study area.

7) Impact and Environment Management Plan

i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.

ii. Water Quality modelling - in case of discharge in water body

iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.

iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.

v. Details of stack emission and action plan for control of emissions to meet standards.

vi. Measures for fugitive emission control

vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.

viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.

ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.

x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.

xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.

xii. Action plan for post-project environmental monitoring shall be submitted.

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

8) Occupational health

i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers

ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.

iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,

iv. Annual report of heath status of workers with special reference to Occupational Health and Safety.

9) Corporate Environment Policy

i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.

ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.

iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.

iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report

10) Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

11) Enterprise Social Commitment (ESC)

i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time

bound action plan shall be included. Socio-economic development activities need to be elaborated upon.

12) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.

13) 'A tabular chart with index for point wise compliance of above TOR.

B. SPECIFIC TERMS OF REFERENCE FOR EIASTUDIES FOR METALLURGICAL INDUSTRIES (FERROUS & NON FERROUS)

1) Complete process flow diagram describing each unit, its processes and operations, along with material and energy inputs & outputs (material and energy balance).

2) Details on blast furnace/ open hearth furnace/ basic oxygen furnace/ladle refining, casting and rolling plants etc.

3) Details on installation/activation of opacity meters with recording with proper calibration system

4) Details on toxic metals including mercury, arsenic and fluoride emissions

5) Details on stack height requirement for integrated steel

6) Details on ash disposal and management -Non-ferrous metal

7) Complete process flow diagram describing production of lead/zinc/copper/ aluminium, etc.

8) Raw materials substitution or elimination

9) Details on smelting, thermal refining, melting, slag fuming, and Waelz kiln operation

10) Details on Holding and de-gassing of molten metal from primary and secondary aluminum, materials pre-treatment, and from melting and smelting of secondary aluminium

11) Details on solvent recycling

12) Details on precious metals recovery

13) Details on composition, generation and utilization of waste/fuel gases from coke oven plant and their utilization.

14) Details on toxic metal content in the waste material and its composition and end use (particularly of slag).

15) Trace metals Mercury, arsenic and fluoride emissions in the raw material.

16) Trace metals in waste material especially slag.

17) Plan for trace metal recovery

18) Trace metals in water

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

C. ADDITIONAL TOR FOR INTEGRATED STEEL PLANT

1). Iron ore/coal linkage documents along with the status of environmental clearance of iron ore and coal mines

2). Quantum of production of coal and iron ore from coal & iron ore mines and the projects they cater to. Mode of transportation to the plant and its impact

3). For Large ISPs, a 3-D view i.e. DEM (Digital Elevation Model) for the area in 10 km radius from the proposal site. MRL details of project site and RL of nearby sources of water shall be indicated.

4). Recent land-use map based on satellite imagery. High-resolution satellite image data having 1m-5m spatial resolution like quickbird, Ikonos, IRS P-6 pan sharpened etc. for the 10 Km radius area from proposed site. The same shall be used for land used/land-cover mapping of the area.

5). Respirable Suspended particulate matter (RSPM) present in the ambient air must be analysed for source analysis - natural dust/RSPM generated from plant operations (trace elements). The RSPM shall also be analysed for presence of poly-aromatic hydrocarbons (PAH), i.e. Benzene soluble fraction, where applicable. Chemical characterization of RSPM and incorporating of RSPM data.

6). All stock piles will have to be on top of a stable liner to avoid leaching of materials to ground water.

7). Plan for the implementation of the recommendations made for the steel plants in the CREP guidelines.

8). Plan for slag utilization

9). Plan for utilization of energy in off gases (coke oven, blast furnace)

10). System of coke quenching adopted with justification.

***

3(b):STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR CEMENT PLANTS PROJECTS AND INFORMATION TO BE INCLUDED IN EIA/ EMP REPORT

A. STANDARD TERMS OF REFERENCE (TOR)

1) Executive Summary

2) Introduction

i. Details of the EIA Consultant including NABET accreditation

ii. Information about the project proponent

iii. Importance and benefits of the project

3) Project Description

i. Cost of project and time of completion.

ii. Products with capacities for the proposed project.

iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.

iv. List of raw materials required and their source along with mode of transportation.

v. Other chemicals and materials required with quantities and storage capacities

vi. Details of Emission, effluents, hazardous waste generation and their management.

vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)

viii. Process description along with major equipments and machineries, process flow sheet (quantative) from raw material to products to be provided

ix. Hazard identification and details of proposed safety systems.

x. Expansion/modernization proposals:

a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing Iexisting operation of the project from SPCB shall be attached with the EIA-EMP report.

b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 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.

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

4) Site Details

i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.

ii. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)

iii. Details w.r.t. option analysis for selection of site

iv. Co-ordinates (lat-long) of all four corners of the site.

v. Google map-Earth downloaded of the project site.

vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.

vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.

viii. Landuse break-up of total land of the project site (identified and acquired), government/ private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)

ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area

x. Geological features and Geo-hydrological status of the study area shall be included.

xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)

xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.

xiii. R&R details in respect of land in line with state Government policy

5) Forest and wildlife related issues (if applicable):

i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)

ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)

iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.

iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon.

v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area

vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife

6) Environmental Status

i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.

ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.

iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.

iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.

v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.

vi. Ground water monitoring at minimum at 8 locations shall be included.

vii. Noise levels monitoring at 8 locations within the study area.

viii. Soil Characteristic as per CPCB guidelines.

ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.

x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.

xi. Socio-economic status of the study area.

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

7) Impact and Environment Management Plan

i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.

ii. Water Quality modelling - in case of discharge in water body

iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.

iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.

v. Details of stack emission and action plan for control of emissions to meet standards.

vi. Measures for fugitive emission control

vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.

viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.

ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.

x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.

xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.

xii. Action plan for post-project environmental monitoring shall be submitted.

xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

8) Occupational health

i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers

ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.

iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,

iv. Annual report of heath status of workers with special reference to Occupational Health and Safety.

9) Corporate Environment Policy

i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.

ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.

iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.

iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report

10) Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

11) Enterprise Social Commitment (ESC)

i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

12) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.

13) A tabular chart with index for point wise compliance of above TOR.

B. SPECIFIC TERMS OF REFERENCE FOR EIASTUDIES FOR CEMENT PLANTS

1. Limestone and coal linkage documents along with the status of environmental clearance of limestone and coal mines
2. Quantum of production of coal and limestone from coal & limestone mines and the projects they cater to;
3. For large Cement Units, a 3-D view i.e. DEM (Digital Elevation Model) for the area in 10 km radius from the proposal site.
4. Present land use shall be prepared based on satellite imagery. High-resolution satellite image data having 1m-5m spatial resolution like quickbird, Ikonos, IRS P-6 pan sharpened etc. for the 10 Km radius area from proposed site. The same shall be used for land used/land-cover mapping of the area.
5. If the raw materials used have trace elements, an environment management plan shall also be included.
6. Plan for the implementation of the recommendations made for the cement plants in the CREP guidelines must be prepared.
7. Energy consumption per ton of clinker and cement grinding
8. Provision of waste heat recovery boiler
9. Arrangement for use of hazardous waste

***

4(b):STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR COKE OVEN PLANTS PROJECTS AND INFORMATION TO BE INCLUDED IN EIA/ EMP REPORT

A. STANDARD TERMS OF REFERENCE

1) Executive Summary

2) Introduction

i. Details of the EIA Consultant including NABET accreditation

ii. Information about the project proponent

iii. Importance and benefits of the project

3) Project Description

i. Cost of project and time of completion.

ii. Products with capacities for the proposed project.

iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.

iv. List of raw materials required and their source along with mode of transportation.

v. Other chemicals and materials required with quantities and storage capacities

vi. Details of Emission, effluents, hazardous waste generation and their management.

vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)

viii. Process description along with major equipments and machineries, process flow sheet (quantative) from raw material to products to be provided

ix. Hazard identification and details of proposed safety systems.

x. Expansion/modernization proposals:

a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing Iexisting operation of the project from SPCB shall be attached with the EIA-EMP report.

b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 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.

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

4) Site Details

i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.

ii. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)

iii. Details w.r.t. option analysis for selection of site

iv. Co-ordinates (lat-long) of all four corners of the site.

v. Google map-Earth downloaded of the project site.

vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.

vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.

viii. Landuse break-up of total land of the project site (identified and acquired), government/ private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)

ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area

x. Geological features and Geo-hydrological status of the study area shall be included.

xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)

xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.

xiii. R&R details in respect of land in line with state Government policy

5) Forest and wildlife related issues (if applicable):

i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)

ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland *(in case of projects involving forest land more than 40 ha)*

iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.

iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon

v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area

vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife.

6) Environmental Status

i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.

ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.

iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.

iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.

v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.

vi. Ground water monitoring at minimum at 8 locations shall be included.

vii. Noise levels monitoring at 8 locations within the study area.

viii. Soil Characteristic as per CPCB guidelines.

ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.

x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.

xi. Socio-economic status of the study area.

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

7) Impact and Environment Management Plan

i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.

ii. Water Quality modelling - in case of discharge in water body

iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.

iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.

v. Details of stack emission and action plan for control of emissions to meet standards.

vi. Measures for fugitive emission control

vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.

viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.

ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.

x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.

xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.

xii. Action plan for post-project environmental monitoring shall be submitted.

xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

8) Occupational health

i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers

ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.

iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,

iv. Annual report of heath status of workers with special reference to Occupational Health and Safety.

9) Corporate Environment Policy

i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.

ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.

iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.

iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report

10) Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

11) Enterprise Social Commitment (ESC)

i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.

12) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.

13) 'A tabular chart with index for point wise compliance of above TOR.

B. SPECIFIC TERMS OF REFERENCEFOREIASTUDIES FOR COKE OVEN PLANTS

1. Justification for selecting recovery/non-recovery (beehive) type batteries with the proposed unit size.

2. Details of proposed layout clearly demarcating various facilities such as coal storages, coke making, by-product recovery area,etc within the plant.

3. Details of coke oven plant (recovery/non-recovery type) including coal handling, coke oven battery operations, coke handling and preparation.

***

ANNEXURE : II(a)

[illegible]

Date: [illegible] February, 2021

To

Shri [illegible]

Subject: [illegible]

Sir,

1. [illegible]

2. [illegible]

Date of Application	Consideration	Details	Date of Accord
[illegible]	[illegible]	[illegible]	[illegible]

3. [illegible]

ANNEXURE : II(a) Contd..

4. [illegible]

S. No.	Particulars	Details
i.	[illegible]	[illegible]
ii.	[illegible]	[illegible]
iii.	[illegible]	[illegible]
iv.	[illegible]	[illegible]
v.	[illegible]	[illegible]
vi.	[illegible]	[illegible]
vii.	[illegible]	[illegible]
viii.	[illegible]	[illegible]

5. [illegible]

[illegible]	[illegible]	Status			Remark
		[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	0	[illegible]	[illegible]
[illegible]	Govt.	[illegible]	0	[illegible]	[illegible]

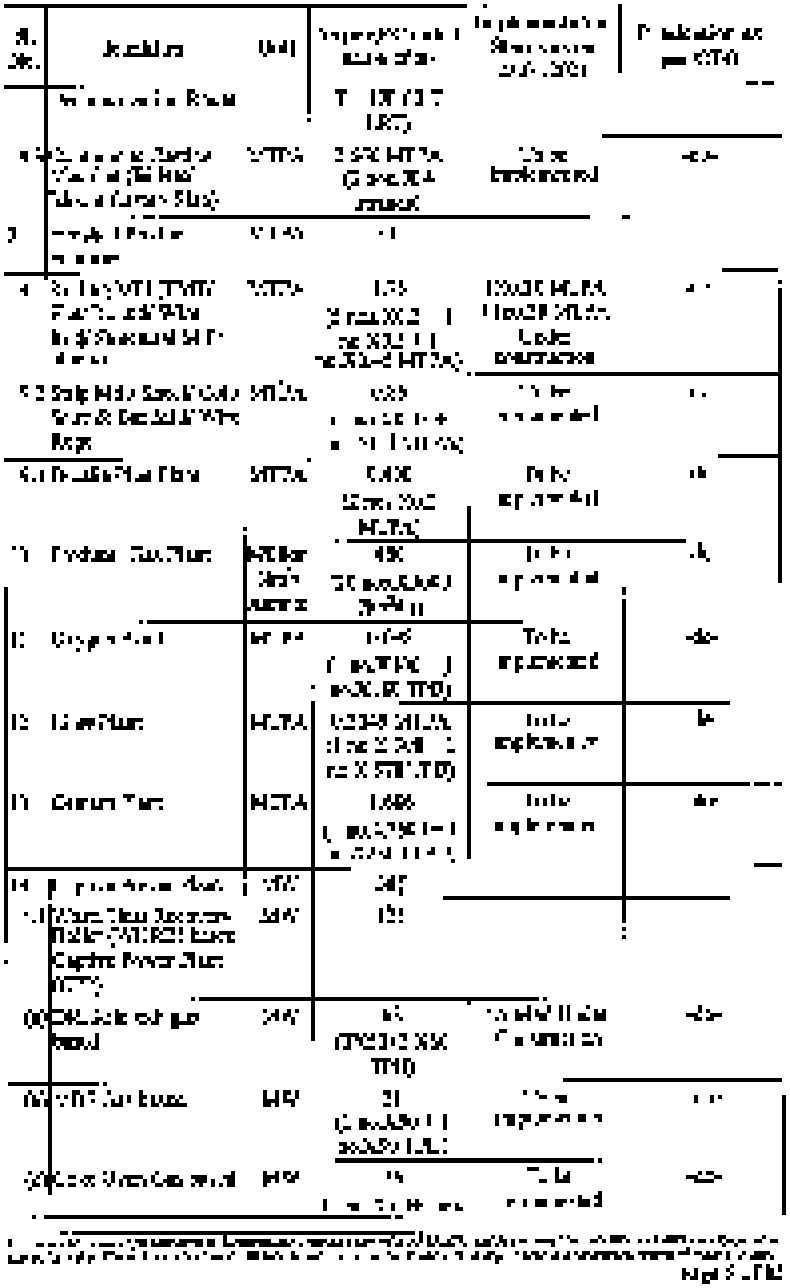
ANNEXURE : II(a) Contd..

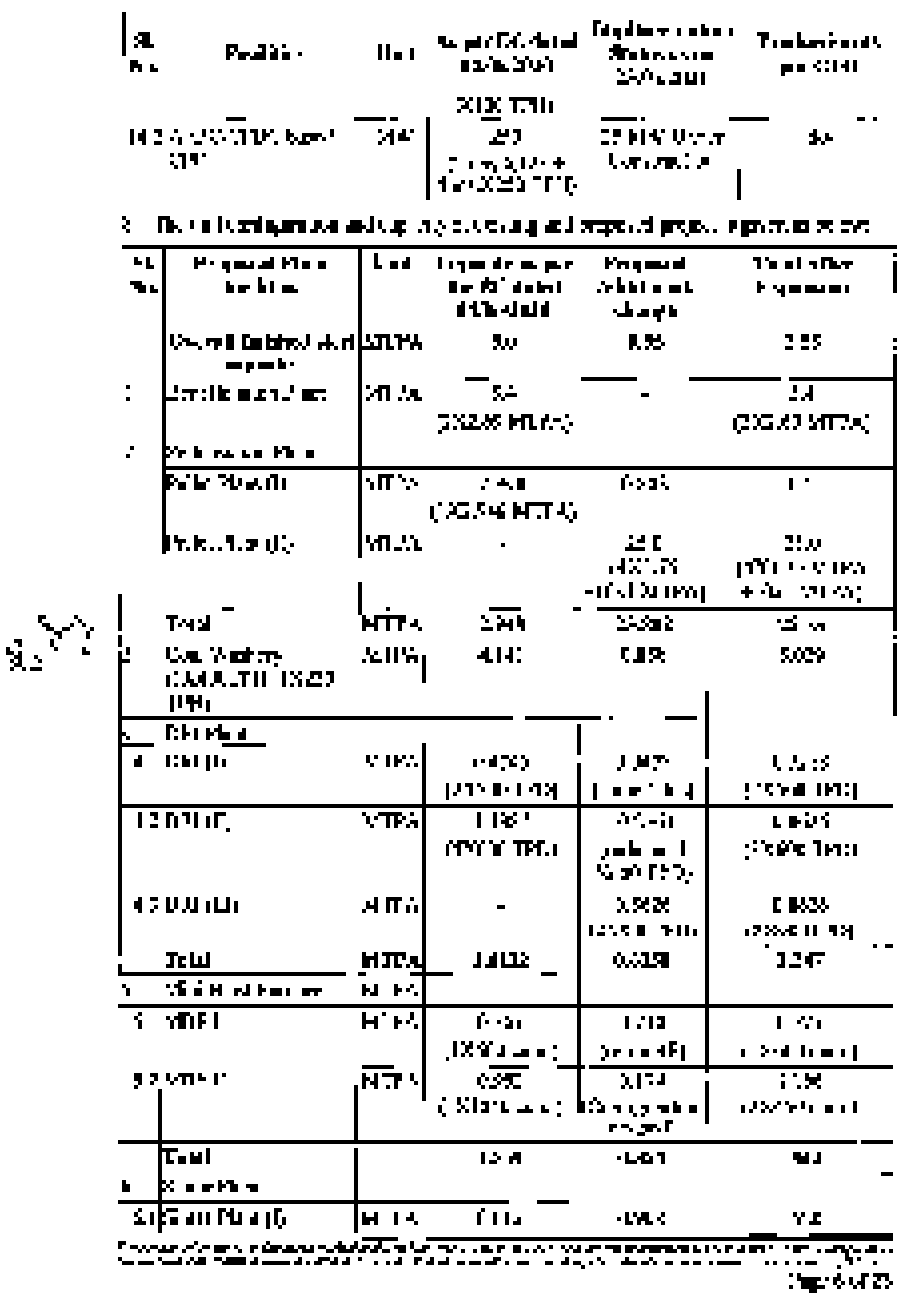
Plant Name	Unit	Status	Remarks

Sr. No.	RF Details

Sr. No.	Particulars	Unit	As per DC dated 01/06/2018	Implementation Schedule as on 31.03.2021	Production as per CTO

ANNEXURE : II(a) Contd..





ANNEXURE : II(a) Contd..

Sl No.	Proposed Plant Facilities	Unit	Capacity/project (Rs. Cr. Rs. Million)	Proposed Addition/ change	Total After Expansion
2.2	Steam Turbine (II)	MW/hr	[illegible]	0.25%	[illegible]
	Total	MW/hr	1,993	1.25%	2,017
3	[illegible]	MW/hr	[illegible]	0.25%	[illegible]
3.1	Steel Melting Shop	MT/hr	2,000	0.25%	2,005
3.2	Steel Melting Shop Expansion Project: Rolling	MT/hr	1,000	0.25%	[illegible]
3.3	Steel Melting Shop Electric Arc Furnace Ladle Refining Furnace Vacuum Degassing Unit Continuous Casting Machine	MT/hr	[illegible]	[illegible]	[illegible]
3.4	Cold Rolling Complex Mill Stand Coilers Pickling Line Annealing Furnace	MT/hr	2,250 MT/hr	0.25%	2,255
3.5	Blast Furnace Facilities	MT/hr	2,000	0.25%	2,005
3.6	Coke Oven Plant (CO) Coke Oven Gas Plant Waste Gas Plant	MT/hr	[illegible]	[illegible]	[illegible]
3.7	Sinter Plant Sinter Machine	MT/hr	1,250	0.25%	[illegible]
3.8	Power Generation	MW/hr	2,000	0.25%	2,005

Sl No.	Proposed Plant Facilities	Unit	Capacity/project (Rs. Cr. Rs. Million)	Proposed Addition/ change	Total After Expansion
4.1	Coke Oven	MT/hr	[illegible]	0.25%	[illegible]
4.2	Coke Oven	MT/hr	[illegible]	[illegible]	[illegible]
4.3	Power Plant	MT/hr	1,000	-	1,000
4.4	Coking Power Plant	MW	25	0.25	0.25
4.5	Waste Heat Recovery Plant (WHRP) Blast Furnace Power Plant (BFPP)	MW	12	100	25
4.6	Coke Oven Gas Plant	MW	48	[illegible]	[illegible]
4.7	Sinter Machine	MW	1	1	25
4.8	Coke Oven Gas Plant	MW	12	1	13
4.9	[illegible]	MW	-	20	17
4.10	[illegible]	MW	12	[illegible]	[illegible]
4.11	[illegible]	Nos.	-	-	24

6. The Company is not required to obtain Consent to Establish under the provisions of Water (Prevention & Control of Pollution) Act, 1974 and Air (Prevention & Control of Pollution) Act, 1981.

11. Particulars of the raw materials required for the proposed expansion and source of procurement along with mode of transport:

Sl No.	Raw Material	Quantity required	Source	Mode of Transport	Distance from source
1	[illegible]	[illegible]	Domestic open market/ Captive Mines	Rail	[illegible]
2	[illegible]	[illegible]	[illegible] & Other Sources/ DMCC Operations	Rail	[illegible]

Sl. No	Description	Total water requirement	Source	Distance from each Source	Mode of transportation
1.	Domestic	40 KLD	Open well	0.5	Pipeline
2.	Flushing purpose	35 KLD	Open well	0.5	Pipeline
3.	Green Belt Development	45 KLD	Open well/ Tube well	1.0	Pipeline
4.	Cooling Tower	10 KLD	Open well/ Tube well/ Municipal Supply	1.0	Pipeline/ Tanker
5.	Boilers	5 KLD	Open well	1.0	Pipeline
6.	Laboratory	2 KLD	Open well	1.0	Pipeline
7.	Canteen	2 KLD	Open well	1.0	Road
8.	Parking	2 KLD	Open well	1.0	Road
9.	Utility	2 KLD	Open well	1.0	Road
10.	Wet Scrubber System	4 KLD	Open well	1.0	Road
11.	Dust Suppression	5-23 KLD	Open well	0.5	Pipeline
12.	Utility	5 KLD	Open well/ Tube well		
13.	Others	11 KLD	Open well	0.5	Road/Rail
14.	Other purposes	15 KLD	Open well	1.0	Road
15.	Total Water	81 KLD	Open well	1.0	Road

[illegible] Proposed water requirement for the project is 81 KLD. Out of which 40 KLD will be used for domestic purpose, 35 KLD for flushing purpose, 45 KLD for green belt development, 10 KLD for cooling tower, 5 KLD for boilers, 2 KLD for laboratory, 2 KLD for canteen, 2 KLD for parking, 2 KLD for utility, 4 KLD for wet scrubber system, 5-23 KLD for dust suppression, 5 KLD for utility, 11 KLD for others and 15 KLD for other purposes. Total water requirement will be met from open well and tube well. Water balance chart is enclosed for your kind reference. (ANNEXURE-II(A))

12. The total percentage [illegible] of the project area will be covered with [illegible] and the rest of the area for the roads and open spaces.

13. Details of Environmental Status

Parameter	Ambient Air Quality (AAQ)
Air (particulate matter)	PM10 = 22.0 to 42.2 µg/m³
Sulphur	PM2.5 = 8.7 to 19.9 µg/m³
	SO2 = 4.3 to 9.6 µg/m³
	NOx = 5.2 to 21.2 µg/m³
	CO = BDL(<0.57) mg/m³
Noise monitoring	Noise level dB(A)
	Day time = 51.3 dB(A)
	Night time = 41.9 dB(A)
Water monitoring (Surface water)	pH = 7.4 to 7.8, Total Hardness = 204 mg/l, Chlorides = 32 mg/l, Fluorides = 0.4 mg/l, Dissolved Oxygen = 5.6 mg/l, Biochemical Oxygen Demand = 2.0 mg/l, Chemical Oxygen Demand = 8.0 mg/l, Oil & Grease = BDL(<1.0) mg/l, Total Dissolved Solids = 1240 mg/l
Water monitoring (Ground water)	pH = 7.15 to 7.49, Total Hardness = 240 mg/l, Chlorides = 48 mg/l, Fluorides = 0.5 mg/l
Soil	Red Sandy Loamy Soil

Page 1 of 2

Traffic management and control	[illegible] of traffic management plan to avoid congestion during construction and operation phase. Adequate parking space will be provided for the vehicles. Traffic signages will be provided at the entry and exit gates. Traffic management plan will be implemented in consultation with local traffic police.
Fire and Safety	Adequate fire fighting system will be provided in the project. Adequate safety measures will be provided in the project. Adequate safety measures will be provided in the project. Adequate safety measures will be provided in the project.

14. [illegible] Environmental Management Plan along with budgetary provisions

Sl. No.	Source	Type of Waste	Quantity generated (TPA)	Mode of Treatment and Disposal
1.	Manufacturing Process	Spent Oil	5 KL/Annum	Will be sold to registered recyclers
		Waste Resin	0.5 MT/Annum	Will be sold to registered recyclers
		Spent Catalyst	0.5 MT/Annum	Will be sold to registered recyclers
		Discarded Containers	1000 Nos/Annum	Will be sold to registered recyclers
2.	Utility	Spent Oil	1 KL/Annum	Will be sold to registered recyclers
		Discarded Containers	50 Nos/Annum	Will be sold to registered recyclers
3.	Effluent Treatment Plant	ETP Sludge	1 MT/Annum	Will be sold to registered recyclers
4.	Domestic Activity	Municipal Solid Waste	1 MT/Annum	Will be sold to registered recyclers

Page 1 of 2

Sl. No.	Source	Type of Waste	Quantity generated (MT/A)	Mode of Treatment / Disposal
		Asbestos		Disposed to authorized recyclers
9	MRF	MS Scrap	552.791	100% used in house in making FBN cement sector/ other project
		Fine Coke and Fines	39.154	100% reused in sinter making in other project
		Bridge Iron SLAG	0	100% consumed after crushing in City SLAG
10	Blast Furnace	Blast Furnace Dust	4,800.78	100% reused in sinter making within project
11	Oxygen Plant	Bag Filter Dust	48.71	100% reused in sinter making in own project
12	Lime Kiln Plant	Bag filter dust	55.063	100% reused in sinter making in own project
		Slag	1,32,000	100% given for road construction and in aggregate & sand for making cement bricks
		Kiln Soda	44,000	100% reused in soda ash plant, in addition plant running & some plant also depends on this product
13	Electrical Furnace	Slag	1,10,000	100% used in road making, filler in cement & in concrete. Used in road construction, concrete making, production of cement bricks
		Bag Filter dust	11,000	100% reused in sinter making within plant/ sold to others
		Scrap	33,000	100%
14	Rolling Mill	Mill Scale	33,000	100% reused in sinter making within project
		Mill Scale	40,000	100% sale
15	Steel Mill	Mill Scale	4,000	100% reused in sinter making within project
		Mill Scale	4,000	100% to
16	Coal to Power Plant	Slag	4,000	100% reused in road making within project
		Mill Scale	500	100% use
		Coke dust	Not separately collected	100% used in sinter plant & mixed with coke breeze
		Gypsum from pollution control	Not separately collected	100% used in cement making

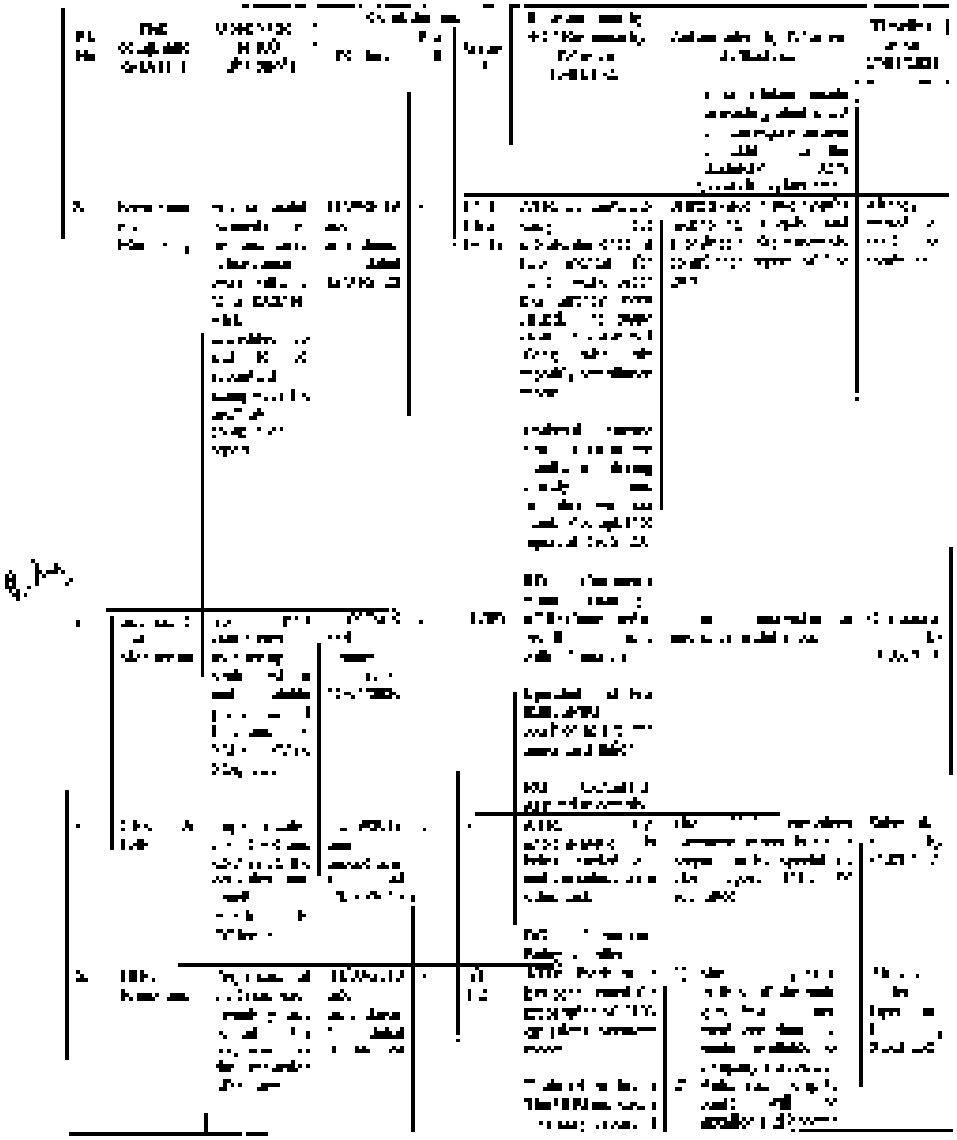
Sl. No.	Source	Type of Waste	Quantity generated (MT/A)	Mode of Treatment / Disposal
		Fly Ash		
17	Captive Power Plant	Fly Ash	1,00,000	100% reused as per CPCB/SPCB guidelines for ash utilization in 2021. Used in cement making, brick making, block making, aggregate making, road construction
		Coal Bottom Ash	25,000	100% used
18	Power Plant	Boiler Ash, Bottom Ash, Fly Ash, Coal Bottom Ash	1,00,000	100% reused as per CPCB/SPCB guidelines for ash utilization in 2021. Used in cement making, brick making, block making, aggregate making, road construction
		Total	10,00,000	

Details of waste disposal agency	TSDF Nava Raipur Ltd (CG0020) (Captive)
Name of Public Consultation	Public Consultation Meeting (CG0020) (Captive)
Date	30/12/2023
Venue	Tahsil Office, Bilha.
Brief outcome of the meeting	All the issues raised during the Public Consultation Meeting were addressed to the satisfaction of the committee members.
Major recommendations	Regular monitoring of ambient air quality, water quality, noise levels, and soil quality in the vicinity of the plant. Implementation of dust suppression measures, including water sprinkling and green belt development. Proper waste management practices, including segregation, recycling, and safe disposal of hazardous waste. Periodic health check-ups for workers and nearby residents. Compliance with all statutory norms and guidelines.

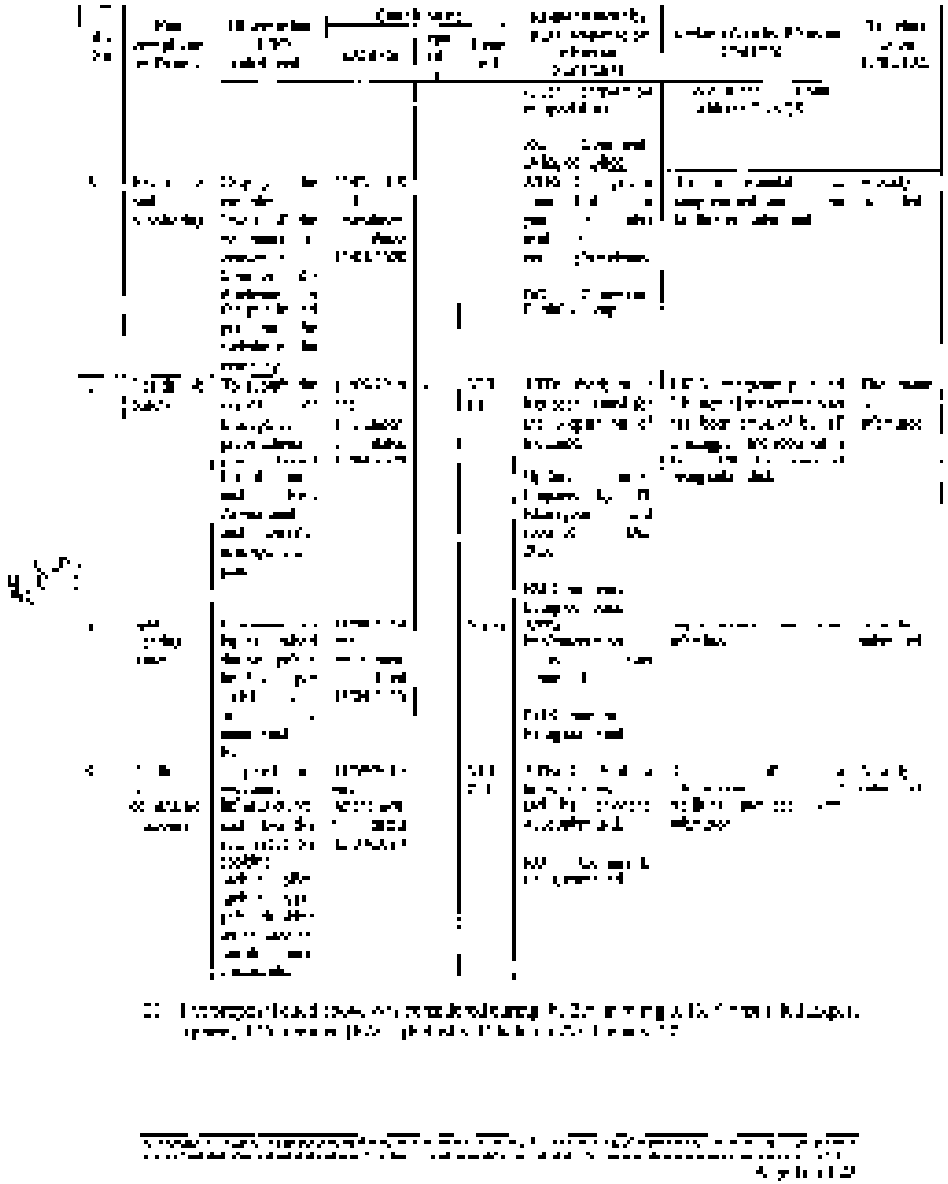
S. No.	Environmental protection measures taken/ proposed	Physical activity/ social activity plan	Tentative Budget (₹ in lakhs)	Time schedule for implementation of action plan
1.	Air Pollution control	• Dust suppression system in material handling areas, conveyor belts, and crushing units. • Installation of bag filters and electrostatic precipitators (ESPs) in furnaces and kilns. • Regular maintenance of pollution control equipment. • Monitoring of ambient air quality and emissions.	50.00	• Ongoing activity • Monthly monitoring and quarterly reporting • Periodic maintenance as per schedule
2.	Water Pollution control	• Effluent treatment plant (ETP) for wastewater from industrial processes. • Rainwater harvesting structures to recharge groundwater. • Recycling and reuse of treated water for non-potable purposes.	30.00	• Continuous operation of ETP • Annual water audit and reporting

ANNEXURE : II(a) Contd..

ANNEXURE : II(a) Contd..



ANNEXURE : II(a) Contd..



ANNEXURE : II(a) Contd..

ANNEXURE : II(a) Contd..

ANNEXURE : II(a) Contd..

ANNEXURE : II(a) Contd..

ANNEXURE : II(a) Contd..

ANNEXURE : II(a) Contd..

v. The project proponent shall submit six monthly reports on the status of compliance of the stipulated environmental conditions including results of monitored data in hard and soft copies to the Ministry of Environment, Forest and Climate Change, the Regional Office, Lucknow and the Zonal Office, CPCB. The project proponent shall also submit the results of monitored data relating to the project and its impact on the environment to the website of the Company and update the same periodically. It shall simultaneously be sent to the Regional Office, Lucknow and the Zonal Office, CPCB.

vi. The project proponent shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of the project.

vii. The project proponent shall inform the Regional Office, as well as the Ministry, the date of commencement of the project, expected date of completion of the project and the project commissioning in phased manner.

viii. The project proponent shall abide by all the commitments and undertakings made to the people during the public hearing/consultation meeting held in connection with the project.

ix. All the commitments made in the Risk Mitigation Plan and Disaster Management Plan shall be implemented in letter and spirit.

x. Adequate safety measures shall be provided in the plant area to control fugitive emissions and to check the work environment as per the norms.

xi. The Ministry may revoke or suspend the clearance if implementation of any of the above conditions is not satisfactory.

xii. The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.

xiii. The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer(s) of the Regional Office by furnishing the requisite data/information/monitoring reports.

xiv. 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.

21. The above conditions will be enforced inter-alia under the Environment (Protection) Act, 1986.

(Sundar Ramakrishnan)
Scientist 'E'

Copy to:

1. Secretary, Department of Planning, Government of Uttar Pradesh, Lucknow.
2. Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi - 110 032.
3. Regional Officer, Ministry of Environment, Forest and Climate Change, Regional Office (NZ), 3rd Floor, Aranya Bhawan, Lucknow - 226 001.
4. Chairman, Uttar Pradesh Pollution Control Board, Tower-B, Vibhuti Khand, Gomti Nagar, Post Office Vibhuti Khand, Lucknow-226 010.
5. Member Secretary, Central Ground Water Authority, Jal Shakti Bhawan, Block-2, A-3, Paschimi Marg, Vasant Vihar, New Delhi - 110 057.
6. Member Collector, Lakhimpur Kheri.
7. Guard File/Record File/Monitoring File.
8. Monitoring Cell.

(Sundar Ramakrishnan)
Scientist 'E'

ANNEXURE : II(b) Contd..

ANNEXURE : II(b)

ANNEXURE : II(b) Contd..

ANNEXURE : II(b) Contd..

ANNEXURE : II(b) Contd..

ANNEXURE : II(b) Contd..

ANNEXURE : II(b) Contd..

ANNEXURE : II(b) Contd..

Sl. No.	Item	As per EC dated [illegible]	Proposed Increase	Total	% change
1	Construction Building Earth	Not available	Nil	Not Given	
2	Transportation Diesel	1.07	[illegible]	1.07	Nil
3	Air (Quality & AAQ) modelling carried out using [illegible]	Stack emissions	Incremental concentrations	Resultant values	
	SO2, PM10	15.12	0.24	15.36	1.57%
	NOx	45.36	0.41	45.81	0.91%
	Boiler	7.8	0.00	7.8	0%

(i) Water and Effluent Treatment: As per EC dated 11.04.2018 the total water requirement for the proposed project is 1,000 KLD (Industrial 1,000 KLD, Domestic Nil). The proposed 1,000 KLD will be sourced from [illegible] Reservoir. The treated effluent from the proposed project will be [illegible] Reservoir. Zero liquid discharge will be maintained in the proposed project. Domestic effluent will be treated in [illegible] STP and treated water will be used for [illegible] purposes.

2. The solid waste generated from the proposed project and its management: As per EC dated 11.04.2018 the solid waste generated from the proposed project will be [illegible] Municipal solid waste will be segregated at source and disposed to [illegible] Municipal solid waste will be disposed to [illegible] Hazardous waste will be disposed to [illegible] Authorized recyclers.

3. The details of green belt development: As per EC dated 11.04.2018 the total area of the project is [illegible] sq.m. Out of which [illegible] sq.m (33%) will be developed as green belt. The green belt will be developed in [illegible] sq.m. Species selected for green belt development are [illegible]. Density of trees will be [illegible] trees per hectare.

4. Public hearing for the existing EC held on 07.03.2018: As per the proceedings dated 11.04.2018 the following issues were raised during the public hearing and commitments made by the project proponent:

[illegible] Water requirement will be met from [illegible] Reservoir. Zero liquid discharge will be maintained in the proposed project.

5. Measures proposed for Rainwater Harvesting Plan: As per EC dated 11.04.2018 the total area of the project is [illegible] sq.m. Out of which [illegible] sq.m (33%) will be developed as green belt. The green belt will be developed in [illegible] sq.m. Species selected for green belt development are [illegible]. Density of trees will be [illegible] trees per hectare.

6. Measures taken for the Compliance:

(i) The Committee noted the following:

a. As per the report made available by the project proponent, the capacity of Recycled Water Treatment Plant (RWTP) is [illegible] KLD. The RWTP is [illegible] and the treated water is [illegible]. The project proponent has submitted that [illegible] KLD of treated water is [illegible] and the remaining [illegible] KLD is [illegible]. The project proponent has also

ANNEXURE : II(b) Contd..

ANNEXURE : II(b) Contd..

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ANNEXURE : II(b) Contd..

ANNEXURE : II(b) Contd..

ANNEXURE : II(b) Contd..

i. The copies of the environmental clearance shall be submitted to the project proponent to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant Officials of the Government who in turn has to display the same for 30 days from the date of receipt.

ii. The project proponent shall upload the status of compliance of the stipulated environmental clearance conditions, including results of monitored data on their website and update the same periodically basis.

iii. The project proponent shall monitor the specified local level namely PM10, SO2, NOx (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the project and display the same in a conspicuous location for disclosure to the public and place the data on the website of the company.

iv. The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions including results of monitored data to the Ministry of Environment, Forest and Climate Change, Government of India.

v. The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.

vi. The project proponent shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities, and the date of commencement of land development work and start of production operation by the project.

vii. The project authorities must strictly adhere to the commitments made by the Bank in Public Hearing/Public Consultation held on the 31st October, 2018.

ix. The project proponent shall abide by all the commitments and mitigation measures made in the EIA/EMP report, commitment made during Public Hearing and also that during the presentation to the Expert Appraisal Committee.

x. No further expansion or modification in the plant shall be carried out without prior approval of the Ministry of Environment, Forest and Climate Change (MoEF&CC).

xi. Concealing factual data or submission of false/fabricated data may result in revocation of this environmental clearance and attract action under the provisions of the Environment (Protection) Act, 1986.

xii. The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.

xiii. The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in consultation with the Regional Office of the Ministry may also impose additional environmental protection measures required, if any.

xiv. The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer(s) of the Regional Office by furnishing the requisite data/information/monitoring reports.

xv. The above conditions shall be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, the Rules and Other

Waste (Management and Transboundary Movement) Rules, 2016, the National Green Tribunal (Qualification, Experience and Terms and conditions of Service of Chairperson and Members) Rules, 2010 and the Public Liability Insurance Act, 1991 along with their subsequent amendments and rules.

xvi. Any appeal against this EC shall lie with the National Green Tribunal if preferred within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.

xvii. The Ministry reserves the right to revoke this Clearance if any of the conditions stipulated are not complied with to the satisfaction of the Ministry.

(A.K. Agarwal)
Director

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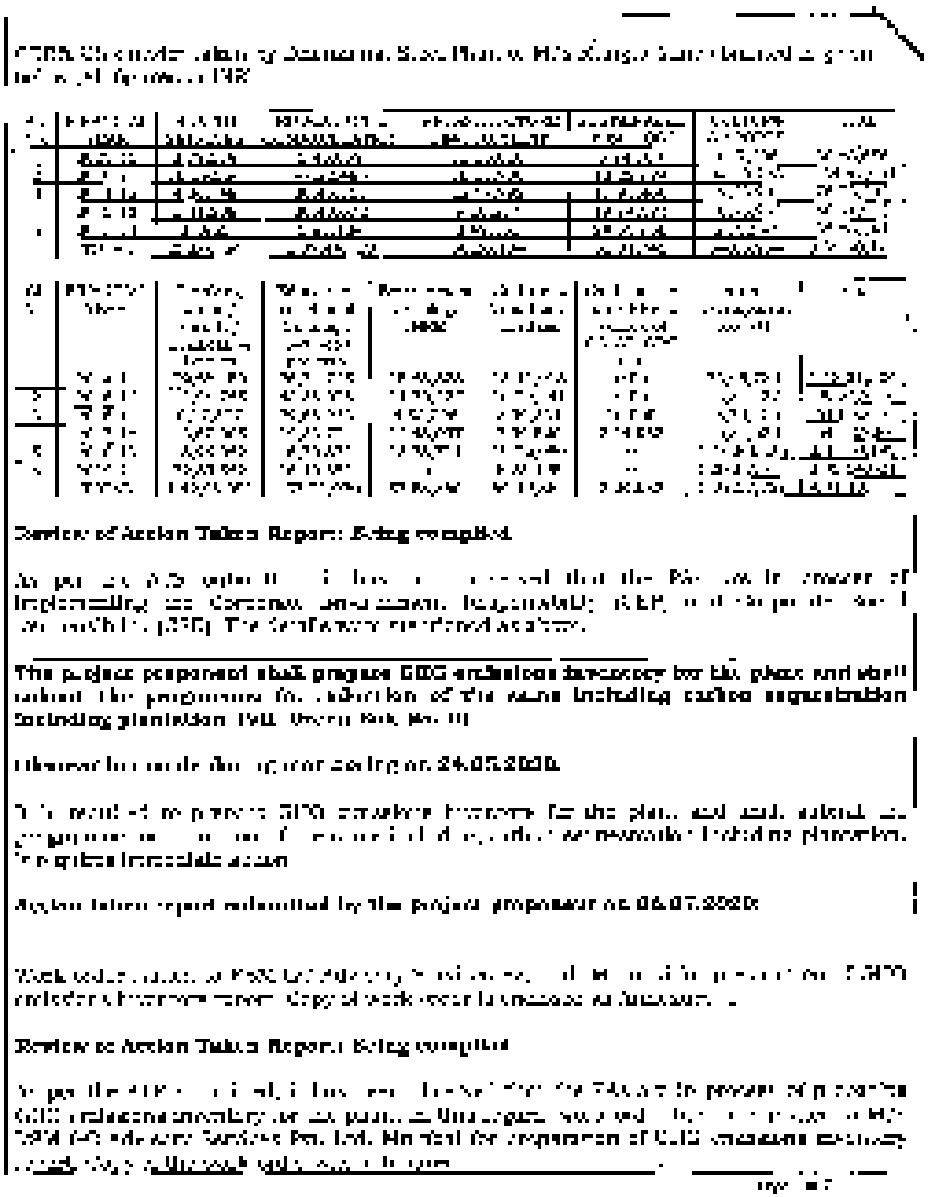
1. Secretary, Department of Industries, Government of Odisha, Secretariat, Bhubaneswar.
2. Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi-110032
3. Member Secretary, Odisha Pollution Control Board, Nilakantha Bhawan, Unit VIII, Bhubaneswar-751012
4. Chairman, Central Ground Water Authority, Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad, Haryana-121001
5. Regional Director, Eastern Region, Ministry of Environment, Forest and Climate Change, A/3, Chandrasekharpur, Bhubaneswar-751023
6. District Collector, Dhenkanal, Odisha
7. District Magistrate, Dhenkanal, Odisha
8. Monitoring Cell, MoEF&CC, New Delhi

(A.K. Agarwal)
Director

ANNEXURE : III

ANNEXURE : III Contd..

ANNEXURE : III Contd..



5. Emergency preparedness plan based on the Hazard Identification and Risk Assessment (HIRA) and Disaster Management Plan shall be implemented (Public hearing and Environment Cell, Annexure No. I).

Observation made during monitoring on 05.05.2020

The project proponent has submitted Emergency preparedness plan based on Hazard Identification and Risk Assessment (HIRA) report and Disaster Management Plan (Page No. 107 of EIA Report).

Action taken report submitted by the project proponent on 06.07.2020:

Work order issued to M/s. Kesar Enterprises for complete Emergency preparedness plan (Hazard identification and risk assessment report, Disaster Management Plan, Occupational Health Centre) vide Annexure-6.

Review of Action Taken report: Being complied

As per the ATR submitted, it has been observed that the project proponent has provided Emergency preparedness plan, Hazard identification and risk Assessment, Health report and Disaster Management Plan. However, the report is under preparation.

7. Observation made during monitoring on 04.05.2020:

It is observed at implementation the leakage noted during EMC meeting is properly rectified. The concerned official is directed to take necessary measures to avoid such incidences in future.

Action taken report submitted by the project proponent on 06.07.2020:

During public hearing most of the points related the project and issues for which related to pollution control measures, occupational health, safety and environment. Action taken on the issues raised during public hearing is given below:

Sr. No.	Issues raised	Action taken
1	Employment	Already 5 persons have been employed in the project proponent. Additional employment will be given to the local people as per requirement of the project. Preference will be given to the local people in employment.
2	Education	Company is also providing CSR (Environment) facilities in the area. Work on construction of primary school is in progress. Company is also providing financial assistance to the local people for education.

ANNEXURE : III Contd..

OFFICE OF THE

STATE POLLUTION CONTROL BOARD, ODISHA

S. No.	Proposed Plant Facilities	Unit	Production details as per EIA report vide letter No./Dtd 25.12.2021	Proposed Additionals changes modification	Enhanced production capacity applied for
	Steel Melting Shop	MTPA	2.50	0.50	3.00
1	Steel Capacity	MTPA	2.50	0.50	3.00
2	Power Plant				
	Power Plant-I	MTPA	2.5*8 10.0 MTPH	CPP Configuration Modification	2.5*8 10.0 MTPH
	Power Plant-II	MTPA		250+60 MW Modification	250+60 MW
	Total	MTPA	2.5*8		3.00
3.	Coal Washery [Coal Washery Modification]	MTPA	4.0	1.00	5.00
4.	Coal Mines				
	Bolani	MTPA	0.25 (Rated Capacity)	0.25 (Rated Capacity)	0.50 (Rated Capacity)
	Kalta	MTPA	0.25 (Rated Capacity)	0.25 (Rated Capacity)	0.50 (Rated Capacity)
	Total	MTPA	0.50	0.50	1.00
5.	Mini Blast Furnace Plant	MTPA	0.25 (Rated Capacity)	0.00	0.25 (Rated Capacity)
	Total	MTPA	6.75	1.25	8.00

SL No.	Proposed Plant Facilities	Unit	Production details as per CTO Limited Vide Letter No./Dtd 25.12.2021	Proposed Additionals changes modification applied for	Enhanced production capacity applied for
	Total		6.75	1.25	8.00
6.	Coke Plant:				
	Coke Plant-I	MTPA	0.50 (Rated Capacity)	0.00 (under closure category)	0.00 (Under closure category)
	Coke Plant-II	MTPA	0.50 (Rated Capacity)	0.00 (Proposed for closure)	0.00 (Under closure category)
	Total	MTPA	1.00	0.00	0.00 (Under closure category)
7.	Sponge Iron Plant	MTPA	0.50 (Rated Capacity)	0.00 (Proposed for closure)	0.00 (Under closure category)
8.	Ferro Alloys Plant				
	Ferro Alloys Plant-I	MTPA	0.50 (Rated Capacity)	0.00 (Proposed for closure)	0.00 (Under closure category)
	Ferro Alloys Plant-II	MTPA	0.50 (Rated Capacity)	0.00 (Proposed for closure)	0.00 (Under closure category)
	Total	MTPA	1.00	0.00	0.00
9.	Pig Iron Plant	MTPA	0.50 (Rated Capacity)	0.00 (Proposed for closure)	0.00 (Under closure category)
10.	Ferro Chrome Plant	MTPA	0.50 (Rated Capacity)	0.00 (Proposed for closure)	0.00 (Under closure category)
11.	Ferro Manganese Plant	MTPA	0.50 (Rated Capacity)	0.00 (Proposed for closure)	0.00 (Under closure category)
12.	Lime Plant	MTPA	0.50 (Rated Capacity) 1200 TPD	0.00 (Proposed for closure)	0.00 (Under closure category) 1200 TPD

ANNEXURE : IV Contd..

ANNEXURE : IV Contd..

ANNEXURE : IV Contd..

ANNEXURE : IV Contd..



Parameters	Water Intake Stream	Consumption Blow down	Discharge

NB: Limiting concentrations may vary from plant to plant

Parameters	Water Intake	Receiving Stream	Water Treatment Plant	Effluent Treatment Plant	Discharge
			Specify		

NB: Limiting concentrations may vary from plant to plant

Parameters	Limiting concentration in mg/l except pH



Parameters	Limiting

ANNEXURE : IV Contd..

ANNEXURE : IV Contd..

ANNEXURE : IV Contd..

ANNEXURE : IV Contd..

...ing the Environmental Clearance, otherwise the same shall stand revoked. The Company shall display the status of compliance of the stipulated conditions on its website.

XIII. The project proponent shall submit six monthly reports on the status of the compliance of the stipulated environmental conditions including results of monitored data in hard copies as well as in e-mail to the Regional Office, Ministry of Environment & Forests, Bhopal, Central Pollution Control Board and the State Pollution Control Board. The project proponent shall also submit the results of monitored data relating to the stipulated environmental conditions to the Regional Office, Ministry of Environment & Forests, Bhopal, Central Pollution Control Board and the State Pollution Control Board once in six months.

XIV. The project proponent shall inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the State Pollution Control Board and may also be seen on the website of the Ministry of Environment & Forests at http://www.envfor.nic.in. This shall be advertised within seven days from the date of issue of the clearance letter, in at least 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 clearance letter shall also be displayed at the Regional Office, District Industries Centre and Collector's Office/Tehsildar's Office for 30 days.

XV. The Ministry may revoke or suspend the clearance if implementation of any of the above conditions is not satisfactory to the Ministry. The decision of the Ministry shall be communicated to the project proponent and also displayed on the website of the Ministry of Environment & Forests at http://www.envfor.nic.in.

XVI. The Ministry may also impose additional environmental conditions or modify the existing ones, if deemed necessary in the interest of environment protection.

Encl: Annexure I (Specific Conditions)

(Dr. [illegible])
SECRETARY

To,

The Director,
Hindustan Zinc Limited,
M/s Rampura Agucha Zinc Mine,
Rampura Agucha Post Office, Bhilwara District,
Rajasthan, 311025.

Copy forwarded to:

1. The Secretary to the Govt. of India, Ministry of Environment & Forests, Paryavaran Bhawan, CGO Complex, Lodhi Road, New Delhi - 110 003.
2. The Member Secretary, Central Pollution Control Board, Parivesh Bhawan, East Arjun Nagar, Delhi - 110 032.
3. The Chief Conservator of Forests, Central Zone, Ministry of Environment & Forests, Regional Office, E-8, Arera Colony, Bhopal - 462 016.
4. The CPCB, Zonal Office, [illegible]
5. The Member Secretary, Rajasthan State Pollution Control Board, Paryavaran Bhawan, Sector-23, Jaipur - 302 001.
6. The Chief Conservator of Forests, Regional Office, Ministry of Environment & Forests, Paryavaran Bhawan, Sector-23, Jaipur - 302 001.
7. The Regional Officer, SPCB, Bhilwara.
8. Guard File/Monitoring File.

(Dr. [illegible])
SECRETARY

ANNEXURE : IV Contd..

ANNEXURE : IV Contd..

The Environment (Protection) Rules, 1986

[SCHEDULE III]
[See rule 4]

AMBIENT AIR QUALITY STANDARDS IN RESPECT OF NOISE

Area Code	Category of Area	Limits in dB(A) Leq	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

Note:

1. Day time is reckoned in between 6 a.m. and 9 p.m.

2. Night time is reckoned in between 9 p.m. and 6 a.m.

3. Silence zone is defined as areas upto 100 meters around such premises as hospitals, educational institutions and courts. The Silence Zones are to be declared by the Competent Authority.

   Use of vehicle horns, loudspeakers and bursting of crackers shall be banned in these zones.

4. Mixed categories of areas should be declared as one of the four above mentioned categories by the Competent Authority and the corresponding standards shall apply.

STATE POLLUTION CONTROL BOARD, ODISHA

No. [illegible] /IND-I-CON-[illegible] Dt. [illegible]

CONSENT ORDER

Sub: Consent for Operating / New operation of the plant under Section 25 of the Water (Prevention & Control of Pollution) Act, 1974 and under Section 21 of the Air (Prevention & Control of Pollution) Act 1981.

Ref: Your online application ID No. 3300717, dtd. 07.12.2021

This Consent to Operate order is hereby granted under section 21(6) of Water (Prevention & Control of Pollution) Act, 1974 and under section 21 of Air (Prevention & Control of Pollution) Act, 1981 and Rules framed thereunder to

Name of the Industry: Directorate General Plant of M/s. Rungta Mines Ltd.

Name of the Occupier & Designation: Mr.P.K.Chintamani, Director

Address: At-Kila, Jharsuguda, PO-Hirakud, Via-Meramundali, Dist-Dhenkanal

This consent order is valid upto the period upto 31.03.2022

This consent order is valid for the product quantity, specified details, discharge quantity and quality, specified domestic wastewater quantity and quality, emissions as mentioned below. This consent is granted subject to the general and special conditions also stated.

A. Details of Products Manufactured

Sl.No.	Products	Quantity
1	Sponge Iron – (As per Rule 3 (1)(b)(i) of the EPR, 2016)	2,52,500 TPA
2	Captive Power Plant	Already issued 25 MW Proposed 10.5 MW Waste heat recovery boiler Total Power Generation=35 MW
3	Steel Melting Shop Induction Furnace – 2x22 Tonnes Billet – 100 x 100 mm Already issued Consent to Operate vide Memo No. 2[illegible] dtd. [illegible]	2,31,000 TPA

B. Quantities permitted for discharge from the outlet and standards to be complied

Outlet No.	Description of outlet	Point of discharge	Quantity of discharge	Prescribed standard
1	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]

C. Emission permitted through the following stack subject to the prescribed standard

Stack / Vent No.	Description of Stack / Vent	Stack height (m)	Quantity of emission (Nm³/hr)	Prescribed Standard mg/Nm³ PM	SO2	NOx
1	[illegible]	[illegible]	[illegible]	[illegible]		
2	Common stack for [illegible]					
	[illegible]	[illegible]	[illegible]	[illegible]		
	Dolo Calcination Kiln	30	90,000	150		
	Dolo Cooler Cyclone Boiler	30	1,00,000	150		
	[illegible]	[illegible]	[illegible]	[illegible]		
	Raw Dolo Crushing	30	6,000	50		
	[illegible]	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]	[illegible]		
	Product Dolo Crushing	30	20,000	50		
	[illegible]	[illegible]	[illegible]	[illegible]		
3	[illegible]	[illegible]	[illegible]	[illegible]		
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]		
6	[illegible]	[illegible]	[illegible]	[illegible]		
7	[illegible]	[illegible]	[illegible]	[illegible]		
8	[illegible]	[illegible]	[illegible]	[illegible]		

ANNEXURE : V Contd..

ANNEXURE : V Contd..

ANNEXURE : V Contd..

ANNEXURE : V Contd..

ANNEXURE : V Contd..

ANNEXURE : V Contd..

ANNEXURE : V Contd..

ANNEXURE : V Contd..

6. [illegible]

To,

The Director
Dhenkanal Steel Plant of M/s. Nalco Ltd.
At/ Po- Dhenkanal, PS- Dhenkanal,
Dist- Dhenkanal
Dhenkanal-759013

Memo No. : As above

ASSISTANT SECRETARY
STATE POLLUTION CONTROL BOARD, ODISHA

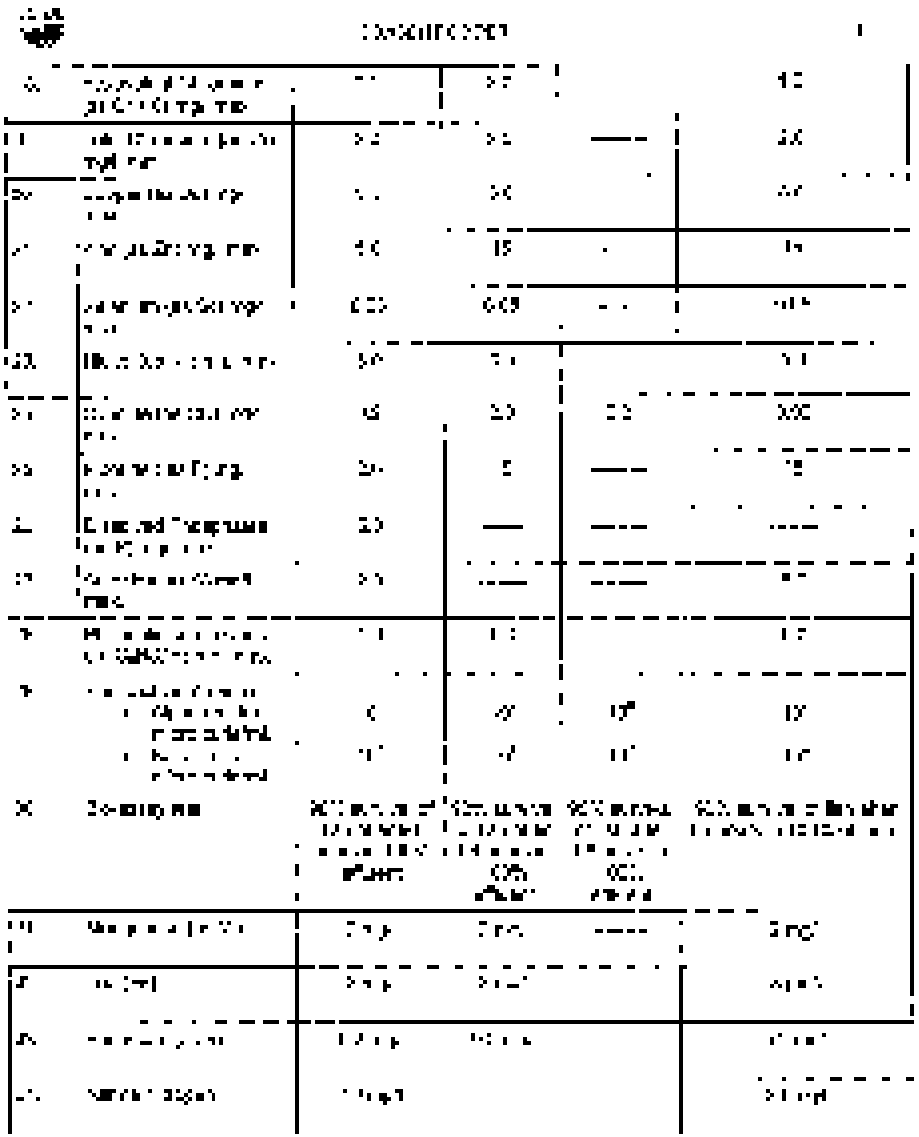
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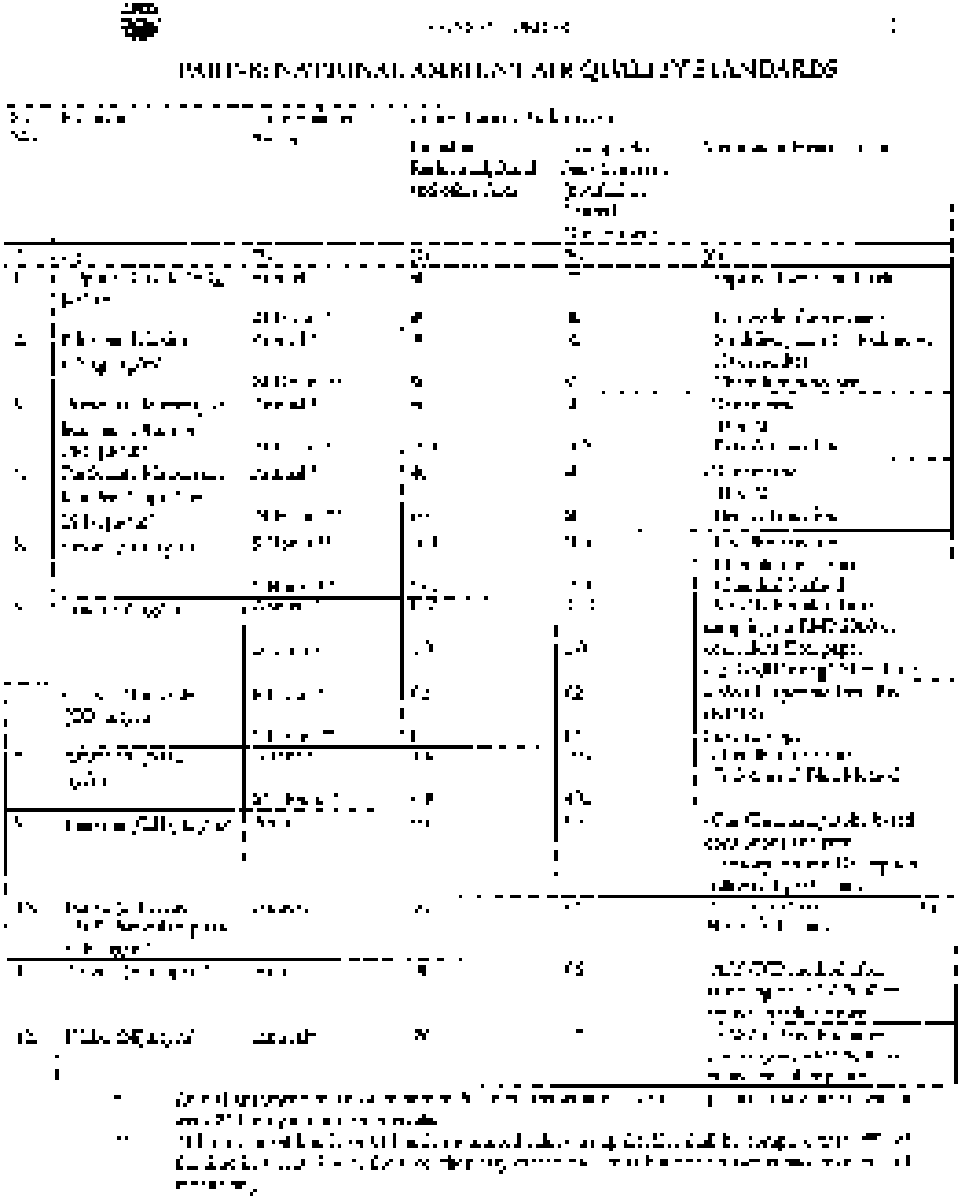
1. Regional Officer, State Pollution Control Board, Angul
2. Sub-Divisional Officer, Dhenkanal
3. D.F.O, Dhenkanal
4. Director of Mines, Odisha, Bhubaneswar
5. [illegible]
6. Consent Engineer

CHIEF ENVI. ENGINEER
STATE POLLUTION CONTROL BOARD, ODISHA

General Standards for discharge of environment pollutants
PART-A:EFFLUENTS

Sl No	Parameters	Standards			
		New Industries	Existing Industries	Coastal Areas	Public Sewers
		(a)	(b)	(c)	(d)
1	Colour (Hazen Units)	Not more than 100 — Shall be decided by the Board		Shall be decided by the Board	Shall be decided by the Board
2	Suspended Solids (mg/l) max.	100	600	200	For process wastewater — 100 For cooling water effluent: 10% above the intake cooling water value
3	Particle size of SS	Shall pass 850 micron sieve	—	—	
4	pH value	Shall be between 5.5 to 9.0	Shall be between 5.5 to 9.0	Shall be between 5.5 to 9.0	Shall be between 5.5 to 9.0
5	Temperature	Shall not exceed 40°C in any section of the stream within 15 metres downstream from the effluent outlet			Shall not exceed 45°C at the point of discharge
6	Oil and Grease (mg/l) max.	10	20	10	20
7	Total residual chlorine (mg/l) max.	1.0		—	3.0
8	Ammonical nitrogen (as N) mg/l max.	50	50	—	50
9	Total Kjeldahl nitrogen (as N) mg/l max.	100		—	100
10	Free ammonia (as NH3) mg/l max.	5.0	—	—	10
11	Biochemical Oxygen Demand (3 days at 27°C) mg/l max.	30	100	100	100
12	Chemical Oxygen Demand mg/l max.	250	—	—	250
13	Arsenic (as As) mg/l max.	0.2	0.2	0.2	0.2
14	Mercury (as Hg) mg/l max.	0.01	0.01	—	0.01
15	Lead (as Pb) mg/l max.	0.1	1.0	—	2.0
16	Cadmium (as Cd) mg/l max.	2.0	1.0		2.0





ANNEXURE : VI Contd..

ANNEXURE : VI

Rungta Mines Limited



Rungta Mines Limited



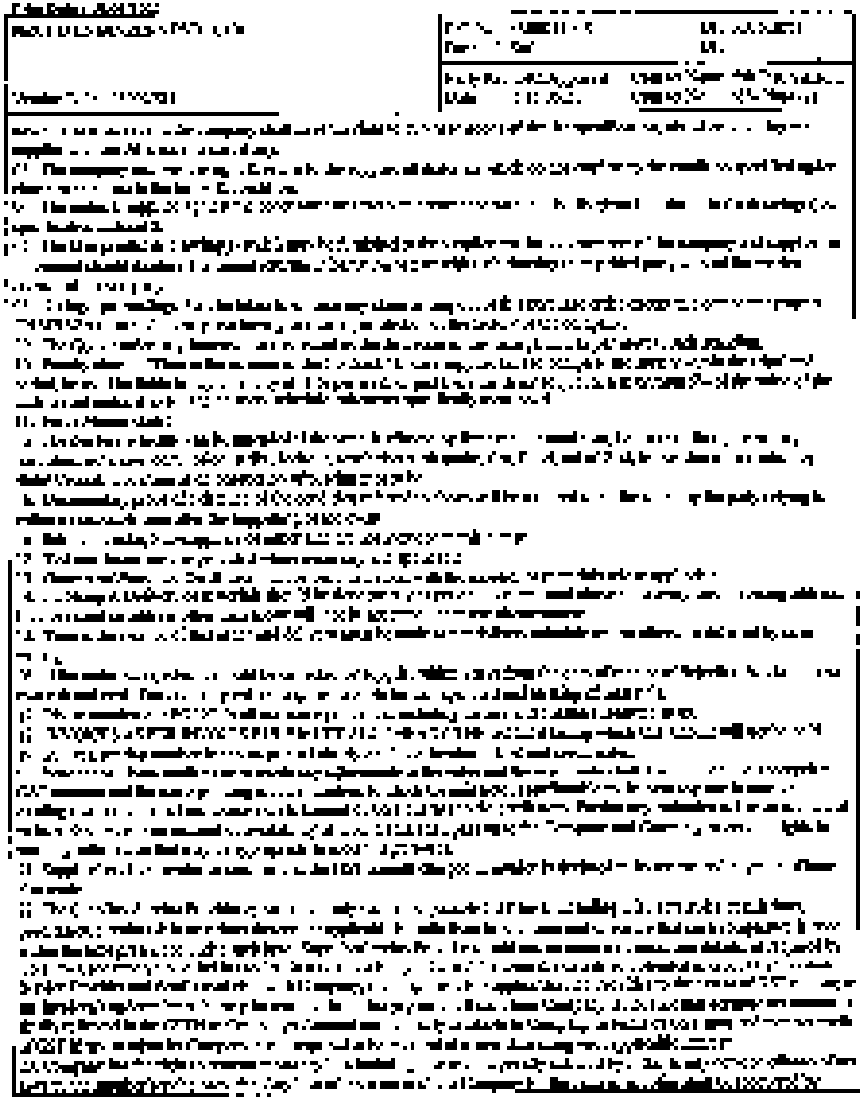
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TRINGTA MINES LIMITED
Chamkarmal Steel Plant

PURCHASE INDENT

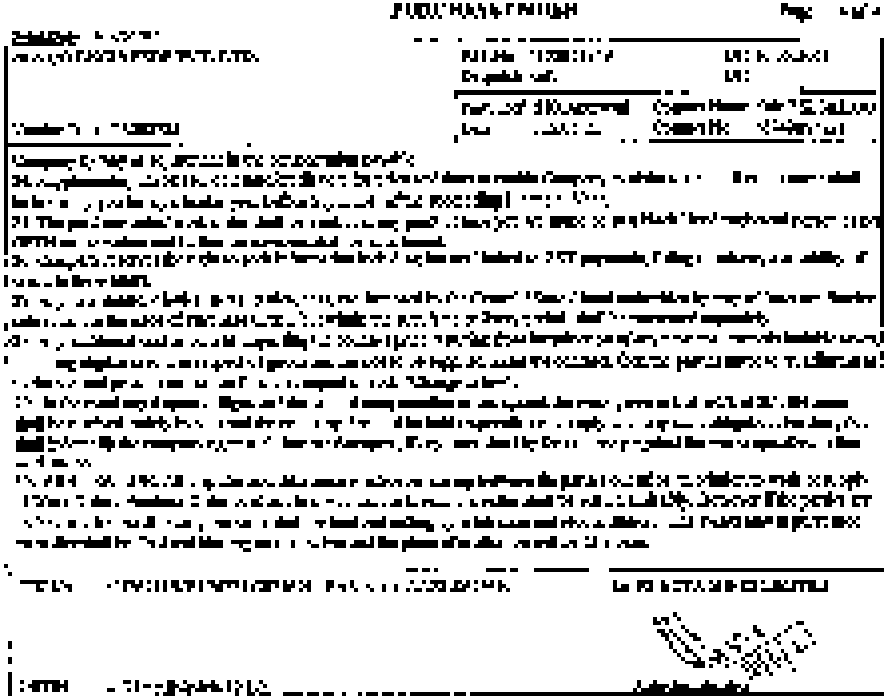


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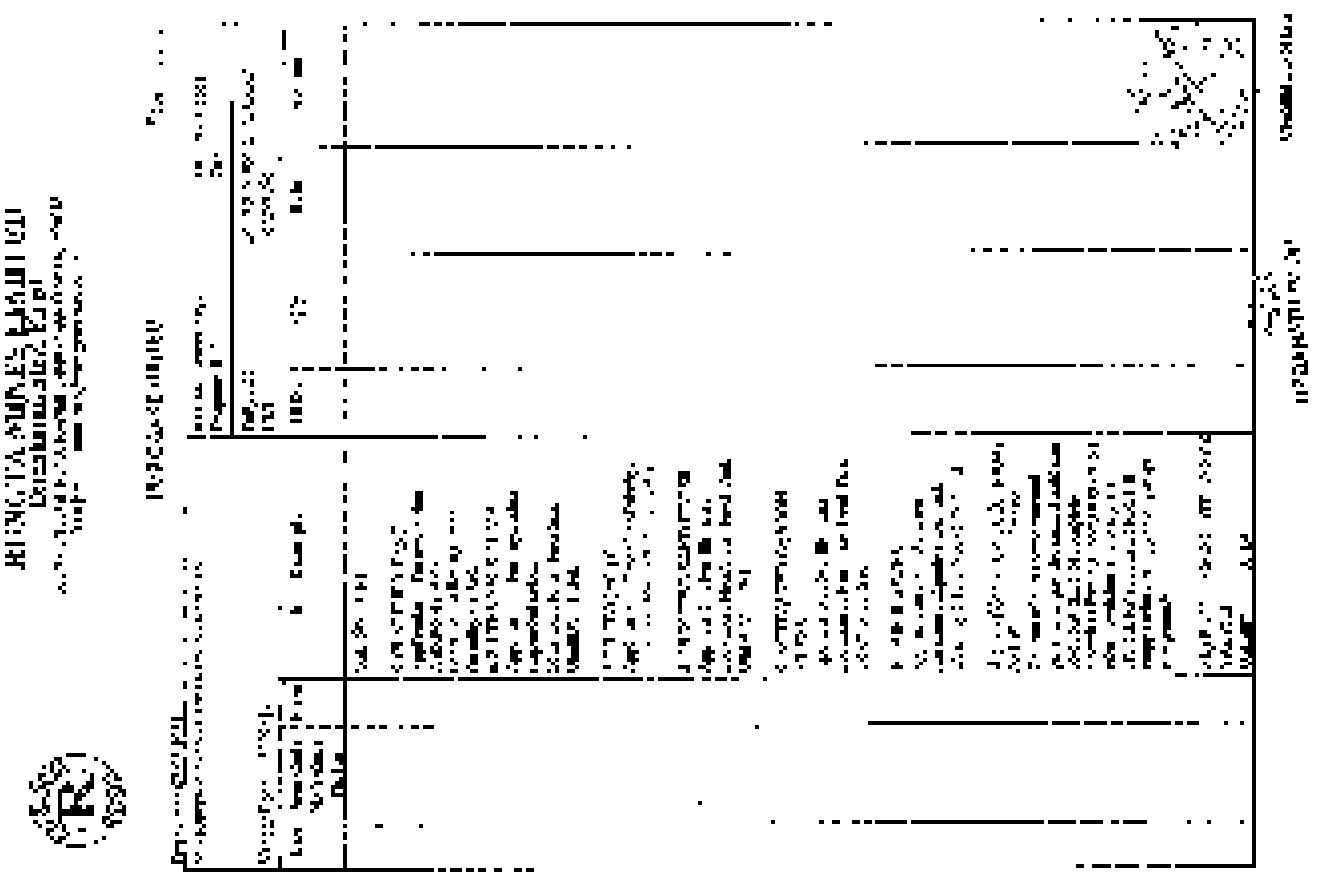


TRINGTA MINES LIMITED
Chamkarmal Steel Plant

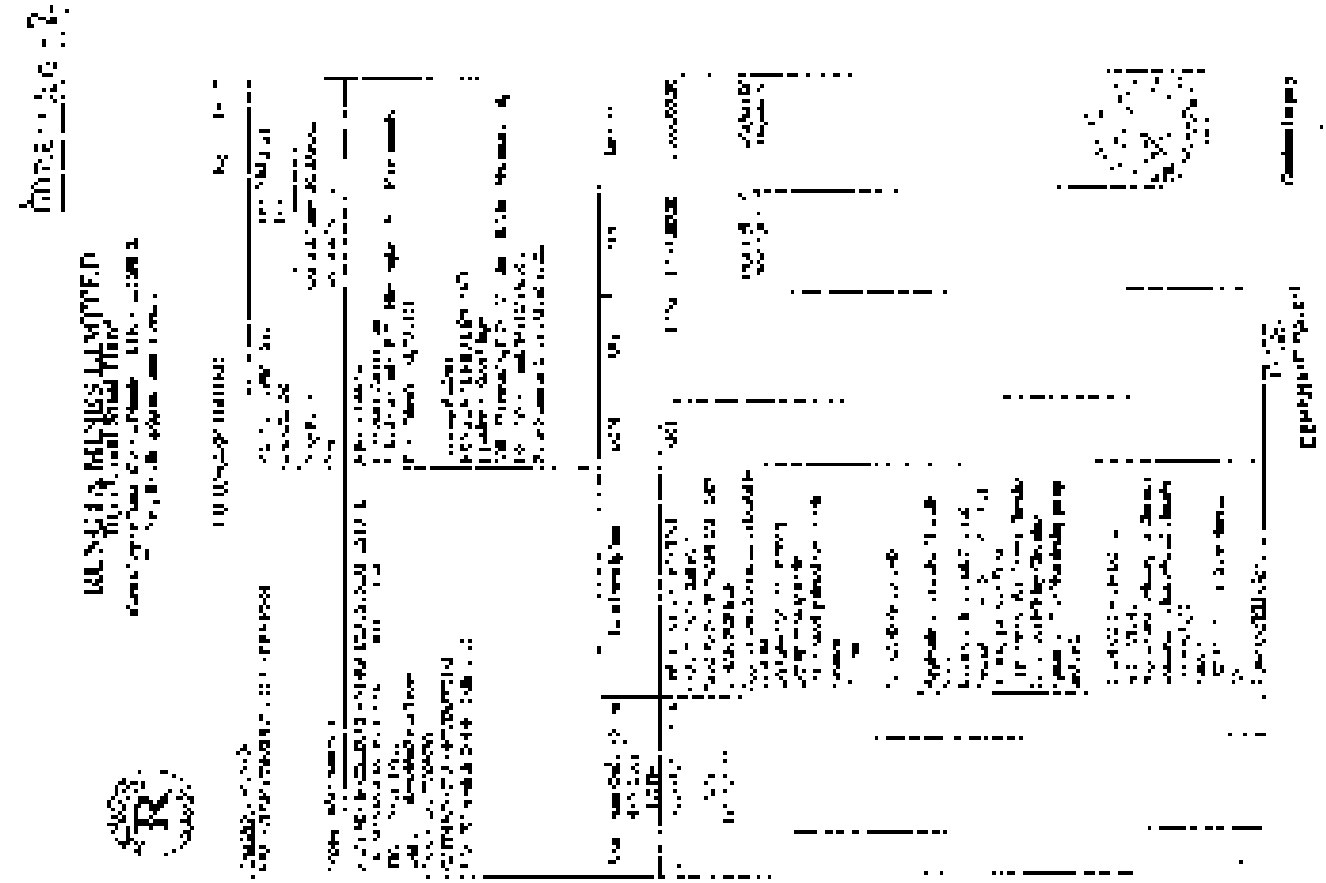
PURCHASE INDENT



ANNEXURE : VI Contd..



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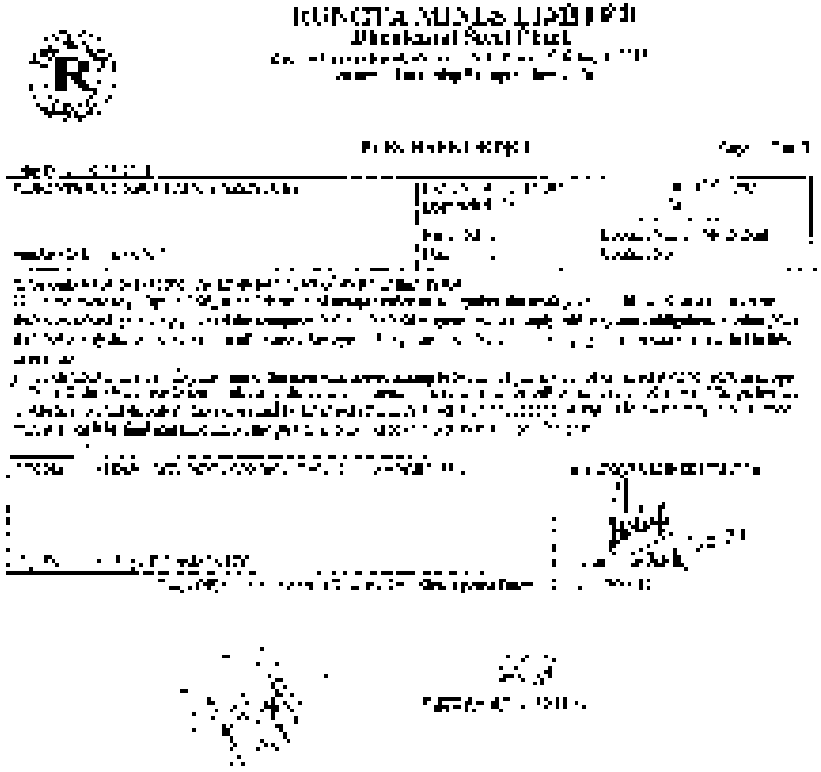


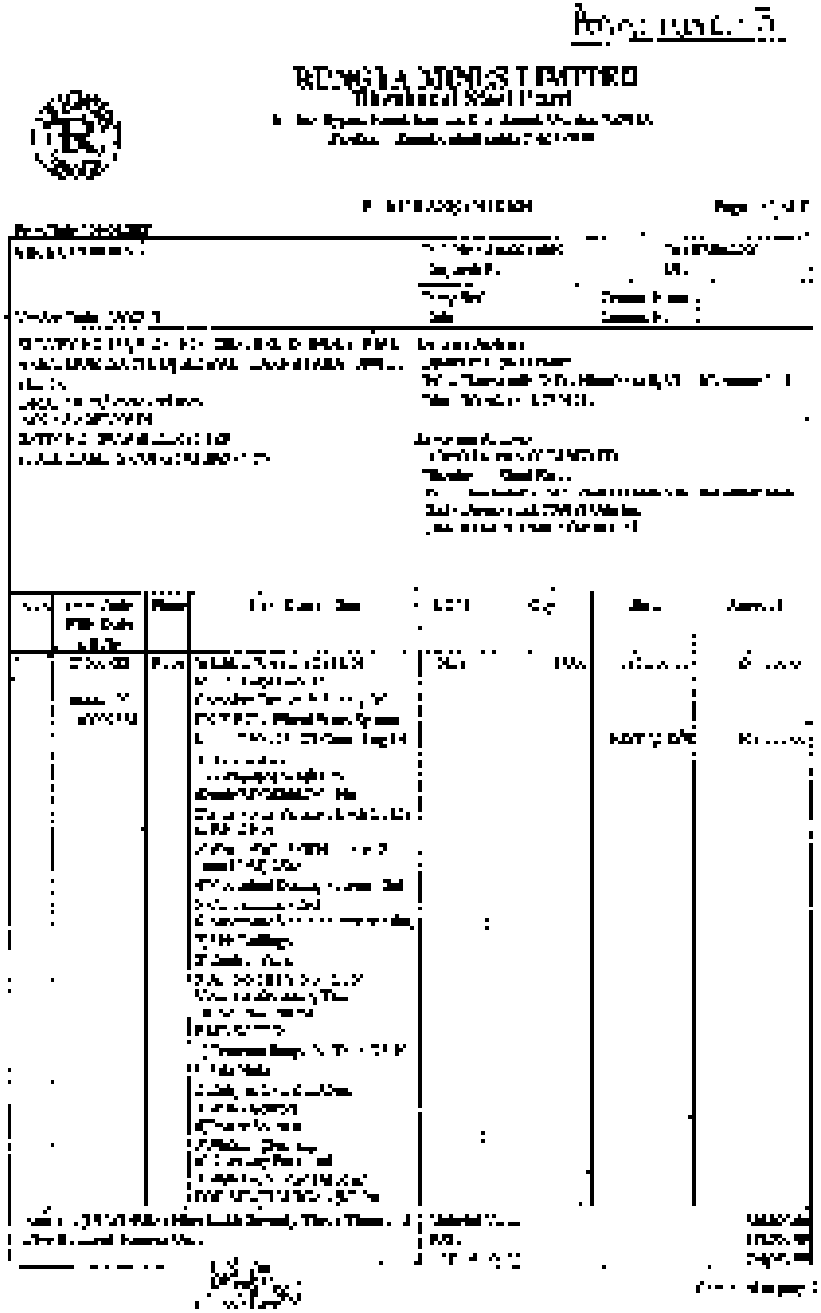
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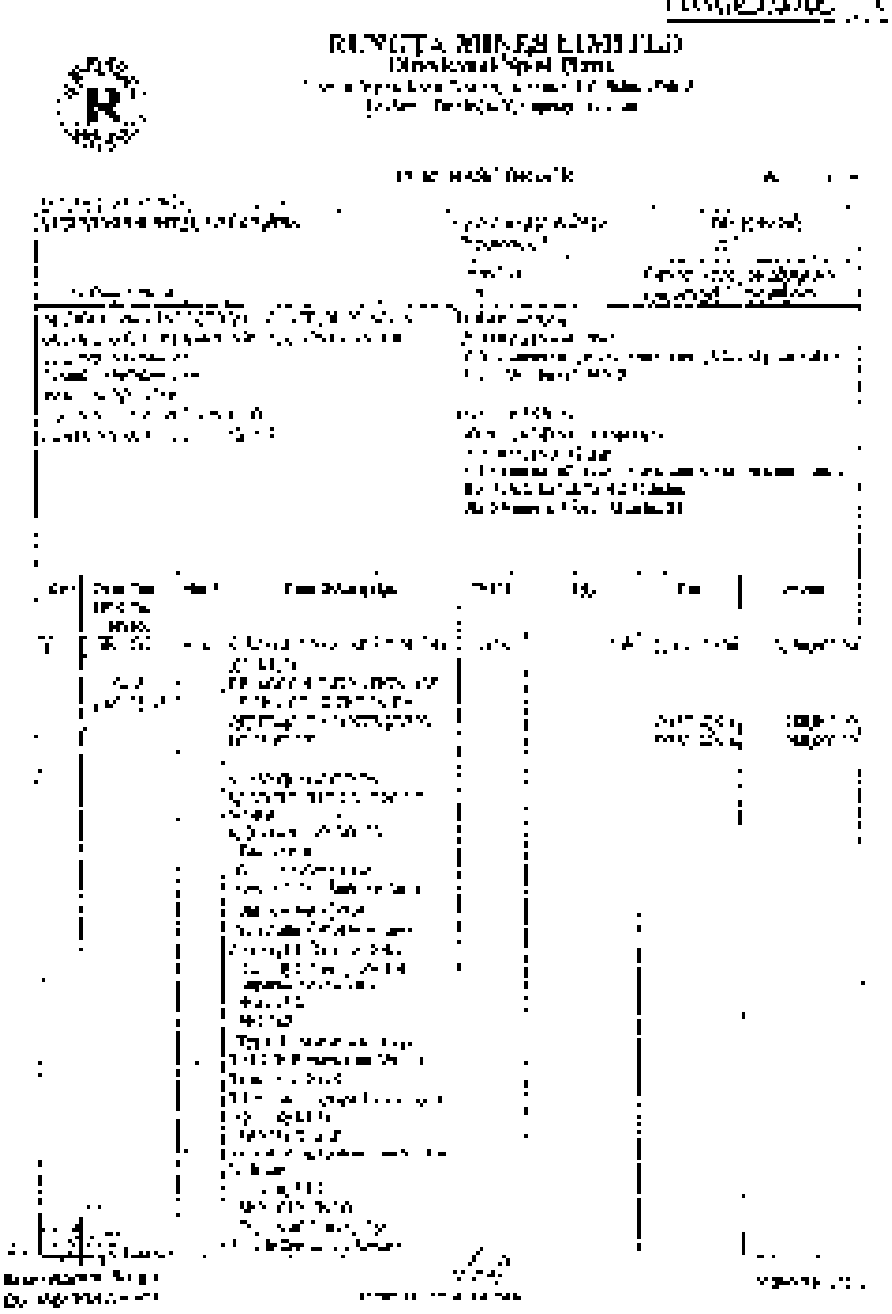
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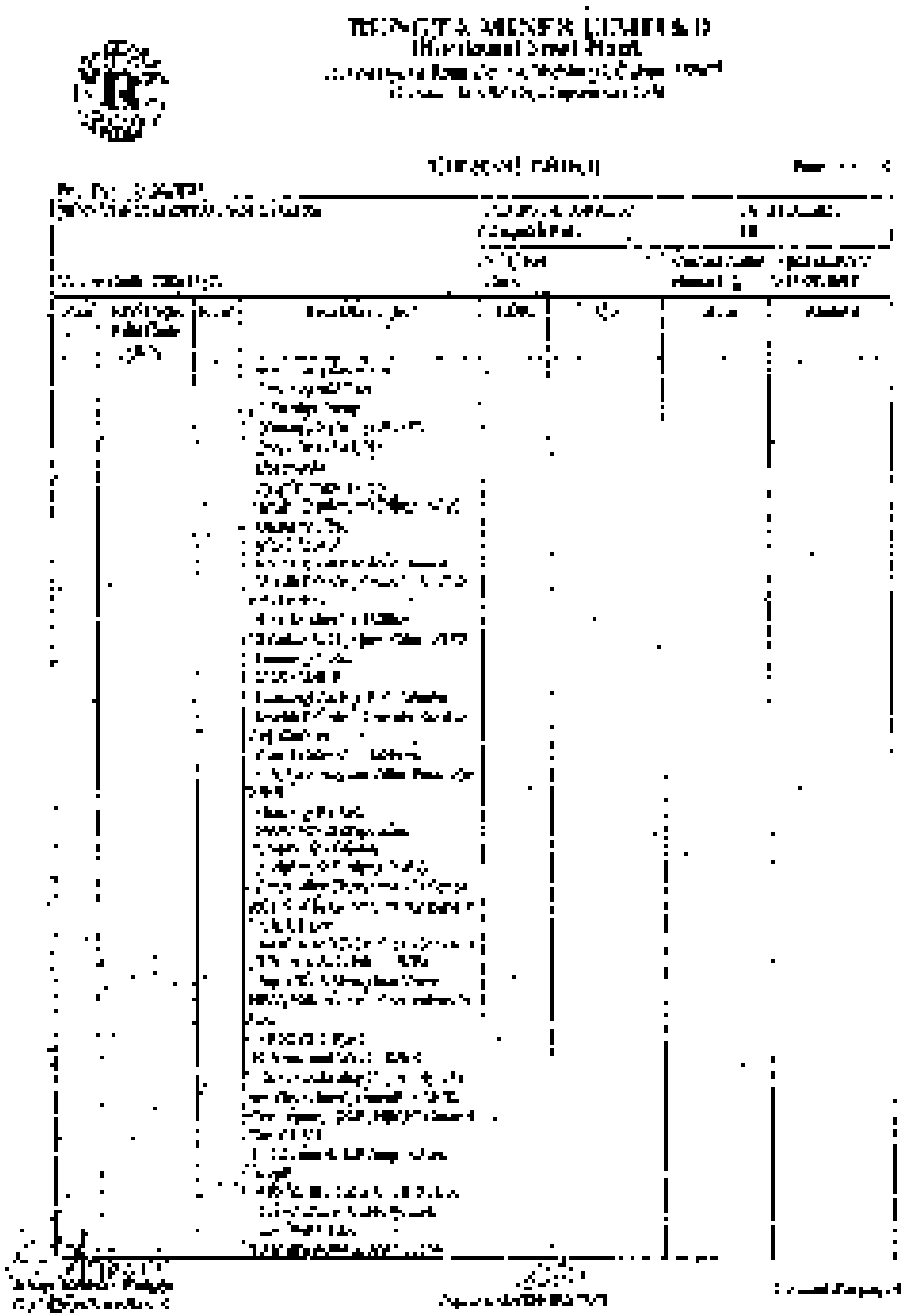
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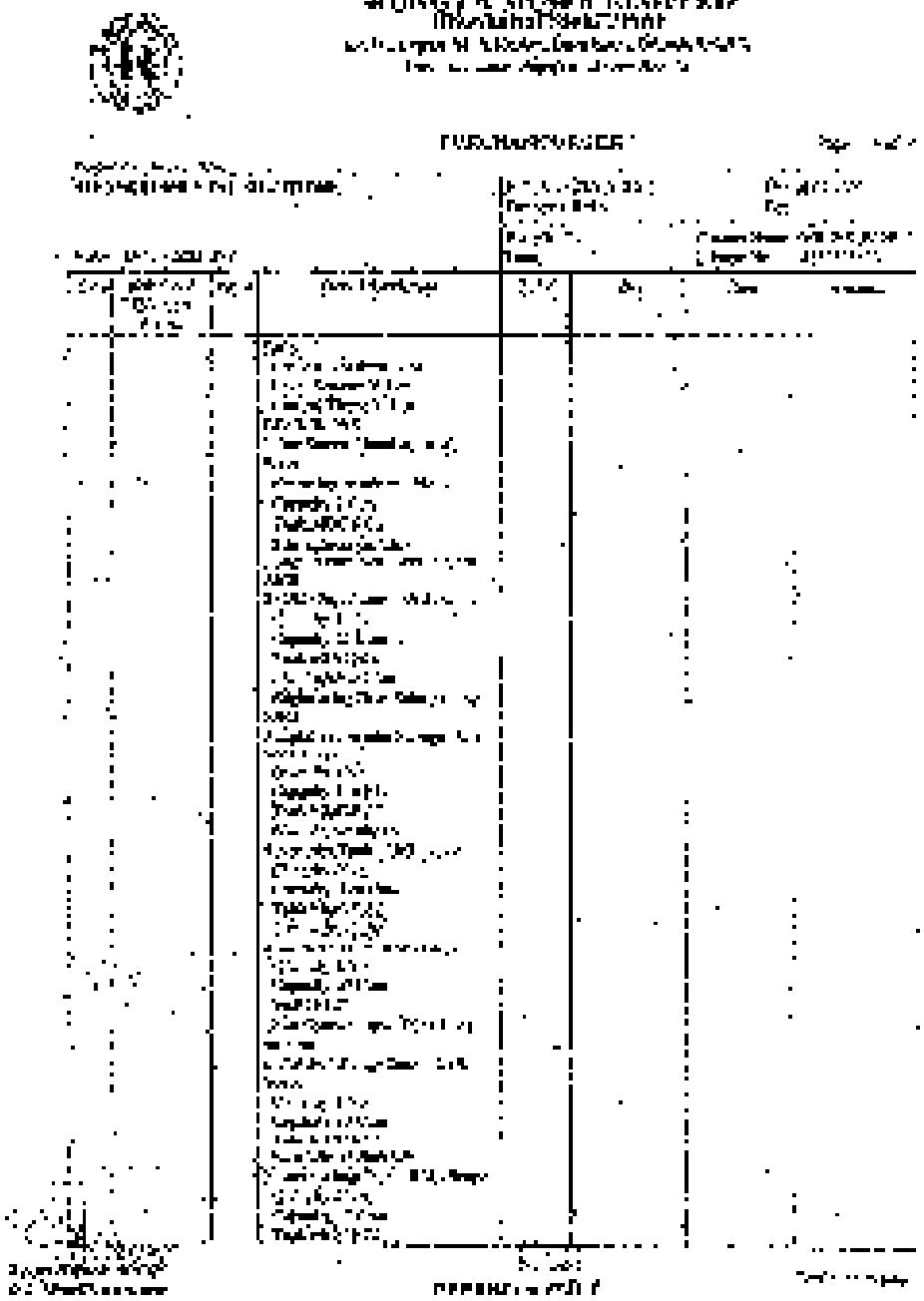


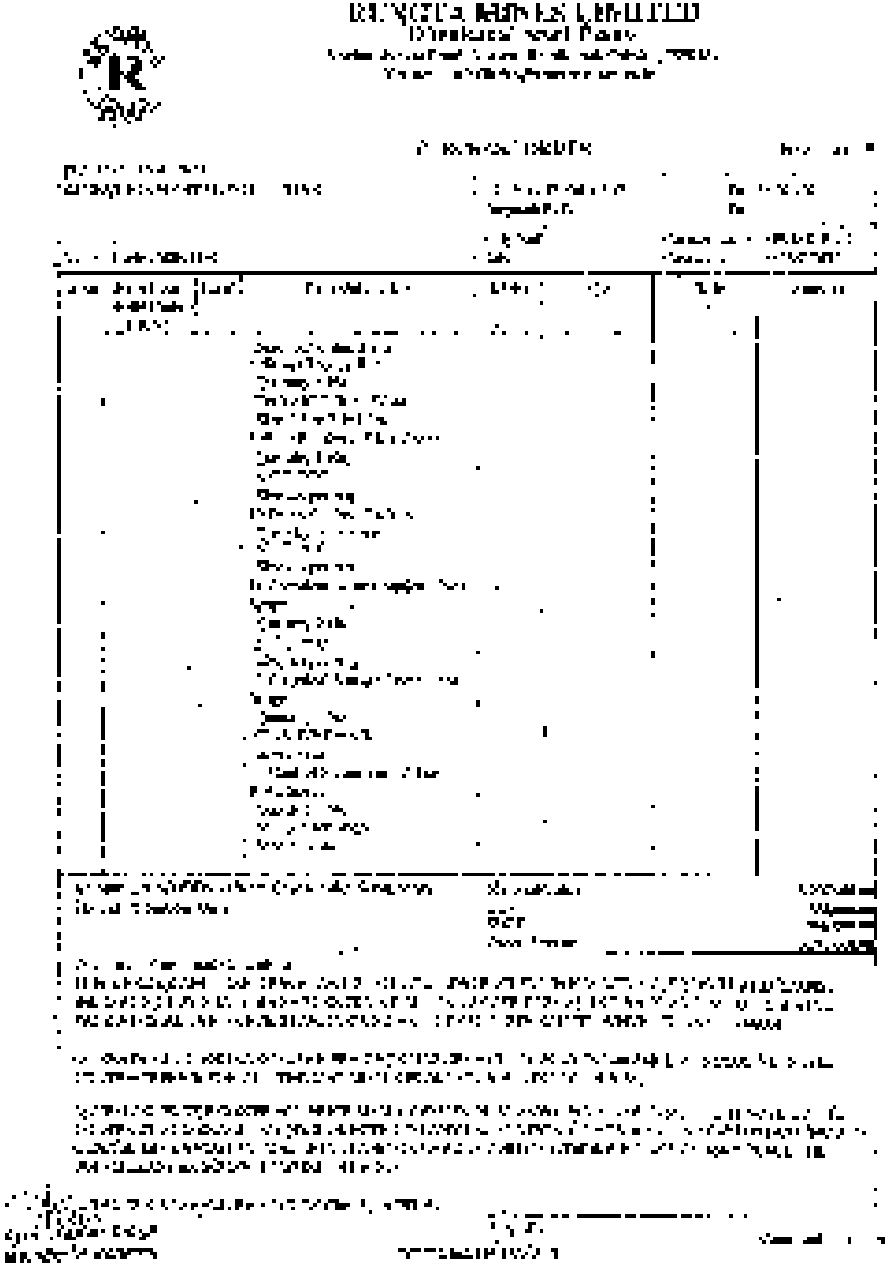


ANNEXURE : VI Contd..









ANNEXURE : VI Contd..

ANNEXURE : VI Contd..

ANNEXURE : VI Contd..



RUNGTA MINES LIMITED
Dhanbad Steel Plant

TENTATIVE ORDER



RUNGTA MINES LIMITED
Dhanbad Steel Plant

ANNEXURE : VI Contd..

ANNEXURE : VI Contd..

RUNGTA MINES LIMITED

Dhirubhai Shed Plant

PURCHASE ORDER

RUNGTA MINES LIMITED

Dhirubhai Shed Plant

PURCHASE ORDER

Government of Odisha
Directorate of Water Resources

No. [illegible] Dated [illegible]

From

[illegible]
Special Secretary to Government

To

[illegible]

Sub: Allocation of 2.54 cusecs of surface water for [illegible] Project in favour of [illegible] for [illegible]

Sir,

[illegible] Project in favour of [illegible] vide Letter No. [illegible] dated 21.2.2022 of the Chief Engineer, [illegible] Circle, [illegible] and the proposal was placed before the Government for allocation of 2.54 cusecs of water from the [illegible] Project in favour of [illegible] for the following purposes:-

1. Phase-I : [illegible]
2. Phase-II : [illegible]
3. Phase-III : [illegible]
4. Phase-IV : [illegible]

Terms & Conditions

1. [illegible] shall not, under any circumstances, claim any compensation in the event of [illegible] Project. Water is available only [illegible] and the [illegible] shall not be responsible for any [illegible] in the availability of water.
2. If, for any reason whatsoever, [illegible] is required to be stopped, the [illegible] shall not be responsible for any [illegible] and [illegible] shall have no right to claim any compensation for [illegible] and [illegible] shall be bound to [illegible]

Contd.

[illegible]

3. [illegible] shall not be entitled to any [illegible] and shall have no right to claim any compensation for [illegible] and [illegible] shall be bound to [illegible]
4. [illegible] shall be responsible for [illegible] and shall have no right to claim any compensation for [illegible] and [illegible] shall be bound to [illegible]
5. [illegible] shall be responsible for [illegible] and shall have no right to claim any compensation for [illegible] and [illegible] shall be bound to [illegible]
6. [illegible] shall be responsible for [illegible] and shall have no right to claim any compensation for [illegible] and [illegible] shall be bound to [illegible]
7. [illegible] shall be responsible for [illegible] and shall have no right to claim any compensation for [illegible] and [illegible] shall be bound to [illegible]
8. [illegible] shall be responsible for [illegible] and shall have no right to claim any compensation for [illegible] and [illegible] shall be bound to [illegible]
9. [illegible] shall be responsible for [illegible] and shall have no right to claim any compensation for [illegible] and [illegible] shall be bound to [illegible]
10. [illegible] shall be responsible for [illegible] and shall have no right to claim any compensation for [illegible] and [illegible] shall be bound to [illegible]

ANNEXURE : VII Contd..

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ANNEXURE : VII Contd..

ODISHA

ANNEXURE : VII Contd..

ODISHA

DAILY AVERAGE OF MICRO-METEOROLOGICAL MONITORED DATA (1 MARCH, 2021 TO 31 MAY, 2021)

DATE	CALM	<---------- DIRECTION WISE AVERAGE WIND SPEED (km/hr) EXCLUDING CALM ---------->																TEMP.	REL_HUM	RAINFALL
	<1.8kmph	E	ENE	NE	NNE	N	NNW	NW	WNW	W	WSW	SW	SSW	S	SSE	SE	ESE	(°C)	(%)	(mm)
01/03/2021	1.49	0.00	0.00	0.00	0.00	0.00	0.00	11.99	12.65	9.11	11.19	8.24	0.00	0.00	0.00	0.00	0.00	28.97	40.00	0.00
02/03/2021	0.85	0.00	0.00	0.00	10.71	16.33	0.00	9.81	0.00	9.17	0.00	9.55	9.09	15.53	0.00	0.00	0.00	28.20	47.00	0.00
03/03/2021	0.00	0.00	11.64	12.03	0.00	0.00	15.00	0.00	0.00	0.00	9.32	14.32	6.59	6.33	0.00	12.84	12.08	28.68	52.00	0.00
04/03/2021	1.36	8.05	0.00	10.47	0.00	0.00	14.03	14.76	0.00	11.51	12.88	6.21	15.26	12.31	0.00	0.00	9.95	28.99	55.00	0.00
05/03/2021	0.67	0.00	0.00	6.10	12.20	11.62	0.00	8.12	0.00	7.42	3.45	10.35	8.34	0.00	0.00	0.00	0.00	29.21	53.00	0.00
06/03/2021	1.08	12.54	0.00	13.23	10.01	13.14	0.00	8.55	9.61	4.93	10.58	9.44	3.45	5.29	0.00	0.00	0.00	29.91	51.00	0.00
07/03/2021	1.08	13.00	10.81	7.08	8.40	10.30	0.00	9.66	11.35	9.32	5.12	8.40	0.00	0.00	0.00	11.39	0.00	30.08	50.00	0.00
08/03/2021	0.93	0.00	0.00	0.00	12.54	8.06	10.89	10.39	0.00	9.43	4.95	0.00	0.00	1.80	13.23	0.00	0.00	30.06	46.00	0.00
09/03/2021	1.13	12.34	11.62	13.37	0.00	8.21	0.00	0.00	0.00	0.00	1.80	9.49	12.19	0.00	0.00	0.00	0.00	29.80	41.00	0.00
10/03/2021	0.98	12.86	5.41	10.05	0.00	0.00	0.00	4.37	0.00	7.02	0.00	12.39	9.47	14.84	0.00	0.00	0.00	30.63	50.00	0.00
11/03/2021	1.06	0.00	0.00	0.00	8.23	10.50	0.00	0.00	14.38	9.74	0.00	11.28	7.25	14.95	0.00	0.00	8.36	31.00	50.00	0.00
12/03/2021	0.78	12.77	6.44	9.92	7.82	0.00	0.00	8.99	11.04	13.46	0.00	10.70	0.00	15.41	0.00	0.00	7.36	31.02	56.00	0.00
13/03/2021	1.23	11.74	10.81	9.90	8.17	12.54	0.00	7.05	9.32	0.00	8.86	0.00	11.02	0.00	0.00	0.00	9.43	31.00	56.00	0.00
14/03/2021	0.82	0.00	8.72	7.59	0.00	13.15	17.14	12.35	7.71	7.94	0.00	17.14	0.00	0.00	0.00	0.00	0.00	31.00	51.00	0.00
15/03/2021	1.06	12.50	0.00	13.29	12.66	12.42	0.00	15.99	0.00	9.09	0.00	13.80	12.19	0.00	5.29	17.37	8.17	31.60	39.00	0.00
16/03/2021	1.16	8.05	5.64	14.07	14.32	11.56	0.00	12.74	0.00	12.66	0.00	5.98	11.45	0.00	0.00	0.00	5.75	32.51	41.00	0.00
17/03/2021	0.76	0.00	6.73	10.58	21.74	0.00	0.00	10.38	9.39	5.29	0.00	10.24	0.00	0.00	0.00	0.00	7.65	31.89	55.00	0.00
18/03/2021	0.00	15.07	0.00	15.76	11.23	14.49	13.57	0.00	12.16	0.00	0.00	13.69	17.14	0.00	13.00	15.87	15.89	30.15	59.00	0.00
19/03/2021	0.95	8.46	0.00	15.96	0.00	0.00	0.00	9.09	0.00	5.75	10.44	15.22	13.00	9.72	0.00	0.00	0.00	28.89	45.00	0.00
20/03/2021	1.06	5.87	0.00	8.44	15.30	0.00	9.35	18.33	14.76	0.00	7.94	6.56	9.43	17.25	0.00	0.00	0.00	33.59	47.00	0.00
21/03/2021	1.04	0.00	0.00	0.00	0.00	19.78	8.40	10.99	5.75	13.00	0.00	9.22	14.61	11.19	9.66	16.26	0.00	34.66	50.00	0.00
22/03/2021	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.46	8.82	11.50	0.00	12.77	13.03	0.00	10.81	0.00	12.42	34.70	48.00	0.00
23/03/2021	1.04	10.43	0.00	16.18	0.00	0.00	0.00	0.00	0.00	9.55	5.98	14.55	17.71	13.00	7.71	8.63	7.94	32.68	58.00	0.00
24/03/2021	1.38	0.00	0.00	12.32	0.00	17.25	0.00	0.00	0.00	0.00	6.56	10.08	14.78	5.75	11.27	3.34	0.00	31.58	67.00	0.00
25/03/2021	0.98	9.90	0.00	10.62	18.52	0.00	0.00	15.41	14.21	0.00	11.39	13.34	0.00	0.00	10.70	11.28	0.00	30.01	72.00	0.00
26/03/2021	1.35	7.65	0.00	9.66	0.00	0.00	0.00	8.32	0.00	0.00	0.00	13.71	10.68	0.00	0.00	0.00	8.17	29.99	66.00	0.00
27/03/2021	1.04	0.00	0.00	10.64	0.00	0.00	0.00	6.35	0.00	10.12	0.00	12.54	8.70	0.00	11.27	0.00	9.78	30.85	64.00	0.00
28/03/2021	1.07	10.79	12.60	19.78	0.00	0.00	0.00	0.00	0.00	3.61	0.00	12.31	17.83	11.73	0.00	4.72	13.78	31.46	66.00	0.00
29/03/2021	0.79	11.22	6.21	10.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.65	19.27	14.87	5.29	8.74	10.58	32.51	60.00	0.00
30/03/2021	1.18	0.00	0.00	12.35	0.00	0.00	0.00	5.87	0.00	0.00	0.00	10.83	0.00	11.27	0.00	0.00	8.07	33.15	57.00	0.00
31/03/2021	1.30	0.00	0.00	16.45	0.00	0.00	0.00	12.15	9.21	12.10	13.34	10.47	0.00	16.80	0.00	0.00	0.00	33.44	46.00	0.00
01/04/2021	0.46	0.00	0.00	14.95	6.16	17.10	12.02	11.10	4.72	9.44	0.00	12.31	9.09	11.16	0.00	0.00	0.00	33.77	50.00	0.00
02/04/2021	0.58	6.90	0.00	12.49	7.82	6.21	0.00	13.12	10.47	8.68	13.81	10.87	0.00	14.78	0.00	0.00	14.72	33.60	48.00	0.00
03/04/2021	0.84	9.55	0.00	0.00	0.00	11.28	16.16	15.26	8.21	11.66	4.14	9.49	0.00	0.00	0.00	0.00	0.00	33.60	43.00	0.00
04/04/2021	0.87	0.00	0.00	0.00	0.00	0.00	0.00	6.76	0.00	10.73	0.00	12.08	8.51	0.00	0.00	8.05	0.00	33.38	39.00	0.00
05/04/2021	1.13	14.49	10.47	17.48	0.00	0.00	5.29	7.71	7.13	11.16	0.00	9.39	12.85	13.59	14.26	0.00	0.00	33.37	49.00	0.00
06/04/2021	1.27	7.71	0.00	16.26	0.00	15.64	0.00	8.74	0.00	0.00	0.00	11.96	6.79	13.20	0.00	0.00	0.00	32.68	36.00	0.00
07/04/2021	1.23	5.29	0.00	14.15	0.00	0.00	3.80	11.41	11.53	7.36	6.56	9.61	7.94	13.57	0.00	0.00	0.00	33.08	48.00	0.00
08/04/2021	0.78	0.00	0.00	0.00	0.00	0.00	8.76	12.70	17.37	12.32	13.76	16.28	0.00	0.00	0.00	0.00	0.00	30.07	64.00	0.00
09/04/2021	1.00	0.00	9.09	0.00	0.00	0.00	11.95	7.71	15.96	9.32	8.52	9.95	6.10	0.00	11.39	13.17	7.94	33.03	53.00	0.00
10/04/2021	0.82	4.14	10.58	13.29	12.77	0.00	9.95	13.76	12.02	9.43	0.00	9.70	0.00	0.00	0.00	10.43	0.00	33.38	48.00	0.00
11/04/2021	0.77	0.00	10.12	13.90	13.80	0.00	10.01	14.61	9.05	0.00	8.97	1.80	16.22	0.00	0.00	17.43	0.00	32.08	52.00	0.00
12/04/2021	0.80	0.00	0.00	12.08	0.00	13.69	0.00	9.17	8.28	13.96	0.00	10.97	6.98	0.00	0.00	14.28	0.00	34.72	49.00	0.00
13/04/2021	0.77	4.14	0.00	9.51	0.00	12.77	8.40	12.02	0.00	0.00	0.00	10.74	8.48	9.55	8.63	12.77	0.00	34.48	49.00	0.00
14/04/2021	0.00	14.61	8.74	10.13	13.11	19.67	0.00	0.00	0.00	14.60	0.00	10.08	0.00	0.00	14.61	14.64	9.89	33.22	50.00	0.00
15/04/2021	1.72	10.30	0.00	0.00	11.16	12.25	13.02	10.89	17.25	10.59	0.00	0.00	0.00	0.00	0.00	15.94	18.63	32.99	53.00	0.00
16/04/2021	0.74	0.00	0.00	0.00	0.00	13.46	11.30	13.46	9.52	10.64	10.13	0.00	0.00	0.00	0.00	0.00	0.00	32.54	41.00	0.00
17/04/2021	0.83	0.00	0.00	0.00	0.00	12.48	14.82	13.07	10.87	15.30	0.00	9.35	0.00	0.00	0.00	0.00	0.00	32.34	38.00	0.00
18/04/2021	0.00	0.00	0.00	16.91	15.41	14.15	15.72	7.50	0.00	12.88	0.00	10.62	0.00	7.25	0.00	7.06	0.00	32.41	36.00	0.00
19/04/2021	0.00	0.00	10.12	10.79	0.00	0.00	9.15	10.13	11.46	6.82	0.00	5.41	0.00	9.21	0.00	6.83	12.65	32.63	41.00	0.00
20/04/2021	0.93	0.00	0.00	19.09	0.00	9.35	13.34	12.27	9.49	12.16	9.78	12.77	0.00	0.00	0.00	8.63	0.00	32.87	43.00	0.00

DAILY AVERAGE OF MICRO-METEOROLOGICAL MONITORED DATA (1 MARCH, 2021 TO 31 MAY, 2021)

DATE	CALM	<---------- DIRECTION WISE AVERAGE WIND SPEED (km/hr) EXCLUDING CALM ---------->																TEMP.	REL_HUM	RAINFALL
	<1.8kmph	E	ENE	NE	NNE	N	NNW	NW	WNW	W	WSW	SW	SSW	S	SSE	SE	ESE	(°C)	(%)	(mm)
21/04/2021	1.47	0.00	0.00	12.59	9.32	11.16	0.00	13.34	10.47	8.86	0.00	0.00	0.00	13.53	0.00	12.25	0.00	33.58	48.00	0.00
22/04/2021	0.83	5.75	0.00	0.00	7.94	10.12	0.00	14.26	0.00	15.01	7.71	11.65	0.00	13.00	11.96	9.36	0.00	34.33	52.00	0.00
23/04/2021	0.83	8.86	7.13	0.00	0.00	0.00	14.57	11.12	15.30	8.69	10.36	7.14	11.96	11.05	0.00	9.78	6.79	35.43	45.00	0.00
24/04/2021	1.44	6.44	0.00	13.89	0.00	0.00	11.70	8.72	14.27	8.60	0.00	13.40	0.00	0.00	8.51	9.43	0.00	35.60	47.00	0.00
25/04/2021	0.54	0.00	0.00	18.17	0.00	14.72	0.00	9.55	0.00	13.56	0.00	22.08	8.01	11.69	7.82	15.94	0.00	34.82	49.00	0.00
26/04/2021	0.00	10.47	0.00	11.39	0.00	0.00	0.00	0.00	0.00	10.36	0.00	13.64	11.39	0.00	13.34	12.77	8.63	34.62	51.00	0.00
27/04/2021	0.00	0.00	0.00	0.00	0.00	11.56	0.00	14.13	12.42	8.16	0.00	18.71	13.58	12.77	16.56	12.39	0.00	33.59	51.00	0.00
28/04/2021	1.63	0.00	0.00	13.69	0.00	0.00	0.00	9.92	9.86	23.00	0.00	21.57	11.68	9.81	12.02	0.00	0.00	33.96	50.00	0.00
29/04/2021	1.68	0.00	0.00	15.30	0.00	0.00	0.00	13.59	7.94	18.52	10.64	16.54	8.97	0.00	9.56	9.26	0.00	34.15	50.00	0.00
30/04/2021	1.30	0.00	0.00	0.00	0.00	0.00	0.00	13.52	12.94	7.94	6.35	8.84	0.00	4.95	0.00	0.00	0.00	34.15	49.00	0.00
01/05/2021	0.13	14.62	0.00	15.15	0.00	0.00	0.00	15.53	0.00	16.03	0.00	9.68	8.40	11.50	0.00	7.60	13.71	34.45	49.00	0.00
02/05/2021	0.00	13.97	0.00	18.06	10.36	0.00	0.00	16.05	18.98	15.89	13.81	0.00	0.00	0.00	0.00	0.00	11.04	33.89	54.00	0.00
03/05/2021	1.76	7.48	0.00	0.00	8.70	8.80	0.00	0.00	7.02	0.00	10.12	10.48	18.52	8.80	9.16	11.60	0.00	33.81	50.00	0.00
04/05/2021	0.00	0.00	0.00	15.30	0.00	0.00	0.00	10.40	22.60	13.42	10.47	0.00	10.47	11.04	0.00	11.09	0.00	34.53	50.00	0.00
05/05/2021	1.20	5.41	0.00	4.37	12.31	0.00	0.00	11.54	11.62	14.15	11.52	13.46	8.32	19.40	0.00	9.43	3.22	33.75	44.00	0.00
06/05/2021	1.76	0.00	0.00	6.79	0.00	0.00	0.00	0.00	0.00	9.05	14.03	11.98	8.23	11.55	15.70	13.34	0.00	34.30	39.00	0.00
07/05/2021	0.70	18.40	0.00	15.95	0.00	0.00	9.04	22.89	11.78	0.00	0.00	10.82	9.09	0.00	14.67	15.77	0.00	34.43	48.00	0.00
08/05/2021	0.00	13.34	0.00	9.20	0.00	0.00	0.00	14.03	12.31	15.76	6.56	0.00	12.27	13.59	18.86	12.77	0.00	34.50	56.00	0.00
09/05/2021	0.00	0.00	0.00	14.84	0.00	0.00	0.00	0.00	6.21	16.29	12.04	13.23	14.15	0.00	16.10	13.13	0.00	33.68	54.00	0.00
10/05/2021	0.46	14.15	0.00	15.43	0.00	0.00	0.00	17.26	8.63	11.68	6.21	15.51	0.00	0.00	10.24	21.28	0.00	33.66	55.00	0.00
11/05/2021	0.00	12.71	0.00	0.00	0.00	0.00	0.00	15.47	0.00	11.65	6.39	12.66	8.28	13.95	14.85	15.83	0.00	34.13	57.00	0.00
12/05/2021	1.32	0.00	0.00	0.00	0.00	0.00	0.00	14.15	14.84	12.73	8.23	6.79	11.09	8.05	11.73	12.16	0.00	34.19	51.00	0.00
13/05/2021	1.36	0.00	0.00	0.00	0.00	0.00	0.00	12.88	7.25	11.39	0.00	0.00	5.29	3.95	4.33	10.28	0.00	34.09	56.00	0.00
14/05/2021	1.18	0.00	0.00	14.72	0.00	0.00	0.00	11.45	9.61	16.91	6.44	9.66	5.98	8.91	5.56	0.00	0.00	34.13	52.00	0.00
15/05/2021	0.00	0.00	0.00	5.83	0.00	0.00	0.00	10.24	0.00	13.96	9.32	12.37	8.98	7.42	8.29	12.33	0.00	34.52	66.00	0.00
16/05/2021	1.47	4.14	0.00	13.11	0.00	0.00	0.00	12.61	0.00	11.22	4.37	10.64	0.00	7.13	5.98	7.04	0.00	34.85	71.00	0.00
17/05/2021	1.28	4.95	0.00	0.00	0.00	0.00	0.00	13.52	0.00	10.08	6.96	11.41	5.29	0.00	7.36	11.27	0.00	32.95	61.00	0.00
18/05/2021	0.92	0.00	0.00	12.08	0.00	0.00	0.00	12.19	0.00	10.01	0.00	5.87	11.04	0.00	0.00	13.34	11.62	34.83	67.00	0.00
19/05/2021	1.20	5.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.21	6.67	0.00	0.00	10.74	35.57	62.00	0.00
20/05/2021	0.86	12.19	0.00	6.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.52	14.21	5.75	9.20	8.13	35.85	56.00	0.00
21/05/2021	1.36	9.48	5.79	11.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.23	0.00	0.00	0.00	34.10	46.00	0.00
22/05/2021	1.63	0.00	0.00	14.61	0.00	0.00	0.00	0.00	0.00	9.20	0.00	8.42	0.00	0.00	3.45	15.87	11.96	34.38	50.00	0.00
23/05/2021	0.00	4.03	0.00	15.07	0.00	0.00	0.00	0.00	0.00	11.16	0.00	6.92	11.02	11.96	5.38	13.11	19.55	33.33	48.00	0.00
24/05/2021	1.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.51	15.78	8.24	8.40	0.00	15.47	32.04	62.00	2.20
25/05/2021	0.00	0.00	0.00	47.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.06	38.70	0.00	0.00	38.64	25.20	92.00	19.40
27/05/2021	0.00	0.00	0.00	17.20	0.00	0.00	16.04	0.00	0.00	0.00	0.00	0.00	0.00	19.88	0.00	13.80	0.00	25.15	96.00	7.90
28/05/2021	0.00	14.21	14.15	0.00	0.00	11.65	11.96	0.00	0.00	0.00	0.00	9.15	0.00	0.00	11.35	0.00	0.00	32.36	57.00	5.30
29/05/2021	1.28	6.00	10.16	7.02	22.54	18.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.41	15.07	0.00	5.06	33.08	51.00	0.00
30/05/2021	1.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.22	9.34	11.12	0.00	0.00	8.05	34.52	49.00	0.00
31/05/2021	0.91	0.00	0.00	9.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.76	11.76	8.42	4.95	0.00	7.90	33.79	46.00	0.00

Note : The above daily average have been arrieved after processing the hourly readings monitored by Automatic Weather Station

Min Mec R&D Laboratory
(A DIVISION OF MIN MEC CONSULTANCY PVT. LTD.)
A-121, Aryavartan Complex, KH42U Road, New Delhi – 110059
Phone: 28522236, 28526891, 28522569
Email: lab.minmec@gmail.com, Visit us at: http://www.minmec.com
Recognised by MOEF&CC (S.No.97 of S.O.3744(E) dated 17/10/2019)

ANNEXURE : IX

Customer's Name & Address

Rungta Mines Ltd., Dhenkanal Steel Plant.
Village – Jharbandh, P.O. – Nimabahali, Via - Meramandali
Dist. – Dhenkanal – 759121

Contact Person : Mr. G.P. Sharma, Phone : 06582-255261

Sample Particulars		
Type of Sample	:	Ambient Air
Work Order No.	:	RML/DSP/EMP/20-21/584(A)
Sampling Location	:	In and around Expansion of 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, NH_3, Pb, As, Ni & Lab SOP/09 for $PM_{2.5}$
Sample Duration	:	24 hour and 1 hour for NH_3
Sampling Team	:	MMRDL (Gaurav)
Sample Reg. No	:	MMA/2021S3L1, L2, L3, L4, L5, L6, L7, L8 & L9/01-24
Date of Sampling	:	01/03/2021 to 31/05/2021
Date of Receipt	:	18/03/2021 to 03/06/2021
Date of Report	:	16/06/2021
Test Report No.	:	MMA/06-2021/52
ULR No.	:	TC633721000000129F
Page	:	1 of 4

TEST REPORT

Sl. No.	Location:→	Core Zone (Existing Plant area)								Beruanpal Village				Mahalunda Village			
	Date of sampling↓	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)	NH_3 (µg/m³)	Pb (µg/m³)	As (ng/m³)	Ni (ng/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)
1	01 - 02-03-2021	74.3	42.0	10.3	13.2	BDL	BDL	BDL	BDL	64.5	37.5	11.8	14.4	60.1	32.9	12.3	13.2
2	05 - 06-03-2021	72.5	39.3	9.8	12.4	BDL	BDL	BDL	BDL	67.9	41.9	12.4	13.2	64.2	35.8	9.3	11.6
3	09 - 10-03-2021	69.4	40.4	10.3	12.0	BDL	BDL	BDL	BDL	64.2	38.0	13.4	14.4	63.4	38.3	10.3	10.5
4	12 - 13-03-2021	67.7	39.3	10.8	18.2	BDL	BDL	BDL	BDL	66.1	35.5	12.4	12.8	63.2	38.3	9.3	10.9
5	16 - 17-03-2021	73.2	41.8	12.9	13.6	BDL	BDL	BDL	BDL	64.0	36.2	12.4	13.2	62.8	35.8	10.8	11.7
6	19 - 20-03-2021	74.7	43.7	12.9	17.1	BDL	BDL	BDL	BDL	68.8	39.4	13.4	15.1	58.2	34.6	8.7	12.0
7	23 - 24-03-2021	74.2	39.9	12.9	15.1	BDL	BDL	BDL	BDL	67.5	37.7	10.8	14.4	64.8	37.0	8.8	12.0
8	27 - 28-03-2021	68.8	38.8	13.9	14.4	BDL	BDL	BDL	BDL	69.9	39.7	11.3	15.9	58.0	33.5	11.8	11.6
9	01 - 02-04-2021	69.2	39.6	11.6	17.7	BDL	BDL	BDL	BDL	68.2	36.6	13.6	13.7	63.1	37.2	8.9	14.1
10	05 - 06-04-2021	74.4	40.7	13.6	15.3	BDL	BDL	BDL	BDL	64.7	36.4	11.6	13.3	59.0	33.3	11.6	12.9
11	09 - 10-04-2021	70.8	40.3	11.6	12.1	BDL	BDL	BDL	BDL	67.6	37.9	13.0	14.9	63.8	36.6	9.5	12.9
12	12 - 13-04-2021	72.1	39.1	10.9	15.7	BDL	BDL	BDL	BDL	69.7	39.1	12.3	15.3	64.6	35.8	12.3	12.5
13	16 - 17-04-2021	69.5	42.2	13.7	16.5	BDL	BDL	BDL	BDL	65.0	37.2	10.9	16.9	63.6	36.0	12.3	12.9
14	19 - 20-04-2021	73.0	40.4	12.3	14.5	BDL	BDL	BDL	BDL	65.9	38.0	14.3	15.7	64.8	37.9	8.9	12.9
15	23 - 24-04-2021	69.5	38.1	14.3	14.9	BDL	BDL	BDL	BDL	65.0	35.1	9.6	12.9	59.6	32.6	12.3	12.5
16	27 - 28-04-2021	73.2	42.6	13.6	16.9	BDL	BDL	BDL	BDL	65.0	36.4	9.5	13.7	59.9	34.3	8.9	12.5
17	01 - 02-05-2021	70.0	37.9	13.0	14.1	0.075	BDL	BDL	0.957	67.2	36.5	13.0	15.7	58.0	33.0	10.2	12.5
18	04 - 05-05-2021	74.0	40.5	13.0	16.1	BDL	BDL	BDL	BDL	68.5	39.1	10.2	12.5	62.9	37.0	8.9	10.5
19	08 - 09-05-2021	71.8	38.4	10.9	14.9	BDL	BDL	BDL	0.886	64.6	38.5	9.6	15.3	58.2	35.1	10.9	12.9
20	11 - 12-05-2021	70.7	41.8	11.6	14.9	BDL	BDL	BDL	BDL	68.7	41.4	13.6	14.1	64.4	36.7	12.3	13.3
21	15 - 16-05-2021	74.5	42.0	11.8	14.2	0.087	BDL	BDL	BDL	69.7	39.7	13.9	16.6	65.0	37.9	10.2	10.9
22	18 - 19-05-2021	72.5	37.7	13.9	15.8	BDL	BDL	BDL	1.081	65.2	38.2	11.2	14.5	61.6	33.7	11.8	12.9
23	22 - 23-05-2021	74.3	43.1	10.2	14.2	BDL	BDL	BDL	BDL	69.5	42.0	13.4	14.2	58.4	34.6	9.1	13.0
24	28 - 29-05-2021	36.8	21.4	5.9	9.7	BDL	BDL	BDL	BDL	35.4	19.6	4.8	9.3	30.4	20.4	3.7	8.9
Minimum		**36.8**	**21.4**	**5.9**	**9.7**	**0.075**	**-**	**-**	**0.886**	**35.4**	**19.6**	**4.8**	**9.3**	**30.4**	**20.4**	**3.7**	**8.9**
Maximum		**74.7**	**43.7**	**14.3**	**18.2**	**0.087**	**-**	**-**	**1.081**	**69.9**	**42.0**	**14.3**	**16.9**	**65.0**	**38.3**	**12.3**	**14.1**
Average		**70.5**	**39.6**	**11.9**	**14.7**	**0.081**	**-**	**-**	**0.975**	**65.5**	**37.4**	**11.8**	**14.2**	**60.5**	**34.9**	**10.1**	**12.1**
98 percentile		**74.6**	**43.4**	**14.1**	**18.0**	**0.087**	**-**	**-**	**1.076**	**69.8**	**42.0**	**14.1**	**16.8**	**64.9**	**38.3**	**12.3**	**13.7**

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ANNEXURE : IX Contd..

Sl. No.	Location:→	Nimabahali Village				Kankalu Village				Patala Village			
	Date of sampling↓	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
1	02 - 03-03-2021	63.1	37.6	11.3	17.5	67.6	37.8	13.9	14.3	63.4	37.0	10.3	10.9
2	06 - 07-03-2021	67.4	38.7	10.8	19.0	70.6	40.4	11.8	13.6	59.0	36.3	9.3	11.6
3	10 - 11-03-2021	58.6	31.6	7.7	10.9	66.9	38.4	14.9	16.7	63.3	35.8	7.7	12.0
4	13 - 14-03-2021	69.1	39.8	10.3	18.2	67.1	39.1	12.3	14.4	64.5	38.3	8.2	12.0
5	17 - 18-03-2021	66.9	38.9	12.9	20.2	69.1	40.0	14.9	15.9	62.8	36.8	8.8	11.3
6	20 - 21-03-2021	67.3	40.9	10.8	19.8	68.9	40.2	12.9	14.4	62.4	37.8	10.3	11.7
7	24 - 25-03-2021	64.1	34.2	14.4	19.4	70.7	38.0	14.9	15.9	64.1	39.3	7.7	11.6
8	28 - 29-03-2021	61.3	32.6	13.4	14.8	67.8	36.8	14.9	15.1	63.0	36.2	10.8	12.8
9	02 - 03-04-2021	61.1	33.7	10.2	20.5	68.7	39.6	15.0	15.3	60.1	34.9	8.9	10.1
10	06 - 07-04-2021	69.1	37.8	10.2	14.9	70.6	38.4	13.0	14.5	64.0	36.0	8.9	12.1
11	10 - 11-04-2021	67.0	38.1	10.9	16.1	68.4	40.2	13.0	14.5	58.0	34.9	7.5	10.5
12	13 - 14-04-2021	64.4	38.3	10.9	21.8	69.0	41.1	15.0	16.9	62.5	36.3	8.2	12.1
13	17 - 18-04-2021	66.2	37.5	13.7	15.7	68.4	38.7	12.3	15.7	60.9	35.1	10.9	11.7
14	20 - 21-04-2021	68.2	38.5	10.9	19.7	70.7	39.1	15.0	16.1	62.8	37.1	10.9	12.1
15	24 - 25-04-2021	65.5	39.6	11.6	20.5	66.7	40.5	12.3	15.7	59.7	37.0	9.5	10.1
16	28 - 29-04-2021	66.9	38.4	11.6	18.1	66.6	37.5	12.9	14.1	62.9	38.0	10.9	12.5
17	02 - 03-05-2021	63.3	36.4	13.6	16.5	68.2	39.9	10.9	14.5	58.0	35.0	8.2	10.9
18	05 - 06-05-2021	67.1	35.8	10.2	19.3	69.4	39.3	13.6	14.5	58.7	36.2	8.9	10.5
19	09 - 10-05-2021	63.9	37.6	14.3	16.1	67.5	38.3	13.0	16.1	64.5	37.4	8.9	12.9
20	12 - 13-05-2021	60.0	35.3	10.9	19.3	66.3	38.5	12.3	14.5	64.6	39.2	10.2	12.1
21	16 - 17-05-2021	61.3	35.1	14.4	15.8	69.4	39.2	12.3	15.0	64.9	40.1	8.6	12.6
22	19 - 20-05-2021	63.7	38.0	14.5	20.2	69.0	37.0	11.8	14.2	58.6	35.1	9.6	9.7
23	23 - 24-05-2021	65.2	37.1	10.2	20.7	68.4	40.1	13.4	16.6	60.1	35.1	8.6	10.1
24	29 - 30-05-2021	37.7	23.3	6.4	13.7	33.9	21.2	5.9	10.9	40.1	24.6	4.3	8.5
Minimum		**37.7**	**23.3**	**6.4**	**10.9**	**33.9**	**21.2**	**5.9**	**10.9**	**40.1**	**24.6**	**4.3**	**8.5**
Maximum		**69.1**	**40.9**	**14.5**	**21.8**	**70.7**	**41.1**	**15.0**	**16.9**	**64.9**	**40.1**	**10.9**	**12.9**
Average		**63.7**	**36.5**	**11.5**	**17.9**	**67.1**	**38.3**	**13.0**	**15.0**	**61.0**	**36.2**	**9.0**	**11.3**
98 percentile		**69.1**	**40.4**	**14.4**	**21.3**	**70.7**	**40.8**	**15.0**	**16.8**	**64.8**	**39.7**	**10.9**	**12.8**

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ANNEXURE : IX Contd..

Sl. No.	Location:→	Narendrapur Village				Benipathar Village (Core zone expansion area)								Barhamunda Village			
	Date of sampling↓	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)	NH_3 (µg/m³)	Pb (µg/m³)	As (ng/m³)	Ni (ng/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)
1	03 - 04-03-2021	65.5	36.2	14.9	15.9	53.9	31.3	8.7	10.9	BDL	BDL	BDL	BDL	61.1	34.7	8.2	13.6
2	07 - 08-03-2021	66.8	37.3	14.4	15.5	58.2	34.2	10.3	11.7	BDL	BDL	BDL	BDL	57.4	31.6	13.4	13.6
3	11 - 12-03-2021	60.2	35.8	15.4	18.6	54.3	30.9	10.8	11.3	BDL	BDL	BDL	BDL	48.1	29.6	9.3	12.0
4	14 - 15-03-2021	67.5	38.5	14.9	21.0	58.5	33.7	9.3	10.9	BDL	BDL	BDL	BDL	57.7	34.1	6.7	12.0
5	18 - 19-03-2021	58.5	33.7	12.9	15.9	54.8	29.6	8.2	10.1	BDL	BDL	BDL	BDL	56.2	31.2	10.3	13.6
6	21 - 22-03-2021	63.6	36.2	15.4	21.7	56.2	31.2	7.7	10.5	BDL	BDL	BDL	BDL	54.7	31.2	7.2	12.8
7	25 - 26-03-2021	62.4	38.0	13.9	17.8	53.3	30.0	8.7	10.8	BDL	BDL	BDL	BDL	51.0	27.5	7.7	12.4
8	29 - 30-03-2021	58.1	39.4	14.4	19.0	55.2	32.1	9.8	10.5	BDL	BDL	BDL	BDL	60.9	35.1	11.3	12.8
9	03 - 04-04-2021	60.1	32.7	15.0	17.7	60.1	33.4	9.5	9.7	BDL	BDL	BDL	BDL	49.5	28.4	9.6	12.5
10	07 - 08-04-2021	67.3	39.0	13.0	18.5	59.7	32.1	8.2	11.7	BDL	BDL	BDL	BDL	55.3	31.3	6.8	12.1
11	11 - 12-04-2021	62.5	35.5	16.4	18.5	53.8	32.1	9.5	11.7	BDL	BDL	BDL	BDL	51.2	29.5	11.6	13.3
12	14 - 15-04-2021	67.5	37.2	14.3	18.1	53.9	30.4	9.5	10.5	BDL	BDL	BDL	BDL	54.2	31.6	10.2	12.1
13	18 - 19-04-2021	59.5	34.6	15.7	17.3	53.4	30.4	10.2	10.5	BDL	BDL	BDL	BDL	59.9	35.1	10.9	13.3
14	21 - 22-04-2021	60.3	35.9	13.0	14.1	53.4	30.0	9.5	11.3	BDL	BDL	BDL	BDL	48.3	26.2	10.9	11.7
15	25 - 26-04-2021	66.6	36.6	13.0	14.5	59.4	32.2	10.9	12.1	BDL	BDL	BDL	BDL	48.6	27.4	12.9	13.3
16	29 - 30-04-2021	63.2	35.5	14.3	18.5	53.6	30.9	10.2	11.3	BDL	BDL	BDL	BDL	58.1	33.5	9.6	11.7
17	03 - 04-05-2021	58.7	33.8	15.0	17.7	55.4	31.6	8.2	10.9	BDL	BDL	BDL	BDL	56.3	32.4	13.0	13.3
18	06 - 07-05-2021	66.4	37.6	14.3	15.7	58.5	31.2	9.5	12.1	BDL	BDL	BDL	BDL	53.7	31.0	11.6	12.5
19	10 - 11-05-2021	67.1	40.0	13.6	16.1	53.6	31.6	10.2	10.5	BDL	BDL	BDL	BDL	60.1	34.6	8.9	12.9
20	13 - 14-05-2021	58.4	32.4	15.7	16.5	58.7	33.0	8.2	10.9	BDL	BDL	BDL	BDL	54.3	31.6	11.6	12.5
21	17 - 18-05-2021	62.4	34.7	12.9	21.5	53.3	30.5	8.6	11.3	BDL	BDL	BDL	BDL	54.4	33.0	8.6	12.5
22	20 - 21-05-2021	59.6	35.0	16.0	19.4	56.6	33.7	10.7	10.9	BDL	BDL	BDL	BDL	54.7	30.0	8.0	12.6
23	24 - 25-05-2021	63.8	35.0	15.5	19.0	54.6	29.5	9.6	11.7	BDL	BDL	BDL	BDL	61.0	35.6	12.8	13.4
24	30 - 31-05-2021	48.8	27.5	10.7	12.9	44.2	22.9	5.9	8.5	BDL	BDL	BDL	BDL	44.9	24.2	6.4	8.9
Minimum		**48.8**	**27.5**	**10.7**	**12.9**	**44.2**	**22.9**	**5.9**	**8.5**	**-**	**-**	**-**	**-**	**44.9**	**24.2**	**6.4**	**8.9**
Maximum		**67.5**	**40.0**	**16.4**	**21.7**	**60.1**	**34.2**	**10.9**	**12.1**	**-**	**-**	**-**	**-**	**61.1**	**35.6**	**13.4**	**13.6**
Average		**62.3**	**35.8**	**14.4**	**17.6**	**55.3**	**31.2**	**9.3**	**10.9**	**-**	**-**	**-**	**-**	**54.7**	**31.3**	**9.9**	**12.5**
98 percentile		**67.5**	**39.7**	**16.2**	**21.6**	**59.9**	**34.0**	**10.9**	**12.1**	**-**	**-**	**-**	**-**	**61.1**	**35.4**	**13.2**	**13.6**

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ANNEXURE : IX Contd..

Sl. No.	Date of Sampling	Location	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	As (ng/m^3)	Ni (ng/m^3)
1	09-10/03/2021	Beruanpal Village	BDL	BDL	BDL	BDL
2	12-13/03/2021		BDL	BDL	BDL	BDL
3	09-10/03/2021	Mahalunda Village	BDL	BDL	BDL	BDL
4	12-13/03/2021		BDL	BDL	BDL	BDL
5	10-11/03/2021	Nimabahali Village	BDL	BDL	BDL	BDL
6	13-14/03/2021		BDL	BDL	BDL	BDL
7	10-11/03/2021	Kankalu Village	BDL	BDL	BDL	BDL
8	13-14/03/2021		BDL	BDL	BDL	BDL
9	10-11/03/2021	Patala Village	BDL	BDL	BDL	BDL
10	13-14/03/2021		BDL	BDL	BDL	BDL
11	11-12/03/2021	Narendrapur Village	BDL	BDL	BDL	BDL
12	14-15/03/2021		BDL	BDL	BDL	BDL
13	11-12/03/2021	Barhamunda Village	BDL	BDL	BDL	BDL
14	14-15/03/2021		BDL	BDL	BDL	BDL

Note: BDL (Below Detection Limit) of NH_3<1.0; Pb<0.07$\mu g/m^3$; As < 0.6ng/m^3; Ni<0.6 ng/m^3

Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	NH_3 ($\mu g/m^3$)	Pb ($\mu g/m^3$)	As (ng/m^3)	Ni (ng/m^3)
Protocol of Measurement	**IS:5182 (Part 23)**	**Lab SOP/09**	**IS:5182 (Part 2)**	**IS:5182 (Part 6)**	**CPCB Guidelines**	**Method of Measurement – IS 3025 (Part 2) ICP Method**		
National Ambient Air Quality Standards (2009) for Concentration in Ambient Air for Industrial, Residential, Rural & Other areas.	**100 (24 hours)**	**60 (24 hours)**	**80 (24 hours)**	**80 (24 hours)**	**400 (24 hours)**	**1.0 (24 hours)**	**06 (Annual)**	**20 (Annual)**

Prepared by

Rashmi Gupta
Administrative Manager

Checked by

Dr. Marisha Sharma
Authorised Signatory

- end of report -

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ANNEXURE : IX Contd..

Customer's Name & Address
Rungta Mines Ltd., Dhenkanal Steel Plant.
Village – Jharbandh, P.O. – Nimabahali, Via - Meramandali
Dist. – Dhenkanal – 759121

Contact Person : Mr. G.P. Sharma, Phone : 06582-255261

Sample Particulars		
Type of Sample	:	Ambient Air
Work Order No.	:	RML/DSP/EMP/20-21/584(A)
Sampling Location	:	In and around Expansion of Dhenkanal Steel Plant, Odisha.
Sampling Procedure	:	CPCB guidelines NAAQMS 96/2012-13 for BaP, C_6H_6, & Instant Reading of CO.
Sample Duration	:	24 hours and Instant reading for CO
Sampling Team	:	MMRDL (Gaurav)
Sample Reg. No	:	MMA/2021S3L1, L2, L3, L4, L5, L6, L7, L8 & L9/01-24
Date of Sampling	:	01/03/2021 to 31/05/2021
Date of Receipt	:	18/03/2021 to 03/06/2021
Date of Report	:	16/06/2021
Test Report No.	:	MMA/06-2021/53
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TEST REPORT

Sl. No.	Location: → / Date of sampling ↓	Core Zone (Existing Plant area)			Beruanpal Village	Mahalunda Village
		BaP (ng/m^3)	C_6H_6 ($\mu g/m^3$)	CO (mg/m^3)	CO (mg/m^3)	CO (mg/m^3)
1	01 - 02-03-2021	N. D	N. D	0.396	0.463	0.411
2	05 - 06-03-2021	N. D	N. D	0.557	0.397	0.240
3	09 - 10-03-2021	N. D	N. D	0.443	0.273	0.401
4	12 - 13-03-2021	N. D	N. D	0.474	0.485	0.458
5	16 - 17-03-2021	N. D	N. D	0.474	0.346	0.365
6	19 - 20-03-2021	N. D	N. D	0.521	0.536	0.453
7	23 - 24-03-2021	N. D	N. D	0.495	0.302	0.328
8	27 - 28-03-2021	N. D	N. D	0.557	0.478	0.443
9	01 - 02-04-2021	N. D	N. D	0.417	0.419	0.307
10	05 - 06-04-2021	N. D	N. D	0.469	0.434	0.333
11	09 - 10-04-2021	N. D	N. D	0.463	0.266	0.307
12	12 - 13-04-2021	N. D	N. D	0.427	0.573	0.391
13	16 - 17-04-2021	N. D	N. D	0.505	0.492	0.323
14	19 - 20-04-2021	N. D	N. D	0.573	0.507	0.302
15	23 - 24-04-2021	N. D	N. D	0.573	0.324	0.24
16	27 - 28-04-2021	N. D	N. D	0.432	0.456	0.271
17	01 - 02-05-2021	N. D	N. D	0.359	0.529	0.333
18	04 - 05-05-2021	N. D	N. D	0.557	0.39	0.229
19	08 - 09-05-2021	N. D	N. D	0.354	0.375	0.234
20	11 - 12-05-2021	N. D	N. D	0.432	0.324	0.411
21	15 - 16-05-2021	N. D	N. D	0.562	0.536	0.411
22	18 - 19-05-2021	N. D	N. D	0.573	0.229	0.437
23	22 - 23-05-2021	N. D	N. D	0.344	0.412	0.432
24	28 - 29-05-2021	N. D	N. D	0.495	0.236	0.276
Minimum		**-**	**-**	**0.344**	**0.229**	**0.229**
Maximum		**-**	**-**	**0.573**	**0.573**	**0.458**
Average		**-**	**-**	**0.477**	**0.408**	**0.347**
98 percentile		**-**	**-**	**0.573**	**0.556**	**0.456**

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Test Report No. : MMA/06-2021/53
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ANNEXURE : IX Contd..

Sl. No.	Location:→	Nimabahali Village	Kankalu Village	Patala Village
	Date of sampling↓	CO (mg/m^3)	CO (mg/m^3)	CO (mg/m^3)
1	02-03-03-2021	0.619	0.545	0.420
2	06-07-03-2021	0.537	0.344	0.376
3	10-11-03-2021	0.594	0.616	0.401
4	13-14-03-2021	0.400	0.648	0.229
5	17-18-03-2021	0.506	0.629	0.439
6	20-21-03-2021	0.669	0.558	0.414
7	24-25-03-2021	0.600	0.447	0.267
8	28-29-03-2021	0.419	0.635	0.446
9	02-03-04-2021	0.344	0.421	0.312
10	06-07-04-2021	0.462	0.409	0.331
11	10-11-04-2021	0.350	0.687	0.331
12	13-14-04-2021	0.375	0.447	0.414
13	17-18-04-2021	0.387	0.642	0.401
14	20-21-04-2021	0.381	0.532	0.382
15	24-25-04-2021	0.406	0.409	0.388
16	28-29-04-2021	0.594	0.434	0.331
17	02-03-05-2021	0.675	0.415	0.458
18	05-06-05-2021	0.569	0.428	0.376
19	09-10-05-2021	0.431	0.428	0.325
20	12-13-05-2021	0.575	0.538	0.395
21	16-17-05-2021	0.587	0.396	0.369
22	19-20-05-2021	0.575	0.655	0.395
23	23-24-05-2021	0.356	0.512	0.293
24	29-30-05-2021	0.687	0.616	0.458
Minimum		**0.344**	**0.344**	**0.229**
Maximum		**0.687**	**0.687**	**0.458**
Average		**0.504**	**0.516**	**0.373**
98 percentile		**0.681**	**0.672**	**0.458**

NOTES:
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ANNEXURE : IX Contd..

Sl. No.	Location:→	Narendrapur Village	Benipathar Village (Core zone expansion area)			Barhamunda Village
	Date of sampling↓	CO (mg/m^3)	BaP (ng/m^3)	C_6H_6 ($\mu g/m^3$)	CO (mg/m^3)	CO (mg/m^3)
1	03 - 04-03-2021	0.737	N. D	N. D	0.240	0.398
2	07 - 08-03-2021	0.737	N. D	N. D	0.294	0.505
3	11 - 12-03-2021	0.632	N. D	N. D	0.286	0.115
4	14 - 15-03-2021	0.573	N. D	N. D	0.279	0.438
5	18 - 19-03-2021	0.684	N. D	N. D	0.329	0.142
6	21 - 22-03-2021	0.655	N. D	N. D	0.233	0.559
7	25 - 26-03-2021	0.626	N. D	N. D	0.344	0.135
8	29 - 30-03-2021	0.720	N. D	N. D	0.333	0.357
9	03 - 04-04-2021	0.696	N. D	N. D	0.247	0.418
10	07 - 08-04-2021	0.608	N. D	N. D	0.254	0.330
11	11 - 12-04-2021	0.726	N. D	N. D	0.294	0.350
12	14 - 15-04-2021	0.802	N. D	N. D	0.311	0.526
13	18 - 19-04-2021	0.755	N. D	N. D	0.229	0.573
14	21 - 22-04-2021	0.573	N. D	N. D	0.315	0.270
15	25 - 26-04-2021	0.761	N. D	N. D	0.326	0.357
16	29 - 30-04-2021	0.796	N. D	N. D	0.294	0.452
17	03 - 04-05-2021	0.643	N. D	N. D	0.301	0.539
18	06 - 07-05-2021	0.679	N. D	N. D	0.340	0.297
19	10 - 11-05-2021	0.790	N. D	N. D	0.322	0.364
20	13 - 14-05-2021	0.714	N. D	N. D	0.290	0.472
21	17 - 18-05-2021	0.790	N. D	N. D	0.304	0.330
22	20 - 21-05-2021	0.673	N. D	N. D	0.236	0.236
23	24 - 25-05-2021	0.755	N. D	N. D	0.326	0.350
24	30 - 31-05-2021	0.720	N. D	N. D	0.276	0.297
Minimum		**0.573**	**-**	**-**	**0.229**	**0.115**
Maximum		**0.802**	**-**	**-**	**0.344**	**0.573**
Average		**0.702**	**-**	**-**	**0.292**	**0.367**
98 percentile		**0.799**	**-**	**-**	**0.342**	**0.567**

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Test Report No. : MMA/06-2021/53

ANNEXURE : IX Contd..

Sl. No.	Date of Sampling	Location	BaP (ng/m^3)	C_6H_6 (µg/m^3)
1	09-10/03/2021	Beruanpal Village	N.D	N.D
2	12-13/03/2021		N.D	N.D
3	09-10/03/2021	Mahalunda Village	N.D	N.D
4	12-13/03/2021		N.D	N.D
5	10-11/03/2021	Nimabahali Village	N.D	N.D
6	13-14/03/2021		N.D	N.D
7	10-11/03/2021	Kankalu Village	N.D	N.D
8	13-14/03/2021		N.D	N.D
9	10-11/03/2021	Patala Village	N.D	N.D
10	13-14/03/2021		N.D	N.D
11	11-12/03/2021	Narendrapur Village	N.D	N.D
12	14-15/03/2021		N.D	N.D
13	11-12/03/2021	Barhamunda Village	N.D	N.D
14	14-15/03/2021		N.D	N.D

Note: N.D: Not Detected, BDL: Below Detection Limit.

Parameter	BaP (ng/m^3)	Benzene (µg/m^3)	CO (mg/m^3)
Protocol of Measurement	**IS:5182 (Part 12)**	**IS:5182 (Part 11)**	**Electrochemical Detection**
National Ambient Air Quality Standards (2009) for Concentration in Ambient Air for Industrial, Residential, Rural & Other areas.	**1 (Annual)**	**5 (Annual)**	**2 (8 Hourly)**

Prepared by

Rashmi Gupta
Administrative Manager

Checked by

Dr. Marisha Sharma
Authorised Signatory

- end of report -

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NATIONAL AMBIENT AIR QUALITY STANDARDS

CENTRAL POLLUTION CONTROL BOARD

NOTIFICATION

Delhi, the 11th November, 2009

S.O. 384(E).—In exercise of the powers conferred by sub-section (2) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981), and in supersession of the Notification No. S.O. 384(E), dated 11th April, 1994 except as respects things done or omitted to be done before such supersession, the Central Pollution Control Board hereby notifies 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 Areas	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO_2), µg/m³	Annual*	50	20	- Improved West and Gaeke
		24 hours**	80	80	- Ultraviolet Fluorescence
2	Nitrogen Dioxide (NO_2), µg/m³	Annual*	40	30	- Modified Jacob & Hochheiser (Na-Arsenite)
		24 hours**	80	80	- Gas Phase Chemiluminescence
3	Particulate Matter (size less than 10µm) or PM10, µg/m³	Annual*	60	60	- Gravimetric - TOEM - Beta attenuation
		24 hours**	100	100	
4	Particulate Matter (size less than 2.5µm) or PM2.5, µg/m³	Annual*	40	40	- Gravimetric - TOEM - Beta attenuation
		24 hours**	60	60	
5	Ozone (O_3), µg/m³	8 hours**	100	100	- UV photometric - Chemiluminescence - Chemical Method
		1 hour**	180	180	
6	Lead (Pb), µg/m³	Annual*	0.50	0.50	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
		24 hours**	1.0	1.0	
7	Carbon Monoxide (CO), mg/m³	8 hours**	02	02	- Non Dispersive Infrared (NDIR) Spectroscopy
		1 hour**	04	04	

(1)	(2)	(3)	(4)	(5)	(6)
8	Ammonia (NH_3), µg/m³	Annual*	100	100	- Chemiluminescence - Indophenol blue method
		24 hours**	400	400	
9	Benzene (C_6H_6), µg/m³	Annual*	05	05	- Gas chromatography based continuous analyser - Adsorption and Desorption followed by GC analysis
10	Benzo(a)Pyrene (BaP) - particulate phase only, ng/m³	Annual*	01	01	- Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As), ng/m³	Annual*	06	06	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m³	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 interval.

** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. However, 2% of the samples may exceed the limits but not on two consecutive days of monitoring.

Note — Whenever and wherever two consecutive days of monitoring results exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

SANJIV PRASAD GAUTAM, Chairman
[ADVT.-III/4/Exty./Pt.(xvi)]

Note: The notifications of National Ambient Air Quality Standards were published by the Central Pollution Control Board in the Gazette of India, extraordinary vide notification No. S.O. 384(E), dated 11th April, 1994 and S.O. 935(E), dated 11th October, 1998.

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ANNEXURE : XI

TEST REPORT

Customer's Name & Address

[illegible]

Sample Particulars

[illegible]

Parameters	Drinking water as per IS 10500:2012 & Amendment		Protocol	Test Results				
	Acceptable	Permissible		Treatment Village Road Pump	Kendu Village Road Pump	Jhansanda Village Road Pump	Kendua Village Road Pump	Bore pump Village Gate Road Pump
Turbidity, NTU	1	5	IS 3025 (Part 10)	01	01	0.42	1.56	2.01
pH value	6.5 - 8.5	No relaxation	IS 3025 (Part 11)	7.2	7.4	6.9	6.9	7.0
Total Hardness as CaCO3, mg/l	-	-	IS 3025 (Part 21)	1250	1256	1251	252	2552
Total Alkalinity as CaCO3, mg/l	200	600	IS 3025 (Part 23)	692	1144	626	1156	1662
Total Suspended Solids, mg/l	-	-	IS 3025 (Part 17)	12	12	01	01	01
Total Dissolved Solids, mg/l	500	2000	IS 3025 (Part 16)	2000	2011	2000	2000	4002
Chlorides, mg/l	250	1000	IS 3025 (Part 32)	402	202	2.5	202	400
Residual free Chlorine, mg/l	0.2	1.0	IS 3025 (Part 26)	02	1.04	02	0.0	0.05
Fluoride as F, mg/l	-	-	IS 3025 (Part 60)	01	01	01	01	0.01
Sulphate as SO4, mg/l	05	200	IS 3025 (Part 24)	01	1.1	05	1.06	1.0
Nitrate as NO3, mg/l			IS 3025 (Part 34)	0.01	12.04	8.46	0.72	3.0
Phosphate as PO4, mg/l	-	-	IS 3025 (Part 31)	0.2	0.4	0.7	0	0.5
Magnesium as Mg, mg/l	30	100	IS 3025 (Part 46)	42	12	12	22	04
Iron as Fe, mg/l	0.3	No relaxation	IS 3025 (Part 53)	01	01	0.01	0.01	0.01
Fluoride as F, mg/l	1.0	1.5	IS 3025 (Part 60)	0.20	0.07	0.73	0.72	0.51

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ANNEXURE : XI Contd..

Parameters	Drinking water limits IS : 10500:2012 & Amendment 1)		Protocol	TEST RESULTS				
	Acceptable	Permissible		[illegible] Village (Hand Pump)	[illegible] Village (Hand Pump)	[illegible] Village (Hand Pump)	[illegible] par Village (Hand Pump)	[illegible] par [illegible] Village, Core Zone (Hand Pump)
Silver as Ag, mg/l	0.1	No relaxation	IS 3025 (Part 2)	ND	ND	ND	ND	ND
Boron as B, mg/l	0.5	1	IS 3025 (Part 2)	ND	ND	ND	ND	[illegible]
Cadmium as Cd, mg/l	0.003	No relaxation	IS 3025 (Part 2)	ND	ND	ND	ND	ND
Chromium as Cr, mg/l	0.05	No relaxation	IS 3025 (Part 2)	ND	ND	ND	ND	ND
Copper as Cu, mg/l	0.05	1.5	IS 3025 (Part 2)	BDL	BDL	BDL	BDL	BDL
Manganese as Mn, mg/l	0.1	0.3	IS 3025 (Part 2)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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)	ND	ND	ND	ND	ND
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)	ND	[illegible]	[illegible]	[illegible]	[illegible]
Acidity, mg/l (as CaCO3)			IS 3025 (Part 22)	[illegible] at pH 8.3	42 [illegible] at pH 8.3	40 at pH 8.3	42 [illegible] at pH 8.3	[illegible] at pH 8.3
Nitrate as NO3, mg/l	45	No relaxation	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Chlorine, mg/l	-	-	[illegible]	ND	ND	ND	ND	ND

NOTE: [illegible]

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ANNEXURE : XI Contd..

TEST REPORT

Customer's Name & Address

Sample Particulars

Sample Code No.

Sampling location : In and around Expansion of Dhenkanal Glass Plant, Odisha

Sampling procedure

Sample qty.

Sampling Date

Date of Receipt

Date of Testing

Date of Report

Test Report No.

TR Number

Parameters	Limits as per India gazette notification S.O. 1033(E) dt. 16.11.2009 & Amendment	Method	Test Results				
	Acceptable	Permissible		Ambient Air Quality (24 hrs Basis)	Ambient Air Quality (8 hrs Basis)	Concentration in Ambient Air Quality (24 hrs Basis)	Concentration in Ambient Air Quality (8 hrs Basis)
Particulate Matter (PM 2.5)	60	100	IS 5182 (Part 24) : 2019	41.6	39.1	42.3	40.1
Ozone (O3)	100	180	IS 5182 (Part 9) : 1974	22.4	21.8	23.1	22.6
Nitrogen Dioxide (NO2)	80	120	IS 5182 (Part 6) : 2006	28.6	27.3	29.4	28.1
Sulphur Dioxide (SO2)	80	120	IS 5182 (Part 2) : 2001	18.2	17.5	18.9	18.1
Carbon Monoxide (CO)	2	4	IS 5182 (Part 10) : 1999	0.8	0.7	0.9	0.8
Ammonia (NH3)	400	1200	IS 5182 (Part 25) : 2018	12.5	11.8	13.2	12.6
Benzene (C6H6)	5	10	IS 5182 (Part 11) : 2006	1.2	1.1	1.3	1.2
Benzo(a)Pyrene (BaP)	1	2	IS 5182 (Part 12) : 2004	0.6	0.5	0.7	0.6
Arsenic (As)	6	12	IS 5182 (Part 22) : 2004	0.8	0.7	0.9	0.8
Nickel (Ni)	20	50	IS 5182 (Part 22) : 2004	1.4	1.3	1.5	1.4

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ANNEXURE : XI Contd..

Parameters	Drinking water limits (IS: 10500:2012)		Protocol	TEST RESULTS				
	Acceptable	Permissible		Nanheda village (Hand Pump)	Tehsil village (Hand Pump)	Kamhedi Village (Hand Pump)	Govt. School Existing Hand Pump (Bore Well)	Gandhi Jan Village (Hand Pump)
Silver (as Ag) mg/l	0.1	No relaxation	IS 3025 (Part 40)	BDL	BDL	BDL	BDL	BDL
Aluminium (as Al) mg/l	0.03	0.2	IS 3025 (Part 55)	BDL	BDL	BDL	BDL	BDL
Arsenic (as As) mg/l	0.01	No relaxation	IS 3025 (Part 37)	BDL	BDL	BDL	BDL	BDL
Barium (as Ba) mg/l	0.7	No relaxation	IS 3025 (Part 37)	BDL	BDL	BDL	BDL	BDL
Boron (as B) mg/l	0.5	1.0	IS 3025 (Part 57)	BDL	BDL	BDL	BDL	BDL
Calcium (as Ca) mg/l	75	200	IS 3025 (Part 40)	0.112	0.09	0.08	0.021	BDL
Chloramines (as Cl2) mg/l	4.0	No relaxation	IS 3025 (Part 26)	BDL	BDL	BDL	BDL	BDL
Chloride (as Cl) mg/l	250	1000	IS 3025 (Part 32)	BDL	BDL	BDL	BDL	BDL
Chromium (as Cr) mg/l	0.05	No relaxation	IS 3025 (Part 52)	BDL	BDL	BDL	BDL	BDL
Copper (as Cu) mg/l	0.05	1.5	IS 3025 (Part 42)	BDL	BDL	BDL	BDL	BDL
Cyanide (as CN) mg/l	0.05	No relaxation	IS 3025 (Part 27)	BDL	BDL	BDL	BDL	BDL
Fluoride (as F) mg/l	1.0	1.5	IS 3025 (Part 60)	0.266	BDL	BDL	BDL	BDL
Free Residual Chlorine mg/l	0.2	1.0	IS 3025 (Part 26)	0.1 pH 8.2	0.2 pH 8.2	0.1 pH 8.2	BDL	BDL
Iron (as Fe) mg/l	0.3	No relaxation	IS 3025 (Part 53)	0.15	0.11	0.12	0.05	0.13
Lead (as Pb) mg/l	0.01	No relaxation	IS 3025 (Part 47)	BDL	BDL	BDL	BDL	BDL
Magnesium (as Mg) mg/l	30	100	IS 3025 (Part 46)	0.112	0.09	0.08	0.021	BDL
Manganese (as Mn) mg/l	0.1	0.3	IS 3025 (Part 59)	BDL	BDL	BDL	BDL	BDL
Mercury (as Hg) mg/l	0.001	No relaxation	IS 3025 (Part 48)	BDL	BDL	BDL	BDL	BDL
Nickel (as Ni) mg/l	0.02	No relaxation	IS 3025 (Part 54)	BDL	BDL	BDL	BDL	BDL
Nitrate (as NO3) mg/l	45	No relaxation	IS 3025 (Part 34)	0.15	0.11	0.12	0.05	0.13
Phenolic Compounds (as C6H5OH) mg/l	0.001	0.002	IS 3025 (Part 43)	BDL	BDL	BDL	BDL	BDL
Selenium (as Se) mg/l	0.01	No relaxation	IS 3025 (Part 56)	BDL	BDL	BDL	BDL	BDL
Sulphate (as SO4) mg/l	200	400	IS 3025 (Part 24)	0.112	0.09	0.08	0.021	BDL
Total Alkalinity (as CaCO3) mg/l	200	600	IS 3025 (Part 23)	0.112	0.09	0.08	0.021	BDL
Total Hardness (as CaCO3) mg/l	200	600	IS 3025 (Part 21)	0.112	0.09	0.08	0.021	BDL
Total Suspended Solids mg/l	-	-	IS 3025 (Part 17)	BDL	BDL	BDL	BDL	BDL
Zinc (as Zn) mg/l	5.0	15	IS 3025 (Part 49)	0.112	0.09	0.08	0.021	BDL

NOTE: BDL (Below Detectable Limit) for Turbidity (0.05 NTU), TDS (5 mg/l), Oil & Grease (3 mg/l), Residual Chlorine (0.2 mg/l), Fluoride (0.6 mg/l), Copper (0.05 mg/l), Iron (0.3 mg/l), Manganese (0.1 mg/l), Chloride (250 mg/l), Zinc (5 mg/l), Sulphate (200 mg/l), Nitrate (45 mg/l), Mercury (0.001 mg/l), Cadmium (0.003 mg/l), Selenium (0.01 mg/l), Arsenic (0.01 mg/l), Lead (0.01 mg/l), Cyanide (0.05 mg/l), Anionic Detergents (0.2 mg/l), Phenolic Compounds (0.001 mg/l), Hexavalent Chromium (0.05 mg/l), Boron (0.5 mg/l), Aluminium (0.03 mg/l), Barium (0.7 mg/l), Silver (0.1 mg/l), Nickel (0.02 mg/l), Mineral Oil (0.5 mg/l), Polynuclear Aromatic Hydrocarbons (0.0001 mg/l), Pesticides (0.001 mg/l), Total Coliform (0 MPN/100 ml), E. Coli (0 MPN/100 ml)

Prepared By
Rashmi Gupta
Administrative Manager

Checked By
Dr. Manisha Sharma
Authorised Signatory

:: End of Report ::

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ANNEXURE : XI Contd..

TEST REPORT

Customer's Name & Address

Bangla Mines Ltd., Dhanbad Site, Tata
Village Jharkhanda, P.O. Nirmalchak, Via Dhanbad
Dist. Dhanbad, Jharkhand - 828121
Contact Person: Mr. D.P. Sharma, Phone: 2268/9/8/8/1

Sample Particulars

Type of Sample: Ball Valve

Work Order No: BML/TSR/TW/EW/2-2020/01

Sampling Procedure: IS 3025 (Part 1)

Sample Quantity: 2 Nos

Sampling Point: MMW/BL/1, 2, 3, 4

Sample Drawn By: Mr. Ravi Kumar

Date of Sampling: 28/05/2021

Date of Receipt: 31/05/2021

Date of Testing: 31/05/2021 to 11/06/2021

Date of Report: 16/06/2021

Test Report No.: MMW/06-2021/47

UTR No./Number: TS0220731000000277

Parameters	Drinking water limits as per IS 10500:2012 Specification		Method	Test Results			
	Acceptable	Permissible		Sample No. 1 (Bangla Mines Ltd. Dhanbad Village Jharkhanda (Near Tata Steel Colony))	Sample No. 2 (Bangla Mines Ltd. Dhanbad Village Jharkhanda (Near Tata Steel Colony))	Sample No. 3 (Bangla Mines Ltd. Dhanbad Village Jharkhanda (Near Nirmalchak Colony))	Sample No. 4 (Bangla Mines Ltd. Dhanbad Village Jharkhanda (Near Nirmalchak Colony))
Turbidity, NTU	1	5	IS 3025 (Part 10)	0.251	0.896	B.D.L.	B.D.L.
pH Value	6.5 - 8.5	No relaxation	IS 3025 (Part 11)	7.1	7.4	7.7	7.1
Total Hardness as CaCO3, mg/l	-	-	IS 3025 (Part 21)	287.5	331	402	298
Total Dissolved Solids, mg/l	500	2000	IS 3025 (Part 16)	72	242	712	286
Total Suspended Solids, mg/l	-	-	IS 3025 (Part 17)	24	16	4	4
Total Chlorides as Cl, mg/l	250	1000	IS 3025 (Part 32)	64	120	175	144
Alkalinity, mg/l	200	600	IS 3025 (Part 23)	80	136	212	192
Sulphate as SO4, mg/l	200	400	IS 3025 (Part 24)	48	72	24	12
Fluoride as F, mg/l	1.0	1.5	IS 3025 (Part 60)	0.5	0.61	0.5	0.61
Nitrate as NO3, mg/l	45	No relaxation	IS 3025 (Part 34)	18	22	28	24
Calcium as Ca, mg/l	75	200	IS 3025 (Part 40)	48	64	80	72
Dissolved Oxygen, mg/l	-	-	IS 3025 (Part 38)	4.2	4.4	4.2	4.4
Biochemical Oxygen Demand (3 Days at 27°C), mg/l			IS 3025 (Part 44)	2.4	1.6	0.4	2.8
Chemical Oxygen Demand (COD), mg/l			APHA 5220 B	8	12	8	8
Residual Chlorine, mg/l			IS 3025 (Part 26)	0.2	0.12	0.12	0.12

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ANNEXURE : XI Contd..

Parameters	Drinking water limits (IS: 10500:2012 & Amendment)		Protocol	TEST RESULTS			
	Acceptable	Permissible		Tehsil Bhawan Khairagarh road Village (Up Stream)	Tehsil Bhawan Chhatpur Village (Down Stream)	Tirpan Hand pump Shivdihan Nahin Village (Up Stream)	Tirpan Hand pump Nichlagaon Village (Down Stream)
Temperature at 25°C, mg/l			IS:3025 (Part-10)	29.8	31.0	31	32.5
Magnesium as Mg, mg/l	30	100	IS:3025 (Part-46)	4	12	10	16
Iron as Fe, mg/l	0	No relaxation	IS:3025 (Part-53)	0.41	0.61	BDL	0.54
Fluoride as F, mg/l	1.0	1.5	APHA-4500-F-	0.27	0.34	0.22	0.25
Oil & Grease, mg/l			IS:3025 (Part-39)	BDL	BDL	BDL	2
Chloride as Cl, mg/l	250	No relaxation	[illegible]	BDL	BDL	BDL	40
Boron as B, mg/l	0.5	1	[illegible]	BDL	1.0	BDL	1.0
Cadmium as Cd, mg/l	0.003	No relaxation	[illegible]	BDL	BDL	BDL	40
Chromium as Cr, mg/l	0.05	No relaxation	[illegible]	BDL	BDL	BDL	BDL
Copper as Cu, mg/l	0.05	1.5	[illegible]	BDL	BDL	BDL	40
Manganese as Mn, mg/l	0	0.3	[illegible]	BDL	BDL	BDL	BDL
Nickel as Ni, mg/l	0.02	No relaxation	[illegible]	BDL	BDL	BDL	40
Selenium as Se, mg/l	0.01	No relaxation	[illegible]	BDL	BDL	BDL	BDL
Arsenic as As, mg/l	0.01	No relaxation	[illegible]	BDL	BDL	BDL	40
Zinc as Zn, mg/l	5	15	[illegible]	0.240	BDL	BDL	BDL
Acidity, mg/l as CaCO3	-	-	IS:3025 (Part-52)	[illegible] 8.0	[illegible] 8.4	[illegible] 8.4	[illegible] 8.6
Total Alkalinity as CaCO3, mg/l	200	No relaxation	[illegible]	0.67	0.89	BDL	0.75
Total Hardness as CaCO3, mg/l	-	-	APHA-2340-C	BDL	BDL	BDL	BDL

NOTE : BDL (Below Detection Limit), MPN/100ml (Most Probable Number per 100 ml), CFU/ml (Colony Forming Unit/ml), Cu (Copper), Ni (Nickel), Cr (Chromium), Mn (Manganese), Fe (Iron), Zn (Zinc), Cd (Cadmium), Pb (Lead), Se (Selenium), As (Arsenic), B (Boron), Al (Aluminium), Cl (Chloride), F (Fluoride), NTU (Nephelometric Turbidity Unit), mg/l (Milligram per Litre)

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ANNEXURE : XI Contd..

TEST REPORT

Customer's Name & Address

Sample Particulars

Sample Description

Sample Quantity

Sample Condition

Date of Sampling

Date of Receipt

Date of Analysis

Date of Report

Test Report No.

Parameters	Drinking water as per IS 10500:2012 & Amendment		Method	Test Results				
	Acceptable	Permissible		Ground Water Source Tubewell Village	Water Reservoir in Petrol Pump	Pump in Nursery Park village	Pump in Kirtan Mandal Village	Pump in Ground village
Turbidity, NTU	1	5	IS 3025 (Part 10)	BDL	BDL	2.1	BDL	4.2
pH Value	6.5 - 8.5	No relaxation	IS 3025 (Part 11)	7.1	7.3	6.8	7.1	6.7
Specific Conductivity, µS/cm	-	-	IS 3025 (Part 14)	468	421	251	1512	1057
Total Dissolved Solids, mg/l	500	2000	IS 3025 (Part 16)	421	378	226	757	951
Total Suspended Solids, mg/l	-	-	IS 3025 (Part 17)	12	4	18	22	10
Total Hardness as CaCO3, mg/l	200	600	IS 3025 (Part 21)	248	189	112	471	151
Alkalinity, mg/l	200	600	IS 3025 (Part 23)	322	128	89	55	225
Total Residual Chlorine, mg/l	0.2	1.0	IS 3025 (Part 26)	0.3	0.2	0.1	0	0.1
Phosphate as PO4, mg/l			IS 3025 (Part 31)	0.021	0.004	BDL	0.01	0.006
Chloride as Cl, mg/l	250	1000	IS 3025 (Part 32)	35	22	18	12	15
Fluoride as F, mg/l	1.0	1.5	IS 3025 (Part 60)	0.7	0.5	0.6	1.2	0.6
Sulphate as SO4, mg/l	-	-	IS 3025 (Part 24)	4.1	2.9	0.8	5.4	2
Biochemical Oxygen Demand (3 Days) mg/l			IS 3025 (Part 44)	2.1	2.4	0.6	6	4.8
Chemical Oxygen Demand (COD), mg/l			ASTM D 7573-14	12	7	4.6	12	16
Total Coliform, MPN/100ml			IS 1622 (Part 3)	170.0	20.5	16.1	2.1	49.0

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ANNEXURE : XI Contd..

Parameters	Drinking water limits (IS: 10500:2012 & Amendment*)		Protocol	TEST RESULTS				
	Acceptable	Permissible		Gond Jhara Village Tubewell	Water Reservoir in Existing Plant	Plant in Mandwal Village	Road in Mohalla Village	Road in Mandwal Village
Turbidity (as NTU), mg/l	1	No relaxation	IS:3025 (Part-10)	BDL	BDL	BDL	BDL	BDL
Total Hardness (as CaCO3), mg/l	200	600	IS:3025 (Part-21)	320	340	360	310	350
Iron (as Fe), mg/l	0.3	No relaxation	IS:3025 (Part-53)	BDL	BDL	BDL	BDL	BDL
Chloride (as Cl), mg/l	250	1000	IS:3025 (Part-32)	180	210	230	190	220
Residual Free Chlorine, mg/l	0.2	1	IS:3025 (Part-26)	0.3	0.4	0.5	0.3	0.4
Fluoride (as F), mg/l	1	1.5	APHA 4500-F-D	0.8	0.9	1.0	0.8	0.9
Copper (as Cu), mg/l	0.05	1.5	IS:3025 (Part-42)	BDL	BDL	BDL	BDL	BDL
Manganese (as Mn), mg/l	0.1	0.3	IS:3025 (Part-59)	BDL	BDL	BDL	BDL	BDL
Sulphate (as SO4), mg/l	200	400	IS:3025 (Part-24)	150	170	190	160	180
Nitrate (as NO3), mg/l	45	No relaxation	IS:3025 (Part-34)	12	14	16	13	15
Phenolic Compounds (as C6H5OH), mg/l	0.001	0.002	IS:3025 (Part-43)	BDL	BDL	BDL	BDL	BDL
Mercury (as Hg), mg/l	0.001	No relaxation	IS:3025 (Part-48)	BDL	BDL	BDL	BDL	BDL
Cadmium (as Cd), mg/l	0.003	No relaxation	IS:3025 (Part-41)	BDL	BDL	BDL	BDL	BDL
Selenium (as Se), mg/l	0.01	No relaxation	IS:3025 (Part-56)	BDL	BDL	BDL	BDL	BDL
Arsenic (as As), mg/l	0.01	No relaxation	IS:3025 (Part-37)	BDL	BDL	BDL	BDL	BDL
Cyanide (as CN), mg/l	0.05	No relaxation	IS:3025 (Part-27)	BDL	BDL	BDL	BDL	BDL
Lead (as Pb), mg/l	0.01	No relaxation	IS:3025 (Part-47)	BDL	BDL	BDL	BDL	BDL
Zinc (as Zn), mg/l	5	15	IS:3025 (Part-49)	BDL	BDL	BDL	BDL	BDL
Anionic Detergents (as MBAS), mg/l	0.2	1	IS:3025 (Part-65)	BDL	BDL	BDL	BDL	BDL
Total Coliform Organisms, MPN/100ml	Shall not be detectable in any 100 ml sample		IS:1622	Absent	Absent	Absent	Absent	Absent
E. Coli, MPN/100ml	Shall not be detectable in any 100 ml sample		IS:1622	Absent	Absent	Absent	Absent	Absent

Prepared By
Rashmi Gupta
Administrative Manager

Checked By
Dr. Manisha Sharma
Authorised Signatory

End of Report

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ANNEXURE : XI Contd..

TEST REPORT

Customer's Name & Address
Name: [illegible] Village: [illegible] P.O.: [illegible] Via Mohammadwal Dist. Chandrawal, Odisha - [illegible] Contact Person: Mr. G.P. Sharma, Phone: [illegible]
Sample Particulars
Type of Sample: [illegible]
Work Order No.: [illegible]
[illegible]
Sampling procedure: [illegible]
Source Well City: [illegible]
Sampling Point: [illegible]
[illegible]
Date of Sampling: [illegible]
Date of Receipt: [illegible]
Date of Analysis: [illegible] to [illegible]
Date of Report: [illegible]
Test Report No.: MMW/06-2021/48

Parameter	Drinking water limits (IS: 10500:2012 & Amendment)		Method	TEST RESULTS			
	Acceptable	Permissible		Chandrawal River water Kushalpura Road Village (Up Stream)	Chandrawal River water Dholpur Village (Down Stream)	Lingara Nallah near Sikri Nichala Village (Up Stream)	Lingara Nallah near Mahuga Village (Down Stream)
Total Coliform (MPN/100ml)			AP.H. 9221 B	2	11	17	2
E. Coli			APHA 9221 F	Absent	Absent	Present	Present

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ANNEXURE : XI Contd..

TEST REPORT

Customer's Name & Address

Sri [illegible] Ltd., Dhanbad Coal Project,
Village : Jharkhandih P.O. : Kirkend, Via Nirsa,
Dist. Dhanbad, Odisha - 828121
Contact Person : Mr. [illegible], Phone: 06257-[illegible]

Sample Particulars

Type of Sample : Surface water

Work Order No. : PM/CTE/ENVR/2021-22/[illegible]

Sampling procedure : IS 3025 (Part 1)

Sample qty. /Size : 2 lit

Sampling Location : MW1 (Downstream)

Sample Drawing Date : [illegible]

Date of Receipt : 15-06-2021

Test of Receipt : 15.06.2021

Date of Testing : 15/06/2021 to 17/06/2021

Test of Report : 17.06.2021

Test Report No. : MMW/06-2021/48

Parameters	Drinking water as per IS 10500:2012 (Amendment)		Protocol	TEST RESULTS				
	Acceptable	Permissible		Conc. (Para Maximum Contaminant Level)	Water Source or Existing Plan.	Found at Vembanpur Village	Found at Kandula Village	Found at Kandula Village
Total Coliforms (MPN/ 100ml)			APHA 9221 B	<1.8	1	<1.8	6	6
E. Coli			APHA 9221 F	Absent	Absent	Absent	Absent	Present

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Checked By
Dr. Manisha Sharma
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End of Report

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ANNEXURE : XII

IS 14543 : 2012

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 definitions 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 used in food preparation.

4 REQUIREMENTS

Drinking water shall comply with the requirements given in Table 1 and 2. The analytical methods given in Table 3 shall be followed by a recognized laboratory using modern quality control procedures. In addition, the water shall be free from taste and odour.

Drinking water shall also comply with the microbiological requirements (see 4.1), virological requirements (see 4.2) and radiological requirements (see 4.3).

4.1 Bacteriological Requirements

4.1.1 Water in Distribution System

Ideally a sample taken from the distribution system including roadside taps, should be free from coliform organisms and the following bacteriological quality of drinking water is desirable in the interest of public health. The methods given in Table 3 is the reference method. However, water 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

(*Clauses* 4.1 *and* 4.2)

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternative Source	Method of Test, Ref to Part of IS 3025	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Odour, Unobjectionable	Agreeable	Agreeable	Part 5	Test cold and when heated
ii)	Taste	Agreeable	Agreeable	Part 7	Test only after safety and odour are found satisfactory
iii)	Turbidity, NTU, Max	1	5	Part 1	—
iv)	Total Dissolved Solids, mg/l, Max	500	2 000	Part 16	—

NOTE — It is recommended that the total dissolved solids in drinking water should preferably be less than 500 mg/l. However, in the absence of alternate source, water with total dissolved solids upto 2 000 mg/l may be tolerated. In the event of this limit also not being available, water with total dissolved solids more than 2 000 mg/l may be used after proper desalination and specific approval of the competent authority should be obtained.

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, Max	0.03	0.2	IS 14925 (Part 51)	—
ii)	Ammonia (as total ammonia-N), mg/l, Max	0.5	No relaxation	IS 3025 (Part 34)	—
iii)	Anionic detergents (as MBAS), mg/l, Max	0.2	1	Annex K of IS 13428	
iv)	Barium (as Ba), mg/l, Max	0.7	No relaxation	Annex F of IS 15302	—
v)	Boron (as B), mg/l, Max	0.5	1.5	IS 3025 (Part 57)	—
vi)	Calcium (as Ca), mg/l, Max	75	200	IS 3025 (Part 40)	
vii)	Chloramines (as Cl_2), mg/l, Max	4.0	No relaxation	IS 3025 (Sec 24) : 1986 or APHA 4500 Cl G	—
viii)	Chloride (as Cl), mg/l, Max	250	1000	IS 3025 (Part 32)	—
ix)	Copper (as Cu), mg/l, Max	0.05	1.5	IS 3025 (Part 42)	—
x)	Cyanide (as CN), mg/l, Max	0.05	0.1	IS 3025 (Part 27)	To be applicable only after chlorination. Where pre-chlorination is not practised, limit is applied. Limit at point of supply 0.1 mg/l
xi)	Fluoride (as F), mg/l, Max	1.0	No relaxation	IS 3025 (Part 60)	To be ascertained by the geographical area. Method given in Part 60 of the standard. Limit 1.5 mg/l
xii)	Free residual chlorine, mg/l, Min	0.2	—	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
xiii)	Iron (as Fe), mg/l, Max	1.0	No relaxation	IS 3025 (Part 53)	To be ascertained by the geographical area. Method given in Part 53 of the standard. Limit 1.5 mg/l
xiv)	Magnesium (as Mg), mg/l, Max	30	100	IS 3025 (Part 46)	
xv)	Manganese (as Mn), mg/l, Max	0.1	0.3	IS 3025 (Part 59)	To be ascertained by the geographical area. Method given in Part 59 of the standard. Limit 0.5 mg/l
xvi)	Mineral oil, mg/l, Max	0.5	No relaxation	Clause 5 of IS 3025 (Part 39) or IS 13428 Annex J	—
xvii)	Nitrate (as NO_3), mg/l, Max	45	No relaxation	IS 3025 (Part 34)	
xviii)	Phenolic compounds (as C_6H_5OH), mg/l, Max	0.001	0.002	IS 3025 (Part 43)	—
xix)	Selenium (as Se), mg/l, Max	0.01	No relaxation	IS 3025 (Part 56) or IS 15303	—
xx)	Silver (as Ag), mg/l, Max	0.1	No relaxation	Annex J of IS 13428	—
xxi)	Sulphate (as SO_4), mg/l, Max	200	400	IS 3025 (Part 24)	To be ascertained by the geographical area. Method given in Annex J of the standard. Limit 400 mg/l
xxii)	Total alkalinity as CaCO3, mg/l, Max	200	600	IS 3025 (Part 23)	—
xxiii)	Total hardness (as CaCO3), mg/l, Max	200	600	IS 3025 (Part 21)	—
xxiv)	Zinc (as Zn), mg/l, Max	5	15	IS 3025 (Part 49)	—

NOTES

1 The maximum concentration of the substance should not be more than the limit in any sample.

2 Unless otherwise stated, the values given in this table are expressed in terms of the substance as such. Values for substances contained in compounds shall be calculated on the basis of the stoichiometric proportion of the pure compound, but shall not be construed to indicate the purity or the composition of the commercial product to be used.

Table 3 Parameters Concerning Toxic Substances
(Clauses 5 and 6.1)

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)	Arsenic (as As), mg/l, Max	0.05	No relaxation	IS 3025 (Part 37)	
ii)	Cyanide (as CN), mg/l, Max.	0.05	No relaxation	IS 3025 (Part 27)	—
iii)	Lead (as Pb), mg/l, Max.	0.01	Not permissible	IS 3025 (Part 47)	
iv)	Mercury (as Hg), mg/l, Max.	0.001	No relaxation	IS 3025 (Part 48) Mercury analyser	—
v)	Selenium (as Se), mg/l, Max.	0.01	No relaxation	IS 3025 (Part 56)	
vi)	Cadmium (Cd), mg/l, Max.	0.003	No relaxation	IS 3025 (Part 41)	—
vii)	Polychlorinated biphenyls, mg/l, Max.	Not detectable	No relaxation	See Table 5	—
viii)	Polynuclear aromatic hydrocarbons, mg/l, Max	0.0003	No relaxation	APHA 6440 B	—
ix)	Polynuclear aromatic hydrocarbons (as Benzo (a) Pyrene), mg/l, Max.	0.00001	No relaxation	APHA 6440	—
x)	Total residual chlorine, mg/l, Min.	0.2	1.0	See Annex C	
xi)	Total pesticides, mg/l, Max.	0.001	Not permissible	See Table 5	—
xii)	Toxic metals				
	a) Boron (as B), mg/l, Max	0.5	Not permissible	APHA 3120 B, 3030 E or APHA 3500 B	
	b) Chromium (as Cr VI), mg/l, Max	0.05	Not permissible	APHA 3120 B, 3030 E or APHA 3500	—
	c) Manganese (as Mn), mg/l, Max	0.1	Not permissible	APHA 3120 B, 3030 E or APHA 3500	—
	d) Molybdenum (as Mo), mg/l, Max.	0.07	Not permissible	APHA 3120 B, 3030 E or APHA 3500	—

NOTES

1 The maximum acceptable concentration should not exceed the permissible limit in the absence of alternate source.

2 Toxic substances from industrial effluents shall be controlled at source rather than attempting to remove them from water supply. Water treatment methods are available for removal of these substances to the extent necessary to make water safe for human consumption.

Table 4 Parameters Concerning Radioactive Substances
(Clauses 5 and 6.1)

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to Part of IS 4194	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Alpha emitters, Bq/l				
	a) Alpha emission Bq/l, Max.	0.1	Not permissible	Part 3	
	b) Beta emission, Bq/l, Max.	1.0	Not permissible	Part 2	—

NOTE — It is recommended that the above table be implemented in phased manner. Initially, the water supply agencies may monitor the gross alpha and gross beta activity in water and if the activity is found to exceed the above limits, then detailed analysis may be carried out to identify the individual radionuclides and their permissible limits. Limits of the above parameters may be modified in consultation with the Atomic Energy Regulatory Board.

AMENDMENT NO. 1 JUNE 2015

TO

IS 10500 : 2012 DRINKING WATER — SPECIFICATION

(Second Revision)

[Page 3, Table 2, Sl No. viii), col 3] — Substitute '0.01' for '0.05'.

[Page 4, Table 3, Sl No. x), col 4] — Substitute 'See Annex C' for '0.2'.

(PAD 24)

Published by Bureau of Indian Standards, New Delhi, India.

ANNEXURE : XII Contd..

CPCB's Water Quality Criteria

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	• Total Coliforms Organism MPN/100ml shall be 50 or less • pH between 6.5 and 8.5 • Dissolved Oxygen 6mg/l or more • Biochemical Oxygen Demand 5 days 20C 2mg/l or less
Outdoor bathing (Organised)	B	• Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/l or more • Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	• Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/l or more • Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Propagation of Wild life and Fisheries	D	• pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more • Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	• pH between 6.0 to 8.5 • Electrical Conductivity at 25C micro mhos/cm Max.2250 • Sodium absorption Ratio Max. 26 • Boron Max. 2mg/l
	Below-E	Not Meeting A, B, C, D & E Criteria

Source: https://cpcb.nic.in/water-quality-criteria/ updated by CPCB on 11 Oct 20219

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ANNEXURE : XIII

TEST REPORT

Customer's Name & Address

Rungta Mines Ltd., Dhenkanal Steel Plant.
Village – Jharbandh, P.O. – Nimabahali, Via - Meramandali
Dist. – Dhenkanal – 759121

Contact Person : Mr. G.P. Sharma, Phone: 06767-276651

Sample Particulars		
Type of Sample	:	Noise
Work Order No.	:	RML/DSP/EMP/20-21/584(A)
Sampling Location	:	In and around Expansion of Dhenkanal Steel Plant,Odisha.
Sampling Procedure	:	Protocol for Ambient Level Noise Monitoring, CPCB
Sample Duration	:	24 hours
Sampling Team	:	MMRDL (Gaurav)
Sample Reg. No.	:	MMN/05-2021/6.1-6.9
Date of Monitoring	:	03/05/2021 to 14/05/2021
Date of Receipt	:	31/05/2021
Date of Report	:	16/06/2021
Test Report No.	:	MMN/06-2021/51
ULR No.	:	TC633721000000128F
Page	:	1 of 4

Day Time : 6 am to 10 pm

Date of Monitoring→	**03-04/05/2021**	**04-05/05/2021**	**05-06/05/2021**	**06-07/05/2021**
Hours↓	**Beruanpal Village**	**Narharipur Village**	**Benipathar Village (Core zone Expansion Area)**	**Kankalu Village**
6-7	45.5	50.1	46.2	50.7
7-8	45.4	50.3	46.3	50.6
8-9	51.2	51.8	48.3	53.0
9-10	51.2	52.4	48.3	53.2
10-11	50.7	52.1	48.5	52.8
11-12	51.5	51.5	48.4	53.0
12-1	50.2	52.1	49.8	51.0
1-2	50.3	51.5	49.4	50.7
2-3	50.4	51.7	49.6	51.0
3-4	50.0	51.0	49.5	50.7
4-5	50.4	51.8	49.3	50.7
5-6	50.1	49.9	47.0	52.4
6-7	49.9	50.0	46.9	52.5
7-8	50.5	50.2	46.6	52.2
8-9	50.2	49.8	46.7	52.3
9-10	49.6	49.8	46.9	53.3

NOTES :

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Test Report No. : MMN/06-2021/51
Page : 2 of 4

ANNEXURE : XIII Contd..

Night Time : 10 pm to 6 am				
Date of Monitoring→	**03-04/05/2021**	**04-05/05/2021**	**05-06/05/2021**	**06-07/05/2021**
Hours↓	**Beruanpal Village**	**Narharipur Village**	**Benipathar Village (Core zone Expansion Area)**	**Kankalu Village**
10-11	42.6	44.8	44.0	45.7
11-12	42.4	44.9	44.2	45.7
12-1	38.9	40.6	39.2	41.9
1-2	39.5	40.5	39.0	41.4
2-3	39.1	40.2	39.1	42.1
3-4	38.7	40.0	38.9	41.7
4-5	39.1	40.5	39.4	42.5
5-6	39.2	40.5	39.3	41.9
Day time Leq.	**50.08**	**51.1**	**48.16**	**52.0**
Night time Leq.	**40.2**	**42.01**	**41.01**	**43.22**

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Test Report No. : MMN/06-2021/51
Page : 3 of 4

ANNEXURE : XIII Contd..

Day Time : 6 am to 10 pm					
Date of Monitoring→	**10-11/05/2021**	**11-12/05/2021**	**12-13/05/2021**	**13-14/05/2021**	**14-15/05/2021**
Hours↓	**Scrub land west side of Expansion boundary**	**Patala Village**	**Sulanali Village**	**Barhamunda Village**	**Sanamunda Village**
6-7	46.0	45.9	40.8	47.8	47.9
7-8	45.3	46.2	47.1	47.9	48.1
8-9	46.6	48.5	46.1	50.6	50.3
9-10	46.8	48.9	48.9	50.8	50.9
10-11	46.8	48.7	49.0	50.5	50.2
11-12	47.0	48.1	49.6	51.0	50.4
12-1	46.7	46.2	49.9	49.3	49.2
1-2	46.1	46.1	48.4	49.1	49.4
2-3	46.1	46.2	48.0	48.7	49.4
3-4	46.3	46.5	48.0	49.1	48.3
4-5	45.9	46.4	47.8	49.2	49.0
5-6	46.4	47.0	47.8	48.1	48.1
6-7	46.3	47.0	46.9	48.1	48.7
7-8	46.5	46.8	47.4	48.4	48.7
8-9	46.4	46.8	47.4	48.4	48.5
9-10	41.7	46.8	47.3	48.2	48.2

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Test Report No. : MMN/06-2021/51
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ANNEXURE : XIII Contd..

Night Time : 10 pm to 6 am					
Date of Monitoring→	**10-11/05/2021**	**11-12/05/2021**	**12-13/05/2021**	**13-14/05/2021**	**14-15/05/2021**
Hours↓	**Scrub land west side of Exp boundary**	**Patala Village**	**Sulanali Village**	**Barhamunda Village**	**Sanamunda Village**
10-11	41.4	41.5	42.4	43.4	42.6
11-12	41.4	41.1	42.1	43.5	42.5
12-1	37.8	40.0	40.0	42.1	40.4
1-2	38.0	39.4	41.0	41.0	40.6
2-3	38.0	39.3	40.7	41.9	40.6
3-4	38.0	39.7	40.4	41.4	40.2
4-5	37.8	39.6	40.6	41.8	40.4
5-6	37.0	39.9	40.8	41.8	40.4
Day time Leq.	**46.18**	**47.11**	**48.05**	**49.21**	**49.19**
Night time Leq.	**39.01**	**40.13**	**41.06**	**42.18**	**41.05**

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 Gupta
Administrative Manager

Checked by

Dr. Marisha Sharma
Authorised Signatory

- end of report -

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THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000

SCHEDULE

[See Rule 3(1) and 4(1)]

Ambient Air Quality Standards in respect of Noise

Area Code	Category of Area/Zone	Limits in dB(A) Leq*	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

Note :

1. Day time shall mean from 6.00 a.m. to 10.00 p.m.
2. Night time shall mean from 10.00 p.m. to 6.00 a.m.

[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].

4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

* dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale 'A' which is relatable to human hearing.

A "decibel" is a unit in which noise is measured.

"A", in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

Leq : It is an energy mean of the noise level over a specified period.

SOURCE : Pollution Control Acts, Rules and Notifications Issued Thereunder, Pollution Control Law Series : PCLS/02/1992 (Fourth Edition) of Central Pollution Control Board, September 2001, pp 711

[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.

SCHEDULE XXIV OF MODEL RULES UNDER THE FACTORIES ACT, 1948
(Corrected up to 01-3-2019)

PART -A HIGH NOISE LEVELS

Table 1: Permissible exposure in cases of continuous noise

Total time of exposure (continuous short term exposures)	Sound pressure level in or a number of dBA per day, in hours
8	85
6	87
4	90
3	92
2	95
1 ½	97
1	100
3/4	102
½	105
1/4	110

Notes : 1. No exposure in excess of 110 dBA is to be permitted.
2. For any period of exposure falling in between any figure and the next higher or lower figure as indicated in column 1, the permissible sound pressure level is to be determined by extrapolation on a proportionate basis.

Table 2: Permissible exposure levels of impulsive or impact noise

Peak sound pressure level in dB	Permitted number of impulses or impact per day
140	100
135	315
130	1,000
125	3,160
120	10,000

Notes: 1.No exposure in excess of 140 dB peak sound pressure level is permitted
2. For any peak sound pressure level falling in between any figure and the next higher or lower figure as indicated in column 1, the permitted number of impulses or impacts per day is to be determined by extrapolation on a proportionate basis.

PART-B HIGH VIBRATION LEVELS

Exposure limit values and action values :

(1) For hand-arm vibration—

(a) the daily exposure limit value is 5 m/s2A(8);

(b) the daily exposure action value is 2.5 m/s2A(8), and daily exposure shall be ascertained on the basis set out in the relevant National/International Standards specified in table 1 below.

(2) For whole body vibration—

(a) the daily exposure limit value is 1.15 m/s2A(8);

(b) the daily exposure action value is 0.5 m/s2A(8), and daily exposure shall be ascertained on the basis set out in the relevant National/International Standards

Table 1:The Threshold Limit Values (TLVs) for exposure of the hand to vibration in X, Y, or Z direction of axes in the three dimensional system shall be as given below:

Total Daily Exposure Duration (hours)	Maximum value of frequency weighted acceleration (m/s2) in any direction
4 to less than 8 hours	4
2 to less than 4 hours	6
1 to less than 2 hours	8
less than 1hour	12

TRAFFIC VOLUME MONITORING RESULTS
PROJECT : DHENKANAL STELL PLANT EXPANSION (7.53 MTPA), ORISSA

LOCATION : NH55 NEAR NIMABAHALI CHOWK
DATE OF MONITORING : 19-20/05/2021

Time (hrs)	Cycles/ Carts	2/3 wheelers	LMV	HMV	Animal Drawn vehicle	Others (Tractors)	Total
0.00 to 1.00	0	0	35	321	0	0	**356**
1.00 to 2.00	0	0	19	364	0	0	**383**
2.00 to 3.00	0	0	35	234	0	0	**269**
3.00 to 4.00	1	5	37	378	0	0	**421**
4.00 to 5.00	6	11	34	321	0	0	**372**
5.00 to 6.00	12	16	95	328	0	0	**451**
6.00 to 7.00	22	31	135	375	0	0	**563**
7.00 to 8.00	45	48	105	487	0	0	**685**
8.00 to 9.00	43	52	104	301	0	0	**500**
9.00 to 10.00	64	135	108	244	0	0	**551**
10.00 to 11.00	52	165	205	255	0	0	**677**
11.00 to 12.00	21	131	235	208	0	0	**595**
12.00 to 13.00	33	181	123	244	0	0	**581**
13.00 to 14.00	18	180	104	259	0	0	**561**
14.00 to 15.00	27	136	88	172	0	0	**423**
15.00 to 16.00	29	102	135	208	0	0	**474**
16.00 to 17.00	25	99	115	227	0	0	**466**
17.00 to 18.00	47	168	182	279	0	0	**676**
18.00 to 19.00	52	139	192	316	0	0	**699**
19.00 to 20.00	24	157	189	281	0	0	**651**
20.00 to 21.00	9	92	240	351	0	0	**692**
21.00 to 22.00	1	68	168	287	0	0	**524**
22.00 to 23.00	0	9	151	364	0	0	**524**
23.00 to 24.00	0	6	138	322	0	0	**466**
TOTAL	**531**	**1931**	**2972**	**7126**	**0**	**0**	**12560**
Factor for Equivalent PCU	0.5	0.5	1	3	8	4.5	
Equivalent PCUs	266	966	2972	21378	0	0	25582

Source: Min Mec R&D Laboratory, New Delhi

LOCATION : NIMABAHALI TO JHARBANDH ROAD
DATE OF MONITORING : 20-21/05/2021

Time (hrs)	Cycles/ Carts	2/3 wheelers	LMV	HMV	Animal Drawn vehicle	Others (Tractors)	Total
0.00 to 1.00	0	0	2	9	0	0	**11**
1.00 to 2.00	0	0	3	10	0	0	**13**
2.00 to 3.00	0	0	1	10	0	0	**11**
3.00 to 4.00	0	1	1	13	0	0	**15**
4.00 to 5.00	0	3	2	12	0	0	**17**
5.00 to 6.00	3	2	1	15	0	0	**21**
6.00 to 7.00	6	3	2	16	0	0	**27**
7.00 to 8.00	15	4	1	11	0	0	**31**
8.00 to 9.00	18	7	4	12	0	0	**41**
9.00 to 10.00	19	11	3	10	0	0	**43**
10.00 to 11.00	17	15	5	9	0	0	**46**
11.00 to 12.00	11	14	4	8	0	0	**37**
12.00 to 13.00	10	12	2	10	0	0	**34**
13.00 to 14.00	7	18	2	9	0	0	**36**
14.00 to 15.00	9	11	3	11	0	0	**34**
15.00 to 16.00	10	10	2	8	0	0	**30**
16.00 to 17.00	20	9	6	9	0	0	**44**
17.00 to 18.00	26	12	3	12	0	0	**53**
18.00 to 19.00	28	13	4	9	0	0	**54**
19.00 to 20.00	13	16	4	10	0	0	**43**
20.00 to 21.00	5	6	3	11	0	0	**25**
21.00 to 22.00	2	3	2	9	0	0	**16**
22.00 to 23.00	0	3	3	13	0	0	**19**
23.00 to 24.00	0	2	2	14	0	0	**18**
TOTAL	**219**	**175**	**65**	**260**	**0**	**0**	**719**
Factor for Equivalent PCU	0.5	0.5	1	3	8	4.5	
Equivalent PCUs	110	88	65	780	0	0	1043

POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) OF RUNGTA MINES LTD.

Town/ village code	Town/village name	Population	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	Waterfall	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
402294	Katabahal	2372	233.00	6.34	32.39	1.49	12.29	2.88	5.00	1.65	5.51	165.45	162.82	2.63	2.63	0.00	0.00	0.00	0.00
402298	Ria	431	130.00	0.10	3.20	10.71	0.98	0.15	0.00	0.00	0.00	114.86	0.00	114.86	0.00	0.00	0.00	0.00	114.86
402304	Panigengutia	1269	531.00	47.21	36.77	119.50	11.92	1.63	0.00	5.10	0.03	308.84	308.84	0.00	0.00	0.00	0.00	0.00	0.00
402305	Roda	2190	503.00	10.47	113.28	52.84	8.24	0.49	0.00	7.07	0.00	310.61	288.04	22.57	22.57	0.00	0.00	0.00	0.00
402306	Renthapat	259	103.00	0.00	20.80	7.75	1.20	0.45	0.00	0.60	0.01	72.19	72.19	0.00	0.00	0.00	0.00	0.00	0.00
402307	Tarahata	162	60.00	0.00	16.15	1.01	21.57	0.00	0.00	0.00	0.00	21.27	0.00	21.27	0.00	0.00	0.00	0.00	21.27
	Sub total	**15080**	**3493.00**	**116.49**	**462.09**	**295.92**	**100.75**	**24.79**	**20.07**	**97.35**	**27.26**	**2348.28**	**1971.81**	**376.47**	**240.34**	**0.00**	**0.00**	**0.00**	**136.13**
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
402902	Tulasidihi	16	41.00	0.53	23.29	8.16	1.54	0.04	0.00	3.70	3.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
402904	Ghantalapasi	20	14.00	0.00	4.38	7.74	0.00	0.01	0.00	1.31	0.56	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
402912	Rangathali	52	31.00	2.00	12.31	14.21	1.55	0.00	0.00	0.50	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
402913	Nagari	940	103.00	0.00	29.33	42.50	2.86	0.00	0.10	15.56	12.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
402914	Gaudapasi	124	131.00	0.00	5.75	53.07	0.39	0.05	0.00	4.05	2.19	65.50	65.50	0.00	0.00	0.00	0.00	0.00	0.00
402915	Chintapokhari	775	93.00	0.00	13.57	70.04	1.27	0.00	0.15	5.73	2.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
402916	Malibido	674	123.00	0.36	16.83	40.10	0.16	0.01	0.03	1.77	2.24	61.50	61.50	0.00	0.00	0.00	0.00	0.00	0.00
402917	Binakarkateni	587	76.00	0.00	9.61	62.46	0.48	0.03	0.02	2.96	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
402918	Budhapanka	669	97.00	0.87	21.44	18.58	1.53	0.00	0.08	3.69	2.31	48.50	48.50	0.00	0.00	0.00	0.00	0.00	0.00
402919	Brajabiharipur	230	125.00	0.00	34.73	77.88	0.02	0.00	0.02	4.16	3.51	4.68	4.68	0.00	0.00	0.00	0.00	0.00	0.00
402920	Salapada	63	51.00	0.00	3.35	16.09	0.03	0.00	0.00	4.44	1.59	25.50	25.50	0.00	0.00	0.00	0.00	0.00	0.00
402922	Kunjabiharipur	531	240.00	0.33	39.24	58.17	0.19	0.00	0.26	13.96	7.85	120.00	120.00	0.00	0.00	0.00	0.00	0.00	0.00
402924	Nadhara	1370	6.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00
402925	Ekagharia	893	165.00	0.42	8.64	0.02	3.36	1.06	0.35	62.09	6.35	82.71	82.71	0.00	0.00	0.00	0.00	0.00	0.00
402926	Bangurasinga	2838	293.00	1.63	17.76	6.94	1.29	2.03	47.65	5.89	33.48	176.33	176.33	0.00	0.00	0.00	0.00	0.00	0.00
402927	Jarada	484	90.00	0.00	9.03	0.11	0.00	0.25	0.34	3.75	9.86	66.66	66.66	0.00	0.00	0.00	0.00	0.00	0.00
402928	Nuara	103	9.00	0.00	0.04	0.00	0.00	0.12	0.00	0.44	0.02	8.38	8.38	0.00	0.00	0.00	0.00	0.00	0.00

ANNEXURE : XVI Contd..

POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) OF RUNGTA MINES LTD.

Town/ village code	Town/village name	Population	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	Waterfall	Other Source
402929	Talabaghalunda	905	97.00	0.00	8.39	22.61	0.00	0.00	0.05	12.26	9.41	44.28	44.28	0.00	0.00	0.00	0.00	0.00	0.00
402930	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
402945	Bautiragada	30	94.00	0.00	2.48	0.00	2.63	0.11	2.55	14.90	10.02	61.31	61.31	0.00	0.00	0.00	0.00	0.00	0.00
402946	Handifuta	670	120.00	4.21	3.41	0.19	4.79	0.23	5.15	9.25	7.97	84.80	34.08	50.72	50.72	0.00	0.00	0.00	0.00
402947	Ghodadian	1348	269.00	13.49	12.83	0.10	9.01	1.04	11.13	39.58	1.23	180.59	35.41	145.18	145.18	0.00	0.00	0.00	0.00
402948	Naraharipur	237	84.00	1.51	4.58	0.72	2.71	1.11	5.31	0.36	55.11	12.59	0.00	12.59	12.59	0.00	0.00	0.00	0.00
402949	Sridihi	686	266.00	0.00	8.48	0.00	7.25	0.51	7.71	39.88	2.41	199.76	124.29	75.47	75.47	0.00	0.00	0.00	0.00
402950	Bachhuribanka	520	128.00	4.55	3.27	0.19	4.98	0.86	5.78	12.26	5.74	90.37	90.37	0.00	0.00	0.00	0.00	0.00	0.00
402951	Chheliabedha	273	96.00	8.07	10.42	0.01	0.12	1.20	0.89	5.76	0.12	69.41	69.41	0.00	0.00	0.00	0.00	0.00	0.00
402952	Paneilo	766	62.00	1.38	1.51	1.33	1.68	0.40	7.46	1.67	15.60	30.97	30.97	0.00	0.00	0.00	0.00	0.00	0.00
402954	Zukateni	2	12.00	0.00	0.37	0.00	0.00	2.71	0.00	0.00	0.50	8.42	8.42	0.00	0.00	0.00	0.00	0.00	0.00
	Sub total	**53075**	**10063.00**	**364.45**	**1426.58**	**2175.99**	**239.38**	**143.56**	**345.39**	**971.11**	**548.25**	**3848.29**	**3242.37**	**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
402987	Mahatala	71	56.00	0.00	0.38	2.79	3.47	0.00	0.00	0.00	0.00	49.36	49.36	0.00	0.00	0.00	0.00	0.00	0.00

POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) OF RUNGTA MINES LTD.

Town/ village code	Town/village name	Population	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	Waterfall	Other Source
402988	Kaliakoli	8	82.00	5.21	0.73	6.60	6.21	0.00	0.00	0.00	0.00	63.25	63.25	0.00	0.00	0.00	0.00	0.00	0.00
402989	Paikpurunakot	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	**22301**	**5374.00**	**283.00**	**1015.09**	**933.39**	**238.67**	**19.71**	**11.43**	**141.97**	**92.89**	**2637.85**	**2570.23**	**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	Iswarapur	241	39.00	7.75	0.86	1.41	0.00	0.00	0.18	2.51	0.00	26.29	0.00	26.29	26.29	0.00	0.00	0.00	0.00
403021	Gotiaberani	119	60.00	0.00	3.00	2.01	1.86	0.00	0.00	0.08	0.09	52.96	52.96	0.00	0.00	0.00	0.00	0.00	0.00
403022	Kantamila	449	115.00	13.90	7.09	3.80	7.38	0.00	0.00	0.86	0.00	81.97	81.97	0.00	0.00	0.00	0.00	0.00	0.00
403024	Mahalunda	1494	161.00	0.00	3.62	12.57	1.54	0.00	0.00	0.07	0.00	143.20	143.20	0.00	0.00	0.00	0.00	0.00	0.00
403025	Bedanali	150	38.00	0.00	0.01	0.12	0.11	0.00	0.00	0.13	0.00	37.63	37.63	0.00	0.00	0.00	0.00	0.00	0.00
403026	Maguberani	396	55.00	3.86	4.74	1.83	1.58	0.00	0.00	1.40	0.25	41.34	41.34	0.00	0.00	0.00	0.00	0.00	0.00
403027	Krushnachandrapur	559	90.00	0.00	3.28	4.02	0.22	0.00	0.00	0.00	0.00	82.48	82.48	0.00	0.00	0.00	0.00	0.00	0.00
403028	Gulehi	1814	337.00	16.33	24.26	8.30	13.27	11.33	1.78	10.12	2.02	249.59	107.33	142.26	0.00	0.00	142.26	0.00	0.00
403029	Dudurokot	5189	1451.00	120.79	100.07	32.90	43.96	85.35	20.89	40.37	28.36	978.31	900.33	77.98	0.00	0.00	77.98	0.00	0.00
403030	Bramhanamara	939	238.00	20.31	22.26	13.76	10.15	6.07	1.87	3.20	0.00	160.38	160.38	0.00	0.00	0.00	0.00	0.00	0.00
403031	Kumurusinga	1276	412.00	40.46	11.19	6.12	20.10	19.51	0.00	4.07	2.07	308.48	294.36	14.12	0.00	0.00	14.12	0.00	0.00
403032	Ranjagola	2817	709.00	55.48	32.38	6.07	27.51	2.83	2.26	40.02	4.45	538.00	488.69	49.31	49.31	0.00	0.00	0.00	0.00
403033	Asarada	1061	268.00	41.46	15.12	8.90	19.90	9.31	0.23	4.58	0.00	168.50	168.50	0.00	0.00	0.00	0.00	0.00	0.00
403034	Balimi	889	206.00	11.42	20.31	1.33	3.13	10.76	0.00	2.02	0.00	157.03	157.03	0.00	0.00	0.00	0.00	0.00	0.00
403035	Kukuta	2961	520.00	9.78	14.02	12.95	13.74	21.27	0.16	10.93	1.66	435.49	435.49	0.00	0.00	0.00	0.00	0.00	0.00

ANNEXURE : XVI Contd..

POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) OF RUNGTA MINES LTD.

Town/ village code	Town/village name	Population	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	Waterfall	Other Source
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**																		
403039	Kansara	2278	628.00	22.60	23.76	22.38	19.21	22.28	30.50	0.00	0.00	487.27	419.06	68.21	49.46	0.00	18.75	0.00	0.00
403040	Chhelachheli	45	80.00	0.00	23.88	26.60	1.57	0.00	0.00	0.00	0.00	27.95	27.95	0.00	0.00	0.00	0.00	0.00	0.00
403041	Kalihundi	234	54.00	0.00	1.60	4.34	0.70	0.00	0.00	0.00	0.00	47.36	47.36	0.00	0.00	0.00	0.00	0.00	0.00
403042	Tutupada	213	57.00	0.00	2.60	1.78	3.53	0.00	0.00	0.00	0.16	48.93	48.93	0.00	0.00	0.00	0.00	0.00	0.00
403043	Tangisal	346	108.00	11.14	3.80	6.74	6.94	0.00	0.00	1.84	0.00	77.54	77.54	0.00	0.00	0.00	0.00	0.00	0.00
403044	Balasar	1198	226.00	7.77	9.96	9.04	26.72	4.48	0.00	0.00	0.00	168.03	168.03	0.00	0.00	0.00	0.00	0.00	0.00
403045	Hatura	997	168.00	0.01	5.87	0.00	3.79	4.16	12.83	0.00	0.01	141.33	141.33	0.00	0.00	0.00	0.00	0.00	0.00
403046	Jayapanga	297	124.00	9.94	5.00	5.71	8.38	0.00	0.00	0.95	0.00	94.02	94.02	0.00	0.00	0.00	0.00	0.00	0.00
403047	Hariharapur	539	140.00	14.08	10.69	4.77	9.57	0.00	0.00	0.00	0.00	100.89	100.89	0.00	0.00	0.00	0.00	0.00	0.00
403048	Bangu	460	152.00	17.56	3.74	6.73	10.68	0.00	0.00	0.69	0.26	112.34	112.34	0.00	0.00	0.00	0.00	0.00	0.00
403049	Pada	2018	768.00	35.00	59.32	150.62	8.45	0.03	0.00	15.38	73.02	426.18	426.18	0.00	0.00	0.00	0.00	0.00	0.00
403050	Kurumitha	1364	600.00	30.55	78.90	89.02	26.06	0.00	0.00	10.90	0.00	364.57	326.22	38.35	0.00	0.00	0.00	0.00	38.35
403051	Ambithi	1249	338.00	69.89	12.08	6.34	12.85	4.04	9.38	8.00	4.17	211.25	129.60	81.65	81.65	0.00	0.00	0.00	0.00
403053	Kantamila	1669	598.00	98.00	50.90	35.73	35.80	18.46	26.23	36.26	18.22	278.40	278.40	0.00	0.00	0.00	0.00	0.00	0.00
403055	Baradapal	1756	482.00	50.06	23.78	32.39	16.90	12.14	3.08	12.15	8.12	323.38	178.76	144.62	144.62	0.00	0.00	0.00	0.00
403056	Sundarapal	235	163.00	17.18	11.60	10.12	6.85	9.31	10.50	9.51	0.80	87.13	44.62	42.51	42.51	0.00	0.00	0.00	0.00
403068	Nizgarh(Hindol)	7672	1576.00	287.18	94.51	136.19	113.19	41.97	28.70	28.34	36.49	809.43	700.44	108.99	108.99	0.00	0.00	0.00	0.00
403069	Tantichira	287	171.00	22.56	17.46	13.66	11.21	17.88	4.89	4.04	0.00	79.30	79.30	0.00	0.00	0.00	0.00	0.00	0.00
403070	Kalanda	1044	460.00	28.89	5.16	72.64	18.59	0.00	0.00	26.63	3.52	304.57	304.57	0.00	0.00	0.00	0.00	0.00	0.00
403071	Sarasinga	706	162.00	20.13	4.33	6.07	10.45	4.85	4.01	0.00	0.00	112.16	112.16	0.00	0.00	0.00	0.00	0.00	0.00
403072	Keutaganthi	2	59.00	5.53	0.06	0.00	4.25	0.00	0.00	0.00	0.00	49.16	49.16	0.00	0.00	0.00	0.00	0.00	0.00
403073	Ostapal	341	68.00	12.66	5.75	2.38	5.06	7.02	2.80	1.61	0.00	30.72	30.72	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
403075	Bhagabanpur	1127	127.00	0.00	3.56	7.29	2.98	1.95	0.01	1.62	1.57	108.02	108.02	0.00	0.00	0.00	0.00	0.00	0.00
403076	Bahalunda	1281	215.00	0.00	5.46	8.10	6.00	2.02	7.44	0.00	0.00	185.98	185.98	0.00	0.00	0.00	0.00	0.00	0.00
403077	Bhaktapur	295	112.00	0.00	3.00	4.18	1.52	2.83	2.02	0.00	0.00	98.45	98.45	0.00	0.00	0.00	0.00	0.00	0.00
403078	Nuabaga	1116	307.00	12.39	8.89	6.09	20.11	9.72	9.16	4.60	2.02	234.02	234.02	0.00	0.00	0.00	0.00	0.00	0.00
403079	Kantakula	388	118.00	0.00	10.07	6.00	9.01	3.04	2.14	0.00	0.00	87.74	38.60	49.14	49.14	0.00	0.00	0.00	0.00
403082	Kantapal	319	83.00	3.33	2.79	4.55	11.63	2.33	2.75	0.00	0.00	55.62	55.62	0.00	0.00	0.00	0.00	0.00	0.00
403083	Badagola	369	254.00	1.71	13.98	4.23	23.66	10.14	9.46	1.21	2.83	186.78	186.78	0.00	0.00	0.00	0.00	0.00	0.00
403087	Rajamohanpur	1332	1112.00	137.08	124.78	98.46	36.87	113.80	132.39	48.34	46.45	373.83	373.83	0.00	0.00	0.00	0.00	0.00	0.00
	Sub total	**32164**	**9881.00**	**956.00**	**632.13**	**794.30**	**524.58**	**333.49**	**307.56**	**224.22**	**203.31**	**5905.41**	**5371.94**	**533.47**	**476.37**	**0.00**	**18.75**	**0.00**	**38.35**
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

POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) OF RUNGTA MINES LTD.

Town/ village code	Town/village name	Population	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	Waterfall	Other Source
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
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
403123	Chitalapur	2052	325.00	1.22	25.64	0.47	2.64	2.19	0.00	0.58	0.01	292.25	292.25	0.00	0.00	0.00	0.00	0.00	0.00
	Sub total	**24412**	**6329.00**	**438.69**	**146.34**	**741.61**	**333.92**	**130.11**	**242.19**	**1.44**	**0.98**	**4293.72**	**3973.12**	**320.60**	**214.05**	**0.00**	**106.55**	**0.00**	**0.00**
District	**Anugul**																		
Sub Distt.	**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
404142	Apartipur	552	55.00	2.40	26.00	0.00	2.00	0.00	0.00	0.00	0.40	24.20	12.20	12.00	3.00	8.00	1.00	0.00	0.00
404143	Bonda	2694	434.00	0.00	53.97	16.13	21.71	7.17	0.00	0.80	11.75	322.47	181.05	141.42	119.52	14.94	6.97	0.00	0.00
404145	Banarpal	1522	60.00	0.00	30.97	0.00	13.35	0.00	0.00	0.00	0.00	15.68	7.94	7.74	2.90	2.90	1.94	0.00	0.00
404146	Joragadia	389	79.00	0.80	20.20	0.00	8.60	0.00	0.00	0.00	0.80	48.60	24.40	24.20	15.00	8.00	1.20	0.00	0.00
404147	Birabahanpur	384	95.00	0.00	26.99	2.13	16.15	0.00	0.00	0.00	5.53	44.20	18.49	25.71	15.94	8.50	1.27	0.00	0.00
404148	Badakhali	362	128.00	1.82	46.13	0.00	4.74	0.73	0.00	0.00	0.73	73.85	29.18	44.67	9.11	27.35	8.21	0.00	0.00
404149	Bhagabatpur	725	162.00	5.20	32.40	0.00	20.40	0.80	0.00	0.80	1.20	101.20	32.40	68.80	20.00	25.00	18.80	0.00	5.00
404150	Narendrapur	405	181.00	0.00	126.00	3.60	6.80	0.00	0.00	0.00	22.40	22.20	10.20	12.00	5.00	5.00	2.00	0.00	0.00
404151	Chauridiha	892	123.00	0.00	40.40	3.60	13.80	0.40	0.00	0.00	0.00	64.80	28.40	36.40	25.00	10.00	1.40	0.00	0.00
404152	Jhajiribahal	994	177.00	0.00	77.67	5.96	28.21	3.18	0.00	0.00	2.38	59.60	27.81	31.79	17.88	8.94	4.97	0.00	0.00
404153	Gadasantri	3877	796.00	0.00	141.33	20.05	32.16	3.18	0.00	1.98	6.76	590.54	269.17	321.37	248.13	49.62	23.62	0.00	0.00
404155	Gangijodi	149	41.00	0.01	11.14	1.26	1.26	0.84	0.00	0.00	0.84	25.65	13.04	12.61	0.00	10.51	2.10	0.00	0.00
404156	Tulasipal	3060	603.00	4.00	170.42	22.99	25.01	18.76	0.00	3.23	4.64	353.95	109.92	244.03	176.47	25.21	42.35	0.00	0.00
404158	Kangula	7528	1458.00	2.00	210.11	77.09	79.69	21.97	15.98	6.79	37.18	1007.19	473.94	533.25	489.31	29.96	3.99	0.00	9.99
404159	Languliabeda	1201	234.00	2.37	51.93	8.89	0.00	6.12	0.00	0.00	0.80	163.89	44.03	119.86	78.98	29.62	11.26	0.00	0.00
404160	Rajibpur	374	41.00	0.00	13.00	4.80	2.00	0.80	0.00	0.00	0.20	20.20	20.20	0.00	0.00	0.00	0.00	0.00	0.00
404163	Purkia	1284	225.00	0.40	58.20	0.00	11.40	1.20	0.00	0.00	0.00	153.80	69.80	84.00	50.00	30.00	4.00	0.00	0.00
404164	Arahat	1513	287.00	0.00	17.34	9.77	36.67	0.80	0.00	1.59	1.60	219.23	57.00	162.23	101.51	48.34	12.38	0.00	0.00
404165	Talatali	1619	420.00	31.27	101.76	37.37	42.74	5.18	0.00	0.00	2.23	199.45	94.54	104.91	74.01	27.75	3.15	0.00	0.00
404166	Kusuna	420	182.00	2.00	53.80	14.60	6.80	0.80	0.00	0.00	21.00	83.00	39.00	44.00	30.00	10.00	4.00	0.00	0.00
404167	Kalandapal	303	82.00	0.00	14.60	2.60	1.60	0.00	0.00	0.00	0.20	63.00	22.00	41.00	20.00	10.00	11.00	0.00	0.00
404168	Ramimunda	429	147.00	0.00	23.33	14.25	10.32	0.83	0.00	0.00	3.30	94.97	41.29	53.68	14.12	32.97	6.59	0.00	0.00
404169	Santarapur	2230	375.00	2.83	98.36	14.25	32.52	6.02	0.00	0.00	1.61	219.41	97.56	121.85	75.28	40.15	6.42	0.00	0.00
404170	Fulapada	2103	672.00	0.00	178.60	76.80	34.00	21.60	0.00	1.60	3.40	356.00	194.00	162.00	98.00	42.00	22.00	0.00	0.00
404172	Rankasinga	554	128.00	0.00	17.00	12.00	1.60	3.60	0.00	0.00	12.80	81.00	32.00	49.00	25.00	15.00	9.00	0.00	0.00
404173	Juharpur	379	63.00	0.00	19.80	8.40	0.80	0.90	0.00	0.00	0.40	32.70	13.00	19.70	5.00	10.00	4.40	0.00	0.30
404174	Similichhuin	440	137.00	0.00	14.20	22.60	11.00	0.20	0.00	0.00	0.80	88.20	28.20	60.00	30.00	20.00	10.00	0.00	0.00
404175	Chakuriapal	73	43.00	0.00	15.60	4.00	0.00	0.80	0.00	0.00	0.00	22.60	10.60	12.00	8.00	3.00	1.00	0.00	0.00
404178	Kainchhabahala	298	66.00	0.00	9.62	3.96	10.75	0.75	0.00	0.00	3.02	37.90	29.04	8.86	1.88	5.66	1.32	0.00	0.00
404179	Girdhabasa	318	109.00	0.00	20.79	2.02	11.91	0.40	0.00	0.00	0.00	73.88	33.10	40.78	20.19	15.14	5.45	0.00	0.00
404180	Tilapanga	356	62.00	0.00	16.70	2.80	0.00	0.00	0.00	0.00	0.10	42.40	42.40	0.00	0.00	0.00	0.00	0.00	0.00
404181	Talamulasasan	4749	1098.00	44.70	33.84	62.58	83.65	7.66	0.00	0.00	25.86	839.71	322.80	516.91	399.10	79.82	37.99	0.00	0.00
404182	Gadatalamul	1813	279.00	0.00	47.00	25.20	6.00	3.90	0.00	0.00	2.40	194.50	68.80	125.70	100.00	20.00	5.40	0.00	0.30
404183	Harichandabasti	124	1.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.40	0.00	0.00	0.00	0.00	0.00	0.00
404184	Talmulpatna Basti	1673	9.00	0.00	3.20	0.00	1.20	0.00	0.00	0.00	0.60	4.00	0.80	3.20	0.00	2.00	1.20	0.00	0.00
404186	Durgaprasadpur	123	107.00	0.01	17.87	3.36	13.03	0.00	0.00	0.00	2.94	69.79	27.75	42.04	26.28	12.61	3.15	0.00	0.00
404187	Harichandajami	13	101.00	1.40	27.20	7.60	4.00	0.00	0.00	0.00	0.00	60.80	28.80	32.00	10.00	15.00	7.00	0.00	0.00

POPULATION AND LANDUSE OF STUDY AREA, CENSUS 2011 (Ha.)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) OF RUNGTA MINES LTD.

Town/ village code	Town/village name	Population	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	Waterfall	Other Source
404189	Khandanali	79	24.00	0.00	4.65	2.01	0.50	0.50	0.00	0.00	7.54	8.80	4.40	4.40	3.14	1.26	0.00	0.00	0.00
404190	Serenabeda	1340	321.00	2.83	63.88	15.56	38.41	4.04	0.00	0.00	20.42	175.86	65.69	110.17	83.89	20.22	6.06	0.00	0.00
404191	Mahidharpur	4188	652.00	40.20	181.20	0.00	44.20	16.20	0.00	0.00	6.00	364.20	162.20	202.00	130.00	65.00	7.00	0.00	0.00
404192	Budhapanka (CT)	6129	1219.00	-	1219.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
404193	Gotamara (CT)	2226	330.30	-	330.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-
404194	Nuahata (CT)	5920	848.00	-	848.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sub total	**66572**	**12739.30**	**144.24**	**4534.90**	**510.63**	**688.78**	**139.33**	**15.98**	**16.79**	**212.23**	**6476.42**	**2815.94**	**3660.48**	**2543.64**	**794.47**	**301.79**	**0.00**	**20.59**
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**
Sub Distt.	**Anugul**																		
404230	Badibahal	885	263.00	8.00	60.80	24.20	9.80	1.20	0.00	0.80	0.40	157.80	52.60	105.20	80.00	20.00	5.20	0.00	0.00
404231	Bandhupur	41	36.00	0.00	4.00	4.20	10.00	0.80	0.00	0.00	0.00	17.00	5.60	11.40	0.00	10.00	1.40	0.00	0.00
404232	Kankinali	839	130.00	0.00	11.80	11.60	2.00	0.80	0.00	0.00	0.80	103.00	39.00	64.00	15.00	40.00	9.00	0.00	0.00
404233	Jadupur	588	37.00	0.00	6.59	3.40	5.10	0.43	0.00	0.00	0.00	21.48	6.59	14.89	0.00	10.64	4.25	0.00	0.00
404234	Barsinga	1157	255.00	2.26	84.37	26.92	16.12	1.52	0.00	1.14	7.58	115.09	49.87	65.22	36.02	18.96	10.24	0.00	0.00
404280	Khandahata	1299	212.00	4.52	26.57	0.00	19.03	6.78	0.00	0.00	1.52	153.58	76.32	77.26	28.26	37.69	11.31	0.00	0.00
404281	Angarbandha	2519	414.00	0.00	30.80	26.20	23.20	5.00	0.00	0.00	4.80	324.00	142.00	182.00	100.00	80.00	2.00	0.00	0.00
404282	Charadapita	5	48.00	0.00	0.59	5.28	0.39	0.00	0.00	0.00	0.00	41.74	41.74	0.00	0.00	0.00	0.00	0.00	0.00
404283	Talasahi	211	79.00	0.20	0.80	11.32	4.50	0.00	0.55	0.00	0.13	61.50	61.50	0.00	0.00	0.00	0.00	0.00	0.00
404289	Kansanali	15	44.00	0.40	0.80	0.38	1.87	0.00	1.87	0.00	0.38	38.30	38.30	0.00	0.00	0.00	0.00	0.00	0.00
404290	Biswanathapur	162	25.00	0.00	0.56	1.24	1.32	0.00	0.00	0.00	0.00	21.88	21.88	0.00	0.00	0.00	0.00	0.00	0.00
404291	Pandupur	381	47.00	1.13	1.71	4.40	3.41	0.00	0.00	0.00	0.01	36.34	36.34	0.00	0.00	0.00	0.00	0.00	0.00
	Sub total	**8102**	**1590.00**	**16.51**	**229.39**	**119.14**	**96.74**	**16.53**	**2.42**	**1.94**	**15.62**	**1091.71**	**571.74**	**519.97**	**259.28**	**217.29**	**43.40**	**0.00**	**0.00**
	GRAND TOTAL	**270396**	**61607.30**	**3163.99**	**9144.32**	**5921.88**	**2745.87**	**1146.15**	**1006.20**	**1670.35**	**1408.06**	**35400.48**	**28819.08**	**6581.40**	**4627.75**	**1021.71**	**736.88**	**0.00**	**195.07**
	%		**100.00**	**5.14**	**14.84**	**9.61**	**4.46**	**1.86**	**1.63**	**2.71**	**2.29**	**57.46**	**46.78**	**10.68**	**70.32**	**15.52**	**11.20**	**0.00**	**2.96**

ANNEXURE : XVI Contd..

ANNEXURE : XVII

ANNEXURE : XVII Contd..

SITE SPECIFIC WILDLIFE CONSERVATION PLAN

FOR

INTEGRATED STEEL PLANT & CAPTIVE POWER PLANT

AT

VILLAGE JHARBANDH, TARKABEDA AND GALPADA UNDER HINDOL TAHSIL IN DHENKANAL FOREST DIVISION

Submitted by

M/S RUNGTA MINES Ltd.

Prepared By

CENTRE FOR ENVOTECH AND MANAGEMENT CONSULTANCY PVT. LTD.

An ISO 9001-2015, OHSAS 18001:2007 & ISO 14001-2015 Certified Company,
Accredited by NABET, QCI for EIA Studies as 'A' Category Consultant Organization.
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Environmental Studies (EIA & EMP), Monitoring, Forest Diversion Planning,
DPR, Wildlife Management Plan, Hazardous & Safety Studies, RS& GIS, Baseline Survey,
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PREFACE

M/s Rungta Mines Ltd. has several iron ore and Manganese mines in Odisha and Jharkhand. As on date value addition plays an important role for better utilization for increasing GDP. This company has established an Integrated Steel with 3.0 mtpa capacity and 385 MW CPP at village Jharbandh in Hindol Tahsil of Dhenkanal district with an estimated cost of Rs. 5500.00 Cr. including Rs.4702.69 lakhs for Environmental issues.

MoEF vide their letter no. 5-ORB207/2014-BHU dt. 02.07.2015 has granted Forest Clearance and vide their letter dated 15.02.2021 granted Environmental Clearance. As per condition No. xxiv of Environmental clearance this Plan has been prepared. As per Environmental clearance the production of this Plant needs to be enhanced from 3.0 mtpa to 3.55 mtpa and CPP from 385 MW to 695 MW.

This Project is located in villages Jharbandh, Galpada and Tarkabada of Hindol Tahasil of Dhenkanal District. The Project area extends over 273.073 ha which includes only 03.156 ha of Forest land, 51.097 ha of non-forest land and 218.820 ha of Private land. In the Zone of influence there exist Jharbandh DPF over 122.82 ha, Nimidha R.F. over 160.70 ha and Gangthigadia DPF over 109.245 ha. In the ZoI Schedule I fauna exist i.e., Elephant, Sloth Bear and Python for which Site-specific Wildlife Conservation Plan is required.

The Project proponent has entrusted M/s Centre for Envotech and Management Consultancy (P) Ltd an empanelled consultancy as per PCCF(Wildlife) and CWLW, Odisha's letter No.2795/7WL-FD&WLC-58/2020 Dt.11.03.2021 us to prepare this Plan.

We feel obliged to Dr. Prakash Chandra Gugenani, IFS, DFO, Dhenkanal and Sri. Prasanna Kumar Behera, IFS, DFO, Angul division for providing us valuable documents, guidance and inputs for preparation of this Plan. We feel obliged to Range Forest Officer, Hindol and Range Forest Officer, Angul and his staff for accompanying us during field visit and providing us data on elephant movement. We feel obliged to the Project Proponent for giving us an opportunity to compile this Plan. We hope if the prescriptions given in this plan is given effect to the true letter and spirit the flora of the ZoI will be safeguarded and the elephant-human conflict will be reduced to permissible limit.



S. K. Mohanty, OFS (Retd.)

EXECUTIVE SUMMARY

1. M/s Rungta Mines Ltd. has several iron ore and Manganese mines in Odisha and Jharkhand. As on day value addition plays an important role for better utilization for increasing GDP. The User Agency has an existing Integrated Steel Plant in Villages Jharbandh, Galpada and Tarkabada in Tahasil Hindol, Dist. Dhenkanal of 3.0 mtpa and Captive Power Plant of 385 MW. Now it intends to increase the capacity to 3.55mtpa and CPP to 695 MW with an estimated cost of Rs.2275.0 Crores. In this respect Rungta Mines Ltd. had signed an MoU with Govt. of Odisha on 03.11.2005 for commissioning the initial project. The total land involved in this project is 273.073 Ha. including 3.156 Ha. of Forest Land, 51.097 ha of non-forest land and 218.820 of Private land.
2. Now Rungta Mines Limited (Dhenkanal Steel Plant) proposes to enhanced production capacity from 3.0 MTPA to 3.55 MTPA steel by expansion of facilities such as palletisation plant (from 2.948 to 28.75 MTPA), coal washery (from 4.141 to 5.029 MTPA), sponge iron plant (from 1.613 to 2.247 MTPA), mini blast furnace (from 1.559 to 1.934 MTPA), sinter plant (from 1.663 to 2.827 MTPA), steel melting shop (from 2.618 to 3.22 MTPA), finished product facilities (from 3.0 to 3.55 MTPA), producer gas plant (from 480 to 5387 million Nm3/annum), oxygen plant (from 0.098 to 0.294 MTPA), and captive power plant (from 385 to 695 MW). The capacity of beneficiation plant (5.4 MTPA), lime plant (0.3045 MTPA) and cement plant (1.686 MTPA) shall remain same. Coke oven plant will reduce from 1.12 to 1.07 MTPA.
3. MoEF vide their letter no. 5-ORB207/2014-BHU dt. 02.07.2015 has granted Forest Clearance and vide their letterNo.J-11011/309/2018-IAII(I) dated 15.02.2021 has granted Environmental Clearance. In the E.C. it has been envisaged that, "the existing Wildlife Conservation Plan shall be updated in consultation with the concerned Dept. and requisite approval from the Competent Authority will be obtained by 31.07.2021.
4. Earlier M/s Rungta Mines Ltd. had prepared a Site-Specific Wildlife Conservation Plan which was approved by Principal Chief Conservator of forest (Wildlife) and CWW Odisha vide his memo no. 3188/1WI-SSCP-10/2015 dt. 09.04.2015 for Rs. 586.53 lakhs (Rs. 188.63 Lakhs for the core area to be implemented by User Agency and 284.78 Lakh deposited with DFO, Dhenkanal & 113.12 Lakh deposited with DFO, Angul) for execution of interventions in the ZoI.
5. As per earlier approved Site-Specific Wild Life Conservation Plan for this project approved by the PCCF (Wild Life and Chief Wild life warden), Odisha vide his letter

No 3188/1WL-SSP-10/2015 dated 09.04. 2015.The project proponent has already deposited Rs 3.979 Cr. towards the CAMPA fund.

6. In the core zone the interventions were development of drainage system, fire protection including one watch tower, regulation of lighting, measures to minimize water pollution, air pollution, noise pollution, prevention of accidents to wild animals (construction of boundary wall around project area) development of green belt, eco-development activities in Dhenkanal Division likewise in the ZoI the interventions were ANR 200 Plants per Ha. in Hitinda and Kandhal RF for 10 years maintenance, soil moisture conservation in the same Hitinda and Kandhal RF, construction of loose boulder structure and vegetative gully plugging, creation of water body, fire prevention measures, maintenance of RF boundary line in Hitinda and Kandhal RF, solar fencing over 10 Km around the villages, repeatedly depredated by wild elephants, awareness programme, monitoring & evaluation, provision of compassionate grant etc.
7. The project area is in villages Jharbandh, Galpada and Tarkabada of Hindol Tahasil of Dhenkanal District.
8. The expansion Project cost is Rs.5500 Crores including Rs.4702.69 lakhs for Environmental mitigative issues.
9. This project finds place in Survey of India Topo Map Survey of India Toposheet No. F45T2 (73 H/2), F45T5 (73 H/5), F45T6 (73 H/6), F45T1 (73 H/1), bounded by Lat: 20^0 45' 14" to 22^0 46' 24" N Long: 85^0 17' 12" to 85^0 18' 45" E
10. In the Zone of influence there exists three forest areas i.e., Jharbandh DPF over 122.82 ha, Nimidha R.F. over 160.70 ha in Dhenkanal Forest Division and Ganthigadia DPF over 109.245 ha in Angul Forest Division. The landscape pattern of the ZoI is mostly hilly and the elevation varies from 390m to 868m.
11. There is no perennial river or water body in the project area. A perusal of the Topo sheet shows that five first order seasonal streams, seventeen ponds and the sheet flow of rainwater 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.
12. There are six ponds within the project area over 674.765 acres sanctioned as per EC dated 04.06.2020. These ponds are seasonal in nature. Of these ponds, four are within/very near the earmarked green belt area. These four ponds will be conserved and developed as water bodies. These would be connected to the proposed Raw Water Reservoir and will facilitate rainwater harvesting.
13. These villages are tribal-dominated, and the literacy rate is low. Working in the nearby mine /industry is the main occupation of the villagers, besides cultivation. In

addition, they depend on the nearby forest area for different purposes like collections of firewood, NTFP and small timber etc. for bonafied purpose.

14. This Project will provide employment to 2200 persons.
15. National Highway NH-42 now re-numbered as NH-55 is the major road coming within Buffer Zone. Besides other major district roads are Angul to Hindol and Gudiakateni to Hindol. Different Block roods, arterial roods connecting Bonai, NH and MDR ore also existing within the Buffer Zone.
16. The Puri-Talcher branch of East Coast Railway is also passing through the Buffer Zone in the northern side of the proposed Steel Plant site.
17. The Rengali right main canal is passing through the Buffer Zone in the northeast direction of the project site.
18. According to the 'India State of Forest Report-2019' the total forest area of Dhenkanal District is 1445.61 sq km including 173.99 sq km of very dense forest, 420.38sq km of moderately dense forest and 851.24sq km of open forest. Similarly, in Angul Dist. The total forest area is 2782.63 sq. K.M. which includes 371.01 sq.Km of Very Dense Forest, 1380.00 sq.Km of Moderately Dense Forest and 1031.62 Sq.K.M. of Open Forest. Whereas the forests of both Forest Division as per Champion and Seth's Classification of Revised Forest types of India has been classified as Northern Tropical Moist Deciduous Forest (3C) and Northern Tropical Dry Deciduous Forest (5B). Which are further subdivided into 3C/C2e (Moist Peninsular Sal Forest), 5B/C1c (Dry Peninsular Sal Forest), 5B/C2 (Northern Dry Mixed Deciduous Forest) and 5/DS1 (Dry Deciduous Scrub Forest).
19. The survey conducted for enlisting the flora and fauna both in the core as well as in the zone of influence, indicates 16 species of trees, 07 species of Shrubs, 07 of Herbs, 4 species of grasses ,9 species of mammals, 06species of reptiles, 16species of birds are found from the core zone and 43 species of trees, 15 species of shrubs,8. species of herbs, 2 species of climbers, 07 species of mammals, 05 species of reptiles, 8 species of birds, species of lizards and 10 species of fishes from the ZoI in Dhenkanal Division.
20. As per the field observation, there is no endemic species found either in the Core or in ZoI. But Schedule-I species like Elephant, Sloth Bear and Python are noticed. Based upon the elephant census report 2017, there are 169 elephants present in the Dhenkanal Forest Division which includes 30 male, 94 female 15 unknown sex and 10 young and 45 Nos. in Angul Forest Division, which includes 13 male, 22 female and 10 young.
21. Elephant movement has been noticed along the N.H. 55, railway line, water course mainly along the Rengali Right Canal and villages of paddy dominated area.

22. Earlier a Site-Specific Wildlife Conservation Plan in respect of Integrated Steel Plant and Captive Power Plant at village Jharbandh, Tarnabeda and Gaisilada under Hindol Tahsil in Dhenkanal Forest Division by M/s Rungta Mines Ltd. and was approved by PCCF(WL) & CWLW, Odisha in his Memo No. 3158/1 WL-SSP-10 Dt. 09.04.2015 for Rs. 386.53 Lakh which includes Rs. 186.63 Lakhs to be spent by User Agency for implementation of activities (14 items) i.e., development of drainage system, Fire Protection, regulation of lighting, measures to minimize water, air and noise pollution, prevention of accidents to wild animals and construction of boundary wall around project area, development of green belt @60,000/per ha with 10 years and waste management, eco-development activities and immunization of livestock in Kaliposi village in Core Zone. The User Agency has complied item no. 1 to 9 of Dhenkanal Forest Division but not done item no. 10 & 11 i.e., eco-development activities and immunization of livestock in Kaliposi village in Dhenkanal Forest Division. Likewise, the User Agency has not complied item no. 12,13 & 14 i.e., eco-development activities, immunization of livestock in Kandhei village and Veterinary Health Camp in Angul Forest Division.

23. The anticipated degradation due to this project are Air pollution, Noise pollution, accident to wildlife, Litter generation, Habitat degradation, Forest fire, and Fragmentation of habitat etc. In view of these, mitigation measures like immunization of livestock, awareness programme and provision of solar light and Wildlife Habitat Improvement, Creation of water body, Anti-depredation Squad, Fire protection measures, displaying glow signage has been provided in the ZoI.

24. The total cost of the conservation plan is **Rs. 706.333 Lakhs (Rs. 643.548 lakhs for Dhenkanal Forest Division and Rs. 62.784 lakhs for Angul Forest Division)** including **cost escalation @ 20%. The entire amount will be deposited by the User Agency in CAMPA. Besides, the User Agency will bear the proportional cost of approved Plan prepared for Regional Wildlife Management Plan.**

Asst. Conservator of Forests
Angul Division

CEMC (P) LTD.
Authorised Signatory

Divisional Forest Officer
Angul Division

Divisional Forest Officer
Dhenkanal Division

For RUNGTA MINES LTD
P. K. CHATURVEDI
Vice-President

CHAPTER-1
INTRODUCTION AND METHODOLOGY

INTRODUCTION

1. A) i) Project:

M/s Rungta Mines Ltd. has several iron ore and Manganese mines in Odisha and Jharkhand. As on day value edition plays an important role for better utilization for increasing GDP. Therefore, these company has come forward to set up an integrated steel plant of 1.9 MTPY capacity and 100 MWWHRB (Waste Recovery Boiler) and 200 MW AFBC power plant at village Jharbandh. Hindol Tahsil of Dhenkanal district with an estimated investment of Rs. 2275.00 Cr. In this respect Rungta Mines Ltd. has signed an MoU with govt. of Odisha on 03.11.2005 for commissioning the project. The total land involved in this project is 273.073 Ha. including 3.156 Ha. of Forest Land.

The project area is in villages Jharbandh, Galpada and Tarkabada of Hindol Tahasil of Dhenkanal District.

1. A) ii) Location:

The Project is located in Dhenkanal Forest Division in Survey of India Toposheet No. F45T2 (73 H/2), F45T5 (73 H/5), F45T6 (73 H/6), F45T1 (73 H/1), bounded by parallels Lat: 200 45' 14" to 220 46' 24" N and Long: 850 17' 12" to 850 18' 45" E

The project area is in Hindol Tahasil of Dhenkanal District (Dhenkanal Forest Division, which is co-terminus with Dhenkanal Civil District, Hindol Forest Range) in Odisha at a distance of 22 km from Tahasil headquarter. The district headquarter Dhenkanal is at about 36 km connected by Road. The nearest Railway Station is Meramandli which is at about 2.5 km. The State capital Bhubaneswar, which is the nearest Airport, is at about 140 km. The proposed project site is located at 4.1 Km. from NH-55 which connects Bhubaneswar to Angul.

1. A) iii) Extent of project area, land schedule and land use pattern:

The impact area has been divided into two zones viz. core zone falling within the boundary of the proposed Integrated Steel Plant Complex which is spread over 273.073 Ha. and buffer zone encompassing the area within 10 Km radius distance from the project boundary.

Land use of the project area:

The breakup of the land use is as given below:

PROPOSED LAND USE PLAN OF PROJECT SITE

Sl.No.	Description of use	Private land (ha.)	Govt. Non-Forest land (ha.)	Revenue forest land (ha.)	Total (ha.)
1.	Admn. Building	0.218	0.105	-	0.323
2.	Internal Road	17.102	0.002	0.223	17.327
3.	Water Reservoir	0.862	1.538	-	2.4
4.	Tailing Pond	7.107	1.849	0.105	9.061
5.	Raw-material Stock Yard	16.119	2.436	0.951	19.506
6.	Solid Waste disposal area	18.478	2.525	-	21.003
7.	Fly Ash disposal area	21.457	3.654	-	25.111
8.	Plant & Machinery installation	69.229	15.066	1.323	85.618
9.	Green Belt	68.248	23.922	0.554	92.724
	TOTAL	**218.820**	**51.097**	**3.156**	**273.073**

ABSTRACT OF LAND SCHEDULE OF THE PROJECT SITE

Name of the Village	Pvt. Land (Ac.)	Govt. Land (Ac.)				Forest Land (Ac.)	Total (Ac.)
		Lease Area	Gochar	Communal	Total		
Jharbandh	261.565	44.030	17.390	12.330	73.750	7.540	342.855

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Tarkabeda	175.870	9.840	0.380	15.170	25.390	0.260	201.520
Galapada	103.270	1.800	16.710	8.610	27.120	-	130.390
Grand Total (Ac.)	**540.705**	**55.670**	**34.480**	**36.110**	**126.260**	**7.80**	**674.765**
Grand Total (Ha.)	**218.820**	**22.529**	**13.954**	**14.614**	**51.097**	**03.156**	**273.073**

Buffer Zone is the project impact area within 10 Km radius of project boundary which is mostly wasteland and degraded forest. The Buffer Zone is spread over 3131,126.927 Ha. (Total impact zone of 31,400.00 Ha. – core zone of 273.073 Ha.). The Buffer Zone is coming within the jurisdiction of Dhenkanal Forest Division (28922.077 Ha.) and Angul Forest Division (2204.85 Ha.). There are three forest blocks occurring in this buffer zone the details of which are furnished below:

Sl.No.	Name	Area (Ha.)	Distance	Direction
1	Jharbandha DPF, Dhenkanal Forest Division	122.82	0.5 KM	E
2	Nimidha RF, Dhenkanal Forest Division	160.70	4.0 KM	NE
3	Ganthigadia DPF, Angul Forest Division (as per Working Plan)	109.245	5.0 KM	NW
	TOTAL	**392.765**		

The satellite imagery interpretation of the 10 KM radius buffer zone for its land use pattern is furnished below:

LAND USE DETAILS OF BUFFER ZONE AS PER SATELLITE IMAGERY

Sl.No.	Land Use	Area (Sq. Km)	%
1	Sparse vegetation	13.30	3.41
2	Medium	31.49	8.07
3	Dense	13.54	3.47
4	Waste land	46.25	11.85
5	Habitation	8.65	2.22
6	Water body	16.82	4.31

7	Industry	6.65	1.70
8	Mining area	0.70	0.18
9	River side sand	7.91	2.03
10	Road & Railway	1.27	0.33
11	Agriculture	243.60	63.43
	TOTAL	**390.18**	**100.00**

Most of the area in the Buffer Zone which is about 93% is coming within the jurisdiction of Dhenkanal Forest Division and the remaining 7% area is coming within Angul Forest Division. Therefore, the study has been focused mainly on Dhenkanal Forest Division portion.

1. **A) iv) Project Status of Forest Diversion Proposal and Environmental Clearance:**
   MoEF vide their letter no. 5-ORB207/2014-BHU dt. 02.07.2015 has granted Forest Clearance and vide their letter no. J-11011/309/2018-IA. II(I) dated 15.02.2021 granted Environmental Clearance.

1.B) i) VILLAGES LOCATED WITHIN THE STUDY AREA, THEIR DEMOGRAPHIC AND OCCUPATIONAL 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 have also been paid. As in Dec 2018, there are no inhabitants within the plant boundary or the proposed expansion area.

Buffer Zone:

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

District & Sub District Wise Population (Census 2011)

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

Demographic Details of The Study Area (As Per Census)

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

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

Employment and occupation

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

1. B) ii) Existing Cropping Pattern:

Kharif is the main crop season of this area. The main crop – paddy is widely cultivated in this area. The Rabi crop represented by green gram, black gram etc. and vegetables are also cultivated in a small scale. The major crop is paddy which is grown over 75% of the Gross Culturable Area and the rest by other crops. Total land holdings are not utilized for cultivation because the fertility gradient of the uncultivable land is low from commercial point of view and they are mostly rain fed. As such agriculture is not intensive, it is mostly for getting rice for own consumption from personal land.

1. B) iii) Extent of Biotic Pressure by the above villages on the Study area especially on forest growth

At present agriculture is not producing any biotic pressure on the natural ecosystem. The population growth is a common phenomenon all over which is not restricted to only within the study area. The population growth has its impact on the natural ecosystem, common to everywhere. The energy consumption by the villagers for cooking food items is entirely depends on adjoining forest areas. Most of the villagers collect firewood from forest.

1. B) iv) Number of families depending upon the NTFP Collection:

Almost all families belong to SC and ST are involved in collection of NTFP. The main product is *mohua* (*Madhuca indica*) flower, apart from mohua they also collect Amla (*Emblica officinalis*), Bahada (*Terminalia bellirica*), Harida (*Terminalia chebula*) and Mango (*Mangifera indica*) fruits and its kernel. Honey and *Jhuna* (resin from Sal tree) collection is infrequent in the study area. Kendu leaf collection is not practiced in the study area. However, during our survey we did not find any family entirely dependent on NTFP collection. The left-over family members of the main work force (old age people, women and children) are mostly engaged in NTFP collection. Apart from NTFP, firewood collection from forest is a traditional and common practice in the study area. Villagers cut the tree for small timber and firewood for their own consumption. They collect their fencing materials and agricultural tools preparing from timber in the surrounding forests.

1. B) v) Method of NTFP Collection:

Handpicking from the ground is the main system of collection of mohua. For collecting from the ground villagers clean the forest floor by igniting fire, which destroy the ground vegetation, as well as restrict the regeneration of tree species. Repeated use of this method adversely impacts herbivore population. Due to the impact of this cleaning process the ground becomes completely barren at places to check the rainwater flow, resulted in soil erosion.

1. B) vi) Cattle population Data and dependency on the forest for grazing

According to Census 2012, the Cattle population of Dhenkanal Dist. is 34,403. In no village, cattle are stall-fed. As the agriculture is of low intensity, the production of agricultural by-products is also scanty to feed their cattle. Therefore, villagers take their cattle to nearby forest area for grazing and dependency is nearly 80%. The impact of cattle grazing reduces the regeneration of plants, changing the forest structure from mesophytic to xerophytic characters and compaction of topsoil combination with at places soil erosion.

1. C) i) Description of Topography

Dhenkanal is one of the centrally located districts of Odisha with a total geographical area of 4452 sq.km. The general topography of the area is quite gentle to steady slopes observed all through. The area of the district is 4452 sq. km, which is about 2.78% of the total area of the state. It is bounded by Keonjhar district in the north, Cuttack district in the east and south and Angul district in the west. The district is divided into three Sub-divisions namely Hindol, Dhenkanal and Kamakhyanagar and eight Community Development Blocks. It very often reels under severe water scarcity condition, especially during the lean season of the year.

1. C) ii) Natural Drainage Lines

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

There are six ponds within the project area of 674.765 acres sanctioned as per EC dated 04.06.2020. These ponds are seasonal in nature. Of these ponds, four are within / very near the earmarked green belt area. These four ponds will be conserved and developed as water bodies. These would be connected to the proposed Raw Water Reservoir and will facilitate rainwater harvesting. However, the volume of water from the plant area going outside the plant will reduce during rainfall as the rainwater will be stored in raw water reservoir / rainwater harvesting ponds. The plant area is 1769 acres (715.90 ha) and rainfall 1216.4 mm. Thus, maximum possible runoff volume getting affected can be 5.39 MCM/ annum of which 86% will occur in June- October. Since 67% of the plant will get constructed or paved or have road or have lining (where material will be stored in open) and 33% will be green belt, average 0.6 runoff coefficient for entire plant has been considered.

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

which is 0.038% of the likely flow in Brahmani river with 50% dependability. Thus, the impact shall be negligible on the flow of Brahmani river.

River/ Nala Present in 10 Km Radius

Sl.No.	River/ Nala	Nearest distance					
		With respect to plant		With respect to water reservoir area		With respect to Staff Colony	
		Distance, km	Direction	Distance, km	Direction	Distance, km	Direction
1.	Nigra or Lingra Nadi	0.7	N				
2.	Brahmani River			4.9	NE		
3.	KisindaJor	5.0	N				
4.	Kantei Nala	4.8	WSW				
5.	Matilia Nadi	7.0	WSW	--	--	--	--
6.	Bauli Nadi	6.9	W	--	--	--	--
7.	Barha Jor	7.8	SE	--	--	--	--
8.	KusumdorJor	3.6	SE				
9.	Agana Nadi	---	--	9.3	ESE	--	--
10.	Bangurasingha Nala	--	--	8.6	E	--	--
11.	Parjang Branch Canal	--	--	7.9	NE	--	--
12.	Ria Jor	--	--	5.9	NE	--	--
13.	Rengali Right Main Canal	--	--	0.7	N	--	--
14.	Pond in Khajuria	7.5	S	--	--	--	--
15.	Pond in Ranjagol	5.6	S	--	--	--	--
16.	Pond in Sanamunda	2.6	SW	--	--	--	--

1. C) iii) Climate

Based on the climate and cropping patterns, Odisha is divided into ten agro climatic viz. North-Western Plateau, North-Central Plateau, North-Eastern Coastal Plain, Eastern and South Eastern Coastal Plain, North Eastern Ghat, Eastern Ghat Highland, South-Eastern Ghat, Western Undulating, Western Central Table Land, Mid-central Table land Zone. Dhenkanal Forest Division comes under mid central table land zone located in the middle of the central table land of the State. The study area is characterized by tropical climate with rainy season from June to September. During April-June heavy thunderstorm is experienced with high wind speed up to 100 km/ph. Winter rains are occasional. The climate of this area is influenced by conditions in the Bay of Bengal.

1. D.i) The Details of Linear Infrastructures:

i. National Highway NH-42 now renumbered as NH-55 is the major road coming within Buffer Zone.
ii. Besides other major district roads area Angul to Hindol and Gudiakateni to Hindol.
iii. Different Block roods, arterial roods connecting Bonai, NH and MDR ore also existing within the Buffer Zone.
iv. The Talcher branch of East Coast Railway is also passing through the Buffer Zone in the northern side of the proposed Steel Plant site.
v. The Rengali right main canal is passing through the Buffer Zone in the northeast direction of the project site.

1.E.i) Description of Flora and Fauna:

As per the field study, the list of flora and fauna available in the area is as detailed below.

CORE ZONE

FLORA:

Sl.No.	Local Name	Scientific Name	Family
		TREES	
1.	Garkhair	*Acacia lenticularis*	Mimosaceae
2.	Babul	*Acacia nilotica*	Mimosaceae
3.	Kaju	*Anacardium occidentale*	Anacardiaceae
4.	Ramphal	*Annona reticulata*	Annonaceae
5.	Sharifa	*Annona squamosa*	Annonaceae

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ANNEXURE : XVII Contd..

6.	Neem	*Azadirachta indica*	Meliaceae
7.	Tal	*Borassus flabellifer*	Palmae
8.	Palas	*Butea monosperma*	Papilionaceae
9.	Narkul	*Cocos nucifera*	Palmae
10.	Amba	*Mangifera indica*	Anacardiaceae
11.	Sajna	*Moringa oleifera*	Moringaceae
12.	Khajur	*Phoenix sylvestris*	Palmae
13.	Amrud	*Psidium guajava*	Myrtaceae
14.	Ambada	*Spondis pinnata*	Anacardiaceae
15.	Jambu	*Syzygium cumini*	Myrtaceae
16.	Borkuli	*Zizyphus mauritiana*	Rhamnaceae
SHRUBS			
17.	Arakha	*Calotropis gigantea*	Asclepiadaceae
18.	Morning glory	*ipomoea purpurea*	Convolvulaceae
19.	Jatropha	*Jatropha podagrica*	Euphorbiaceae
20.	Bholupodi	*Lantana camara*	Verbenaceae
21.	Bankhajuri	*Phoenix acaulis*	Palmae
22.	Arand	*Ricinus communis*	Euphorbiaceae
23.	Begunia	*Vitex negundo*	Verbenaceae
HERBS			
24.	Chirchira	*Achyranthus aspera*	Amaranthaceae
25.	chaulii	*Amaranthus spinosus*	Amaranthaceae
26.	Dudhi bel	*Euphorbia hirta*	Euphorbiaceae
27.	Lajwanti	*Mimosa pudica*	Mimosaceae
28.	Tulsi	*Ocimum sanctum*	Labiatae
29.	Bhatkadrana	*Solanum nigrum*	Solanaceae
GRASSES			
30.	Duba	*Cynodon dactylon*	Poaceae

31.	Marvel grass	*Dichanthium annulatum*	Poaceae
32.	Sinkula	*Heteropogon contortus*	Poaceae
33.	Rooi grass	*Themeda triandra*	Poaceae

FAUNA:

MAMMALS				
Sl.No.	**Local Name**	**English Name**	**Scientific Name**	**Schedule**
1.	Bilua	Jackal	*Canis aureus*	II
2.	Badudi	Short-nosed fruit bat	*Cynopterus sphinx*	V
3.	Gunduchi musa	Five stripped palm squirrel	*Funambulus pennanti*	IV
4.	Hanu Mankada	Langur	*Presbytis entellus*	II
5.	Neula	Common mongoose	*Herpestes edwardsi*	II
6.	Thekua	Indian hare	*Lepus nigricollis*	IV
7.	Pati Mankada	Rhesus macaque	*Macaca mulatta*	II
8.	Musa	Common house rat	*Rattus rattus*	V
9.	Barha	Indian wild boar	*Sus scrofa*	III
REPTILES				
Sl.No.	**Local Name**	**English Name**	**Scientific Name**	**Schedule**
1.	Chiti	Common Indian krait	*Bungarus caeruleus*	IV
2.	Jhitipiti	Common garden lizard	*Calotes versicolor*	-
3.	Pohala endua	Indian chameleon	*Chamaeleon zeylanicus*	II
4.	Boda Sapa	Saw scaled viper	*Echis carinatus*	IV
5.	Jhitipiti	Northern house gecko	*Hemidactylus flaviviridis*	-

ANNEXURE : XVII Contd..

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6.	Dhamana	Common rat snake	*Ptyas mucosus*	II
LIZARDS				
Sl.No.	**Local Name**	**English Name**	**Scientific Name**	**Schedule**
1.	Champainoi	Skink	*Mabuya bibro*	-
2.	Endua	Rock geeko	*Hemidactylus maculatus*	-
BIRDS				
Sl.No.	**Local Name**	**English Name**	**Scientific Name**	**Schedule**
1.	Baga	Egret Cattle	*Babulcus ibis*	IV
2.	Ban kukuda	Jungle fowl	*Gallus gallus*	IV
3.	Bani	Myna Indian	*Acridothere stristris*	IV
4.	Baya	Baya weaver bird	*Ploceus phillipinus*	IV
5.	Bhadabhadalia	Roller	*Coracias bengalensis*	IV
6.	Damara kau	Cow jungle	*Corvus macrorhynchos*	IV
7.	Gobara chadhei	Bulbul (red vented)	*Pyononotus cafer*	IV
8.	Haladi basanta	Oriole black headed	*Oriolus xanthornus*	IV
9.	Kajalpati	Black drongo	*Dicrurus macrocerus*	IV
10.	Kantiabaga	Paddy bird	*Ardeo lagrayili*	IV
11.	Kau	Crow house	*Corvus splendens*	IV
12.	Koili	Indian Cuckoo	*Cuculus micropterus*	IV
13.	Para	Blue rock Pigeon	*Columba livia*	-
14.	Pecha	Owl	*Bubo Bubo*	IV
15.	Sua	Indian Parakeet large	*Psittacula eupatria*	IV
16.	Teetiri	Patridge grey	*Francolinus pondicerianus*	IV

ZONE OF IMPACT

FLORA

Sl.No.	Local Name	Scientific Name	Family
TREES			
1.	Acacia	*Acacia auriculiformis*	Mimosaceae
2.	Amba	*Mangifera indica*	Anacardiaceae
3.	Ambada	*Spondis pinnata*	Anacardiaceae
4.	Amrud	*Psidium guajava*	Myrtaceae
5.	Aswastha	*Ficus religiosa*	Moraceae
6.	Babul	Acacia nilotica	Mimosaceae
7.	Bara	*Ficus benghalensis*	Moraceae
8.	Barakoli	*Zizyphus mauritiana*	Rhamnaceae
9.	Batra	*Melia composite*	Meliaceae
10.	Bel	*Aegle marmelos*	Rutaceae
11.	Bohl	*Mimus opselengi*	Sapotaceae
12.	Char	*Buchanania lanzan*	Anacardiaceae
13.	Chhaitian	*Alstonia scholaris*	Apocynaceae
14.	Dhumar	*Ficus glomerata*	Moraceae
15.	Garkhari	*Acacia ferruginea*	Mimosaceae
16.	Gulmohar	*Delonix regia*	Caesalpiniaceae
17.	Jambu	*Syzygium cumini*	Myrtaceae
18.	Kadamba	*Anthocephalus chinensis*	Rubiaceae
19.	Kaitho	*Limonia acidissima*	Rutaceae
20.	Kaju	*Anacardium occidentale*	Anacardiaceae
21.	Karanj	*Pongamia pinnata*	Papilionaceae
22.	Kendu	*Diospyros melanoxylon*	Ebenaceae
23.	Khajur	*Phoenix sylvestris*	Palmae
24.	Mahalimb	*Ailanthus excelsa*	Simaroubaceae

ANNEXURE : XVII Contd..

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25.	Mahul	*Madhuca indica*	Sapotaceae
26.	Maranga/Tentra	*Albizia procera*	Mimosaceae
27.	Narkul	*Cocos nucifera*	Palmae
28.	Neem	*Azadirachta indica*	Meliaceae
29.	Panasa	*Artocarpus heterophyllus*	Moraceae
30.	Palas	*Butea monosperma*	Papilionaceae
31.	Patas	*Eucalyptus hybrid*	Myrtaceae
32.	Patmossu	*Polyalthia cerasiodes*	Annonaceae
33.	Peacock flower	*Caesalpinia pulcherrima*	Caesalpiniaceae
34.	Ramphal	*Annona reticulata*	Annonaceae
35.	Sajna	*Moringa oleifera*	Moringaceae
36.	Sharifa	*Annona squamosa*	Annonaceae
37.	Simili	*Bombax ceiba*	Bombacaceae
38.	Siris	*Albizia lebbeck*	Mimosaceae
39.	Sissu	*Dalbergia sissoo*	Papilionaceae
40.	Sunari	*Cassia fistula*	Caesalpiniaceae
41.	Tal	*Borassus flabellifer*	Palmae
42.	Teak	*Tectona grandis*	Verbenaceae
43.	Tentuli	*Tamarindus indica*	Caesalpiniaceae
BAMBOO			
44.	Kanta bans	*Bambusa arundinacea*	Bambusaceae
45.	Salia	*Dendrocalamus strictus*	Gramineae
SHRUBS			
46.	Basak	*Adhatoda vasica*	Acanthaceae
47.	Arakha	*Calotropis gigantea*	Asclepiadaceae
48.	Candle-stick tree	*Cassia alata*	Caesalpiniaceae
49.	Kumti	*Clerodendron viscosum*	Verbenaceae

50.	Dhatura	*Datura metal*	Solanaceae
51.	Kantasidhu	*Euphorbia neriifolia*	Euphorbiaceae
52.	Gurhal	*Hibiscus rosa-sinensis*	Malvaceae
53.	Korei	*Holarrhena antidysenterica*	Apocynaceae
54.	Morning glory	*ipomoea purpurea*	Convolvulaceae
55.	Jatropha	*Jatropha podagrica*	Euphorbiaceae
56.	Bholupodi	*Lantana camara*	Verbenaceae
57.	Kaner	*Nerium oleander*	Apocynaceae
58.	Bankhajuri	*Phoenix acaulis*	Palmae
59.	Arand	*Ricinus communis*	Euphorbiaceae
60.	Begunia	*Vitex negundo*	Verbenaceae
61.	Dhatki	*Woodfordia fruticosa*	Lythraceae
HERBS			
62.	Chirchira	*Achyranthus aspera*	Amaranthaceae
63.	chaulii	*Amaranthus spinosus*	Amaranthaceae
64.	Dudhi bel	*Euphorbia hirta*	Euphorbiaceae
65.	Gopha	*Leucas montana*	Labiatae
66.	Lajwanti	*Mimosa pudica*	Mimosaceae
67.	Banatulsi	*Ocimum gratissimum*	Labiatae
68.	Tulsi	*Ocimum sanctum*	Labiatae
69.	Bhatkadrana	*Solanum nigrum*	Solanaceae
CLIMBERS			
70.	Palas lata	*Butea superba*	Papilionaceae
71.	Makai	*Ziziphus oenoplia*	Rhamnaceae
GRASSES			
72.	Duba	*Cynodon dactylon*	Poaceae
73.	Marvel grass	*Dichanthium annulatum*	Poaceae
74.	Sinkula	*Heteropogon contortus*	Poaceae

ANNEXURE : XVII Contd..

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75.	Rooi grass	*Themeda triandra*	Poaceae

FAUNA:

MAMMALS				
Sl.No.	**Local Name**	**English Name**	**Scientific Name**	**Schedule**
1.	Hati	Indian Elephant	*Elephas maximas*	I
2.	Bhalu	Sloth Bear	*Melursus ursinus*	I
3.	Gunduchi musa	Five stripped palm squirrel	*Funambulus pennanti*	IV
4.	Neula	Common mongoose	*Herpestes edwardsi*	II
5.	Thekua	Indian hare	*Lepus nigricollis*	IV
6.	Patimankada	Rhesus macaque	*Macaca mulatta*	II
7.	Musa	Common house rat	*Rattus rattus*	V
REPTILES				
Sl.No.	**Local Name**	**English Name**	**Scientific Name**	**Schedule**
1.	Chiti	Common Indian krait	*Bungarus caeruleus*	IV
2.	Dhamana	Common rat snake	*Ptyas mucosus*	II
3.	Naga	Indian cobra	*Naja naja*	II
4.	Panidhanda	Checkered keel back	*Natrix piscator*	II
5.	Ajagara	Indian Rock Python	*Python molurus*	I
LIZARDS				
Sl.No.	**Local Name**	**English Name**	**Scientific Name**	**Schedule**
1.	Jhititpiti	Common garden lizard	*Calotes versicolor*	-
2.	Pohala Endua	Indian chameleon	*Chamaeleon zeylanicus*	II
3.	Kala Jhitipiti	Northern house gecko	*Hemidactylus flaviviridis*	-

BIRDS				
Sl.No.	**Local Name**	**English Name**	**Scientific Name**	**Schedule**
1.	Bani	Indian myna	*Acridotheres tristis*	IV
2.	Pecha	Owl	*Bubo bubo*	IV
3.	para	Blue rock Pigeon	*Columba livia*	-
4.	Kua	House crow	*Corvus splendens*	V
5.	Jangali Kukuda	Jungle fowl	*Gallus gallus*	IV
7.	Damara Kua	King crow	*Dicrurus adsimilis*	-
8.	Baunsapatria Sua	Large Indian Parakeet	*Psittacula supatria*	IV

Details of Endemic, threatened and Scheduled Species:

So far, according to our study and from the available literature, there is no endemic plant or animal species present in this area. As far as, threatened fauna is concerned all Schedule – I species is threatened. Schedule I species present in the study area are **Elephant, Sloth Bear and Python**.

1. F) i) Description of Forest and habitat condition

According to Champion and Seth's 'Classification of Revised Forest types of India' the forests of Dhenkanal Forest Division has been broadly classified in the Working Plan as Northern Tropical Moist Deciduous Forest (3C), Northern Tropical Dry Deciduous Forest (5B) and Tropical Semi Evergreen Forest (2B/C3). Which are further subdivided in to 3C/C2e (Moist Peninsular Sal Forest), 5B/C1c (Dry Peninsular Sal Forest), 5B/C2 (Northern Dry Mixed Deciduous Forest), and 5/DS1 (Moist Mixed Shrub Deciduous Forest).

Forest Condition According to FSI Report:

According to the 'India State of Forest Report -**2019**' the total forest area of Dhenkanal District is 1445.61sq km including 173.99sq km of Very Dense Forest, 420.38sq km of Moderately Dense Forest and 82 1.24sq km of Open Forest. In comparison to the geographic area of this district (4,452 sq km) the forest cover is 32.47%. In this district the total forest area is gradually increasing. As per the above report the forest area has increased from 1417Sq km to 1445.61sq km since last two years (FSI 2017).

District	Total forest in km^2	% of Very Dense Forest	% of Moderately Dense Forest	% of Open Forest
Dhenkanal	1445.61	12.00	29.00	59.00

1. F) ii) Wildlife habitat and prevailing wildlife scenario:

The habit and habitats of particularly Schedule-I species are narrated below-

Elephant (*Elephas maximus*):



Habit: Elephants are social animals and live-in herds, which vary between 3–6. The Elephants are matriarchal and the herd is led by the oldest female. Herd usually breaks into clans and rejoins again. For long-distance movement some time a few herds mix and form a big group which is coordinated by the oldest female for searching for better habitat – food and water. Several herds maintain contact through sub-sonic vocalization according to findings on work with African Elephants. Adult males remain away from the herd and occasionally join with the herd when females are in oestrous. They are polygamous. Only dominant males have the chance to mate with females. Old males usually lead a solitary life, while sub-adult males some time form an unstable group of 2 to 7 animals. Such a group is known as *Muljuria* group. Elephants are very sensitive to hot and prefer shady moist areas during noontime. The matriarch herds, as well as males, are long-ranging. Their home Range varies between 150 and 1200 sq km, depending on the habitat condition. An Elephant may run at a speed of 45 km per hour for a short distance for two to five minutes. Their average life span is the same as human beings, and around 70 years. In Elephant there is no seasonality in oestrous cycle, and the interbirth interval varies from 3 to 5 years, depending on the habitat quality. The gestation period is 18 to 22 months and the suckling period is around one and a half years. Young calves start taking grass from 6 months onwards. Mother continues to bestow maternal care to their offspring for several years after weaning. The sense of touch and hearing is well developed in Elephant, but its eyesight is poor. Most males have prominent tusks, while some time females have tushes which are hardly visible from outside. Male Elephants sometimes have only one tusk (known as *Ganesh*), or even without tusk (known as *Makhna*). They have 6 sets of molar teeth,

of which only one set is in use at a given time. With the loss of the last set of molar teeth they are deprived of taking any food and eventually do not survive. The unique identity of Elephant is his trunk with a single finger-like tip at the end and it has versatile utility, used in eating, drinking, smelling, breathing, touching, washing & dusting of the body, fighting, and vocalizing. Mud wallowing is fun for the Elephants, though it protects them from insects and sun.

Habitat: The body size and food requirement of this non-ruminant "mega-herbivore" have made the Elephant a generalist vegetarian to feed on a variety of plant species. Even within one region, they feed on well over a hundred species of plants. They not only depend on leaves, fruits & twigs but also consume barks, roots, stem pith, flowers, grasses and salt with soil. Though, depending on seasons they select distinctly different plant parts depending on their availability. In the dry deciduous Forest region, their dietary habit usually alternates between predominantly grazing during the wet season and browsing during the dry season. In quantitative terms, they prefer grasses, reeds, and sedges (Poaceae and Cyperaceae). Their preferred tree families are Combretaceae, Euphorbiaceae, Moraceae, Malvaceae, and Legumes. They cannot survive entirely as grazers. Thus, browse species are extremely important in the nutrition of Elephant. On average, they take 150 kg of vegetation and 100 litres of water per day. The efficiency of digestion is poor (40 to 45%) with the symbiotic bacteria in the stomach. They are in constant motion while feeding and generally cover 15 to 20 km in a day. Elephants are well established in dry deciduous Forests to moist evergreen Forests.

Human activities like agriculture (cultivation of crop, irrigation system); development works (Roads, Railways, Townships, Dams, Industries, and Mines etc.) are fragmenting their habitat and creating obstructions to their movement which they traditionally follow.

They are in conflict with human when they move through that fragmented area and also damage various cultivated crops (like paddy, ragi, banana, sugar cane, etc.).

Sloth Bear (*Melursus ursinus*):

Distributed throughout the Odisha, except a few areas of the coastal Districts and is an endangered species.



Habit: Sloth Bear has a long snout and lips are detached from the gum and are well adapted to the forceful intake and expulsion of air. The absence of a middle pair of incisors in the upper jaw permits the

passage of air freely. The tongue is large protractible. Long claws of the forelimbs (longer than hind limbs) are good instruments of digging. The animal produces enough suction force to suck out termites from mounds.

Bears are nocturnal in habit, their sense of smell is well developed than their sight and hearing. During an accidental encounter with a human being, they cause severe damage to the human or even death. When they have cubs, they move with them, otherwise, they are solitary or are in pair with the opposite sex. They have a specific breeding season. Mating takes place in June or July and they give birth to cubs in caves during December and January. Litter varies between 1 and 3 cubs. Parental care lies with mother only. Their average life span is around 40 years.

Habitat: They are in good number in drier and secondary Forests are also found in dense forests. They are omnivorous in nature. They feed on tubers, roots, grubs, various fruits, various insects, honey, termites, flowers (mahua, simul, etc.). It also damages sugar cane crop, maize, etc. Their home Range is limited and restricted. In the quest of food, they may travel several kilometres. It is believed that their gall bladder and bile have medicinal properties and hence they are exposed to poaching, particularly due to the demand of these parts in China and other Southeast Asian countries.

Indian Rock Python (*Python molurus*):



Habit: This is a non-venomous snake and can grow up to 4m and weigh 45 kg. The colour is dark brown to yellowish white in a blotched pattern. They are very good swimmers and take to water when disturbed but on land, they hiss and remain motionless. The species is oviparous and lay up to 100 eggs in a clutch protected and incubated by the female. Being exothermic, python basks in open but can also raise body temperature by muscular contraction.

Habitat: Python occurs in wide Range of habitats viz. rocky foothills, grasslands, marshes, swamps, woodlands, open jungle. At times, they take refuge in mammal burrows, hollow trees etc. It has also been reported close to habitation and crop fields. The snake feeds on small mammals, birds, and reptiles but prefers the first. Chital deer, fawns, hares, mouse deer, jungle fowl are natural food.

It can swallow prey bigger than its size as the jaw bones are not hinged. The prey is constricted to death by muscular movement and swallows headfirst. Once held in the jaw, prey cannot escape because of inward bent teeth. It is listed as one of the Lower Risk /Near Threatened species according to IUCN Red List.

1. G) Movement of mega Wildlife

Elephant is the flagship species of this area and the only mega herbivore (wildlife) with long ranging movement behaviour, present in the study area. Elephants follow streams and move in valleys and unless hard pressed try to avoid hilly terrain to conserve energy. This behaviour exposes them close to human habitation. To the north of the project area flows river Brahmani, which is a perennial river which helps to quench the thirst of wild animals along with the elephants throughout the year.

1. H) Man-animal conflict and Depredation caused by the wild animals:

- This is restricted in the Dhenkanal Wildlife Division area. The olfactory sense of these animals is of very high order and they smell stored grain and country brew (Handia and mahuli), which is very common in this area. Once got addicted to country liquor, elephants learn to visit the place again and again in search of Handia (rice brew) or Mohuli (brew of Mahua flowers). Generally, elephants depredate human habitation during paddy crop and ravi crop season. Also, the fruit plants present around villages like Jack fruit, Banana, Sugarcane and Mangoes attract elephants to invade the human habitation. When elephants are driven from one crop field to other and denied rest and food and driven by shooting arrows, this injures and enrages the animals. Such injuries ultimately suppurate and lead to septicaemia and agonizing death.
- In the present context the villagers become outrageous due to regular loss to their crops. Hence sometime the villagers make the attempt to chase behind the elephants and make howling, which ultimately makes the elephants more violent giving injury to the public. Hence, Villagers need to be counselled to keep calm and not to resort to such practices by proactive outreach activities, before reaching of any concerned government authorities i.e., Forest Dept. Field executives.

Elephant Depredation Data of Dhenkanal Division:

	2017-18	2018-19	2019-20
CROP DAMAGE	5938	5887	5253
HUMAN DEATH BY WILD ANIMALS	21	29	22

1. I) Location of other project in the Zone of Impact of the current project

The list of projects coming under Buffer Zone are furnished below: -

Sl. No.	Name of Project
1.	MGM Steel's sponge iron unit & WHRB
2.	Navbharat Ventures Ltd.'s Ferro-chrome plant and power plant

3.	MLR's Tulsidiha Ferro-alloys plant
4.	Bhushan Steel Limited's Steel Plant
5.	Lanco power plant
6.	BRG Irons & Steel Co.'s sponge iron & ingot manufacturing unit
7.	Kanak Durga stone crusher
8.	GMR Kamalanga Energy Ltd.
9.	Hind Metals Pvt. Ltd.'s Ferro Alloys plant
10.	Ravirun Vinmay Pvt. Ltd.
11.	Bhuvee Profile and Stainless (P) Ltd.

1. J) Experts involved in the study

Sl. No.	Name	Expertise	Years of Experience
1.	Mr. L. K. Das, IFS (Retd.)	Forest, Biodiversity & Wildlife	36 years
2.	Mr. Siba Kumar Mohanty, OFS (Retd.)	Forest & Wildlife	30 years
3.	Dr. Bidyut Kumar Patra	Environment	12 years
4.	Dr. Rabi Kumar Mishra	Wildlife & Bio-Diversity	14 years
5.	Miss Swetagni Mohanty	M.Sc., Wildlife & Bio-Diversity	02 year

The above team members conducted the study being assisted by Range Officer Hindol Range and his field staff. The flora available in the study area was listed through field observations. In course of study, dropping of wild animals, pug marks, burrows, nests, scratching, scat/dung and physical presence on ground, tress bushes were identified and recorded for both core and buffer area.

METHODOLOGY

- The study is based on Survey of India Topo Maps.
- The Village list and demographic composition has been collected from 2011 Census Report.
- Conflict data and Movement of Mega-fauna records collected from the Dhenkanal Forest Division.
- Active search method applied for listing of the flora and fauna. Villagers were shown photographs from a book compiled by Sri N.C. Mohanty, IFS (Retd.) to identify the faunal species for confirmation.

Findings:

In the buffer zone of the project, scheduled (I) species like, **Asiatic Elephant**, **Sloth Bear**, **Indian python.**

CHAPTER-2

THE PERCEIVED IMPACTS OF THE PROJECT ON THE ENVIRONMENT

A. Impact on the environment in General:

Any industrial project has its impacts on the biotic, physical and socio-economic environment. Some are beneficial to the society some are not. Evaluating these impacts, all projects are implemented. This project is not left untouched in these aspects. When certain impacts are disasters, it necessitates mitigating such problem with established technology and scientific study. Such negative impacts are discussed here to help in implementing mitigative measures.

Before any attempt is made to reduce various stresses and to avoid/minimize or mitigate their adverse impacts, it is necessary to identify various factors that have negative influence on the biodiversity (flora and fauna). These are specified below considering the terms of reference for the preparation of Site-Specific Wildlife when certain impacts are identified, it needs to mitigate with modern technology and scientific study. Such negative impacts are discussed here to help in implementing mitigative measures.

i) Impact on soil

It is anticipated that the effect on soil quality may arise during construction and operation of this project. During Operation due to open yard storage of raw materials like iron ore, coal and limestone. As the project area has very sparse vegetation, some amount of soil erosion is inevitable from surface run-off, which will increase the sediment load of the streams. The earthwork and storage of constructions material may temporarily affect the topsoil in terms of erosion. Transport of construction material would lead to an increase in traffic flux. Further, dumping of solid wastes like char, ESP dust, sludge from DRI/blast furnace, FES dust, BF slag, fly ash, etc. on land would also deteriorate soil quality, if appropriate control and mitigation measures will not be implemented. The topsoil and other stored material may erode and thereby affect the soil of the periphery and introduce toxic materials to the soil If not properly stored and will affect to the wildlife like rodents and other burrowing animal present in that area.

ii) Geomorphic changes:

No major geomorphic changes will occur due to execution of this project except for minor leveling and slight rise in plinth area. Raw material will temporarily increase elevation in storage area. The natural sheet flow will be obstructed due to the buildings but that shall be taken care by the provision of storm water drains.

iii) Moisture loss

Moisture loss will be occurred in both the core and the buffer zone of the project due to release of various gas with a very high temperature from the boiler of the plant if adequate measures will not be taken. Operation of heavy vehicle for transportation and loss of vegetation due to the project is also cause moisture loss. Under such circumstances, re-establishment of vegetation is delayed and difficult but constant input of imported materials like fertilizers, organic manure, water and regular attention can escalates the cost of reforestation in such refractory area.

iv) Impact on Vegetation

The major Forest blocks are Jharbandha DPF, Nimidha RF and Ganthigadia DPF located within the buffer zone of the project. However, no forest land of any Reserve Forest falls within the core area of this project. Therefore, direct impact on vegetation is not envisaged. Some increase in the concentration of SO2 in the study area is visualized. Concentrations of NOx and SPM will also increase. Fugitive dust emissions may also cause higher ambient SPM 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. In addition, due to this industrialisation anthropogenic pressure will put huge pressure on the vegetation of the cluster area of the project.

v) Habitat loss

As there is no forest area involved in this direct habitat loss due to this project is not anticipated. However due to implementation of the project development of infrastructure, establishment of township and the subsequent population pressure may cause loss of habitat at the periphery of the Steel Plant.

vi) Impact on Water Regime

Total freshwater requirement of the project is estimated to be 2,950 m^3/hour which will be drawn from river Brahmani. The various sources of wastewater generation are: Power Plant, Blast Furnace, Steel Making Shop, Iron Ore Beneficiation Plant, Coal Washery, Cock Oven Plant, DM Plant, domestic wastewater etc. The quantum of wastewater from these sources has been estimated to be 243 KLH which need to be reused/recycled after proper treatment.

These are two first order streams originating from the plant area which are seasonal in nature. Some streams in the project area are the streams are likely to be silted with increase in total suspended solids (TSS). Other waste and oily material likely to be

generated during steel production activities may contaminate the stream flow down below if proper arrangement is not made to trap such hazardous material.

vii)Impact on Air:

Project implementation will contribute towards air pollution in two ways:
Addition of gaseous pollutants to the atmosphere and the dust particles. The gaseous pollutants include NOx, SO2 and Hydrocarbons. The sources of pollutants from construction and operational activity include:

- Operation of Heavy transport vehicles and mechanical equipments which mostly run-on diesel.
- Loading/unloading operations.
- Transportation of ore and other raw materials.
- Construction and erection of proposed plants.
- Emission of gases from Beneficiation Plant, Palletisation Plant, Sinter Plant, Coke Oven Plant, Sponge Iron, Blast Furnace, Steel melting & Captive Power Plant and Coal Washery.
- Polluted air will create respiratory problem among the animals.

Fly Ash and Other Gas:

Fly ash which is composed of SiO2 55-60%, Al2O3 25-30%, CaO 2-5% contains elements like N, P, K, Ca, S, Mg, Mn and toxic metals like Be, Hg, Cr, Zn, Cd, Pb, Se, etc. Fly ash, both from the Power plant and the Steel plant will be trapped by Electrostatic Precipitators (ESP) with 99.8 % efficiency and will use for brick making land fill and road making etc. Besides during operation phase, air quality may deteriorate due to emission of several toxic gases (So2, Nox, Co etc.) from the various units of the sponge iron, blast furnace, steel melting and captive power plant etc. Hence, for control over the toxic gas the following measures will be taken.

- Use of After Burning Chamber in the DRI units, coke oven plant and sinter plant for combustion of CO.
- Use of high efficiency electrostatic precipitators in case of DRI kilns and FBC boiler to limit SPM level below 50 mg/Nm3.
- keeping appropriate stack height.
- Dust extraction system with bag filters shall be provided at different places, such as kiln inlet area, crushing unit, cooling outlet area to suppress SPM level below 50 mg/Nm3.
- Dust and fume extraction systems have been incorporated in the blast furnaces and the induction furnaces for control of dust and fumes.
- Leakage from the equipment, ducts and transfer points shall be regularly checked and stopped.

- Development of green belt to act as pollution sinks.

viii) Noise pollution

The sources of noise generation during operation phase are as follows:

- Operation of the Kilns and furnaces,
- Material handling operations, crushers
- ID Fans, motors, pumps
- Trucks, dumpers, loaders, scrappers and earthmovers
- Operation of turbines, etc.

Operation of these equipments will continuously generate noise, which will have adverse impact on the ambient noise levels. This is one of the factors contributing to displacement of species, even large ones like Deer and elephant if sufficient measures will not be taken. Adverse effects of noise are.

- Hearing impairment.
- Signal masking i.e., inability to hear important environmental clues and alarm, distress and mating calls of con specifics for survival.
- Increased heartbeat respiration and stress reaction.
- Loss of fecundity or inability to litter or increase in abortion.
- Erosion of faculty to suckle young and successful rearing of the brood.
- Decline in bird population due to muffling of mating calls.

ix) Light Pollution

All animals are adapted to rhythm of solar light and darkness and accordingly remain passive or active depending on their nature (diurnal, crepuscular or nocturnal). During construction phase, a number of lights will be illuminated in the Project area for the purpose of visibility and safety/ security of the work force. Besides frequent plying of trucks/ trailers and large number of vehicles, movements of supervising personnel will add up illumination in the area. Since birds and animals are sensitive to light in night time, the illumination due to above factors may affect their biological cycle. All animals present within the ZoI area will be affected by the incidence of light as artificial lights are very sensitive to the cornea. Animals are adapted to constant phase of light, when changes happen, they move to area of their choice. Sudden lighting, off and on after dusk by the moving vehicles is harmful. At times, animals will face accidental death, unable to escape and get distracted from their natural path will lead to depredation to the nearby villages or accidental fall in the deep mining pit present at the nearby areas. The above activities will increase the stress condition. Animals exposed to light exhibit erratic behaviour pattern, expressed in their deflected movement and aggressive behaviour.

B. Quantum of pollutants that may be produced by the project and effect on soil, water, air, vegetation and animals.

Two types of generation and discharge of pollutants, viz., fugitive emissions and stack emissions, have been considered. The stack emissions comprise of the hot gases from the kilns, which contain particulate matters, SO2 and NOx in significant quantities having ground level concentration of SPM, SO2 and NOx to the extent of 10.03 µg/m3 of SPM, 6.0 µg/m3 of SO2 and 4.90 µg/m3 of NOx. Whereas Fugitive emissions comprise mostly of raw material/ product dust generated from different material handling operations, e.g., transport, storage, processing, transfer, loading, unloading, etc. Appropriate measures have taken by the project proponent for minimize the effect of these pollutants to the environment and the wildlife. Similarly, as such the plant working has been planned on zero discharge basis therefore not pollution of any form is expected on account of industrial activity. Weather some impact on drainage is envisaged during construction and operation phase if appropriate measures are not taken. The core area slopes towards northeast. A pond will be constructed to keep water within the plant. The same pond shall serve as the collection point for the rainwater falling over the project area. Thus, the water collected in the pond will be used for operation of the plant and facilities. This can be considered as a minor positive impact on the drainage system, as the mechanism executed for water harvesting would restrict soil erosion due to restricted flow. Hence it may not affect significantly to the soil, water, air, vegetation or animals of the surrounding.

C. Degradation Anticipated and Qualitative Changes in the Wildlife Habitat:

As no forest land is involved in this project direct degradation is not observed due to implementation of this project. However direct absorption of 1752 people in the project and indirect employment of around 2000 people put huge stress on surrounding forest habitat. In addition, habitat fragmentation, loss of biodiversity, forest fire, illicit felling, encroachment, litter generation etc are anticipated due to this project.

Habitat fragmentation:

This is the result of clearance of native vegetation by any developmental related activities in the midst of hilly forested area. Habitats, once contiguous, become divided into separate fragments. After clearance, separate fragments tend to be small units or is-lands isolated spatially. Habitat fragmentation involves some habitat impairment of the is-land units as well. Fragmentation involves increase in edge habitats and decrease in interior habitats. Biodiversity of each of the fragments get reduced for the above

reason. Habitat fragments are rarely representative samples of the initial landscape. Species like elephants, deer, move between the fragments and make use of both. Small species having no ability to move between fragments must make do with what is available in the single isolated habitat.

Habitat fragmentation leads to edge effect. Microclimate changes alter ecology of interior and exterior habitats. Species adapted to interior habitats are less likely to survive in an edge habitat of smaller units. Smaller units support smaller population with reduced carrying capacity. Small population face decreased heterozygosis, increase in inbreeding and possibly inbreeding depression. If there is no migration between populations and genetic exchange, genetic drift sets in. This means, directional selection for advantageous alleles can cause certain alleles to become fixed in a population, thereby decreasing variation. Such loss of diversity, however, will not affect elephants, as movement path of elephant changes with available alternatives. But species with low cruising radius will be affected. No elephant movement path from one habitat to another is located in this area, but this area forms a part of the larger habitat of Keonjhar and Sundargarh elephants, within the buffer zone.

Loss of biodiversity:

Biodiversity is an important component for maintaining natural balance and sustainable ecosystems. Clearly, biodiversity loss is critical for survival of human and wildlife in many ways. Development activities such as industries can significantly alter the biodiversity of an area. Its biggest impact is due to felling of trees for industry purposes and forest fire.

The forests are home to huge number of organisms. Felling of trees for industry purpose leads to loss of habitat of wildlife. This puts the survival of animal species at stake. The cutting down of trees itself is a bigger threat to number of plants, birds and animals living in the forests. Any change in the biodiversity will have an adverse impact on the ecology of the area leading to many changes in the habitat as in this case. However, the adjoining habitat is also having forest growth to which the wildlife living in this Project area can shift.

Habitat destruction by illicit felling:

The workers involved during construction phase are skilled and highly organized. They may not depend for fuel wood for their bonafied rather prefer to use cooking gas.

Forest fire:

Forest fire is very common to all the ecosystems of the world. It affects both vegetation and soil. It is also helpful in maintaining diversity and stability of ecosystems. Effect of forest fire and prescribed fire on forest soil is very complex.

With increase in industrial and human activities due to setting up of new units and movement of labor force, contractors, transporters and others close/ near to forest areas may induce forest fire.

D. Nature of Threats to the Flora and Fauna

Habitat loss, habitat fragmentation, fire, discussed above, there are other threats also emerges due to degradation of forests and are mentioned below.

Encroachment:

Increase in human presence occur due to implementation of projects. This also results in development of town and human habitation near the industry area. This plant does not involve any forest land and interestingly the workers are most recruited from local villages.

Litter generation:

Labourers generate much litter in shape of polythene wrappers, carry bags, paper wrappers, leaf plates and left- over food. This is not only is obtrusive to sight but can attract animals like pigs, Hyena. Wolf and jackals. Ingestion of indigestible polythene can lead to blockade of gut and eventual death of these animals. The workshop will produce mobile cans, plastic jars, spent mobile and grease. The canteen and office will also produce various wastes. Litters strewn all over not only destroy aesthetic appeal but are injurious to plant and animal life in many other respects.

Road Accident:

Daily about 1000 numbers of trucks, Bus, Car, Jeep etc. will run over the NH 55 adjacent to this Industry. Such increase in traffic not only keeps the area disturbed by their repelling noise and dust but also pose threat from accidents.

E. Probable increase in the vehicular traffic and its impact.

According to the survey report, the vehicular traffic of that area is moderate. Due to implementation of this project, ***1000 Nos of Truck, Bus, Car, Jeep, two wheelers*** will be added every day. Though traffic density of this area is moderate as of now, but this increase of vehicle will put significant stress to the animal and plant of that area.

F. Noise Pollution, Air and underground pollutions etc. and its probable impact on flora and fauna:

These are discussed in detail in this chapter in Section **(a)** above.

G. Study techniques adopted and observations of the experts in the field giving details of visits, areas visited, observations, records referred to, sampling methods adopted and justification in extrapolation:

During field survey, we visited the plant area and its buffer zone. We have collected much information by discussing with the local villagers. We also discussed with Project personnel about the project details and Mrs Dharitri Sahu, Range Forest Officer, Dhenkanal regarding the forest condition and forest covers of the fringe area.

Records Referred:

1. DPR of the Project
2. Champion H G. and Seth S K. (1968). A revised survey of forest types of India. Govt. of India: New Delhi.
3. Flora of Orissa-Bihar, Saxena & Brahman.
4. Right of Passage-elephant corridors of India - Wildlife Trust of India.
5. Sar C. K. and Lahiri-Choudhury D.K. (2009). Project: Elephant – Human Conflict in Asia, Report on Orissa, India (Part-I), State Report. Education Centre, Kolkata.
6. Sar C K & Lahiri-Choudhury D K. (2002). Project: Elephant - Human Conflict in Asia, Report on Orissa - India (Pt.-II-e), Keonjhar Forest Division, Keonjhar District (1992- April 2000). Kolkata.
7. State of India's Forest Report (2019). Forest Survey of India. Dehradun

Sampling Method adopted:

The methods of the sampling are described in detail in **Section (k) of Chapter -1.**

Justification in Extrapolation:

The study was conducted by our team members by following the methodology of direct observation and indirect evidence from the field. They had also discussed with the local villagers and the Forest Staffs regarding the forest and the flora, fauna.

The study of topographical feature, natural drainages pattern of the project area and its buffer zone were conducted with help of the Topo Map (1:50,000) scale which was prepared by Survey of India. Similarly, other important data about the project was collected from the EIA Report. All the sources from which the data have been collected, are authenticated, and accepted by wide range of audiences. Hence, it is justified that, no exemption has been made by the Project proponent as well as the experts involved in the field study.

CHAPTER-3

OBJECTIVES OF MANAGEMENT AND MITIGATION STRATEGIES

A. Objective of Management:

The main objective of this plan is to reduce various stress occurring due to implementation of this expansion project in this locality having wildlife importance. The site-specific Wildlife Conservation Plan will suggest measures to mitigate such stress and if possible, how to avoid certain activities which could reduce the negative influence. Wildlife management consists of promoting welfare factors, arresting or reducing the impacts of decimating factors and neutralizing harmful effects of limiting factors that keep the animal population lower than the carrying capacity of the area. It also aims at management of human dimensions relating to regulation of habitat use, sufferance from animal damages, livelihood issues and taking people as partners in conservation management. Such concerns are reflected in the prescriptions. The management of the project core area will aim for maintenance of habitat for smaller animals that used to live and share habitat with the Project area.

Objective of management to mitigate the threats to the wildlife is covering the following aspects:

1. Conservation, Protection and Improvement of the flora and fauna in and around the Project area in a sustainable basis.
2. To conserve a viable population of Wildlife in general and the Pachyderm in particular, in their natural habitat.
3. To conserve the natural bio-diversity aesthetic and geo-morphological value of the area through appropriate management of site, habitat and landscape.
4. To reduce the dependency of local people on the forest resources of the ZoI through culturally, socially, economically acceptable and ecologically sustainable and viable alternatives by undertaking eco-development programme.
5. To reduce man-animal conflict by ensuring contiguity of habitat in the buffer zone by improving forest cover in long term basis.

In the ZoI 3 species of Schedule I fauna are noticed and care has to be taken for their food, cover and protection, which are narrated below: -

a. **Elephant**–Elephants chiefly frequent areas covered with tall forests where the ground is hilly or undulating and where bamboos grow in profusion. Elephants sleep during hot hours of the day being intolerant of the sun, feed early in the morning and evening and come out after nightfall to feed in open forest or to raid crops, retiring to sleep after midnight. Their food consists of various kinds of grasses and

leaves and stems and leaves of wild bamboo and plantains, all species of crops and the bark of kinds of trees (moraceae family). A full-grown elephant, will eat from 270 Kg to 320 Kg of green fodder per day. Besides it requires grass and 150 ltrs of water per day. To meet this, we have given provision for bamboo ball technology to increase percentage of bamboo in the forest. There is also a provision for 2 water holes to be excavated in slanting manner (1:6) so that in the upper slope big animals can consume water and at the dead end the reptiles.

b. **Sloth Bear** **–** Sloth bear prefer places where outcroppings of rock and tumbled boulders offer them shelter during the hot weather and the rains. They come out of their cave shortly before sunset, hunt for food throughout the night and retire at the dawn. Their food consists mainly of fruit and insects. Fruit in our forests is more plentiful during summer like banyan, wild figs, mangoes, jamun, dates, jack fruit etc. They are also fund of honey (*Apis dorsata* or *Apis indca*). During monsoon insect food is more plentiful and bears find many insects under stone, fallen logs, under bark and in the crevices of trees, but main insect it likes is **termite.** They also prefer sugar cane, maize crop and where date palms are tapped, they climb the trees to drink the toddy (neera) from the pots fixed by villagers. In the cold weather bar fruit and between Mach-April, mohua trees bloom and carpet the ground with heavy scented flowers. Therefore, plantation of bar fruits, jamun, mango, bel, date palm etc. has been prescribed. Attempts should be made to protect Termite mounds.

c. **Indian Rock Python** – Python is a lethargic and slow-moving snake even in its native hunts, exhibiting little, if any, timidly, rarely rousing itself seriously to escape even when attacked. Python also have a peculiar method of movement, a rectilinear progression, the body moving in a straight line like a millipede, waves of motion of the ribs can be seen in quick succession. Pythons climb sell in search of prey and often hide among the branches of a tree. They are quiet at home in water, swim deftly and strongly, when necessary, but usually remain near the bank partially or wholly submerged except for the tip of the snout. The can, when needed, remain completely submerged for many minutes. In order to suit to its habit, provision of water holes has been provided. After a long swimming when it feels hungry, go for preying. It prefers to swallow fawn of deer group, civets, even calf, goat, sheep and twist around a tree to break the bone of the prey.

B. Strategies to mitigate and minimize adverse impacts:

Keeping the above objectives in view, following interventions are suggested.

I) Strategies for Core Zone:

I.1) Awareness Promotion

The User Agency will create awareness among the Industry Executive, staffs and workers and sensitize them to maintain cleanness of the project premises. They will also be aware to protect any type of wildlife including snakes if noticed in the project area. In such an event instead of killing it being afraid, they should intimate the nearest Forest staff or snake charmer available in every Division Office now-a-days for rescue of the wildlife and safe release in the nearby forest. They should also be aware not domesticate any wildlife as it goes against the Wildlife Protection Act, 1972. The Drivers of heavy earth moving vehicles will be told to keep the noise levels to the barest minimum, take all precaution against fire, damage to trees etc. Drivers will be told to control speed so as not to run over slow-moving wildlife like snakes, lizards, mongoose, civets etc. Behavioural change will be expected from each worker on the above points and use of garbage bins. Any sick and injured animal will have to be rescued and given first aid and water. Such animal is to be subsequently handed over to the nearest forest official and released after healing the wound. No worker shall get involved in crime against animals & forests.

I.2) Immunization to Livestock

As the cattle of the area adjoining to the plant, graze in the forest (ZoI) by tradition and come in contact with wild herbivores; any cattle born epidemic may contaminate wild animals. Hence, the cattle population should be immunized at regular intervals (once in a year) with the technical co-operation of local Veterinary Asst. Surgeon. This will not only prevent spread of cattle borne diseases to wild animals but also raise the milk yielding capacity of the domestic cows and thus the rural people will be benefitted. Negligence to cattle immunisation has caused to sacrifice 6 elephants in the recent past in Karlapat Sanctuary of Kalhanadi (South Division). The Cattle mostly suffer from FMD (FOOT and Mouth Disease) which propagates to elephant, Wild boar etc.

Recently Govt. Of India has allocated funds to Animal Husbandry Dept. for vaccination@Rs.1/- per cattle which is being governed by vaccine Veterinary Expert Dr. Balaram Sahu (Cell No.9437290258) of OUAT, Bhubaneswar. The disease is ***Haemorrhagic septicaemia***. The vaccine used is as mentioned below. Therefore, no additional fund needs to be allocated for this purpose by Forest Dept.

Product name	Type	Strain/Subtype	Adjuvant	Licensed Countries
FUTVAC	Killed Virus	Types O (Strain IND/O/R2/75), Type A (Strain IND/A/40/2000), Type Asia-1(Strain INd/Asia1/63/72)	Oil	India

Franchise -Brilliant Bio Pharmacy Ltd.

I.3) Provision of Solar lighting system

From the study, it was evident that in the project area the main problem is man-animal conflict, particularly with the mega herbivore i.e., elephant.

Hence, taking in to account the whole scenario of conflict, there is a provision to install solar street lights around plant area where elephant movement is seen solar lighting will be provided.



II) Strategies to mitigate and minimize the adverse impact so observed in the Zone of Influence (ZoI):

II.1) Seed Ball Technology for Bamboo Propagation

Elephants are the flagship species of this area. Hence to mitigate any of the adverse impact due to the expansion of this project, there is a provision of habitat improvement of elephants through Bamboo ball Plantation. The forest experts are of the opinion that shortage of fodder in the forest is one of the major reasons for which the elephants venture into the human habitation. Therefore, with forestation the elephants would not be deprived of food and it will also improve the condition of the forest vis-à-vis environment.

A packed mixture of fertile soil, water and cow dung is first made and shaped germination of the seed. This seed ball is thrown by Forest field executives to far away and inaccessible places where the seeds can germinate and develop into bamboo clumps. Elephants are fond of eating bamboo. Therefore, the seed ball technology can compensate bamboo percentage in Kandhar RF and in the long run elephants may not

like to go outside the RF. The other major aspect of seed ball plantation method is to enhance bamboo percentage in Kandhar RF, which will reduce ever rising human-elephant conflict in the locality. This will be done @10,000 seed balls per year for a period of 05 years.

II.2) Creation of Water Hole (Dew Pond)





During summer most of the streams except some major water sources remain dry for which the wild animals often face difficulty to get water deep inside the forest. During this time the wild animal come close to the human habitation in search of water as a result, the chance of human-wildlife conflict gets increased.

The larger water bodies are meant for the big animals like elephants etc. But the mini water holes are aimed at where small mammals like rabbits, mongoose, reptiles can fulfill their water requirement. Such water holes will be irregularly distributed in the forest which will be filled up tankers during peak period of summer i.e., march, April & may in RFs Kandhra, Hitinda, Nandinia, Koi and Nimida.

II.3) Anti-Poaching Squad

In Vejia RF of Hindol Range, professional poachers are camping and using double barrel gun attempting to kill tuskers with an intension of collection of tusks for commercial purpose. In order to counteract them, it has been proposed to station one anti-poaching squad of 10nos. equipped with arms.

II.4) Fire Watchers

One fire fighting squad including 10 persons will be engaged for a period of 5 months (February to June) annually. They will be equipped with one hired vehicle, Mobile phones and other communicating devices for instant contact with the forest officials. Fire blowers will also be provided to them to douse the fire immediately. Also provided with logistic support to the fire fighting squad.





II.5) Fire Blower

It has been proposed to procure 10 fire blowers to be provided to Fire watchers for cutting of weeds, heaping them and burning along the fire line in order to prevent forest fire.





II.6) Fire Line Maintenance

In Kandhara, Hitinda, Nandania and Koi RFs the boundary line comes to 200 KMs of Dhenkanal Forest Division & Kandhal RF of Angul Forest Division the boundary line comes to 7.782 Kms which need to be clean at a width of 10m before commencement of fire season and control burning to be made to the garbage. If such operations are practiced regularly year after year, then it will come back fire hazard.

DETAILS OF THE BOUNDARY OF VARIOUS FOREST BLOCKS IN DHENKANAL FOREST DIVISION

FOREST BLOCK	AREA IN HA.	BOUNDARY LENGTH IN KM
KANDHARA	11172.94	42.24
HITINDA	705.79	15.68
NANDANIA	527.70	7.56
KOI	2266.30	36.94

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ANNEXURE : XVII Contd..



II.7) Early Warning System

To send back the wild elephants from village area to the nearby forest, it has been proposed to provide Early warning system with IR Sensors and SMS alert service in sensitive villages at Hindol Range along with maintenance for 10 years

II.8) Construction of outpost

Identifying 2 villages which are prone to wildlife depredation, unlike toll gates on NH-Outpost will be constructed at the extreme end of the villages or entry point of wildlife's to prevent elephant entry and causing damage to human and property and on such outpost villagers in rotation will remain throughout the day and night particularly on wee hours to alert the villagers.

II.9) Solar Street Lights



From the study, it was evident that in the Zone of Influence (ZoI), the main problem is man animal conflict, particularly with the mega herbivore i.e., elephant. Elephants make their frequent depredation to the nearby villages located in the ZOI of the project area, especially from dusk to dawn. One of the causes of conflict occur in the wee hours when the whole area become darker, due to absence of a regular stretch of lighted areas around the villages, because of lack of electric supply. It



results in direct confrontation between the people and the elephant, which usually hide itself in dark and bushy areas.

Hence, taking in to account the whole scenario of conflict, there is a provision to install solar streetlights, most preferably at strategic locations around the elephant affected village areas both in Dhenkanal Forest Division.

As these lights can work even without electricity, it will help the villagers to get rid of elephant attack. The lights shall be integrated light with lithium Ferro phosphate battery and will be provided at the required strategic locations in the ZoI of the project area considering the elephant movement.

II.10) Purchase of Anti-depredation kit for Villagers (Gaja Sathi)

Gaja Sathi are engaged particularly to alert the villagers about wild elephants approach to villagers. Such persons are very important to dissuade the wild elephant. They have no particular hour if duty rather they perform their responsibility as required. They will be provided with uniforms, umbrella, torch light, note book, mobile phones with facility for monthly recharging, haversack, Khukuri, hat etc.

II.11) Purchase of Anti-depredation equipments

In order to prevent elephant depredation and to defend poaching the squad need to be provided with equipments like single barrel rifle with cartridges, crackers, beat up drums, bamboo stick of 2.5m height and head cap.

II.12) Informer Money

An incentive (secrete fund) will be awarded to the VSS members who will inform the forest field executives about the persons involved in illicit felling, poaching, collection of wild animal trophies, hide (un-tanned skin of wild animal), tusk, Pangolin scales, sticks (thorn like) of Porcupine, bile of sloth bear etc. for commercial or medicinal purpose, feeding monkeys on the road side, making snake show in road side etc. This will reduce the practice of poachers for killing wild animals of course gradually. But their name will not be disclosed else the poachers may take vindictive view and may kill them also.

II.13) Provision for contractual driver

A provision has been made to accommodate the remuneration of contractual drivers engaged for mobilizing hired vehicles engaged in anti-depredation and anti-poaching squad.

II.14) POL for Hired Vehicles

Provision has been made to accommodate fuel consumption for hired vehicles engaged in anti-depredation and anti-poaching squads.

II.15) Glow Signage (Sign Boards)

To promote coexistence with wildlife and to aware people, good quality sign boards with display of wildlife features should be placed along the Project premises, road etc. Fluorescent Sign Boards with good write ups about movement of wild animals will be provided on in order to make aware the passers-by about occurrence of accident if they confront with wildlife.

















II.16) Establishment of GIS Cell

Provision has been made for establishment of GIS Cell to maintain database of the division to enlist depredation of wild animals, fire hazard, plantation programmes etc.

II.17) Purchase of Rifle 315 brand

Professional Poachers of local villages and/or from other State camp at Vejia R.F. of Hindol range with sophisticated arms to kill tuskers and collect their tusk. In order to counteract such practice, it has been proposed to procure single barrel Rifle (315 model) with cartridge to provide to anti-poaching Squad stationed at in Vejia RF of Hindol Range. They will also be trained about use of such Rifle. In addition, the field staff like Foresters and Forest Guards will also be trained how to use such arms.

II.18) Soil Moisture Conservation

Soil Moisture conservation is one of the most important activities to fulfil the broad objective of conserving fertile topsoil, enhancing soil moisture regime. Therefore, it is suggested to execute soil moisture conservation activities. i.e., Cement concrete Check dam, other check dams with spill way, Gully plugging, contour trenching, contour bonding, siltation pond etc. in Kandhal RF in Talcher Range of Angul Forest Division.



(Gully Plugging)



(Contour Trenching)

II.19) Habitat Improvement of Elephants

Elephants are the prominent species of this area. Hence, to mitigate any of the adverse impacts on elephant adequate provision for food, water and cover has to be made. Therefore, it is suggested to undertake planting Ficus species like *Ficus bengalensis* (Bar), *Ficus religiosa* (Aswastha) and *Ficus glomerata* (Dimiri) plants in Kandhal RF in Talcher Range of Angul Forest Division.

II.20) Renovation of Water body in Kandhal RF

During summer most of the streams except some major water sources remain dry for which the wild animals often face difficulty to get water deep inside the forest. During this time the wild animal come close to the human habitation in search of water as a result, the chance of human-wildlife conflict gets increased. Hence, to resolve the water scarcity inside the forest area during the pinch period, it is proposed to renovate the existing water body in Kandhal RF in Talcher Range of Angul Forest Division.

CHAPTER-4

MANAGEMENT STRATEGIES WITHIN THE PROJECT AREA WITH FINANCIAL FORECAST

A. Interventions with Justification:

All measures for protection of bio-diversity of the site as well as wildlife have been discussed in **Chapter-3.** The financial requirement of various interventions suggested in the plan as per current costs of **Rs.311/-** day is given in the following table for the plan period of 10 years i.e., 2021-22 to 2029-30 and annual cash flow there-of. All activities within the project area will be implemented by the project proponent.

Table-4.1: Financial provision of works in the project area (Wage rate@ Rs.311)

DHENKANAL DIVISION

Sl. No.	Para Ref.	Management Interventions	Amount in lakh
1.	3.8. II. 1)	Awareness programme	To be borne by User Agency
2.	3.8. II. 2)	Immunization to live stock in Kalipal and surrounding villages (Approximate 5000 cattle) for 10 years.	
3.	3.8. II. 3)	Provision of Solar Light	
		TOTAL	
		10 % escalation	
		Grand Total	

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Dhenkanal Division

ANNEXURE : XVII Contd..

ANGUL DIVISION

Sl. No.	Para Ref.	Management Interventions	Amount in lakh: To be borne by User Agency
1.	3.8. II. 1)	Awareness programme	
2.	3.8. II. 2)	Immunization to live stock in Kundiar and adjoining villages (Approximate 2000 cattle) for 10 years	
		TOTAL	
		30 % escalation	
		Grand Total	

For RUNGTA MINES LTD
R. K. Rungta
Chairman & Managing Director

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Angul Division

Plan period preferably for 10 years with suitable provision for interim review and suitable modification

Annual Work Programme:

Details of the flow of funds for different years of the plan for project area are given below: (Rs. in Lakh)

Sl. No.	Para Ref	Type of Interventions	y1	y2	y3	y4	y5	y6	y7	y8	y9	y10	Total
1.	3.8. II. 1)	Awareness programme											To be borne by User Agency
2.	3.8. II. 2)	Immunization to live stock											
3.	3.8. II. 3)	Provision of Solar Light											
												Total	NIL
												30 % escalation	
												Grand Total	NIL

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Divisional Forest Officer
Dhenkanal Division

CHAPTER- 5

MANAGEMENT STRATEGIES WITHIN THE ZONE OF INFLUENCE OF THE PROJECT WITH FINANCIAL FORECAST

A. Financial Provision of Works in Zone of Influence (ZoI):

The financial requirement of various interventions suggested in the conservation plan as per current wage rate i.e., Rs.311/- is given in following table for a plan period of 10 years followed by annual cash flow for the ZoI of the project area. All activities in the ZoI will be implemented by respective Divisional Forest Officer.

Financial provision of works in Zone of Influence (Wage rate @ 311.00)

DHENKANAL DIVISION

Sl. No.	Para Ref.	Interventions	Amount in lakh
		Wildlife Habitat Improvement	
1.	3.B. II. 1)	**Bamboo/Fodder development** by seed ball Technology in Kandhara RF, Compartment-7&4 @ Rs.15/- each ball X 10000 Nos. / Year x 5years = **Rs.7.50 Lakhs**	**7.50**
2.	3.B. II. 2)	**a)** Provision of 20 artificial water hole saucer shape (dew pond made of concrete) dimensions 4 m dia and 60 cm depth at the centre in RFs Kandhara, Nandinia, Nimidha and Koi @ Rs.50,000/- each=**Rs.10.00 Lakhs** meant for small mammals, reptiles and birds. The structures shall be made near to barracks for protection. **b)** Provision of water filling in 20 dew ponds by tanker during summer season i.e., March, April & May (90 days) **Rs.1.00 Lakh** x 10 years = **Rs.10.00 Lakhs**.	**20.00**
		Protection and Surveillance	
3.	3.B. II. 3)	a. One No. **Anti-Poaching Squad** consisting of 10 members Rs.12,600/- x 10 members x12 months x10 years = **Rs 151.20 Lakhs to be stationed at Vejia RF of Hindol Range.** b. Recharge of Mobile Phone @Rs.1000/- PM per Squad x 12 months x 10 years = **Rs.1.20 Lakhs**	**155.00**

		c. Medicinal Expenses Rs.20,000/- per Squad per year x 10 years = **Rs.2.00 Lakhs** f. Uniform, Camp equipments= **Rs 0.60 Lakhs**	
Fire Protection			
4.	**3.8.II.4)**	**a)** i. 10 nos. of **Fire watchers** will be engaged a period of 5 months (February to June) for 10 years @ Rs.9,330/- per month/watcher x 10 nos x 05 months x 10 years = **Rs. 46.65 Lakhs** ii. Hired Vehicle Rs. 31,000/- x 05 months x 10 years = **Rs. 15.50 Lakhs** iii. POL for vehicle Rs. 15000/- x 05 months x 10 years = **Rs. 07.50 Lakhs** iv. Recharge of Mobile Phone @Rs.1000/- PM per Squad x 05 months x 10 years = **Rs.0.5 Lakhs** v. Medicinal Expenses Rs.20,000/- per Squad per year x 10 years = **Rs.2.00 Lakhs** vi. Contingencies expenses = **Rs 3.5 Lakhs** **b)** Logistic support to fire fighting squad @ Rs. 81,000/- per year x 10 years = **8.10 Lakhs**	**83.75**
5.	**3.B. II. 5)**	Purchase of Fire Blower 10 Nos. @ Rs.61,000/- = **Rs.6.10 Lakhs** Maintenance Rs.20,000/- per year x 09 years = **Rs.1.80 Lakhs**	**7.90**
6.	**3.B. II. 6)**	Fire line maintenance 200 K.Ms at RFs Kandhara, Hitinda, Nandinia and Koi @ 10 Mandays per K.M. Rs.311/- x 10 md x 200 KMs x 10 years=**Rs.62.20 Lakhs**	**62.20**
7.	**3.B. II. 7)**	Early Warning system with IR Sensors and SMS alert service to be deployed in sensitive villages at Hindol Range and maintenance for 10 years i.e., 20 Nos. @ **Rs.0.55 Lakhs** = **Rs.11 Lakhs** and maintenance 20,000 per year × 10 years = **2 Lakhs**	**13.00**
8.	**3.B. II. 8)**	Construction of outpost for villagers to use as lookout posts at edges of forest & crop fields for frequently animal entry in villages 02 Nos. @ **Rs.15 Lakhs** each = **Rs.30 Lakhs**	**30.00**

9.	**3.B. II. 9)**	Solar street lights at critical points to prevent human death. The street lights shall be of integrated light with lithium Ferro phosphate battery. Rs.75,000 × 16 = **Rs.12 Lakhs**	**12.00**
10.	**3.B. II. 10)**	Purchase of light, maiya phone equipment's as anti-depredation kit for villagers (Gaja Saathi) effected by depredation 15,000/- per kit to 40 villages = **Rs.06 Lakhs**	**06.00**
11.	**3.B. II. 11)**	Purchase of anti-depredation equipment's for front line forest staffs for anti-depredation activities.	**02.00**
Protection to Animals			
12.	**3.B. II. 12)**	Local villagers will be encouraged to inform the nearest field forest executive about illicit felling, poaching etc., and for this act they will be paid incentive but the name of the informer will not be disclosed @ **Rs 1 Lakh/Year**	**10.00**
13.	**3.B. II. 13)**	Provision for contractual driver for 2 Hired vehicles for 24 hours patrolling in anti-poaching particularly illegal hooking at night.	**30.00**
14.	**3.B. II. 14)**	POL for various vehicles of Dhenkanal Forest Division used in anti-depredation works including ARMMT operation, @ **Rs 1.2 Lakhs/ year**	**12.00**
Infrastructure			
15.	**3.B. II. 15)**	Cost of Glow Signage i.e., sign boards to be fixed in sensitive locations of elephant crossings the road. **Rs.15.00 Lakhs**	**15.00**
16.	**3.B. II. 16)**	Establishment and incidental charges of GIS cell for 10 years of this Plan @ Rs.50,000/- PM x 12-month x 10 years = **Rs. 60.00 Lakhs**	**60.00**
17.	**3.B. II. 17)**	Purchase of Rifle 315 brand 5 Nos @ Rs.1,10,000/- each to be supplied to Anti-Poaching Squad at Vedic RF = **Rs.5.50 Lakhs.** Cost of 400 Cartridges @ Rs.110/- each=**Rs.0.44 Lakhs** (Cost collected from Jena Armours, Bhubaneswar (9937336907 Sanjaya Kumar Jena)	**5.94**
		Total	**336.20**
		20% Escalation	**107.258**
		Grand Total	**643.548**

(Rupees Six Hundred Forty Three Lakh, Fifty Four Thousand and Eight Hundred) Only

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Divisional Forest Officer
Dhenkanal Division

ANNEXURE : XVII Contd..

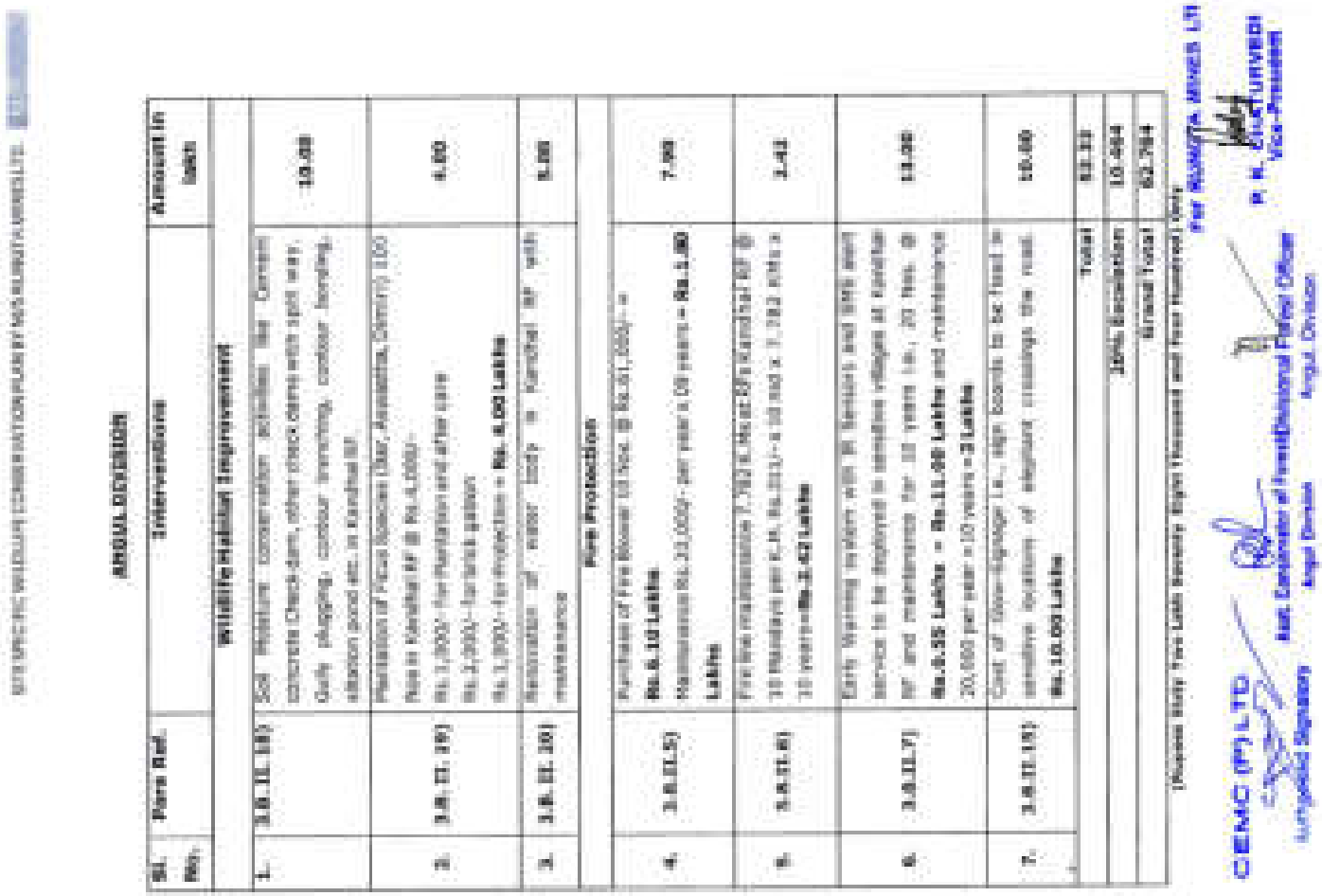
7.	3.B. II. 7)	Early Warning System with IR Sensors and SMS alert service and maintenance	11.20	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	**13.00**
8.	3.B. II. 8)	Construction of outpost for villagers	30.00	-	-	-	-	-	-	-	-	-	**30.00**
9.	3.B. II. 9)	Solar Street Lights at critical points	12.00	-	-	-	-	-	-	-	-	-	**12.00**
10.	3.B. II. 10)	Purchase of light, mega phone equipment's as anti-depredation kit for villagers	-	-	-	6.00	-	-	-	-	-	-	**06.00**
11.	3.B. II. 11)	Purchase of anti-depredation equipment's for front line forest staff	2.00	-	-	-	-	-	-	-	-	-	**02.00**
12.	3.B. II. 12)	Informer Money	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	**10.00**
13.	3.B. II. 13)	Provision for contractual driver	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	**39.00**
14.	3.B. II. 14)	POL for vehicles	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	**12.00**
15.	3.B. II. 15)	Glow-Signage	10.00	-	-	-	-	-	-	-	-	-	**10.00**
16.	3.B. II. 16)	Establishment of GIS Cell	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	**60.00**

Annual Work Programme:

Details of the flow of funds for different years of the plan for ZoI area are given below (Rs. In Lakh)

Sl. No	Para Ref	Type of interventions	y1	y2	y3	y4	y5	y6	y7	y8	y9	y10	Total
1.	3.B. II. 1)	Bamboo Ball plantation	1.5	1.5	1.5	1.5	1.5	-	-	-	-	-	**7.50**
2.	3.B. II. 2)	a) Provision of 20 artificial water hole saucer shape b) Provision of water filling by tanker	10.00 1.00	- 1.00	- 1.00	- 1.00	- 1.00	- 1.00	- 1.00	- 1.00	- 1.00	- 1.00	**20.00**
3.	3.B. II. 3)	Anti-poaching squad	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	**155.00**
4.	3.B. II. 4)	a) Fire watcher 10 nos b) Logistic support to fire fighting squad	7.565 0.81	7.565 0.81	7.565 0.81	7.565 0.81	7.565 0.81	7.565 0.81	7.565 0.81	7.565 0.81	7.565 0.81	7.565 0.81	**83.75**
5.	3.B. II. 5)	Fire Blower with maintenance	6.10	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	**7.90**
6.	3.B. II. 6)	Fire line maintenance	6.22	6.22	6.22	6.22	6.22	6.22	6.22	6.22	6.22	6.22	**62.20**

ANNEXURE : XVII Contd..



Sl. No.	Para Ref.	Interventions	Amount in lakh
		Wildlife Habitat Improvement	
1.	3.6.11.1(f)	Soil Moisture conservation activities like Gabion, concrete Check dam, other check dams with split wall, Gully plugging, contour trenching, contour bunding, silvicon pond etc. in Kandhal RF	10.38
2.	3.6.11.1(f)	Plantation of Fruit Bearing Trees (Mar, Jamun, Chironji) 100 Nos in Kandhal RF @ Rs.4,000/- Rs.1,800/- For Plantation and After care Rs.2,200/- For tank palan Rs.1,800/- For protection = **Rs. 4.00 Lakhs**	4.00
3.	3.6.11.1(f)	Renovation of water body in Kandhal RF with maintenance	5.00
		Fire Protection	
4.	3.6.11.5)	Purchase of Fire Bowser 03 Nos. @ Rs.2,50,000/- = **Rs. 8.10 Lakhs** Maintenance Rs.33,000/- per year x 09 years = **Rs.1.80 Lakhs**	7.90
5.	3.6.11.6)	Fire line maintenance 7,500 K.Mtrs @ Rs.4/- per K.Mtr. Rs.211/- x 3.50 x 1,182 K.Mtrs 10 Watchers per K.M. Rs.211/- x 3.50 x 1,182 K.Mtrs 10 years = **Rs.3.42 Lakhs**	3.42
6.	3.6.11.7)	Early Warning system with IR Sensors and SMS alert service to be deployed in sensitive villages at elevated hill and maintenance for 10 years i.e., 20 Nos. @ **Rs.0.55 Lakhs + Rs.11.00 Lakhs** and maintenance 20,000 per year x 10 years = **2 Lakhs**	13.55
7.	3.6.11.10)	Cost of Wayside Eco-Refuge i.e., sign boards to be fixed in sensitive locations of elephant crossings the road. **Rs. 10.00 Lakhs**	10.00
		Total	53.33
		20% Escalation	10.664
		Grand Total	63.994

(Rupees Sixty Two Lakh Seventy Eight Thousand and Four Hundred Only)

For SUNGETA MINES LTD

P. K. CHATURVEDI
Vice President

CEMC (P) LTD
Authorised Signatory

Asst. Conservator of Forests/Divisional Forest Officer
Angul Division

SITE SPECIFIC WILDLIFE CONSERVATION PLAN BY M/S SUNGETA MINES LTD

11.	3.6.11.17)	Purchase of Rifle 315 brand	5.50	–	–	–	–	–	–	–	–	–	5.84
		Cost of 100 Cartridges	0.44	–	–	–	–	–	–	–	–	–	
		Total	101.000	45.000	45.000	51.000	45.000	43.000	43.000	43.000	43.000	45.000	526.39
												Cost escalation 20%	101.256
												Grand total	643.940

CEMC (P) LTD.
Authorised Signatory

Divisional Forest Officer
Dhenkanal Division

B. Location of the proposed Iinterventions

Location of the above-mentioned interventions have been decided by DFO, Dhenkanal Division & DFO, Angul Division according to availability of space and requirement.

C. Monitoring Committee

There shall be a monitoring committee for proper implementation, planning, site selection providing guidance and review of the activities/interventions. The committee will be headed by the DFO Dhenkanal Forest Division and DFO Angul Forest Division with representative of the Project proponent, Range officers, Foresters as members. ACF (HQ) will be the member Secretary of the committee.

D. Plan period

The plan is for a period of 10 years from 2020-21 to 2030-31, in consonance with accepted norm. The intermediate revision is not foreseen unless the project increases in size or is closed down or there is slump in market or departure of present Government policy for forest management.

E. Cumulative total of Interventions for both Project Area and Zone of Influence: The total cost of the conservation plan is **Rs.706.332 Lakhs (Rs. 643.548 lakhs for Dhenkanal Forest Division and Rs.62.784 lakhs for Angul Forest Division)** including **cost escalation @ 20%. The entire amount will be deposited by the User Agency in CAMPA.**

[illegible]

Annual Work Programme:

Details of the flow of funds for different years of the plan for 2nd area are given below (Rs. in Lakh)

Sl. No	Para Ref.	Type of Intervention	y1	y2	y3	y4	y5	y6	y7	y8	y9	y10	Total
1.		Soil Moisture Conservation	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	10.00
2.		Plantation Flora Species 100 Nos	2.0	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	4.00
3.		Renovation of existing Water body	5.89	-	-	-	-	-	-	-	-	-	5.89
4.		Fire Beaters with maintenance	0.10	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	7.89
5.		Fire line maintenance	0.242	0.242	0.242	0.242	0.242	0.242	0.242	0.242	0.242	0.242	9.42
6.		Early Warning System with IR Sensors and SMS alert service and maintenance	11.20	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	13.89
7.		Glow Signage	10.00	-	-	-	-	-	-	-	-	-	10.00
			30.542	1.742	1.742	1.742	1.742	1.742	1.742	1.742	1.742	1.842	53.22
												20% Escalation	10.464
												Grand Total	62.784

CEMC (P) LTD.
Authorised Signatory

Asst. Conservator of Forests
Angul Division

Divisional Forest Officer
Angul Division

For RUNGTA MINES LTD.
P. K. CHATURVEDI
Vice-President

ABSTRACT OF COST

Division	Core	Buffer	Total Amount in lakh(s)
DHENKANAL	-	643.548	643.548
ANGUL	-	62.784	62.784
TOTAL AMOUNT IN LAKH(S)	-	706.332	706.332

(Rupees Seven Hundred Six Lakh Thirty Three Thousand and Two Hundred) Only

For RUNGTA MINES LTD

R. K. CHATURVEDI
Vice-President

GEMC (P) LTD.

Authorised Signatory

Asst. Conservator of Forests
Angul Division

Divisional Forest Officer
Dhenkanal Division

Divisional Forest Officer
Angul Division

CHAPTER- 6

ANNEXURE AND MAPS

a. Map indicating Project area with 10 K.M. Buffer. **(Plate-I)**
b. Map indicating Elephant Movement Locations. **(Plate-II)**
c. Map indicating Project area with 10 K.M. Buffer showing other Industry details. **(Plate-III)**
d. Map indicating the distance of protected area to project area. **(Plate-IV)**
e. Copy of Environmental Clearance Dt. 15.02.2021.**(Annexure-I)**
f. Copy of Stage-II Clearance Dt. 02.07.2015. **(Annexure-II)**
g. Compliance to conditions stipulated in Wildlife Plan for core zone. **(Annexure-III)**

VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) 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
402294	Katabahal	633	2372	1209	1163	268	140	128	291	0	1613	905	708
402298	Ria	98	431	211	220	43	26	17	21	0	331	175	156
402304	Panigengutia	322	1269	602	667	148	81	67	364	212	840	451	389
402305	Roda	564	2190	1171	1019	208	119	89	507	16	1510	878	632
402306	Renthapat	68	259	125	134	37	19	18	143	4	157	81	76
402307	Tarahata	52	162	73	89	27	14	13	122	0	77	41	36
	Sub total	**3876**	**15080**	**7638**	**7442**	**1563**	**851**	**712**	**2682**	**232**	**10742**	**5931**	**4811**
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
402902	Tulasidihi	3	16	16	0	1	1	0	0	9	14	14	0
402904	Ghantalapasi	6	20	18	2	0	0	0	0	1	20	18	2
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
402912	Rangathali	9	52	34	18	4	4	0	16	3	43	30	13
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
402926	Bangurasinga	696	2838	1506	1332	267	153	114	704	239	2031	1171	860
402927	Jarada	108	484	256	228	55	33	22	66	92	372	212	160

VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) 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
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
402945	Bautiragada	6	30	15	15	4	3	1	30	0	16	7	9
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
402954	Zukateni	2	2	2	0	0	0	0	0	0	2	2	0
	Sub total	**12549**	**53075**	**27709**	**25366**	**6184**	**3341**	**2843**	**13410**	**2997**	**37968**	**21626**	**16342**
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
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

VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) 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
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
402988	Kaliakoli	3	8	5	3	0	0	0	8	0	4	2	2
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	**5188**	**22301**	**12030**	**10271**	**2656**	**1381**	**1275**	**4867**	**2579**	**15858**	**9449**	**6409**
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
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

VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) 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
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**												
403039	Kansara	501	2278	1145	1133	292	138	154	572	513	1266	749	517
403040	Chhelachheli	13	45	22	23	4	1	3	41	4	32	19	13
403041	Kalihundi	60	234	117	117	29	14	15	219	0	162	96	66
403042	Tutupada	66	213	105	108	26	13	13	61	0	160	88	72
403043	Tangisal	90	346	192	154	44	28	16	77	0	278	157	121
403044	Balasar	283	1198	608	590	142	78	64	272	263	839	456	383
403045	Hatura	272	997	486	511	108	51	57	96	3	700	368	332
403046	Jayapanga	77	297	142	155	21	8	13	85	33	184	97	87
403047	Hariharapur	141	539	278	261	56	38	18	40	0	370	205	165
403048	Bangu	107	460	229	231	33	19	14	128	0	365	197	168
403049	Pada	526	2018	906	1112	239	126	113	552	80	1376	669	707
403050	Kurumitha	325	1364	695	669	137	78	59	217	45	994	560	434
403051	Ambithi	298	1249	650	599	165	85	80	131	197	808	473	335
403053	Kantamila	360	1669	852	817	175	105	70	228	271	1080	601	479
403055	Baradapal	448	1756	906	850	219	118	101	180	231	1186	692	494
403056	Sundarapal	61	235	126	109	29	16	13	20	9	169	96	73
403068	Nizgarh(Hindol)	1902	7672	3954	3718	971	494	477	3167	354	4702	2654	2048
403069	Tantichira	80	287	154	133	28	18	10	0	207	203	112	91
403070	Kalanda	257	1044	516	528	120	59	61	233	59	627	341	286
403071	Sarasinga	161	706	380	326	79	46	33	78	0	506	307	199
403072	Keutaganthi	1	2	1	1	0	0	0	0	0	0	0	0
403073	Ostapal	75	341	180	161	52	26	26	0	0	139	87	52
403074	Baghadharia	271	987	502	485	94	47	47	209	9	647	359	288
403075	Bhagabanpur	260	1127	553	574	138	81	57	56	0	769	408	361
403076	Bahalunda	285	1281	665	616	121	81	40	198	0	851	470	381
403077	Bhaktapur	77	295	155	140	28	14	14	5	86	204	116	88
403078	Nuabaga	275	1116	554	562	153	80	73	305	95	654	365	289
403079	Kantakula	109	388	185	203	49	28	21	116	0	283	143	140
403082	Kantapal	59	319	164	155	51	22	29	0	0	133	75	58
403083	Badagola	74	369	183	186	38	20	18	87	6	201	111	90
403087	Rajamohanpur	337	1332	802	530	143	93	50	223	31	1022	658	364
	Sub total	**7851**	**32164**	**16407**	**15757**	**3784**	**2025**	**1759**	**7596**	**2496**	**20910**	**11729**	**9181**
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

VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)
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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
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
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
403123	Chitalapur	484	2052	1049	1003	224	113	111	545	96	1421	810	611
	Sub total	**5901**	**24412**	**12557**	**11855**	**2608**	**1420**	**1188**	**5244**	**1069**	**16960**	**9535**	**7425**
District	**Anugul**												
Sub Distt.	**Banarpal**												
404141	Tentulihata	180	768	402	366	129	74	55	755	0	567	307	260
404142	Apartipur	126	552	284	268	66	30	36	28	153	393	222	171
404143	Bonda	598	2694	1411	1283	275	148	127	170	23	1970	1107	863
404145	Banarpal	335	1522	769	753	176	87	89	632	25	1205	641	564
404146	Joragadia	87	389	204	185	44	27	17	0	0	270	152	118
404147	Birabahanpur	91	384	193	191	56	27	29	381	0	242	138	104
404148	Badakhali	88	362	192	170	41	21	20	53	90	248	147	101
404149	Bhagabatpur	169	725	394	331	84	46	38	90	137	507	307	200
404150	Narendrapur	92	405	209	196	47	26	21	90	235	313	169	144
404151	Chauridiha	189	892	445	447	74	41	33	78	0	632	341	291
404152	Jhajiribahal	212	994	508	486	111	63	48	212	23	715	411	304
404153	Gadasantri	883	3877	2062	1815	426	241	185	554	222	2689	1561	1128
404155	Gangijodi	42	149	82	67	18	10	8	29	5	106	59	47
404156	Tulasipal	683	3060	1561	1499	349	181	168	429	126	2179	1210	969
404158	Kangula	1753	7528	3852	3676	926	453	473	1576	548	5173	2935	2238
404159	Languliabeda	281	1201	609	592	129	66	63	133	21	974	517	457
404160	Rajibpur	88	374	198	176	47	25	22	26	0	276	160	116
404163	Purkia	323	1284	674	610	127	73	54	82	9	947	533	414
404164	Arahat	403	1513	770	743	157	92	65	40	100	1078	604	474
404165	Talatali	384	1619	815	804	146	82	64	264	34	1104	615	489
404166	Kusuna	93	420	215	205	67	39	28	375	0	202	121	81
404167	Kalandapal	71	303	175	128	35	23	12	43	0	218	139	79
404168	Ramimunda	93	429	218	211	48	30	18	23	13	291	162	129
404169	Santarapur	514	2230	1142	1088	299	140	159	375	103	1559	891	668
404170	Fulapada	434	2103	1071	1032	235	129	106	464	546	1511	841	670
404172	Rankasinga	120	554	276	278	60	35	25	143	39	419	221	198
404173	Juharpur	83	379	197	182	61	37	24	341	0	262	145	117
404174	Similichhuin	105	440	215	225	39	13	26	316	0	353	186	167
404175	Chakuriapal	20	73	33	40	8	3	5	8	0	63	30	33
404178	Kainchhabahala	70	298	158	140	41	21	20	120	64	220	127	93
404179	Girdhabasa	63	318	155	163	49	24	25	0	303	243	120	123
404180	Tilapanga	71	356	179	177	41	24	17	0	20	256	138	118
404181	Talamulasasan	1119	4749	2500	2249	632	356	276	1214	49	3295	1899	1396

VILLAGE WISE POPULATION AND LITERACY WITHIN THE STUDY AREA (CENSUS 2011)
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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
404182	Gadatalamul	427	1813	939	874	197	104	93	629	242	1306	742	564
404183	Harichandabasti	28	124	58	66	13	7	6	0	0	101	49	52
404184	Talmulpatna Basti	365	1673	891	782	199	114	85	103	95	1240	716	524
404186	Durgaprasadpur	30	123	59	64	22	10	12	0	83	81	45	36
404187	Harichandajami	4	13	5	8	3	1	2	6	0	7	3	4
404189	Khandanali	19	79	42	37	11	9	2	2	0	58	27	31
404190	Serenabeda	330	1340	667	673	169	96	73	556	0	944	504	440
404191	Mahidharpur	1064	4188	2113	2075	487	273	214	818	13	2964	1604	1360
404192	Budhapanka (CT)	1265	6129	3162	2967	661	381	280	1225	615	4339	2471	1868
404193	Gotamara (CT)	488	2226	1168	1058	271	147	124	629	73	1640	934	706
404194	Nuahata (CT)	1301	5920	3146	2774	690	385	305	1516	76	4309	2485	1824
	Sub total	**15184**	**66572**	**34418**	**32154**	**7766**	**4214**	**3552**	**14528**	**4085**	**47469**	**26736**	**20733**
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**
Sub Distt.	**Anugul**												
404230	Badibahal	197	885	463	422	95	56	39	190	436	637	348	289
404231	Bandhupur	11	41	20	21	6	4	2	0	0	24	13	11
404232	Kankinali	212	839	450	389	81	51	30	228	38	519	295	224
404233	Jadupur	138	588	302	286	89	43	46	290	36	409	230	179
404234	Barsinga	270	1157	537	620	133	70	63	94	0	716	370	346
404280	Khandahata	285	1299	655	644	163	90	73	210	0	813	465	348
404281	Angarbandha	518	2519	1321	1198	348	193	155	251	134	1454	843	611
404282	Charadapita	2	5	2	3	1	0	1	0	0	4	2	2
404283	Talasahi	43	211	105	106	34	17	17	210	0	149	84	65
404289	Kansanali	3	15	9	6	1	1	0	15	0	8	6	2
404290	Biswanathapur	44	162	87	75	17	7	10	23	93	111	71	40
404291	Pandupur	102	381	194	187	53	31	22	67	4	275	149	126
	Sub total	**1825**	**8102**	**4145**	**3957**	**1021**	**563**	**458**	**1578**	**741**	**5119**	**2876**	**2243**
	GRAND TOTAL	**64703**	**270396**	**139838**	**130558**	**30999**	**16721**	**14278**	**61431**	**15196**	**187896**	**106561**	**81335**
	Percentage		**100.00**	**51.72**	**48.28**	**11.46**	**6.18**	**5.28**	**22.72**	**5.62**	**69.49**	**39.41**	**30.08**

VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) 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
402294	Katabahal	1138	546	238	107	19	182	592	18	327	27	220	1234
402298	Ria	113	79	24	40	7	8	34	0	23	9	2	318
402304	Panigengutia	423	332	84	97	38	113	91	1	80	3	7	846
402305	Roda	667	538	92	86	113	247	129	2	71	7	49	1523
402306	Renthapat	82	40	5	8	0	27	42	2	26	0	14	177
402307	Tarahata	73	21	0	0	1	20	52	0	42	0	10	89
	Sub total	**5097**	**2741**	**868**	**666**	**196**	**1011**	**2356**	**181**	**1544**	**66**	**565**	**9983**
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
402902	Tulasidihi	15	13	1	0	0	12	2	0	0	0	2	1
402904	Ghantalapasi	16	2	0	0	0	2	14	0	0	0	14	4
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
402912	Rangathali	23	13	0	0	0	13	10	1	1	2	6	29
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
402926	Bangurasinga	1084	702	49	177	28	448	382	10	258	5	109	1754
402927	Jarada	177	101	9	11	0	81	76	0	0	0	76	307

VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)
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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	
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
402945	Bautiragada	11	9	0	2	0	7	2	0	1	0	1	19
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
402954	Zukateni	2	2	0	0	0	2	0	0	0	0	0	0
	Sub total	**18465**	**14699**	**2095**	**1561**	**535**	**10508**	**3766**	**268**	**1554**	**180**	**1764**	**34610**
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
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

ANNEXURE : XIX Contd..

VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) 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	
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
402988	Kaliakoli	3	3	0	3	0	0	0	0	0	0	0	5
402989	Paikpurunakot	432	339	25	13	7	294	93	4	19	0	70	913
402991	Jhaduberani	128	64	4	0	2	58	64	27	37	0	0	259
	Sub total	**7953**	**6320**	**591**	**386**	**152**	**5191**	**1633**	**176**	**509**	**77**	**871**	**14348**
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
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

ANNEXURE : XIX Contd..

VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) 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	
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**												
403039	Kansara	1121	1038	313	498	8	219	83	0	25	6	52	1157
403040	Chhelachheli	14	14	1	12	1	0	0	0	0	0	0	31
403041	Kalihundi	64	62	0	58	0	4	2	0	2	0	0	170
403042	Tutupada	62	53	18	0	0	35	9	0	6	0	3	151
403043	Tangisal	102	97	16	0	0	81	5	0	3	0	2	244
403044	Balasar	502	313	55	71	9	178	189	3	140	7	39	696
403045	Hatura	358	264	61	23	3	177	94	2	45	0	47	639
403046	Jayapanga	90	89	33	48	1	7	1	0	0	0	1	207
403047	Hariharapur	271	147	30	42	3	72	124	1	80	1	42	268
403048	Bangu	218	217	22	163	0	32	1	0	0	0	1	242
403049	Pada	536	447	141	98	8	200	89	19	43	3	24	1482
403050	Kurumitha	394	311	48	96	4	163	83	11	51	0	21	970
403051	Ambithi	463	338	83	146	33	76	125	2	78	27	18	786
403053	Kantamila	1008	749	54	565	29	101	259	7	246	3	3	661
403055	Baradapal	691	579	177	78	55	269	112	8	50	3	51	1065
403056	Sundarapal	202	55	14	6	4	31	147	1	16	1	129	33
403068	Nizgarh(Hindol)	2527	1654	119	144	210	1181	873	54	246	52	521	5145
403069	Tantichira	68	56	0	55	0	1	12	0	1	0	11	219
403070	Kalanda	369	328	72	198	3	55	41	2	5	0	34	675
403071	Sarasinga	357	239	33	27	2	177	118	22	32	5	59	349
403072	Keutaganthi	0	0	0	0	0	0	0	0	0	0	0	2
403073	Ostapal	145	36	7	14	4	11	109	1	56	11	41	196
403074	Baghadharia	335	262	87	55	11	109	73	21	21	0	31	652
403075	Bhagabanpur	338	320	33	139	7	141	18	2	1	4	11	789
403076	Bahalunda	342	109	42	1	2	64	233	7	155	2	69	939
403077	Bhaktapur	100	83	20	22	2	39	17	3	11	0	3	195
403078	Nuabaga	351	261	82	33	6	140	90	13	14	2	61	765
403079	Kantakula	114	95	11	36	0	48	19	1	12	1	5	274
403082	Kantapal	91	41	37	0	0	4	50	0	17	1	32	228
403083	Badagola	102	67	38	0	0	29	35	1	1	3	30	267
403087	Rajamohanpur	445	321	108	27	36	150	124	1	83	32	8	887
	Sub total	**11780**	**8645**	**1755**	**2655**	**441**	**3794**	**3135**	**182**	**1440**	**164**	**1349**	**20384**
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

VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) 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	
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
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
403123	Chitalapur	750	358	93	57	20	188	392	57	278	11	46	1302
	Sub total	**8288**	**5887**	**1454**	**983**	**257**	**3193**	**2401**	**279**	**1138**	**100**	**884**	**16124**
District	**Anugul**												
Sub Distt.	**Banarpal**												
404141	Tentulihata	198	165	52	12	96	5	33	12	2	7	12	570
404142	Apartipur	190	144	29	2	1	112	46	5	6	6	29	362
404143	Bonda	1043	686	60	5	65	556	357	24	100	11	222	1651
404145	Banarpal	484	458	54	107	20	277	26	4	3	6	13	1038
404146	Joragadia	136	93	13	10	51	19	43	3	28	11	1	253
404147	Birabahanpur	127	66	2	20	36	8	61	2	48	10	1	257
404148	Badakhali	128	110	2	40	16	52	18	4	4	3	7	234
404149	Bhagabatpur	409	280	56	11	0	213	129	62	22	0	45	316
404150	Narendrapur	123	110	14	0	0	96	13	1	0	1	11	282
404151	Chauridiha	303	157	18	3	9	127	146	19	12	9	106	589
404152	Jhajiribahal	292	283	37	12	2	232	9	1	0	0	8	702
404153	Gadasantri	1218	679	53	150	128	348	539	62	204	65	208	2659
404155	Gangijodi	57	45	12	1	0	32	12	2	6	0	4	92
404156	Tulasipal	1012	900	213	279	7	401	112	10	65	2	35	2048
404158	Kangula	2358	1769	392	123	48	1206	589	51	306	7	225	5170
404159	Languliabeda	325	180	82	2	0	96	145	23	100	0	22	876
404160	Rajibpur	121	90	22	0	0	68	31	10	18	0	3	253
404163	Purkia	367	284	40	5	2	237	83	19	60	0	4	917
404164	Arahat	388	373	25	101	16	231	15	1	10	0	4	1125
404165	Talatali	444	413	37	31	5	340	31	2	19	5	5	1175
404166	Kusuna	120	83	1	47	0	35	37	0	4	1	32	300
404167	Kalandapal	98	89	4	35	1	49	9	5	0	0	4	205
404168	Ramimunda	314	83	37	45	0	1	231	50	176	4	1	115
404169	Santarapur	745	539	114	139	6	280	206	4	154	10	38	1485
404170	Fulapada	758	665	58	275	23	309	93	29	49	0	15	1345
404172	Rankasinga	258	258	73	142	0	43	0	0	0	0	0	296
404173	Juharpur	88	88	65	0	0	23	0	0	0	0	0	291
404174	Similichhuin	170	167	59	99	2	7	3	0	3	0	0	270
404175	Chakuriapal	21	18	9	3	3	3	3	1	1	0	1	52
404178	Kainchhabahala	171	171	46	124	0	1	0	0	0	0	0	127
404179	Girdhabasa	92	90	6	42	0	42	2	0	1	0	1	226
404180	Tilapanga	126	125	12	46	0	67	1	0	0	0	1	230
404181	Talamulasasan	1430	685	140	118	76	351	745	42	446	43	214	3319

VILLAGE WISE EMPLOYMENT PATTERN IN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) 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	
404182	Gadatalamul	467	313	16	15	25	257	154	26	33	11	84	1346
404183	Harichandabasti	20	15	0	0	0	15	5	1	0	0	4	104
404184	Talmulpatna Basti	485	171	8	11	0	152	314	6	40	11	257	1188
404186	Durgaprasadpur	33	32	27	0	0	5	1	1	0	0	0	90
404187	Harichandajami	6	1	0	0	0	1	5	0	0	0	5	7
404189	Khandanali	23	3	0	0	0	3	20	0	0	1	19	56
404190	Serenabeda	694	297	31	138	3	125	397	3	40	5	349	646
404191	Mahidharpur	1313	630	179	171	40	240	683	20	135	56	472	2875
404192	Budhapanka (CT)	1888	1652	98	29	64	1461	236	38	74	18	106	4241
404193	Gotamara (CT)	687	594	22	16	31	523	94	9	21	5	59	1539
404194	Nuahata (CT)	1904	1477	122	67	141	1147	427	13	92	19	303	4016
	Sub total	**21634**	**15531**	**2340**	**2476**	**917**	**9796**	**6104**	**565**	**2282**	**327**	**2930**	**44938**
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**
Sub Distt.	**Anugul**												
404230	Badibahal	306	115	3	31	11	70	191	9	171	3	8	579
404231	Bandhupur	15	15	7	0	0	8	0	0	0	0	0	26
404232	Kankinali	283	279	72	24	5	178	4	1	1	0	2	556
404233	Jadupur	165	160	3	35	3	119	5	0	4	0	1	423
404234	Barsinga	394	150	51	62	5	32	244	13	212	2	17	763
404280	Khandahata	401	340	128	85	9	118	61	19	21	3	18	898
404281	Angarbandha	863	586	116	82	5	383	277	44	104	1	128	1656
404282	Charadapita	2	2	1	1	0	0	0	0	0	0	0	3
404283	Talasahi	55	52	1	0	2	49	3	0	0	0	3	156
404289	Kansanali	2	2	0	0	0	2	0	0	0	0	0	13
404290	Biswanathapur	48	46	18	23	0	5	2	2	0	0	0	114
404291	Pandupur	195	126	21	93	1	11	69	2	66	1	0	186
	Sub total	**2729**	**1873**	**421**	**436**	**41**	**975**	**856**	**90**	**579**	**10**	**177**	**5373**
	GRAND TOTAL	**93302**	**65124**	**11650**	**11249**	**3030**	**39193**	**28179**	**2408**	**13495**	**1382**	**10894**	**177094**
	Percentage	**34.51**	**24.08**	**17.89**	**17.27**	**4.65**	**60.18**	**10.42**	**8.55**	**47.89**	**4.90**	**38.66**	**65.49**

ANNEXURE : XIX Contd..

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)

DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) OF RUNGTA MINES LTD.

Town/ village code	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)	-	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)	-	N.A.	-	N.A.	-	N.A.	-		
402289	Sankamar	(10+ km)	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	N.A.	-	N.A.	-	N.A.	-		
402290	Gailo	(10+ km)	-	1	-	1	1	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	1	1	(10+ km)	-	N.A.	-	N.A.	-		
402291	Kundandeipur	(10+ km)	-	1	-	1	-	1	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	N.A.	-		
402292	Panibhandar	(10+ km)	-	2	-	1	-	(5-10 km)	-	(5-10 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)	-	N.A.	-	N.A.	-	N.A.	-		
402294	Katabahal	(10+ km)	-	3	-	2	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	N.A.	-	N.A.	-		
402298	Ria	(10+ km)	-	1	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	(10+ km)	-	N.A.	-		
402304	Panigengutia	(10+ km)	-	1	-	1	-	1	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	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)	-	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)	-	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)	-	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)	-	(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)	-	N.A.	-	N.A.	-	N.A.	-		
402899	Kochilamada	(5-10 km)	-	1	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	N.A.	-	(10+ km)	-	N.A.	-		
402901	Charadagadia	(5-10 km)	-	1	-	1	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	N.A.	-	(10+ km)	-	N.A.	-		
402902	Tulasidihi	N.A.	-	(<5 km)	-	(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.	-		
402904	Ghantalapasi	N.A.	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	N.A.	-	N.A.	-	N.A.	-	N.A.	-		
402905	Motunga	(<5 km)	-	2	-	1	-	1	-	1	-	(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)	-	(<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)	-	(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)	-	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)	-	(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)	-	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)	-	(<5 km)	-	N.A.	-	(<5 km)	-	N.A.	-		
402912	Rangathali	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	N.A.	-	N.A.	-	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)	-	N.A.	-	N.A.	-		
402914	Gaudapasi	(10+ km)	-	1	-	(<5 km)	-	(5-10 km)	-	-	1	(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)	-	(<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)	-	N.A.	-		
402917	Binakarkateni	N.A.	-	1	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	N.A.	-	N.A.	-	N.A.	-	N.A.	-		
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)	-	N.A.	-		
402919	Brajabiharipur	N.A.	-	1	-	(<5 km)	-	(<5 km)	-	-	1	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	-	1	N.A.	-	N.A.	-	N.A.	-		
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)	-	-	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)	-	(5-10 km)	-	N.A.	-	N.A.	-		
402924	Nadhara	(10+ km)	-	2	1	1	1	1	-	1	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(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)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-		
402926	Bangurasinga	(<5 km)	-	3	1	1	1	-	1	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	-	1	N.A.	-	(10+ km)	-	N.A.	-		
402927	Jarada	(<5 km)	-	1	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	N.A.	-	(10+ km)	-	N.A.	-		
402928	Nuara	N.A.	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	N.A.	-	N.A.	-	N.A.	-	N.A.	-		
402929	Talabaghalunda	N.A.	-	1	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	N.A.	-	N.A.	-	N.A.	-	N.A.	-		
402930	Uparbaghalunda	N.A.	-	1	-	(5-10 km)	-	(<5 km)	-	(10+ km)	-	(5-10 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)	-	N.A.	-	N.A.	-	(10+ km)	-	N.A.	-		
402932	Nayabhagirathipur(West	N.A.	-	1	-	1	-	1	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	N.A.	-	(10+ km)	-	N.A.	-		
402933	Kalusahukateni	N.A.	-	1	-	1	-	1	-	-	1	-	1	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	(5-10 km)	-	N.A.	-	N.A.	-	N.A.	-		
402934	Haladibahali	N.A.	-	2	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	(5-10 km)	-	N.A.	-	(10+ km)	-	N.A.	-		
402935	Budhipahad	N.A.	-	1	-	(5-10 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	1	-	1	-	N.A.	-	N.A.	-	N.A.	-		
402936	Uperpal	(5-10 km)	-	1	-	1	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-		
402937	Meramandali	(5-10 km)	-	1	-	1	-	1	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	N.A.	-	(10+ km)	-	N.A.	-		
402938	Nimidha	(<5 km)	-	1	1	1	1	-	1	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-		
402939	Ranibania	(10+ km)	-	1	-	1	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	N.A.	-	(10+ km)	-	N.A.	-		
402940	Badalo	(<5 km)	-	1	-	1	-	1	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-		
402942	Artasantrakateni	(10+ km)	-	1	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-		
402943	Murdangapali	(10+ km)	-	1	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-		
402944	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.	-		
402945	Bautiragada	N.A.	-	1	-	(<5 km)	-	(5-10 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	N.A.	-	(10+ km)	-	N.A.	-		
402946	Handifuta	N.A.	-	1	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	N.A.	-	(10+ km)	-	N.A.	-		

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) OF RUNGTA MINES LTD.

Town/ village code	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.
402947	Ghodadian	N.A.	-	1	-	1	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(<5 km)	-	(10+ km)	-	N.A.	-
402948	Naraharipur	N.A.	-	1	-	(5-10 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	N.A.	-	N.A.	-	N.A.	-	N.A.	-
402949	Sridihi	(5-10 km)	-	1	-	1	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	N.A.	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	N.A.	-	(10+ km)	-	N.A.	-
402950	Bachhuribanka	(5-10 km)	-	1	-	1	-	(<5 km)	-	1	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	N.A.	-
402951	Chheliabedha	N.A.	-	1	-	(5-10 km)	-	(<5 km)	-	(10+ km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	(<5 km)	-	(10+ km)	-	N.A.	-	N.A.	-
402952	Paneilo	(5-10 km)	-	1	-	(5-10 km)	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
402954	Zukateni	N.A.	-	(<5 km)	-	(5-10 km)	-	(<5 km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	N.A.	-	N.A.	-	N.A.	-	N.A.	-
	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)	-	N.A.	-	N.A.	-
402968	Itapa	N.A.	-	1	1	-	1	-	1	-	1	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	N.A.	-	(5-10 km)	-	N.A.	-	N.A.	-
402969	Narendrapur	(<5 km)	-	2	-	1	-	(5-10 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	(10+ km)	-	N.A.	-	(10+ km)	-	N.A.	-
402970	Asanabania	(5-10 km)	-	1	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	N.A.	-	N.A.	-	N.A.	-
402971	Sibapur	(5-10 km)	-	2	-	1	-	1	-	-	1	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
402972	Rakala	(5-10 km)	-	1	-	1	-	1	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-
402973	Panaghudughuda	(5-10 km)	-	1	-	1	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
402974	Amana	(5-10 km)	-	1	-	1	-	1	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
402975	Sanjapada	(10+ km)	-	2	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
402976	Badibahal	(10+ km)	-	1	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
402977	Khaliberana	(10+ km)	-	1	-	1	-	1	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
402978	Nadeilo	(5-10 km)	-	1	-	1	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
402979	Bramhanapurunakot	(<5 km)	-	1	-	1	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
402980	Naraharipur	(<5 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
402981	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.	-
402988	Kaliakoli	N.A.	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-	N.A.	-	N.A.	-	N.A.	-	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)	-
	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)	-	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)	-	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)	-	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)	-	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)	-	N.A.	-
402998	Nimabahali	(10+ km)	-	1	-	1	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	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)	-	N.A.	-

ANNEXURE : XX Contd..

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) OF RUNGTA MINES LTD.

Town/ village code	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.
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)	-	(5-10 km)	-	(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)	-	(5-10 km)	-	(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)	-	(<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.	-
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																														
403039	Kansara	(10+ km)	-	2	-	1	-	1	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403040	Chhelachheli	(<5 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403041	Kalihundi	(<5 km)	-	1	-	(5-10 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403042	Tutupada	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403043	Tangisal	(5-10 km)	-	1	-	(5-10 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(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)	-	(10+ km)	-	N.A.	-
403045	Hatura	-	1	1	-	1	-	1	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403046	Jayapanga	(<5 km)	-	1	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(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)	-	(10+ km)	-	N.A.	-
403048	Bangu	(10+ km)	-	1	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403049	Pada	(<5 km)	-	2	-	1	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403050	Kurumitha	(<5 km)	-	1	-	1	-	1	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403051	Ambithi	N.A.	-	1	-	1	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403053	Kantamila	N.A.	-	2	-	1	-	1	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403055	Baradapal	(10+ km)	-	2	-	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.	-
403056	Sundarapal	(10+ km)	-	1	-	1	-	1	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403068	Nizgarh(Hindol)	(10+ km)	-	5	-	2	-	2	-	-	1	1	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403069	Tantichira	(10+ km)	-	1	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403070	Kalanda	(10+ km)	-	1	-	1	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403071	Sarasinga	(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)	-	(10+ km)	-	N.A.	-
403072	Keutaganthi	(10+ km)	-	(<5 km)	-	(5-10 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403073	Ostapal	(10+ km)	-	1	-	(5-10 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(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)	-	(10+ km)	-	N.A.	-
403075	Bhagabanpur	(10+ km)	-	1	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403076	Bahalunda	(10+ km)	-	1	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403077	Bhaktapur	(5-10 km)	-	1	-	1	-	1	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403078	Nuabaga	(10+ km)	-	1	-	1	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403079	Kantakula	(<5 km)	-	1	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
403082	Kantapal	(<5 km)	-	(<5 km)	-	(5-10 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.	-
403083	Badagola	(5-10 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.	-
403087	Rajamohanpur	(10+ km)	-	1	1	1	1	-	1	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(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)	-	(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)	-	(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)	-	(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)	-	(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)	-	(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)	-	(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)	-	(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)	-	(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)	-	(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)	-	(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)	-	(10+ km)	-	N.A.	-
403123	Chitalapur	(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.	-
	District : Anugul																														

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)

DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) OF RUNGTA MINES LTD.

Town/ village code	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.: 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.	-
404142	Apartipur	(<5 km)	-	1	-	(5-10 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404143	Bonda	(<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.	-
404145	Banarpal	-	1	2	-	1	-	1	-	-	1	-	1	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	-	2	(10+ km)	-	(10+ km)	-	N.A.	-
404146	Joragadia	(<5 km)	-	1	-	1	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	N.A.	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404147	Birabahanpur	(5-10 km)	-	1	-	-	1	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404148	Badakhali	(5-10 km)	-	1	-	1	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404149	Bhagabatpur	(5-10 km)	-	1	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404150	Narendrapur	(5-10 km)	-	1	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404151	Chauridiha	(<5 km)	-	1	-	1	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404152	Jhajiribahal	(5-10 km)	-	1	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	N.A.	-
404153	Gadasantri	(5-10 km)	-	3	-	1	-	1	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404155	Gangijodi	(5-10 km)	-	(<5 km)	-	(5-10 km)	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404156	Tulasipal	(<5 km)	-	1	-	1	-	1	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	N.A.	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404158	Kangula	(5-10 km)	-	6	-	3	-	1	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	N.A.	-
404159	Languliabeda	(10+ km)	-	1	-	(5-10 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(5-10 km)	-	N.A.	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404160	Rajibpur	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(<5 km)	-	(10+ km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404163	Purkia	(10+ km)	-	1	-	1	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	N.A.	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404164	Arahat	(5-10 km)	-	2	-	1	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	N.A.	-	-	1	-	1	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	N.A.	-
404165	Talatali	(5-10 km)	-	2	-	1	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404166	Kusuna	(<5 km)	-	1	-	(5-10 km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404167	Kalandapal	(5-10 km)	-	1	-	1	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404168	Ramimunda	(5-10 km)	-	1	1	-	1	-	1	(5-10 km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404169	Santarapur	-	1	3	-	1	-	1	-	(5-10 km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404170	Fulapada	-	1	3	-	1	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404172	Rankasinga	(<5 km)	-	1	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404173	Juharpur	(10+ km)	-	1	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(5-10 km)	-	N.A.	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404174	Similichhuin	(5-10 km)	-	1	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404175	Chakuriapal	(<5 km)	-	1	-	1	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404178	Kainchhabahala	N.A.	-	1	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	N.A.	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404179	Girdhabasa	(<5 km)	-	1	4	-	1	(<5 km)	-	-	1	(5-10 km)	-	(5-10 km)	-	N.A.	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404180	Tilapanga	(<5 km)	-	1	1	-	1	-	1	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404181	Talamulasasan	(<5 km)	-	4	-	1	-	(<5 km)	-	-	1	-	1	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404182	Gadatalamul	(<5 km)	-	2	-	1	-	1	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404183	Harichandabasti	N.A.	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404184	Talmulpatna Basti	(<5 km)	-	2	-	1	-	(<5 km)	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404186	Durgaprasadpur	(5-10 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)	-	N.A.	-
404187	Harichandajami	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(<5 km)	-	(10+ km)	-	(<5 km)	-	(5-10 km)	-	N.A.	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404189	Khandanali	(<5 km)	-	1	1	-	2	-	1	(10+ km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404190	Serenabeda	(<5 km)	-	1	-	1	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	N.A.	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404191	Mahidharpur	(<5 km)	-	4	-	2	-	1	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	-	1	(10+ km)	-	(10+ km)	-	N.A.	-
	Sub distt.: Bhusan Steel Limited																												
404195	Talabahal	(5-10 km)	-	1	-	1	-	1	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404196	Ganthigadia	(5-10 km)	-	1	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
	Sub distt.: Anugul																												
404230	Badibahal	(5-10 km)	-	1	-	1	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	N.A.	-
404231	Bandhupur	(10+ km)	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404232	Kankinali	(10+ km)	-	1	-	1	-	1	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404233	Jadupur	(10+ km)	-	1	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	(<5 km)	-	(<5 km)	-	(10+ km)	-	(10+ km)	-	(10+ km)	-	N.A.	-
404234	Barsinga	(5-10 km)	-	1	-	1	-	1	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(<5 km)	-	(<5 km)	-	(5-10 km)	-	N.A.	-	(5-10 km)	-	N.A.	-
404280	Khandahata	(10+ km)	-	1	-	1	-	1	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	N.A.	-
404281	Angarbandha	(10+ km)	-	1	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.	-
404282	Charadapita	(5-10 km)	-	(<5 km)	-	(5-10 km)	-	(<5 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	N.A.	-
404283	Talasahi	(5-10 km)	-	1	-	-	1	(5-10 km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(10+ km)	-	(10+ km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	(5-10 km)	-	N.A.	-
404289	Kansanali	(10+ km)	-	(<5 km)	-	(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.	-
404290	Biswanathapur	(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.	-
404291	Pandupur	(10+ 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.	-

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) OF RUNGTA MINES LTD.

Town/ village code	Town/village name	MEDICAL FACILITIES																				DRINKING WATER FACILITY										POWER SUPPLY			
		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	TWT	TWUT	CW	UW	HP	TW/BW	S	R/C	T/P	WO	PSDU	PSIAU	PSCU	PSALL
	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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	Y	Y	N	Y	Y	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
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	-	N	N	N	Y	Y	Y	N	Y	Y	Y	Y	N	N	N
402289	Sankamar	(10+ km)	(10+ km)	(10+ km)	(10+ km)	1	1	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
402290	Gailo	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	1	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	N	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
402294	Katabahal	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	N	Y	Y	Y	Y	T	Y
402298	Ria	(10+ km)	(5-10 km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
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	-	N	N	N	Y	Y	N	N	Y	Y	Y	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
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	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
	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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
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	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	N	N	N	Y	N	N	N
402902	Tulasidihi	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N
402904	Ghantalapasi	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N
402905	Motunga	(10+ km)	(5-10 km)	(<5 km)	1	(10+ km)	1	(10+ km)	1	1	(10+ km)	1	-	-	-	1	-	-	-	-	-	N	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y	T	Y
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	-	N	Y	N	Y	Y	Y	N	Y	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	Y	Y	N	Y	N	N	N
402909	Bido	(10+ km)	(10+ km)	1	(5-10 km)	(<5 km)	(5-10 km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	-	-	-	1	-	-	-	3	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
402910	Taladanga	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	1	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
402912	Rangathali	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	N	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	Y	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	N	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	N	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	N	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	T	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	Y	Y	N	Y	N	N	N
402926	Bangurasinga	(5-10 km)	(10+ km)	1	1	(10+ km)	1	(10+ km)	(<5 km)	1	(10+ km)	1	-	-	-	-	-	-	-	3	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	Y	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	N	N	N	N
402929	Talabaghalunda	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	N	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
402934	Haladibahali	(10+ km)	(<5 km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	1	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
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	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
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	-	N	N	N	Y	Y	Y	N	N	N	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
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	-	N	N	N	Y	Y	N	Y	Y	Y	N	Y	Y	N	N
402942	Artasantrakateni	(10+ km)	(<5 km)	(<5 km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(<5 km)	(<5 km)	(10+ km)	(<5 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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	-	N	N	N	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	N
402945	Bautiragada	(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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	N	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) OF RUNGTA MINES LTD.

Town/ village code	Town/village name	MEDICAL FACILITIES																				DRINKING WATER FACILITY										POWER SUPPLY			
		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	TWT	TWUT	CW	UW	HP	TW/BW	S	R/C	T/P	WO	PSDU	PSIAU	PSCU	PSALL
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	T	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	N	N	N	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	N	N	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	N	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	Y	N	N	Y	N	N	N
402954	Zukateni	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	N	N	Y	N	N	N
	Sub distt.: Bhusan Ste																																		
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)	-	-	-	-	-	-	-	-	-	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	Y	Y	N	Y	N	T	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	N	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	N	N	N	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
402983	Mitikapasi	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
402984	Sarapa	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
402985	Raghunathapur	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	N	N	Y	N	N	N
402988	Kaliakoli	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	N	N	N	N	N	N	N	N	N	N	N
402989	Paikpurunakot	(10+ km)	(10+ km)	1	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	1	1	(10+ km)	(10+ km)	-	-	-	-	-	-	-	3	-	N	Y	N	Y	Y	N	Y	Y	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	N	N	N	N
	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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	Y	N	Y	Y	N	Y	Y	Y	N	Y	N	N	N
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	-	N	N	N	Y	Y	N	Y	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
402998	Nimabahali	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	Y	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	N	N	N	N
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	-	N	N	N	Y	Y	N	N	N	Y	Y	Y	N	T	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	Y	Y	N	T	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	N	Y	N	Y	N	N	N
403006	Kadala	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403007	Benipathara	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403012	Jharabeda	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	Y	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	N	Y	N	N	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	N	Y	N	N	N	N	N

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) OF RUNGTA MINES LTD.

Town/ village code	Town/village name	MEDICAL FACILITIES																				DRINKING WATER FACILITY										POWER SUPPLY			
		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	TWT	TWUT	CW	UW	HP	TW/BW	S	R/C	T/P	WO	PSDU	PSIAU	PSCU	PSALL
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403024	Mahalunda	(5-10 km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	Y	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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	-	N	Y	N	Y	Y	Y	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	Y	Y	Y	T	Y
403032	Ranjagola	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(<5 km)	(10+ km)	(5-10 km)	(5-10 km)	1	(10+ km)	1	-	-	-	-	-	-	-	-	-	N	Y	N	Y	Y	N	N	N	Y	N	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	N	N
	Sub distt.: Hindol																																		
403039	Kansara	(10+ km)	(10+ km)	1	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	3	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
403040	Chhelachheli	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403041	Kalihundi	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403042	Tutupada	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403045	Hatura	(10+ km)	(10+ km)	1	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	3	-	N	Y	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403046	Jayapanga	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403048	Bangu	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	N	N	N	N
403049	Pada	(10+ km)	(10+ km)	(<5 km)	(<5 km)	(10+ km)	(<5 km)	(10+ km)	1	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403050	Kurumitha	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403051	Ambithi	(10+ km)	(10+ km)	(5-10 km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403053	Kantamila	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
403055	Baradapal	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	(5-10 km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403056	Sundarapal	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403068	Nizgarh(Hindol)	(10+ km)	(10+ km)	(5-10 km)	1	1	1	(10+ km)	1	1	(10+ km)	1	-	-	-	-	-	-	-	-	-	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	T	Y
403069	Tantichira	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(5-10 km)	(5-10 km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
403070	Kalanda	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(5-10 km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	N	Y	N	Y	N	N	N
403071	Sarasinga	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(5-10 km)	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
403072	Keutaganthi	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	(5-10 km)	(5-10 km)	(10+ km)	(5-10 km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	N	N	N	N
403073	Ostapal	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
403074	Baghadharia	(10+ km)	(10+ km)	(5-10 km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(<5 km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
403075	Bhagabanpur	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(5-10 km)	(5-10 km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
403076	Bahalunda	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
403077	Bhaktapur	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(5-10 km)	(5-10 km)	(10+ km)	(5-10 km)	(<5 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
403078	Nuabaga	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
403079	Kantakula	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(<5 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
403082	Kantapal	(10+ km)	(10+ km)	(<5 km)	(<5 km)	(5-10 km)	(5-10 km)	(10+ km)	1	(<5 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	N	N	N	N	N	N
403083	Badagola	(10+ km)	(10+ km)	(<5 km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	N	N	N	N
403087	Rajamohanpur	(10+ km)	(10+ km)	1	(5-10 km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	3	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
	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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	N	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403098	Giridharprasad	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	N	Y	N	Y	Y	T	Y
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	-	N	N	N	Y	Y	Y	N	N	Y	N	Y	Y	T	Y
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	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
403102	Bedapada	(10+ km)	(10+ km)	1	(10+ km)	(10+ km)	(10+ km)	(<5 km)	1	(10+ km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	3	-	N	N	N	Y	Y	Y	Y	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
403123	Chitalapur	(10+ km)	(<5 km)	1	(5-10 km)	(10+ km)	(5-10 km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(<5 km)	-	-	-	-	-	-	-	3	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
	District : Anugul																																		

AMENITIES AVAILABLE IN VILLAGES WITHIN THE STUDY AREA (CENSUS 2011)
DHENKANAL STEEL PLANT EXPANSION (7.53 MTPA) OF RUNGTA MINES LTD.

Town/ village code	Town/village name	MEDICAL FACILITIES																				DRINKING WATER FACILITY										POWER SUPPLY			
		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	TWT	TWUT	CW	UW	HP	TW/BW	S	R/C	T/P	WO	PSDU	PSIAU	PSCU	PSALL
	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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
404142	Apartipur	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(<5 km)	(<5 km)	(<5 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	N	Y	N	N	N	Y	N	Y	N	N	N
404143	Bonda	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(<5 km)	(<5 km)	(<5 km)	(10+ km)	(<5 km)	-	-	-	-	-	-	-	-	-	N	Y	N	Y	Y	N	N	N	Y	N	Y	N	N	N
404145	Banarpal	(10+ km)	1	1	(10+ km)	(10+ km)	(10+ km)	1	(<5 km)	1	(10+ km)	1	-	-	-	2	-	-	-	3	-	N	Y	N	Y	Y	N	N	N	Y	N	Y	N	T	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	N	Y	N	Y	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	N	Y	N	N	N	Y	N	Y	N	N	N
404151	Chauridiha	(10+ km)	(5-10 km)	(5-10 km)	(5-10 km)	(10+ km)	(<5 km)	(10+ km)	(5-10 km)	(<5 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
404152	Jhajiribahal	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	Y	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
404156	Tulasipal	(10+ km)	(5-10 km)	1	(10+ km)	(10+ km)	(<5 km)	(<5 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	3	-	N	Y	N	Y	Y	N	N	N	Y	N	Y	N	N	N
404158	Kangula	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(<5 km)	(<5 km)	1	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	Y	N	Y	Y	N	N	Y	Y	N	Y	Y	N	N
404159	Languliabeda	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(<5 km)	(10+ km)	(<5 km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
404160	Rajibpur	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(<5 km)	(<5 km)	(<5 km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
404163	Purkia	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(<5 km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	N	N
404164	Arahat	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(5-10 km)	(5-10 km)	(5-10 km)	(5-10 km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	Y	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
404166	Kusuna	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
404167	Kalandapal	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(<5 km)	(10+ km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
404168	Ramimunda	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(<5 km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
404169	Santarapur	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	Y	N	Y	Y	N	Y	Y	Y	N	Y	Y	T	Y
404170	Fulapada	(10+ km)	(5-10 km)	1	1	(10+ km)	(5-10 km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	1	-	N	N	N	Y	Y	N	Y	Y	Y	N	Y	Y	T	Y
404172	Rankasinga	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	Y	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	N	Y	N	N	Y	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	N	Y	N	N	Y	Y	N	Y	Y	T	Y
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)	-	-	-	-	-	-	-	-	-	N	N	N	N	Y	N	N	N	Y	N	Y	Y	T	Y
404178	Kainchhabahala	(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)	-	-	-	-	-	-	-	-	-	N	N	N	N	Y	N	Y	N	Y	N	Y	Y	T	Y
404179	Girdhabasa	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
404180	Tilapanga	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	Y	N	Y	N	Y	Y	T	Y
404181	Talamulasasan	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(5-10 km)	2	-	-	-	-	-	-	2	-	N	N	N	Y	Y	N	Y	N	Y	N	Y	Y	T	Y
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	-	-	-	-	N	Y	N	N	Y	N	Y	N	Y	Y	Y	Y	T	Y
404183	Harichandabasti	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	N	Y	N	Y	N	Y	N	Y	Y	T	Y
404184	Talmulpatna Basti	(10+ km)	(10+ km)	1	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	3	-	N	Y	N	Y	Y	N	Y	N	Y	N	Y	Y	T	Y
404186	Durgaprasadpur	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	N	Y	N	Y	N	Y	N	Y	N	N	N
404187	Harichandajami	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	N	N	N	N	N	N	N	N	N	N	N
404189	Khandanali	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	N	N	N	N	N	N	N	Y	N	N	N
404190	Serenabeda	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
404191	Mahidharpur	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(5-10 km)	1	1	(10+ km)	(5-10 km)	-	-	-	1	3	-	-	3	-	N	Y	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
	Sub distt.: Bhusan Ste																																		
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)	-	-	-	-	-	-	-	-	-	N	N	N	N	Y	N	N	N	Y	N	Y	N	N	N
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)	-	-	-	-	-	-	-	-	-	N	N	N	N	Y	N	N	N	Y	N	Y	N	N	N
	Sub distt.: Anugul																																		
404230	Badibahal	(10+ km)	(<5 km)	(10+ km)	(5-10 km)	(10+ km)	(5-10 km)	(5-10 km)	(5-10 km)	(<5 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
404231	Bandhupur	(10+ km)	(5-10 km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(5-10 km)	(<5 km)	(5-10 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	N	N	N	N	N	N	N	N	N	N	N
404232	Kankinali	(10+ km)	(<5 km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(<5 km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
404233	Jadupur	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	N	Y	N	N	N	Y	N	Y	N	N	N
404234	Barsinga	(10+ km)	(<5 km)	(5-10 km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(<5 km)	(<5 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	N	N	N
404280	Khandahata	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(5-10 km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	N	N	N
404281	Angarbandha	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	Y	Y	N	Y	Y	T	Y
404282	Charadapita	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(5-10 km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
404283	Talasahi	(10+ km)	(10+ km)	(5-10 km)	(5-10 km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
404289	Kansanali	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(<5 km)	(10+ km)	(10+ km)	(10+ km)	(10+ km)	-	-	-	-	-	-	-	-	-	N	N	N	N	Y	N	N	N	Y	N	Y	Y	T	Y
404290	Biswanathapur	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(5-10 km)	(10+ km)	(10+ km)	(10+ km)	(5-10 km)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y
404291	Pandupur	(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)	-	-	-	-	-	-	-	-	-	N	N	N	Y	Y	N	N	N	Y	N	Y	Y	T	Y

ANNEXURE : XXI

	Rungta Mines Ltd. **(Dhenkanal Steel Plant)**	Format No: Rev: Date:
	[Form No.31-A] **Health Record** **(Pre-employment/Periodical)** **[Prescribed under Rule 62-J]**	SL No:

1. Name of the factory :
2. Name of the Employee :
3. Employee Distinguishing Number :
4. Age of the employee :
   Identification mark :
   Nature of the job :
5. Date of employment :
6. Length of service in years :
7. General Survey :
   Health :- Good / Fair / Poor
   Height :-_____ cms.
   Weight :-_____ Kg.
8. Blood group :
9. Eye Vision : Normal / Abnormal
   Use of glass :- Yes/No
10. Hearing : Normal/Abnormal
11. Respiratory system and Chest Measurement
    Inspiration :
    Expiration :
    Respiration: _____rate/min.
    Remarks, if any
12. Cardiovascular system
    Pulse rate :
    B.P. :
    Heart Sound :
    ECG :
    Remarks, if any
13. Abdomen Tenderness: Yes/No
14. Nervous system
    History of Fits : Yes/No
    Epilepsy : Yes/No
    Remarks on Mental Health
15. Locomotors System : Normal / Abnormal

16. Skin condition : Normal / Abnormal

Remarks on any skin Disease Noticed:-

17. Hearnias : Present / Absent
18. Hydrocele : Present / Absent
19. Present Complain, if any
20. Summary of Findings:

Heart disease

Hypertension

Diabetes

T.B.

Epilepsy

Poisoning

Others

Occupational disease, if any:

21. Recommendation, if any for any further investigation.

Signature of the Employee

Signature of the Medical Officer

Date:

Date:

Form 30

[Prescribed under Rule 96]

Certificate of Fitness

Sl. No.....

Date.....

I certify that I have personally examined (name)..... Son of (father's name)..... residing at ……..... (Address) who is desirous of being employed as..... designation) in (process, department and factory) and that his age, as nearly as can be ascertained from my examination is..... Years, and that he is my opinion fit/unfit for employment in the above mentioned factory as mentioned above.

- He may be produced for further examination after a period of.....
- The serial No. of the previous certificate is.....
- Signature/Left hand thumb impression of the person examined.

Signature of the Employee

Signature of the Certifying Surgeon

ANNEXURE : XXII

HEALTH CHECK-UP RECORD, DHENKANAL STEEL PLANT EXPANSION

DATE : 11/11/2019

CONTRACTOR : ISGEC HEAVY ENGG. LTD.

SL. NO	E.CODE	NAME	SEX	AGE	BLOOD GROUP	DESIGNATION	WEIGHT/ HEIGHT	BMI	BLOOD PRESSURE	PULSE (Min)	VISSON	RESULT
1	5	ANIAL MONDAL	M	26	AB+	Rigger	60/170	20.51	90/60	74	Normal	Fit
2	1	JIARUL SAIKH	M	35	A+	Foreman	70/170	24.22	126/84	100	Normal	Fit
3	2	RASHUL MONDAL	M	35	O+	Rigger	55/155	22.89	118/88	88	Normal	Fit
4	3	KHADHIBUL ISLAM	M	32	B+	Rigger	60/168	21.27	130/80	84	Normal	Fit
5	4	MOIDHUL MONDAL	M	35	O+	Rigger	75/160	27.17	138/88	80	Normal	Fit
6	11	KHEJMAT SHIKH	M	32	O+	Fitter	48/161	18.53	122/76	80	Normal	Fit
7	8	RAKIBUL MONDAL	M	27	B+	Welder	57/161	22	110/70	64	Normal	Fit
8	6	AJMAD ALI KHAN	M	30	B+	Rigger	58/161	22.39	140/80	76	Normal	Fit
9	27	GIYASUDDIN SEIKH	M	38	AB+	Khalasi	68/174	22.51	120/76	94	Normal	Fit
10	12	RABIUL SEIKH	M	25	B+	Fitter	55/163	20.91	124/66	72	Normal	Fit
11	7	HRUSHIKESH BHOKTA	M	36	O+	Driver	62/166	22.54	126/88	84	Normal	Fit
12	14	ARIFUL DAFADAR	M	20	A+	Khalasi	55/169	21.48	118/74	88	Normal	Fit
13	10	SENTU MONDAL	M	30	A+	Rigger	70/169	24.56	120/74	98	Normal	Fit
14	13	KALLU BISWAS	M	36	AB+	Fitter	57/164	21.26	112/80	84	Normal	Fit
15	25	SUKEN SHAIKH	M	50	A+	Khalasi	65/164	24.25	130/80	90	Normal	Fit
16	19	MANOJ SAIKH	M	34	O+	Fitter	64/161	24.71	112/66	90	Normal	Fit
17	15	AJIM SAIKH	M	18	AB+	Khalasi	47/154	19.83	116/74	88	Normal	Fit
18	21	MONTAL S.K.	M	24	O+	Rigger	46/161	17.46	110/66	90	Normal	Fit
19	32	VINAY KUMAR CHAUHAN	M	27	O+	Rigger	64/166	23.27	120/68	110	Normal	Fit
20	42	RAJ MANI	M	28	O+	Rigger	58/166	21.09	120/74	80	Normal	Fit
21	31	DEEPAK ROY	M	20	O+	Khalasi	54/163	20.53	128/78	80	Normal	Fit
22	36	DINESH KU. RAI	M	30	B+	Rigger	50/174	16.5	110/66	88	Normal	Fit
23	68	KAMALESH KUMAR RAY	M	35	B+	Fitter	65/173	21.73	134/78	82	Normal	Fit
24	61	SARWAN PATEL	M	25	B-	Welder	50/160	19.53	100/58	84	Normal	Fit
25	41	GIRISH CHANDRA SINGH	M	47	O+	Rigger	74/177	23.64	148/86	118	Normal	Fit
26	54	GOVIND PATEL	M	24	O+	Welder	41/150	18.22	124/84	82	Normal	Fit
27	33	ANUP KUMAR	M	32	O+	Rigger	59/157	23.93	124/72	82	Normal	Fit
28	82	MOJIBUR SAIKH	M	18	B+	Khalasi	56/166	20.36	113/86	80	Normal	UNFIT
29	83	NAIBUL DADABAR	M	20	A+	Rigger	54/161	20.84	140/80	100	Normal	Fit
30	50	RAHUL KUMAR	M	19	O+	Khalasi	52/164	19.4	114/70	94	Normal	Fit
31	94	DINESH KUMAR JENA	M	40	B+	Fitter	59/165	21.69	114/76	78	Normal	Fit
32	84	NASIR DAFADAR	M	23	A+	Rigger	60/165	22.09	128/72	78	Normal	Fit
33	22	HABIB BISWAS	M	22	B+	Khalasi	46/159	18.25	116/80	84	Normal	Fit
34	46	SAJEEWAN NISHAD	M	39	O+	Fitter	51/156	20.98	130/80	68	Normal	Fit
35	60	RAHUL SINGH	M	23	O+	Welder	55/158	22.08	110/74	10	Normal	Fit
36	72	MOTI MONDAL	M	27	A+	Rigger	58/157	23.57	126/80	106	Normal	Fit
37	77	RAHUL MONDAL	M	19	B+	Rigger	60/167	21.58	110/68	88	Normal	Fit
38	110	AFTAB SHAIKH	M	20	A-	Helper	51/162	19.46	124/74	80	Normal	Fit
39	79	JAINAL ALI HAUSAN	M	32	B+	Helper	53/164	19.77	130/80	100	Normal	Fit
40	105	SABIR ALI	M	27	B+	Rigger	74/163	27/52	114/72	80	Normal	UNFIT
41	112	ASLAM KHAN	M	26	A+	Rigger	63/167	22.66	116/74	78	Normal	Fit
42	81	SALIM SHAIKH	M	32	B+	Welder	63/162	23.95	114/70	84	Normal	Fit
43	73	ABDULLAH SHAIKH	M	26	B+	Rigger	53/168	23.04	110/66	72	Normal	Fit
44	113	HAIDAR ALI	M	27	B+	Rigger	68/163	25.66	116/72	82	Normal	Fit
45	107	SAMSUD ALI	M	19	B+	Helper	60/176	19.41	130/60	84	Normal	Fit
46	109	SHAUKATH ALI	M	23	A+	Welder	75/159	29.76	130/76	72	Normal	Fit
47	108	ALLAUDIN	M	38	O+	Welder	50/170	17.30	100/68	84	Normal	Fit
48	106	KABIR	M	25	B+	Rigger	68/155	28.33	122/76	80	Normal	Fit
49	90	DHARMENDRA KUMAR SINGH	M	36	O+	Fitter	55/167	19.78	112/76	82	Normal	Fit
50	102	TUNTUN MAJHI	M	45	B+	Rigger	63/162	24.04	140/80	90	Normal	Fit
51	91	KUNAL KUMAR	M	19	O+	Helper	58/179	18.07	96/58	72	Normal	Fit
52	53	MANISH KUMAR	M	23	O+	Welder	53/165	19.48	114/70	82	Normal	Fit
53	80	ABU THALIM	M	24	B+	Khalasi	72/160	28.12	128/82	120	Normal	Fit
54	96	HAYATUL MONDAL	M	21	O+	Rigger	59/166	21.45	120/66	78	Normal	Fit
55	97	FEROJ ALI MONDAL	M	30	AB+	Rigger	52/168	18.43	110/68	100	Normal	Fit
56	76	HASSANUL SHAIKH	M	32	B+	Rigger	62/169	21.98	140/76	72	Normal	Fit
57	49	AMARJEET KUMAR	M	20	O+	Khalasi	56/168	19.85	110/68	76	Normal	Fit
58	63	SWAPAN GAMTA	M	27	B+	Rigger	65/159	25.79	118/74	84	Normal	Fit
59	87	ROOPESH KUMAR	M	27	O+	Welder	59/162	30.34	117/80	74	Normal	Fit
60	65	DEVNATH GUMPTA	M	19	B+	Khalasi	49/167	17.62	124/68	128	Normal	Fit
61	89	PRADEEP KUMAR	M	18	B+	Helper	56/171	19.17	106/70	72	Normal	Fit
62	67	SRIKANTH MAITY	M	21	B+	Rigger	53/150	23.55	110/64	90	Normal	Fit
63	64	SOMNATH GUNTA	M	22	B+	Rigger	68/170	23.52	140/90	112	Normal	Fit
64	66	TAPAS GUNTA	M	28	A+	Rigger	47/162	17.93	122/74	86	Normal	Fit
65	55	SUMAN BISWAS	M	32	O+	Welder	56/164	20.89	120/78	80	Normal	Fit
66	70	LALCHAND SHAIKH	M	30	B+	Welder	61/166	22.18	128/78	108	Normal	Fit
67	121	BAPUNU NAYAK	M	32	B+	IBR Welder	70/170	24.22	110/72	84	Normal	Fit
68	92	BAIDHAR HALDAR	M	33	A+	Welder	60/160	23.43	116/84	88	Normal	Fit
69	99	CHAYEN KU. SARKAR	M	32	A+	Welder	70/157	28.45	140/90	90	Normal	Fit
70	114	IRFAN ALI KHAN	M	27	O+	Accountant	78/163	29.43	102/58	62	Normal	Fit
71		UMAKANTA YADAV	M	26	B+	Crane Operator	65/159	25.79	126/78	98	Normal	Fit
72		RANJIT YADAV	M	40	O+	Crane Operator	84/172	28.47	126/80	90	Normal	Fit

ANNEXURE : XXII Contd..

SL. NO	E.CODE	NAME	SEX	AGE	BLOOD GROUP	DESIGNATION	WEIGHT/ HEIGHT	BMI	BLOOD PRESSURE	PULSE (Min)	VISSON	RESULT
73	98	SANTOSH KUMAR SAH	M	34	O+	Welder	65/162	24.80	128/86	78	Normal	Fit
74	74	SALIN SHAIKH	M	27	B-	Rigger	50/162	19.08	114/64	108	Normal	Fit
75	75	NAJBUL SHAIKH	M	25	B+	Rigger	55/171	18.83	112/66	92	Normal	Fit
76	101	MITESH KUMAR	M	20	A+	Helper	53/170	20.06	123/60	72	Normal	Fit
77	52	VIJAY CHAUHAN	M	33	B+	Welder	94/170	32.52	140/80	100	Normal	Fit
78	100	DHARMENDER MAJHI	M	24	O+	Welder	60/164	22.33	134/84	76	Normal	Fit
79		JITENDRA KUMAR SAHOO	M	24	O+	Engineer	70/167	25.17	130/170	84	Normal	Fit
80	93	RANJAN SAHOO	M	30	B+	Electrician	62/162	23.66	112/76	88	Normal	Fit
81	71	SUDAN SHAIKH	M	26	O+	Rigger	63/173	21.07	120/82	90	Normal	Fit
82	111	JEMSHED	M	19	B+	Helper	65/161	25.09	124/70	80	Normal	Fit
83	69	RAFIQ SHAIKH	M	38	B+	Foreman	66/161	25.48	122/80	82	Normal	Fit
84	115	SAKESH LAHORE	M	29	B+	Safety Officer	65/162	24.70	124/74	84	Normal	Fit
85	2410	ASIT JANA	M	36	O+	Site In-charge	73/170	28.71	140/96	80	Normal	Fit
86		B DOLEI	M	59	O+	Store In-charge	77/159	30.55	130/80	80	Normal	Fit
87	118	SUSHIL KUMAR SHAMA	M	26	O+	Engineer	63/155	24.30	114/64	76	Normal	Fit
88	117	VIJAY GUPTA	M	26	B+	Mechanic	65/172	22.03	118/74	72	Normal	Fit
89	119	AVIJIT BHOWMIK	M	56	B+	Foreman	64/164	23.88	144/84	84	Normal	Fit
90	120	BIJU DAMODAR	M	49	B+	Project Manager	92/174	30.30	200/106	86	Normal	Fit
91	122	SUDHIR BHUTIA	M	30	O+	Hydra Operator	54/158	21.60	126/86	84	Normal	Fit
92		PARTHASARATHI R.	M	33	A+	Engineer	71/166	25.70	122/82	86	Normal	Fit
93	3	P. POW RAJ	M	32	O-	Engineer	61/166	22.91	130/84	86	Normal	Fit
94	3617	SUSHIL KUMAR SAHOO	M	30	B+	Sr. Engineer	85/173	28.04	120/80	84	Normal	Fit
95	116	B. UMESH PILLAI	M	28	O-	Store Keeper	60/166	21.07	144/84	88	Normal	Fit

DATE : 11/11/2019

CONTRACTOR : Thermax

96	7	NIRANJAN THATOI	M	53	A+	Site In-charge	75/160	29.29	16./94	82	Normal	Fit
97	8	KSHIROD KUMAR SAHU	M	39	B+	Hydra Operator	64/168	22.69	158/92	87	Normal	Fit
98	6	CHINTAMANI AHOO	M	30	A+	Supervisor	65/164	24.25	122/84	80	Normal	Fit
99	11	DEBENDRA DAS	M	46	O+	Rigger	60/167	19.41	110/70	72	Normal	Fit
100	2	MANOJ KUMAR	M	33	A+	Fitter	50/156	20.07	113/72	96	Normal	Fit
101	3	GOUTAM KUMAR	M	19	AB+	Khalasi	55/151	24.12	122/62	80	Normal	Fit
102	4	SIDDHARTHA PRIYARANJAN LENKA	M	26	A+	Admin	90/168	31.91	130/80	98	Normal	Fit
103	5	RANJAN BISWAL	M	46	A-	Electrician	86/171	29.45	150/98	90	Normal	UNFIT
104	9	BABAJI NAYAK	M	56	AB+	Rigger	50/153	21.36	128/72	72	Normal	Fit
105	10	RAFULLA BALA	M	56	B+	Welder	66/156	27.1	128/90	80	Normal	Fit
106	12	ANIRUDDHA NANDA	M	32	O+	Rigger	54/158	21.68	138/78	98	Normal	Fit
107	13	AKHILESH KUMAR GUPTA	M	25	O+	Rigger	55/172	18.64	114/76	100	Normal	Fit
108	14	ASHOK SAW	M	25	A+	Rigger	52/163	21.05	110/70	72	Normal	Fit
109	15	UMA SAW	M	20	O+	Khalasi	67/170	23.18	120/70	78	Normal	Fit
110	16	RAMAKANTA GUPTA	M	32	B+	Rigger	54/164	20.14	130/70	94	Normal	Fit
111	17	MANOJ KUMAR SINGH	M	38	O+	Fitter	54/168	20.37	110/78	74	Normal	Fit
112	18	KRISHNA PAL	M	41	O+	Rigger	60/172	20.33	140/80	64	Normal	Fit
113	19	VIPUL PAL	M	19	B+	Khalasi	55/164	20.52	118/72	72	Normal	Fit
114	20	HIMANSU SEKHAR KHATUA	M	39	O+	Safety Officer	76/178	24.59	142/74	92	Normal	Fit
115	01	DEBABRATA BARIK	M	25	O+	Engineer	58/175	18.94	132/86	85	Normal	Fit
116	21	PRAMOD KUMAR BHUE	M	24	AB+	Store Keeper	62/167	22.30	114/90	86	Normal	Fit
117	22	SUSHIL GUPTA	M	22	A+	Rigger	50/162	19.08	96/60	80	Normal	Fit

DATE : 12/11/2019

CONTRACTOR : SENCO INDIA PROJECTS PVT. LTD

118		HEMANTA PRADHAN	M	46	B+	Store Keeper	50/161	19.20	114/64	76	Normal	Fit
119		AMAN HALDAR	M	57	B+	Supervisor	51/165	18.70	120/80	76	Normal	Fit
120		SARBESWAR BARIK	M	42	A+	Supervisor	60/162	22.80	112/62	76	Normal	Fit
121		RANJIT NANDU	M	30	B+	Driver	36/154	14.70	120/80	76	Normal	Fit
122		DILIP DAS	M	58	A+	Supervisor	100/164	37.10	162/98	88	Normal	UNFIT
123		AMIT MAL	M	34	A+	Supervisor	76/172	25.60	128/88	76	Normal	Fit
124		BINAY RAY	M	51	B+	Supervisor	70/173	23.30	150/80	86	Normal	Fit
125		SUNADHAR SAHOO	M	55	A+	Safety Supervisor	60/165	22.00	168/88	78	Normal	UNFIT
126		SANKAR DALAI	M	45	B+	Electrician	48/161	18.50	110/60	76	Normal	Fit
127		SHAMIM AKHTAR	M	20	A+	Dozer Operator	54/163	20.30	110/60	76	Normal	Fit
128		NARAYAN DAS	M	22	O+	Helper	52/161	20.00	120/80	72	Normal	Fit
129		PARMANANDA MONDAL	M	40	B-	Carpenter	67/166	24.30	160/90	86	Normal	UNFIT
130		SAPAN DAS	M	32	B+	Helper	45/162	17.10	114/64	76	Normal	Fit
131		AKSHAY DALAI	M	22	B+	Helper	55/164	18.50	126/86	80	Normal	Fit
132		BABLU RAY	M	35	B+	Helper	57/159	22.50	116/66	72	Normal	Fit
133		SUSANTA GIRI	M	48	O+	Helper	37/152	16.00	124/84	76	Normal	Fit
134		TAPAN KUMAR MAJI	M	31	O+	Fitter	48/159	19.90	124/84	76	Normal	Fit
135		LALU ROY	M	27	B+	Fitter	42/152	18.10	120/80	76	Normal	Fit
136		SUBHANKAR MUGRAI	M	38	B+	Fitter	44/163	16.50	104/64	76	Normal	Fit
137		TAPAN DHARA	M	38	B+	Carpenter	45/155	17.80	130/84	76	Normal	Fit
138		RAJU ROY	M	28	O+	Fitter	43/150	19.10	130/80	76	Normal	UNFIT
139		PABAN MONDAL	M	33	A+	Helper	49/160	19.10	120/80	76	Normal	Fit
140		SRIPUT	M	28	AB+	Helper	53/160	20.00	130/80	76	Normal	Fit
141		ATTAL BISWAS	M	45	O+	Cook	44/159	17.40	130/80	76	Normal	Fit
142		KRISHNA MONDAL	M	30	O+	Helper	51/158	20.40	108/73	87	Normal	Fit
143		ANANT RAJBANSHI	M	22	O+	Helper	53/162	20.10	110/60	76	Normal	Fit

ANNEXURE : XXII Contd..

SL. NO	E.CODE	NAME	SEX	AGE	BLOOD GROUP	DESIGNATION	WEIGHT/ HEIGHT	BMI	BLOOD PRESSURE	PULSE (Min)	VISSON	RESULT
144		UJJAL MONDAL	M	22	AB+	Helper	50/158	20.00	130/80	76	Normal	Fit
145		SIYARED SHEIKH	M	37	A+	Mason	58/160	22.60	120/80	76	Normal	UNFIT
146		JEEVAN MONDAL	M	33	B+	Carpenter	46/168	16.20	120/80	76	Normal	Fit
147		MEYARED HAQUE	M	33	O-	Helper	48/157	19.40	116/66	76	Normal	Fit
148		SURYA MUYRAI	M	34	B+	Helper	52/159	20.50	110/60	76	Normal	Fit
149		ATTIUR RAHMAN	M	19	A+	Helper	45/162	17.10	120/80	78	Normal	Fit
150		LAKHIKANT KHAN	M	29	A+	Helper	60/170	20.70	130/80	76	Normal	Fit
151		AKTARUL SK	M	25	O+	Supervisor	60/178	18.90	100/60	80	Normal	Fit
152		DIBYENDRA SAMANTA	M	40		Project Manager	78/180	24.00	120/80	76	Normal	Fit
153		BHOLANATH BANERJEE	M	28	B+	Driver	82/167	17	130/80	76	Normal	Fit
154		MANOJ RAJBANSI	M	25	A+	Helper	54/161	20.8	116/66	76	Normal	Fit
155		MILAN SHIKH	M	19	O+	Massion	51/175	16.6	110/60	80	Normal	Fit
156		FITU SHAIKH	M	40	O+	Massion	41/158	16.4	118/68	76	Normal	Fit
157		MATAKABAR SHAIKH	M	19	B+	Helper	47/159	18.5	110/60	76	Normal	UNFIT
158		SAPAN PARIYA	M	50	A+	Electrician	53/159	20.9	130/80	76	Normal	Fit
159		RAHMOTULLA	M	20	AB+	Helper	44/158	17.6	104/64	72	Normal	Fit
160		SURAJ RAJBANSHI	M	18	AB+	Helper	41/156	16.8	140/80	82	Normal	Fit
161		TASBAL SHAIKH	M	20	B+	Helper	45/167	16.1	118/68	86	Normal	Fit
162		NAYAN RAJBANSHI	M	19	A+	Helper	52/169	18.2	120/80	88	Normal	Fit
163		BHATAN RAJBANSHI	M	25	O+	Helper	48/156	19.7	124/84	86	Normal	Fit
164		MINARUL SHAIKH	M	35	B+	Helper	53/156	21.70	110/60	84	Normal	Fit
165		RAKIBUL Sk (1)	M	22	A+	Helper	47/159	18.5	126/84	82	Normal	Fit
166		REHAMAT Sk	M	24	B+	Helper	43/156	17.6	120/80	86	Normal	Fit
167		RAKIBUL Sk (2)	M	23	B+	Helper	49/155	20.3	120/80	76	Normal	Fit
168		SISIR KUMAR SAHU	M	44	A+	Saltipar	64/164	23.7	120/80	78	Normal	Fit
169		RANJIT BARMAN	M	35	A+	Fitter	69/168	25.6	130/80	78	Normal	Fit
170		SASANKA PATRA	M	52	B-	Fitter	42/160	16.2	120/80	76	Normal	Fit
171		SUBRAT DUTTA	M	27	O+	Supervisor	70/172	23.6	120/80	76	Normal	Fit
172		NIMAIN KAUILA	M	35	AB+	Carpenter	65/164	24.1	120/80	76	Normal	Fit
173		BALARAM DINA	M	47	AB+	Supervisor	55/165	23.6	120/80	76	Normal	Fit
174		RABINDRANATH MAITY	M	45	AB+	Helper	60/162	23.1	120/80	76	Normal	Fit
175		SRIKANTA BERA	M	50	O+	Fitter	47/167	16.8	120/80	76	Normal	Fit
176		GOUTAM GUCHHAIT	M	27	O+	Carpenter	61/172	20.6	126/86	76	Normal	Fit
177		MANAS DAS	M	30	O+	Supervisor	64/164	23.7	112/86	78	Normal	Fit
178		JUGALA BEHERA	M	26	B+	JCB Operator	60/163	22.5	120/80	78	Normal	Fit
179		GOBINDA MAJI	M	36	B+	Fitter	44/184	16.3	106/66	74	Normal	Fit
180		RAMESWAR DINDA	M	44	B+	Cook	43/148	19.6	120/80	76	Normal	Fit
181		MADASER Sk	M	19	A+	Helper	48/161	16.5	120/80	76	Normal	Fit
182		AMIT JETHI	M	38	B+	Safety Officer	81/176	24.1	140/80	76	Normal	Fit
183		SADANANDA NAYAK	M	37	B+	Supervisor	75/168	27.9	130/80	84	Normal	Fit
184		UTTAM SAMANTA	M	18	B+	Helper	43/165	15	110/60	78	Normal	Fit
185		GRIDHARI DIXIT	M	21	O+	Helper	42/165	15.4	120/80	86	Normal	Fit
186		MEHERUL Sk	M	18	A+	Helper	44/161	16.9	110/60	76	Normal	Fit
187		JAYADEV DAS	M	39	O+	Work Assistant	59/159	23.3	120/80	76	Normal	Fit
188		KHUDIRAM SOREN	M	19	B+	Driver	53/162	20.1	128/88	86	Normal	Fit
189		ALARIGIN Sk	M	19	B+	Helper	48/163	18.0	110/60	78	Normal	Fit
190		UJJWAL GHOSH	M	25	O+	Engineer	65/183	19.4	126/86	86	Normal	Fit
191		SOUMITRA JENA	M	25	A+	Engineer	66/162	25.1	130/84	86	Normal	Fit
192		SANTANU NATH	M	21	B+	Engineer	85/176	27.4	116/66	88	Normal	Fit
193		PRADIP KHATRI	M	26	B+	Engineer	48/156	19.7	140/84	72	Normal	Fit
194		Sk HASIBUL HAQUE	M	35	A+	Sr. Surveyor	89/170	30.7	130/80	76	Normal	Fit
195		SOMAI HANSDA	M	19	AB+	Helper	51/161	19.6	130/84	76	Normal	Fit
196		SUBHADIP GUHATHA KURTA	M	27	B+	Sr. Engineer	70/182	21.1	124/84	90	Normal	Fit
197		ARNAB SAHU	M	25	B+	Engineer	71/178	22.4	140/80	76	Normal	Fit
198		GANESH BERA	M	45	O+	Helper	53/167	19.0	126/84	84	Normal	Fit
199		BAPPA BARIK	M	28	O+	Fitter	60/172	20.2	120/80	76	Normal	Fit
200		SUJIT MAL	M	28	A+	Carpenter	55/166	19.5	120/80	76	Normal	Fit
201		ABDUL KADIR	M	30	A+	Mason	45/158	18.0	110/60	88	Normal	Fit
202		SAMAR MONDAL	M	34	A+	Pump Operator	60/164	22.3	110/60	76	Normal	Fit
203		ANDAN Sk	M	21	AB+	Mason	46/159	18.1	130/80	86	Normal	Fit
204		JALLU SHAIKH	M	28	A+	Helper	48/164	17.8	130/80	76	Normal	Fit
205		SURIO MARADI	M	22	O+	Operator	50/160	19.5	130/80	76	Normal	Fit
206		NEFAUR Sk	M	19	O+	Rigar Helper	46/154	19.3	112/62	82	Normal	Fit
207		JHANTU DAS	M	48	AB+	Cook	57/163	21.4	114/64	76	Normal	Fit
208		MAHADEV DAS	M	54	B+	Supervisor	60/164	22.3	130/80	76	Normal	Fit
209		BIKRAM MONDAL	M	20	O+	Carpenter	59/163	22.2	124/84	78	Normal	Fit
210		SAMAR RAVI DAS	M	24	B+	Carpenter	58/163	21.8	130/80	76	Normal	Fit
211		NAGARI CHANDRA BISWAL	M	57	B+	Fitter	49/167	17.5	124/84	78	Normal	UNFIT
212		DUAR NAYAK	M	40	AB+	Night Watchman	61/166	22.1	130/80	76	Normal	Fit
213		SADIN RAJBANSI	M	51	B+	Helper	51/169	17.8	130/80	76	Normal	Fit
214		MAHASEN Sk	M	24	AB+	Helper	49/169	17.1	128/88	74	Normal	Fit

ANNEXURE : XXII Contd..

SL. NO	E.CODE	NAME	SEX	AGE	BLOOD GROUP	DESIGNATION	WEIGHT/ HEIGHT	BMI	BLOOD PRESSURE	PULSE (Min)	VISSON	RESULT
DATE : 12/11/2019												
CONTRACTOR : SARAT SHRADHA INFRASTRUCTURE P												
215		MANOJ KUMAR NAIK	M	25	B+	Schwing Operator	80/166	29.0	112/62	78	Normal	Fit
216		BIVISHAN TIRIA	M	23	O+	Driver	74/163	27.8	126/86	88	Normal	Fit
217		PASANT BHARA	M	36	A+	Driver	86/175	28.0	130/84	82	Normal	Fit
218		NETRANANDA POE	M	21	B+	PC Helper	55/174	18.1	106/66	72	Normal	Fit
219		CHANDAN SAHOO	M	30	O+	Supervisor	71/174	23.4	118/68	86	Normal	Fit
220		ATMOJ SETHY	M	34	B+	Supervisor	58/168	20.5	130/80	76	Normal	Fit
221		LALIT BEHERA	M	50	A+	Roller Operator	66/169	23.1	134/84	74	Normal	Fit
222		ARJUN NAIK	M	23	A+	Operator	61/166	22.1	134/84	86	Normal	Fit
223		SAGARJIT MAJHI	M	23	B+	Operator	69/164	25.6	124/84	76	Normal	Fit
224		SURAJ KUMAR BARAL	M	27	B+	Engineer	65/169	22.7	120/80	88	Normal	Fit
225		ADHIKARI TIRIA	M	23	B+	Driver	55/162	20.9	126/80	82	Normal	Fit
226		SHATENDU NAYAK	M	50	O+	Supervisor	58/170	20.0	116/66	76	Normal	Fit
227		TIPUN BEHERA	M	22	O+	Operator	66/171	22.5	124/84	78	Normal	Fit
DATE : 12/11/2019												
CONTRACTOR : RAJ CONSTRUCTION												
228		BUDHIRAM PURTI (A)	M	40	O+	Fitter	61/160	23.8	130/80	84	Normal	Fit
229		HRUDANANDA PRADHAN	M	28	O+	Carpenter Helper	58/162	22.1	130/80	76	Normal	Fit
230		PRASANNA PRADHAN	M	44	A+	Carpenter	54/157	21.9	200/130	110	Normal	**UNFIT**
231		SANATAN BEHERA	M	38	O+	Carpenter	61/171	20.8	114/64	78	Normal	Fit
232		GAYA ANGARI	M	20	O+	Wire Binder	50/157	20.2	130/80	76	Normal	Fit
233		LAXMIDHAR MUNDA	M	20	A+	Wire Binder	56/175	18.2	124/84	76	Normal	Fit
234		DAMODAR PURTY	M	32	B+	Bar Binder	57/156	23.4	124/84	76	Normal	Fit
235		RAJESH PURTI	M	40	A+	Wire Binder	41/150	18.2	114/64	76	Normal	Fit
236		SAMA ANGARI	M	28	A+	Helper	41/157	16.6	112/62	84	Normal	Fit
237		BUDHIRAM PURTI (B)	M	27	B+	Wire Binder	60/162	22.5	112/62	86	Normal	Fit
238		JITENDRA MUNDA	M	22	O+	Wire Binder	51/162	19.4	110/60	76	Normal	Fit
239		SANTOSH MUNDA	M	40	B+	Helper	46/158	18.4	130/84	92	Normal	Fit
240		RAJESH MUNDA	M	19	B+	Helper	55/161	21.2	130/180	76	Normal	Fit
241		SMRUTI RANJAN SAHOO	M	20	O+	Safety Incharge	53/167	19.0	110/60	78	Normal	Fit
242		MANOJ BEHERA	M	25	B+	Carpenter	63/160	24.6	114/64	76	Normal	Fit
243		RABINDRA MUNDA	M	24	O+	Wire Binder	56/163	21.0	120/80	76	Normal	Fit
DATE : 12/11/2019												
CONTRACTOR : MECH-CON												
244		SRIDHAR BEHERA	M	38	O+	PAINTER	48/167	17.2	124/84	84	Normal	Fit
245		PRAHALLAD BEHERA	M	40	B+	HELPER	65/165	23.8	130/80	84	Normal	Fit
246		DOLAGOBINDA NAYAK	M	39	B+	GRINDER	63/165	23.1	114/64	78	Normal	Fit
247		MITU SAMAL	M	44	B+	RIGGER	65/158	26.0	170/110	90	Normal	**UNFIT**
248		PINU SAHOO	M	23	A+	AUTO OPERATOR	64/175	20.8	130/80	78	Normal	Fit
249		MANMATH BEHERA	M	40	B+	PAINTER	73/172	24.6	124/84	76	Normal	Fit
250		KUNNU MUDULI	M	25	B+	WELDER	53/173	17.3	110/60	76	Normal	Fit
251		BICHITRA SAMAL	M	30	B+	HELPER	43/154	18.1	112/62	78	Normal	Fit
252		AJIT KUMAR BEHERA	M	38	O+	ELECTRICIAN	69/173	22.5	120/84	76	Normal	Fit
DATE : 12/11/2019												
CONTRACTOR : SHIVA ENGINEERING												
253		BIKRAM KUMAR PRADHAN	M	39	O+	Mechanic	85/174	28.0	124/84	76	Normal	Fit
DATE : 13/11/2019												
CONTRACTOR : NEM ENGINEERING PROJECT PVT. LTD												
254		AJAYA KUMAR SAHU	M	32	B+	Operator	75/164	27.9	128/80	78	Normal	Fit
255		KUTARTH BEHERA	M	42	B+	Supervisor	65/161	25.5	120/60	76	Normal	**UNFIT**
256		ASHOK KUMAR MISHRA	M	56	O+	Labour	54/164	20.0	120/80	78	Normal	**UNFIT**
257		NIMAI BOITA	M	20	A+	Helper	45/156	18.4	116/66	76	Normal	Fit
258		ANOOSH KUMAR	M	41	B+	Manager	83/170	28.7	140/80	86	Normal	Fit
259		SHREE HARI DIGAL KUMAR ROUT	M	23	B+	Store Keeper	65/162	24.7	110/80	76	Normal	Fit
260		PRAKASHNAIK	M	26	B+	Helper	56/165	20.5	140/90	86	Normal	Fit
261		PANCHANAN BEHERA	M	53	A+	Helper	45/160	17.5	114/64	84	Normal	Fit
262		ALOK NAIK	M	23	A+	Electrical Helper	73/172	24.6	124/84	78	Normal	Fit
263		TARANISEN SAHOO	M	40	B-	Survey Helper	53/172	17.9	110/60	84	Normal	Fit
264	70463	MANAS BAIRI	M	35	O+	Sr. Surveyor	93/166	23.7	140/80	80	Normal	**UNFIT**
265		ABHIRAM SAHOO	M	31	A+	Supervisor	78/175	25.4	114/64	60	Normal	Fit
266		SUBRAT BEHERA	M	19	B+	Helper	53/165	19.4	114/64	76	Normal	Fit
267		PRAMOD KUMAR BOITA	M	30	O+	Carpenter	50/175	20.2	106/66	78	Normal	Fit
268		BENUDHAR NAIK	M	30	O+	Helper	40/162	15.2	110/60	76	Normal	Fit
269		ANANDA KUMAR GOPE	M	32	B+	Carpenter	51/160	19.9	130/80	78	Normal	Fit
270		RAMESH GOPE	M	33	A+	Carpenter	49/169	17.1	130/84	76	Normal	Fit
271		OPIN GOPE	M	22	B+	Helper	48/159	18.9	130/84	76	Normal	Fit
272		ASHOK GOPE	M	19	AB+	Helper	44/153	18.7	120/80	76	Normal	Fit
273		DEBSENAPATI MONDAL	M	40	O+	Survey	78/180	24.0	140/80	86	Normal	Fit
274		ARTATRANA SAHOO	M	47	B+	Helper	58/171	19.8	130/80	78	Normal	Fit
275		RANJAN KUMAR SAHOO	M	33	O+	Supervisor	83/164	30.8	130/80	78	Normal	Fit
276		TRINATH KUMAR BHUYA	M	30	B+	Foreman	78/172	26.3	126/86	68	Normal	Fit
277		SUDARSHAN BAITA	M	29	O+	Carpenter	54/167	19.3	134/84	76	Normal	Fit
278		HEMANTA NAIK	M	31	O+	Helper	63/167	22.5	110/60	76	Normal	Fit
279		NARENDRA BAITA	M	20	O+	Helper	48/160	18.7	122/62	78	Normal	Fit

ANNEXURE : XXII Contd..

SL. NO	E.CODE	NAME	SEX	AGE	BLOOD GROUP	DESIGNATION	WEIGHT/ HEIGHT	BMI	BLOOD PRESSURE	PULSE (Min)	VISSON	RESULT
280		RAJESH SAHOO	M	21	A+	Helper	58/174	19.1	114/64	78	Normal	Fit
281		SAGAR HEMBRAM	M	20	O+	Helper	45/160	17.5	130/80	84	Normal	Fit
282		SUBASH BEHERA	M	48	B+	Helper	40/157	16.2	130/80	90	Normal	Fit
283		DAMU NAIK	M	29	O+	Helper	46/161	17.7	120/80	76	Normal	Fit
284		TRILOCHAN PATRA	M	39	O+	Helper	60/167	21.5	112/62	76	Normal	Fit
285		BIRSINGH SAMAD	M	24	O+	Helper	50/160	19.5	128/88	74	Normal	Fit
286		PABITRA NAIK	M	40	A+	Helper	64/169	22.4	130/80	92	Normal	Fit
287		ANANT BISWAL	M	52	A+	Helper	49/158	19.6	130/80	78	Normal	Fit
288		KRISHNA GOPE	M	25	A+	Carpenter	46/164	17.8	110/60	76	Normal	Fit
289		BINOD GOPE	M	25	AB+	Carpenter	49/163	18.4	110/60	78	Normal	Fit
290		ROHITA ROUT	M	40	AB+	Helper	66/157	26.7	114/64	76	Normal	Fit
291		BIRSINGH BIRUA	M	33	A+	Carpenter	36/151	15.7	116/68	90	Normal	Fit
292		SARAT NAIK	M	47	A+	Helper	57/163	21.4	112/62	88	Normal	Fit
293		NABAGHANA SAHU	M	43	O+	Helper	35/153	14.9	120/80	76	Normal	Fit
294		TUNA BASHA	M	32	B+	Foreman	70/167	25.6	114/64	76	Normal	Fit
295		NIRAKAR NAIK	M	40	O+	Rod Fitter	51/161	19.6	120/80	78	Normal	Fit
296		ABHIMANYU NAIK	M	30	AB+	Helper	45/158	18.0	120/80	76	Normal	Fit
297		MANORANJAN SAHU	M	21	B+	Helper	44/166	15.9	130/84	76	Normal	Fit
298		MINAKETAN DAS	M	41	A+	Helper	48/166	17.4	128/78	72	Normal	Fit
299		SUDHAKAR SENAPATI	M	55	B+	Carpenter	64/158	25.6	130/86	76	Normal	Fit
300		DIPAK NAIK	M	45	A+	Helper	51/156	20.9	134/84	78	Normal	Fit
301		BABULI NAIK	M	50	O+	Helper	50/162	19.0	124/84	72	Normal	Fit
302		NALU BEHERA	M	40	AB+	Helper	40/145	19.7	90/60	84	Normal	Fit
303		HIRENDA DALA BEHERA	M	35	O+	Helper	67/159	26.5	130/86	84	Normal	Fit
304		SUNIL KUMAR BISHI	M	21	B+	Helper	6+5/173	21.7	124/84	96	Normal	Fit
305		ARABINDA SAMAL	M	46	B+	Foreman	53/168	18.7	120/80	76	Normal	Fit
306		GOBINDA BOIPOI	M	22	B+	Helper	41/157	16.6	130/84	68	Normal	Fit
307		PRASANNA SAHOO	M	55	O+	Store Keeper	44/154	18.5	134/84	74	Normal	Fit
308		SAMIR SAHOO	M	40	O+	Helper	46/163	17.3	120/84	76	Normal	Fit
309		DAMU SUNDI	M	29	B+	Helper	50/163	18.8	130/80	76	Normal	Fit
310		SHANKAR MUNDA	M	38	B+	Bar Bender	49/158	19.6	114/64	88	Normal	Fit
311		MANGAL SINGH SAMAD	M	39	B+	Helper	40/159	15.8	116/66	76	Normal	Fit
312		CHINMAYANANDA ROUT	M	24	A+	Security Guard	95/179	29.6	116/66	76	Normal	Fit
313		NIRANJAN SOREN	M	31	O+	Bar Bender	71/169	24.8	130/84	76	Normal	Fit
314		UTTAM TIYU	M	22	AB+	Carpenter	46/167	16.4	130/84	84	Normal	Fit
315		VISHNU MUNDA	M	37	B+	Bar Bender	44/168	15.5	162/110	98	Normal	Fit
316		GANESH SANDIP	M	56	O+	Bar Bender	35/155	14.5	174/84	76	Normal	Fit
317		DULAL SINGH	M	30	A+	Helper	42/156	17.2	104/64	76	Normal	Fit
318		BAGUN RUGU	M	36	B+	Helper	40/150	17.7	114/64	76	Normal	Fit
319		SUDHIR SAARDAN	M	31	O+	Bar Bender	64/163	23.7	120/80	76	Normal	Fit
320		PRAKASH BLUITA	M	24	A+	Helper	42/164	15.6	110/60	76	Normal	Fit
321		SITARAM KISAN	M	20	O+	Helper	40/154	16.8	120/80	76	Normal	Fit
322		BUNJU DANGA	M	21	AB+	Helper	44/169	15.4	110/60	94	Normal	Fit
323		GANDHI HEMBRAM	M	20	B+	Helper	44/161	16.9	110/60	70	Normal	Fit
324		SIKANDAR HEMBRAM	M	24	O+	Helper	55/174	18.1	110/60	76	Normal	Fit
325		SANU HEMBRAM	M	33	B+	Helper	60/169	21.0	130/60	76	Normal	Fit
326		RAGHUNATH MAHANTA	M	38	A+	Plant Operator	58/158	20.3	134/84	82	Normal	Fit
327		DHOBEI JENA	M	48	O+	Painter	35/165	12.8	110/60	76	Normal	UNFIT
328		KHIROD NAIK	M	48	B+	Helper	55/162	20.9	130/80	76	Normal	Fit
329		DILLIP KUMAR MOHANTA	M	48	B+	Hyva Operator	62/164	23.0	170/80	76	Normal	UNFIT
330		TRIBHUBAN MOHANTA	M	24	A+	Milar Driver	58/161	22.3	124/84	76	Normal	Fit
331		BIRSINGH DANGA	M	24	A+	Helper	45/160	17.5	130/84	80	Normal	Fit
332		CHANDRAI MARANDI	M	19	O+	Helper	44/173	14.7	118/68	74	Normal	UNFIT
333		DUDARANI MAJHI	M	35	O+	Helper	61/172	20.6	104/64	76	Normal	Fit
334		BUDHRAM HEMBRAM	M	58	B+	Helper	55/164	20.6	110/60	76	Normal	UNFIT
335		DHARANIDHAR SAHOO	M	55	A+	Helper	52/157	21.0	138/84	70	Normal	Fit
336		PRAFULLA MAJHI	M	35	B+	Helper	55/161	21.2	112/62	84	Normal	Fit
337		ARENDRA DALA BEHERA	M	30	O+	Helper	52/156	21.3	118/68	76	Normal	Fit
338		RAJU JENKO	M	23	A+	Helper	57/166	20.6	112/60	76	Normal	UNFIT
339		RAJESH SUREN	M	23	AB+	Khalasi	53/161	21.4	114/64	80	Normal	Fit
340		SADHU SINGH	M	23	B+	Helper	44/161	16.9	120/80	76	Normal	Fit
341		SOMAYA MURMU	M	24	A+	Carpenter	47/157	19.0	112/62	78	Normal	Fit
342		INDRAJEET MURMU	M	25	A+	Helper	53/162	20.1	124/84	76	Normal	Fit
343		DULUMU SINKU	M	19	O+	Carpenter	42/150	18.6	114/64	76	Normal	Fit
344		NIMAI TUDU	M	25	A+	Carpenter	64/166	23.2	126/86	84	Normal	Fit
345		TILWAR SANDAR	M	33	B-	Carpenter	60/172	20.2	124/84	78	Normal	Fit
346		KTNTARU LOHARA	M	50	AB+	Helper	40/150	17.7	134/84	76	Normal	Fit
347		SUSHIL NAIK	M	21	AB+	Helper	65/166	22.8	122/76	80	Normal	Fit
348		BABULU SAHOO	M	34	O+	Khalasi	40/164	14.8	104/64	86	Normal	UNFIT
349		SUSHANTA BEHERA	M	48	A+	Helper	57/165	20.9	116/66	78	Normal	Fit
350		DEETOR HEMBRAM	M	58	O+	Helper	40/169	14.0	118/76	72	Normal	Fit
351		PARIKSHIT DAS	M	43	O+	Mason	48/158	19.2	130/80	76	Normal	Fit
352		SRIRAM HO	M	20	A+	Helper	46/159	18.9	110/60	90	Normal	Fit
353		SANJAY KUMAR DHIR	M	30	O+	Carpenter	47/165	17.2	120/80	78	Normal	Fit
354		ARNAB SENAPATI	M	48	B+	Painter	58/169	20.3	110/60	76	Normal	Fit

ANNEXURE : XXII Contd..

SL. NO	E.CODE	NAME	SEX	AGE	BLOOD GROUP	DESIGNATION	WEIGHT/ HEIGHT	BMI	BLOOD PRESSURE	PULSE (Min)	VISSON	RESULT
355		SARBESWAR NAIK	M	42	A+	Helper	53/169	18.5	130/80	78	Normal	UNFIT
356		BASANTA SENAPATI	M	45	B+	Painter	45/175	14.6	138/88	78	Normal	UNFIT
357		PRADIP KUMAR SARDAR	M	34	A+	Foreman	60/167	21.5	180/90	86	Normal	UNFIT
358		KARU HEMBRAM	M	19	O+	Helper	41/169	14.3	112/64	76	Normal	UNFIT
359		ACHARYA PRADHAN	M	36	O+	Tractor Driver	70/178	22.0	118/68	76	Normal	Fit
360		SANTOSH KUMAR NAYAK	M	38	B+	Store Ex	60/159	23.7	110/60	84	Normal	Fit
361		RAHUL BASURI	M	27	A+	Engineer	65/174	21.4	140/84	76	Normal	Fit
362		RITESH KUMAR	M	25	B+	Accountant	67/175	21.8	114/64	76	Normal	Fit
363		LAMBODAR MAHANTA	M	36	AB+	Security Supervisor	80/180	24.6	124/84	76	Normal	Fit
364		PRAKASH CHANDRA SAHU	M	30	O+	Office Helper	42/162	16.0	104/64	76	Normal	Fit
365		PARTHA SARATHI DHIR	M	32	O+	Cook	73/170	25.2	110/60	76	Normal	Fit
366		DHARMENDRA KUMAR RAI	M	29	B+	Plant Operator	62/174	20.4	126/86	84	Normal	Fit
367		BISWANATH BEHRA	M	40	O+	Helper	49/164	18.2	140/80	76	Normal	Fit
368		UPENDRA NATH PATRA	M	52	O+	Supervisor	77/160	30.0	164/84	84	Normal	UNFIT
369		BABULI PRADHAN	M	31	A+	Lader Operator	60/160	23.4	130/84	76	Normal	Fit
370		DHARANI SAHU	M	44	O+	Supervisor	60/165	22.0	140/84	76	Normal	Fit
371		JAGA SINGH	M	26	B+	Mson	41/159	16.2	110/60	76	Normal	Fit
372		LAGALA PALEYA	M	23	O+	Helper	47/165	17.2	140/80	84	Normal	Fit
373		GOBINDA SANDAR	M	20	O+	Helper	51/170	17.6	112/62	76	Normal	Fit
374		AMBARA SAMAD	M	19	A+	Helper	38/159	15.0	120/60	76	Normal	UNFIT
375		TERI SAMAD	M	24	B+	Helper	56/168	19.8	114/64	76	Normal	Fit
376		RAJENDRA MUNDA	M	47	O+	Foreman	44/162	16.7	136/86	78	Normal	Fit
377		RAJESH HANSADA	M	26	AB+	Helper	58/161	22.3	120/80	84	Normal	Fit
378		DASMANT MURMU		35	B+	Bar Bender	66/163	24.8	124/84	76	Normal	Fit

DATE : 13/11/2019

CONTRACTOR : MECH-CON

379		NILAMANI SAMAL	M	34	O+	Fitter	51/165	18.7	110/60	76	Normal	Fit
380		SUMANTA HATI	M	36	O+	Grinder	71/160	27.7	180/110	76	Normal	UNFIT
381		RAGHUNATH HEMBRAM	M	28	AB+	Fitter	52/161	20.0	130/80	76	Normal	Fit
382		JAGABANDHU SAHOO	M	49	B+	Arch Welder	45/154	18.9	120/80	86	Normal	Fit
383		BUDDHESWAR HEMBRAM	M	24	B+	Rigger	53/165	19.4	130/80	76	Normal	Fit
384		SUBHAM SENAPATI	M	18	AB+	Helper	38/165	13.9	118/68	76	Normal	UNFIT
385		PRASHANT KUMAR BEHERA	M	24	O+	Helper	43/163	17.3	116/66	78	Normal	Fit
386		KABI BEHERA	M	46	O+	Supervisor	67/164	24.9	110/60	74	Normal	Fit
387		RAVI SAHOO	M	40	B+	Khalasi	50/166	18.1	110/60	72	Normal	Fit
388		SUNDAR HEMBRAM	M	44	B+	M. Welder	42/162	16.6	144/84	84	Normal	Fit
389		DURGA SOREN	M	19	AB+	Khalasi	54/170	18.6	126/86	86	Normal	Fit
390		GOLEKH PRADHAN	M	50	AB+	Painter	50/154	21.0	126/86	90	Normal	Fit
391		DURGA CHARAN HEMBRAM	M	35	B+	Supervisor	86/166	30.4	124/84	78	Normal	Fit
392		SURYA KANTA SAHU	M	30	B+	Rigger	76/166	27.5	124/84	82	Normal	Fit
393		PRAHALLAD BEHERA	M	38	O+	Helper	40/163	15.0	130/84	78	Normal	Fit
394		TIKU MOHAPATRA	M	25	A+	Helper	51/172	17.2	110/62	76	Normal	Fit
395		BAPI BEHERA	M	27	B+	T. Welder	43/173	14.3	116/66	78	Normal	UNFIT
396		SAMIR BEHERA	M	24	B+	A. Fitter	47/170	16.2	114/64	76	Normal	Fit
397		RABINDRA SAMAL	M	33	A+	Helper	57/158	22.8	114/64	78	Normal	Fit
398		NIRANJAN BEHERA	M	22	O+	Welder	60/159	23.7	120/80	74	Normal	Fit
399		DIBANABDHU SAHU	M	51	A+	Gas Cutter	65/163	24.4	130/80	76	Normal	Fit
400		RAJ KISHORE SAMAL	M	21	O+	Fitter	46/160	17.9	100/60	76	Normal	Fit
401		DHARMA NAIK	M	22	B+	Asst. Fitter	58/172	19.6	146/86	84	Normal	Fit
402		NIRAKAR MOHARANA	M	27	O+	Gas Cutter	60/156	24.6	114/64	76	Normal	Fit
403		MILAN BHATTA	M	21	O+	Welder	52/169	18.2	106/66	96	Normal	Fit
404		AKBAR ANSARI	M	40	O+	Welder	54/157	25.9	120/80	76	Normal	Fit
405		SRIRAM DEWARI	M	43	O+	Gas Cutter	70/163	26.3	110/60	78	Normal	Fit
406		MALAYA RANJAN BHATTA	M	18	B+	Fitter	40/163	15.0	110/60	76	Normal	Fit
407		HEMANTA BEHERA	M	53	B+	Rigger	53/171	18.1	120/80	76	Normal	Fit

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CONTRACTOR : RAJ CONSTRUCTION

408		BALMIK MUNDA	M	25		Bar Bender	46/161	17.7	110/60	76	Normal	Fit
409		LAXMAN PRUSTY	M	28		Bar Bender	41/164	15.2	124/84	76	Normal	Fit
410		KRISHNA MUNDA	M	30		Bar Bender	60/158	24.0	140/84	86	Normal	Fit
411		AJIT MUNDA	M	20		Bar Bender	45/158	18.0	130/84	76	Normal	Fit
412		KUNA MUNDA	M	22		Bar Bender	58/162	22.1	124/84	78	Normal	Fit
413		JAMAM SINGH MUNDA	M	25		Bar Bender	43/154	18.1	124/84	78	Normal	Fit
414		SANDIRA NAIK	M	19		Pump Helper	50/155	20.8	130/84	76	Normal	Fit
415		SUSHIL MUNDA	M	22		Bar Bender	49/157	19.8	126/86	76	Normal	Fit
416		BHIM CHARAN HANSADA	M	32		Pump Operator	56/153	23.9	128/70	86	Normal	Fit
417		JAMDAR AGARIA	M	29		Helper	45/162	17.3	140/80	76	Normal	Fit
418		BIRSINGH DEBANGAN	M	47		Bar Bender	60/163	22.5	140/84	74	Normal	Fit
419		JIVENDRA YADAV	M	30		Electrical Fitter	50/160	19.5	112/62	76	Normal	Fit
420		PABAN KUMAR	M	24		Helper	41/159	16.2	114/64	78	Normal	Fit
421		RAISAN DIGI	M	26		Bar Bender	48/167	17.2	120/80	78	Normal	Fit
422		JAMESWAR MUNDA	M	30		Bar Bender	40/155	16.6	116/66	84	Normal	Fit
423		PALAK NAIK	M	22		Concret	58/160	22.6	124/84	76	Normal	Fit
424		RUBEN BAGE	M	37		Bar Bender	69/162	26.2	110/60	76	Normal	Fit

ANNEXURE : XXII Contd..

SL. NO	E.CODE	NAME	SEX	AGE	BLOOD GROUP	DESIGNATION	WEIGHT/ HEIGHT	BMI	BLOOD PRESSURE	PULSE (Min)	VISSON	RESULT
DATE : 13/11/2019												
CONTRACTOR : DEBABRATA BHATTA												
425		RASHMI RANJAN ROUT	M	23	O+	ELECTRICIAN	55/166	19.9	110/60	76	Normal	Fit
426		SUSHIL NAIK	M	22	O+	ELECTRICIAN	51/162	19.4	120/80	76	Normal	Fit
427		KIRTI RANJAN DASH	M	32	O+	ELECTRICIAN	55/171	18.8	116/66	64	Normal	Fit
428		RAMESH CHANDRA SAHU	M	36	O+	ELECTRICIAN	84/164	31.2	124/84	96	Normal	Fit
429		DUSMANTA KUMAR BEHERA	M	46	O+	ELECTRICIAN	60/159	23.7	144/84	76	Normal	Fit
430		KANHA PRADHAN	M	19	O+	HELPER	70/178	22.0	114/64	76	Normal	Fit
431		RAJAT NAIK	M	19	O+	HELPER	45/164	16.7	116/60	78	Normal	Fit
432		GAGAN BIHARI NAIK	M	36	O+	FITTER & ELECTRIC	60/173	20.0	120/80	78	Normal	Fit
433		AMIYA GOCHHAYAT	M	31	A+	SWEEPER	50/162	19.0	126/76	80	Normal	Fit
434		BIRASH GOCHHAYAT	M	29	O+	SWEEPER	58/168	20.5	130/80	76	Normal	Fit
DATE : 13/11/2019												
CONTRACTOR : SUMAN												
435		RAJESH SAMAL	M	28		CARPENTER	56/165	20.5	120/80	76	Normal	Fit
DATE : 14/11/2019												
CONTRACTOR : RAJ CONSTRUCTION												
436		BAHADULA PINGUA	M	48	O+	Bar Bender	40/156	16.4	130/84	78	Normal	Fit
437		SUMIT MUNDA	M	31	B+	Bar Bender	50/153	25.1	114/64	70	Normal	Fit
438		SAIRAM TIRIA	M	19	A+	Bar Bender	52/162	19.8	134/84	78	Normal	Fit
439		SIBA MUNDA	M	19	AB+	Bar Bender	43/156	17.6	124/84	78	Normal	Fit
440		TARUN NAIK	M	27	O+	Carpainter	40/156	16.4	114/64	78	Normal	Fit
441		BAGUN ANGARIA	M	24	B+	Bar Bender	48/156	19.7	116/66	76	Normal	Fit
442		SUMIT PANDEY	M	50	B+	Carpainter	56/161	21.6	140/84	78	Normal	Fit
443		AKBAR ANSARI	M	26	A+	Carpainter	78/166	28.3	120/80	776	Normal	Fit
444		KANHAI ROY	M	52	A+	Carpainter	43/148	19.6	114/64	78	Normal	Fit
445		HIRA MUNDAL	M	19	B+	Carpainter	42/163	15.8	120/80	76	Normal	Fit
446		ARUN NAIK	M	28	O+	Carpainter	40/154	16.8	114/64	88	Normal	Fit
447		LAL MOHAN MONDAL	M	22	O+	Carpainter	47/165	17.2	130/84	86	Normal	Fit
448		RAJESH MONDAL	M	21	O-	Carpainter	75/170	25.9	130/84	76	Normal	Fit
449		CHINIBAS SAHIS	M	49	O+	Carpainter	45/162	17.1	110/60	76	Normal	Fit
450		ANIL	M	19	B+	Mason	46/152	19.9	124/64	76	Normal	Fit
451		BHARAT	M	19	O+	Mason	45/158	18.0	130/80	76	Normal	Fit
452		TAJ ANSARI	M	19	A+	Carpainter	54/170	18.60	104/64	76	Normal	Fit
453		BISHNU MONDAL	M	19	O+	Helper	36/160	14.00	110/60	84	Normal	UNFIT
454		BIMDABAN RAJISWAD	M	30	B+	Helper	40/160	15.60	124/84	78	Normal	UNFIT
455		MUMIN	M	24	O+	Mason	73/168	25.80	124/84	76	Normal	Fit
456		JEAULI EK	M	30	O+	Mason	46/166	16.60	120/80	84	Normal	Fit
457		IMSAN ANSARI	M	26	A+	Helper	75/168	20.50	116/66	74	Normal	Fit
458		SATYABAD MONDAL	M	29	O+	Carpainter	40/154	16.80	100/60	74	Normal	Fit
459		ABI VISAI	M	29	B+	Carpainter	35/153	14.90	106/66	76	Normal	UNFIT
460		PINTU MONDAL	M	24	B+	Helper	60/161	23.10	126/86	76	Normal	Fit
461		PABITRA MONDAL	M	32	O+	Helper	46/155	19.10	118/68	76	Normal	Fit
462		MUJAHIDIN SEK	M	26	B+	Mason	50/161	19.20	110/60	76	Normal	Fit
463		ABHAYA MONDAL	M	19	O+	Carpainter	52/162	19.80	116/66	76	Normal	Fit
464		DEEPAK KUMAR RATHORE	M	24	B+	Operator	56/173	18.70	100/60	72	Normal	Fit
465		MANGAL CH. NAYAK	M	33	A+	Carpainter	49/151	21.70	120/80	74	Normal	Fit
466		SARBAN MONDAL	M	20	O+	Helper	60/172	20.20	124/78	94	Normal	Fit
DATE : 14/11/2019												
CONTRACTOR : NEM ENGINEERING PROJECT PVT. LTD												
467		N. SRINIVASAN	M	25	O+	Engineer	50/161	19.2	114/64	86	Normal	Fit
468		MANGULU NAIK	M	36	A+	Helper	65/173	21.7	120/80	76	Normal	Fit
469		KUNA MOHARANA	M	49	AB+	Carpenter	50/164	18.5	134/84	82	Normal	Fit
470		SANKAR BEHERA	M	45	A-	Helper	40/156	16.4	118/76	82	Normal	Fit
471		NIRANJAN MOHARANA	M	35	O+	Driver	40/160	15.6	100/60	76	Normal	UNFIT
472		SOMAN PALLAI	M	58	AB+	Engineer	76/172	25.6	140/74	76	Normal	Fit
473		ARABINDA NAIK	M	22	O+	Helper	50/162	19.0	124/84	86	Normal	Fit
474		KHIROD NAIK	M	27	O+	Helper	58/166	21.0	112/62	76	Normal	Fit
475		SURENDRA NAIK	M	55	O+	Carpenter	46/161	17.7	166/90	84	Normal	UNFIT
476		SURESH PARIDA	M	50	O+	Supervisor	49/160	19.1	102/62	76	Normal	Fit
477		MANU BEHERA	M	47	A+	Rod Fitter	53/164	19.7	150/100	96	Normal	UNFIT
478		DIPTI RANJAN JENA	M	25	O+	Carpenter	50/161	19.2	132/82	84	Normal	Fit
479		PANCHU SAMAL	M	58	A+	Helper	40/168	14.1	124/84	76	Normal	Fit
480		GANDHARBA SAMAL	M	42	A+	Helper	45/165	14.6	120/86	76	Normal	UNFIT
481		PRATAP NAIK	M	36	O+	Site Fitter	58/164	21.0	116/66	76	Normal	Fit
482		ARATA MOHARANA	M	42	B+	Helper	50/162	19.0	170/90	94	Normal	UNFIT
483		SUNIL NAIK	M	26	AB+	Supervisor	73/167	26.1	130/80	76	Normal	Fit
484		GOPABANDHU NAIK	M	27	O+	Helper	38/152	16.4	114/64	78	Normal	UNFIT
485		ASHOK KUMAR NAIK	M	36	O+	Carpenter	70/169	24.5	118/68	76	Normal	Fit
486		KISHORE SAMAL	M	36	A+	Carpenter	55/164	20.4	124/84	96	Normal	Fit
487		SANTOSH SETHY	M	26	AB+	Helper	46/160	17.9	120/80	76	Normal	Fit
488		SUSHANTA BAITHA	M	19	O+	Helper	47/162	17.9	124/84	76	Normal	Fit
489		KHILIJ KHADIRATNA	M	43	B+	Rod Fitter	53/168	18.7	124/84	86	Normal	Fit
490		DHIRA KHATUA	M	21	O+	Carpenter	40/163	15.0	130/80	76	Normal	Fit
491		MADHUSUDAN KHILAR	M	32	A+	Carpenter	65/174	21.4	134/84	78	Normal	Fit

ANNEXURE : XXII Contd..

SL. NO	E.CODE	NAME	SEX	AGE	BLOOD GROUP	DESIGNATION	WEIGHT/ HEIGHT	BMI	BLOOD PRESSURE	PULSE (Min)	VISSON	RESULT
492		SANTOSH KUMAR SAHOO	M	36	O+	Helper	55/177	17.5	120/80	76	Normal	Fit
493		CHITTARANJAN BEHERA	M	47	B+	Helper	49/169	17.1	112/62	76	Normal	Fit
494		RAJIV NAIK	M	28	A+	Helper	55/168	19.4	128/88	96	Normal	Fit
495		SAMBHU SAMAL	M	37	B+	Helper	42/162	16.0	116/66	76	Normal	Fit
496		JAGADISH NAIK	M	33	B+	Helper	38/157	15.4	116/66	76	Normal	Fit
497		SUBASH GADANAYAK	M	35	A+	Carpenter	55/165	20.2	114/64	78	Normal	UNFIT
498		SUDHAKAR NAIK	M	33	AB+	Rod Fitter	66/165	24.2	130/84	78	Normal	Fit
499		PRADIP NAIK	M	33	O+	Carpenter	60/161	23.1	132/82	96	Normal	Fit
500		LIPUN MOHARANA	M	21	A+	Helper	49/164	18.2	120/80	76	Normal	Fit
501		PRAVAT GURU	M	30	B+	Helper	45/160	17.5	120/80	74	Abnormal	UNFIT
502		ARUN KUMAR PRUSTY	M	34	B+	Safety Officer	50/166	30.1	120/80	76	Normal	Fit
503		JYOTI RAJNAN BEHERA	M	23	B+	GET	45/165	16.5	126/86	76	Normal	Fit
504		GYANA RANJAN SAHOO	M	35	O+	Engineer	62/158	24.8	126/82	86	Normal	Fit
505		HARMAN NAYAK	M	51	A+	Supervisor	64/169	22.4	126/86	76	Normal	Fit
506		ASHWINI KUMAR JENA	M	30	O+	Helper	54/161	20.8	116/66	82	Normal	Fit

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CONTRACTOR : MECH-CON

507		ISWAR BEHERA	M	20	O+	Helper	58/161	22.3	120/80	76	Normal	Fit
508		PRAVAS BEHRA	M	32	O+	Helper	58/161	22.3	130/60	84	Normal	Fit
509		ARJUN SAHU	M	48	O+	Khalasi	62/171	21.2	116/66	76	Normal	Fit
510		DILIP BEHERA	M	46	A+	Rigger	55/161	21.2	124/86	76	Normal	UNFIT
511		BASANTA KUMAR BEHERA	M	50	O+	Khalasi	40/164	14.8	116/70	72	Normal	Fit
512		MANOJ BEHERA	M	42	AB+	Khalasi	51/164	18.9	132/82	92	Normal	Fit
513		ARABINDA SAMAL	M	26	B+	Helper	54/164	20.0	130/80	76	Normal	Fit
514		JITEN SAHU	M	25	B+	Older (Welder)	74/171	25.3	120/80	78	Normal	Fit
515		SUMANTA BEHERA	M	40	O+	Helper	56/170	19.3	142/82	76	Normal	Fit
516		HIMANSU BHUSANKAR	M	30	O+	Fitter	61/169	21.3	140/84	88	Normal	UNFIT
517		SARAT KUMAR DALEI	M	26	B+	Helper	54/167	19.3	124/84	76	Normal	Fit
518		CHITTA RANJAN PRADAN	M	29	O+	Welder	56/172	18.9	110/60	76	Normal	Fit
519		SAKIR KHAN	M	20	O+	Helper	56/160	21.8	134/84	76	Normal	Fit
520		AKASH MIRZA	M	18	B+	Helper	48/165	17.6	120/80	84	Normal	Fit
521		UDASH BHUYAN	M	31	A+	Gas Cutter	45/154	18.9	114/64	76	Normal	Fit
522		CHABRU SWAIN	M	26	B+	Driller	66/156	27.1	130/80	76	Normal	Fit
523		NANDA KISHORE MONDAL	M	43	O-	Supervisor	72/166	26.1	130/80	76	Normal	UNFIT
524		SUNIL KUMAR SAHOO	M	26	B+	Mig Welder	70/169	24.5	120/80	78	Normal	Fit
525		MAHIBUL MALLICK	M	24	B+	Welder	72/165	26.4	140/84	76	Normal	Fit
526		AMULYA KUMAR NAIK	M	41	A+	Helper	55/166	19.9	120/80	76	Normal	Fit
527		DHIREN KUMAR SETHI	M	35	O+	T. Welder	81/173	27.0	140/84	76	Normal	Fit
528		JITENDRA KUMAR THAKUR	M	45	B-	Fitter	61/162	23.2	120/80	76	Normal	Fit
529		DHANANJAY RAI	M	26	A+	Gas Cutter	70/168	24.8	164/90	76	Normal	UNFIT
530		RAJA MOHANTY	M	18	B+	Helper	40/166	14.6	114/64	76	Normal	Fit
531		PRADEEP KUMAR SAHOO	M	6	B+	Rigger	60/173	20.0	112/62	76	Normal	Fit
532		HIKIM CHANDRA HASDA	M	29	A+	Gas Cutter	48/164	17.8	116/60	76	Normal	Fit
533		CHINMAYA DAS	M	21	O+	Helper	49/166	17.7	110/60	76	Normal	Fit
534		BHIMA NAG	M	31	O+	Welder	58/165	21.3	116/78	90	Normal	Fit
535		CHITTA RANJAN JENA	M	33	O+	Fitter	59/160	23.0	114/64	78	Normal	Fit
536		PRAKASH HEMBRAM	M	19	A+	Helper	43/154	18.1	114/64	80	Normal	Fit
537		SUKUR MIRZA	M	21	O+	Mig Welder	52/163	19.5	120/80	76	Normal	Fit
538		SUDARSAN BEHERA	M	34	B+	Welder	73/172	24.3	126/86	96	Normal	Fit
539		SILU BEHERA	M	20	A+	Helper	50/163	18.8	106/66	74	Normal	Fit
540		AUROBINDA SAHU	M	21	A+	Helper	70/169	24.5	130/80	76	Normal	Fit
541		SANJAY KUMAR SAHOO	M	32	AB+	Mig Welder	68/169	23.8	116/74	88	Normal	Fit
542		MITHUN BEHERA	M	20	AB+	Helper	70/173	23.3	110/60	76	Normal	Fit
543		MRAMESH SINGH	M	38	B+	Fitter	65/169	22.7	116/66	78	Normal	Fit
544		PRABHAKAR BISWAL	M	40	A+	Helper	58/162	22.1	130/80	76	Normal	Fit
545		ASHWIN DAS	M	20	A+	Helper	100/170	34.6	Not Resumed		UNFIT	Fit
546		TANKADHAR DAS	M	33	A+	T. Welder	65/163	24.4	110/60	76	UNFIT	Fit
547		JADUMANI PRADHAN	M	30	B+	Gas Cutter	50/165	18.3	124/64	76	Normal	Fit
548		GHANSHYAM KUDUDA	M	45	A+	Rigger	64/162	24.3	120/80	76	Normal	Fit
549		ANADI PRADHAN	M	42	A+	Rigger	56/170	19.3	124/84	76	Normal	Fit
550		SANJAY KUMAR MOHAPATRA	M	29	B+	Hydra Operator	69/175	22.5	130/80	76	Normal	Fit
551		ARYAN BONDA	M	35	B+	Rigger	64/164	23.7	130/80	78	Normal	Fit
552		PRAKASH BISWAL	M	48	O+	Helper	46/156	18.4	116/66	76	Normal	Fit
553		RAMANANDA PRASHAD	M	26	B+	Rigger	60/177	19.1	116/66	78	Normal	Fit
554		MUNNA BEHERA	M	42	A+	Helper	47/165	17.2	140/80	78	Normal	Fit
555		ANANTA GHOSAL	M	27	O+	Fitter	38/158	15.2	126/66	76	UNFIT	Fit
556		SAMANTA BISWAL	M	42	O+	Helper	65/162	24.7	140/80	82	Normal	Fit
557		AKHTAR KHAN	M	27	B+	Welder	54/161	20.8	138/76	88	Normal	Fit
558		MD. FIROJ	M	28	B+	Welder	60/159	23.7	114/64	76	Normal	Fit
559		KOUSHIK GIRI	M	21	B+	Mig Welder	53/168	18.7	116/66	76	Normal	Fit
560		RAMLAL SIDAR	M	33	B+	Rigger	69/175	22.5	130/80	76	Normal	Fit
561		BRAJESH SHARMA	M	29	O-	Electrician	65/168	23.0	130/80	76	Normal	Fit
562		SANJAY PAL	M	18	A+	Helper	53/157	21.5	124/84	76	Normal	Fit

ANNEXURE : XXII Contd..

SL. NO	E.CODE	NAME	SEX	AGE	BLOOD GROUP	DESIGNATION	WEIGHT/ HEIGHT	BMI	BLOOD PRESSURE	PULSE (Min)	VISSON	RESULT
DATE : 13/11/2019												
CONTRACTOR : SSS SECURITY												
563		JAGDAL BEHERA	M	21	O+	Security Guard	46/171	15.7	112/62	76	Normal	Fit
564		AILESH KUMAR	M	28	A+	Security	60/169	21.0	106/66	78		
565		PRABHAKAR ROUT	M	33	O+	Security	56/164	18.5	114/64	76		
566		RAM KISHAN YADAV	M	25	B+	Security Guard	65/162	24.7	116/66	76		
567		HEMANTA NAIK	M	47	O+	Security	50/160	19.5	140/84	84		
568		BIDYA BHUSAN BAGH	M	28	B+	Security	63/169	22.0	130/80	76		
569		BANSIDHAR SAMAL	M	39	O+	Security	73/169	25.5	130/80	76		
570		PADMANAV PRADHAN	M	47	O+	Security Guard	45/165	16.5	110/60	76		
571		MANOJ KUMAR GHADAI	M	28	O+	Security Guard	71/174	23.4	110/60	76		
572		CHHABILA SWAIN	M	21	B+	Security Guard	62/176	20.0	112/62	86		
573		ASHOK KUMAR DORA	M	46	O+	Security	56/168	19.8	140/80	76		
574		SURESH KHANDELWAL	M	43	O+	Security	54/171	18.4	126/84	78		
575		HIMANSHU BEHERA	M	29	O+	Security Guard	67/169	23.4	112/62	76		
576		DIBAKAR ROUT	M	36	O+	Security	56/169	19.6	120/80	76		
577		KANHEI MATIARI	M	44	A+	Security	60/169	21.0	110/60	76		
578		BIJAYA KUMAR SAHU	M	46	B+	Security	43/170	14.8	130/80	76		
579		SURESH CHANDRA BEHERA	M	22	AB+	Security Guard	79/177	25.2	112/62	76		
DATE : 13/11/2019												
CONTRACTOR : KARTAVYA SECURITY												
580		PRAMOD PRADHAN	M	21	O+	Security Guard	64/166	23.2	124/04	78	Normal	Fit
581		AVIMANYU DAS	M	28	A+	Security Guard	66/167	23.6	126/76	80	Normal	Fit
582		BANAMBAR BEHERA	M	33	A+	Security Guard	63/165	23.1	130/80	76	Normal	Fit
583		ANAND TIWARI	M	25	O+	Security Guard	65/166	23.5	120/80	76	Normal	Fit
584		DILLIP KUMAR BEHERA	M	47	A+	Security Guard	57/169	23.4	120/80	76	Normal	Fit
585		ARUN KUMAR NAYAK	M	28	A+	Security Guard	61/172	20.6	124/84	76	Normal	Fit
586		HARENDRA PANDEY	M	39	B+	Security	55/175	17.6	120/84	76	Normal	Fit
587		UMESH PRASAD SINGH	M	47	O+	Security	60/163	22.5	120/80	76	Normal	Fit
DATE : 14/11/2019												
CONTRACTOR : DEBABRATA BHATTA												
588		UMAKANTA SAHOO	M	41	A+	Cook	55/166	19.9	110/60	76	Normal	Fit
589		PRADIPTA SAHOO	M	21	B+	Office Boy	51/162	19.4	120/80	76	Normal	Fit
590		KULDIP NAIK	M	29	B+	Survey Helper	55/171	18.8	116/66	64	Normal	Fit
591		PRIYABRATA NAIK	M	27	A+	Survey Helper	84/164	31.2	124/84	96	Normal	Fit
592		PRASANTA NAIK	M	32	O+	Survey Helper	60/159	23.7	144/84	76	Normal	Fit
DATE : 14/11/2019												
CONTRACTOR : MECH-CON												
593		LALITA KUMAR BEHERA	M	27	B+	Welder	42/158	16.8	116/60	76	Normal	Fit
594		SRIKANTA PRADHAN	M	25	B+	Taker Welder	55/174	18.1	134/80	84	Normal	Fit
595		BINOD SAMAL	M	19	B+	Helper	40/163	15.0	130/80	76	Normal	Fit
596		PRAVAT PRADHAN	M	22	O+	Helper	40/171	13.6	104/64	76	Normal	**UNFIT**
597		ASHOK KUMAR SAMAL	M	31	O+	Gas Cutter	65/163	23.0	128/84	88	Normal	Fit
598		AJAYA KUMAR MOHANTY	M	24	B+	Tor Welder	54/170	18.6	110/60	78	Normal	Fit
599		RAJIB BISWAL	M	27	O+	Fitter	50/168	17.7	124/84	78	Normal	Fit
600		RANJIT BISWAL	M	23	O+	Helper	57/164	13.7	90/60	84	Normal	Fit
601		DANDADHAR PRADHAN	M	22	B+	Helper	37/172	23.3	144/84	81	Normal	**UNFIT**
602		PRAMOD KUMAR MAJHI	M	41	O+	Fitter	68/170	21.4	140/80	76	Normal	Fit
DATE : 14/11/2019												
CONTRACTOR : MECH-CON (Dharania Cast)												
603		ARABINDA SAHU	M	28	O+	Welder	82/161	23.9	116/66	76	Normal	Fit
604		RANJAN NAYAK	M	21	O+	Fabricator	70/157	28.3	124/84	80	Normal	Fit
605		SUNIL AMANTA	M	43	A+	Fabricator	51/166	18.5	120/80	76	Normal	Fit
606		RANJAN ROUT	M	36	AB+	Fabricator	62/162	23.6	132/82	84	Normal	Fit
607		SUSHANTA DASH	M	30	B+	Fabricator	47/172	15.8	124/84	78	Normal	Fit
608		RAJENDRA PRASAD DAS	M	32	A+	Fabricator	42/171	14.7	90/60	76	Normal	Fit
609		BIDHI BHOI	M	40	A+	Fabricator	40/163	15.0	114/64	72	Normal	Fit
610		KAILASH AMANTA	M	30	B+	Fabricator	60/166	21.7	106/66	76	Normal	Fit
DATE : 14/11/2019												
CONTRACTOR :SUMIT KUMAR PRADHAN												
611		BISWAJIT MAHALI	M	19	O+	Site Supervisor	61/174	20.1	120/80	76	Normal	Fit
612		ANAM NAIK	M	30	B+	Labour	44/162	16.7	110/80	74	Normal	Fit
613		AJIT PRADHAN	M	24	B+	Driver	46/166	16.3	130/80	76	Normal	Fit
614		RAJIA NAIK	M	24	O+	Labour	50/170	17.3	130/84	76	Normal	Fit
615		SURESH SAHOO	M	27	O+	Driver	57/161	21.9	130/80	76	Normal	Fit
616		SUSANTA KUMAR NAIK	M	24	B+	Labour	46/155	19.1	114/64	76	Normal	Fit
DATE : 14/11/2019												
CONTRACTOR : NETRANANDA PRADHAN												
617		Bramhananda Sahoo	M	48	A+	Operator	71/172	23.9	120/80	76	Normal	Fit
618		Trinath Naik	M	50	A+	Laser	38/152	16.4	168/88	76	Normal	**UNFIT**
619		Tinendu Naik	M	22	O+	Laser	46/161	17.7	124/84	76	Normal	Fit
620		N. Suryakant	M	25	O+	Site Engineer	31/171	27.7	124/84	78	Normal	Fit
621		Anakhit Sahoo	M	45	A+	Labour	48/167	17.2	114/64	76	Normal	Fit
622		Subhransu Bhusan Sahoo	M	32	O+	Supervisor	42/170	14.5	100/60	80	Normal	**UNFIT**

ANNEXURE : XXII Contd..

SL. NO	E.CODE	NAME	SEX	AGE	BLOOD GROUP	DESIGNATION	WEIGHT/ HEIGHT	BMI	BLOOD PRESSURE	PULSE (Min)	VISSON	RESULT
DATE : 15/11/2019												
CONTRACTOR : RUNGTA MINES LIMITED (EMPLOYEE)												
623		DINESH KUMAR NAYAK	M	47	O+	Sr. Manager	75/174	24.7	130/80	76	Normal	Fit
624		NARAHARI SAHOO	M	38	O+	HR Assistant	45/170	15.5	104/64	76	Normal	Fit
625		GOVIND CHANDRA NAYAK	M	44	A+	Asst. Manager	75/168	26.5	110/80	78	Normal	Fit
626		AJAYA KUMAR DASH	M	50	A+	AGM-HR	80/162	30.4	140/90	86	Normal	Fit
627		PRAVAT RANJAN AICH	M	38	B+	Asst. Mgr (HR)	82/184	24.2	144/84	84	Normal	Fit
628		MADAL LAL SHARMA	M	43	B+	Asst. Mgr (Store)	78/173	26.0	130/90	84	Normal	Fit
629		ARUN KUMAR SINGH	M	39	O+	Dy. Manager (Purcl	90/182	27.1	130/90	84	Normal	Fit
630		VIVEK KRISHNA	M	45	O+	Manager (HR& Adr	70/161	27.0	114/76	82	Normal	Fit
631		LAXMIDHAR POI	M	44	O+	Security Supervisor	76/175	24.8	120/80	84	Normal	Fit
632	11110053	DUSMANTA KUMAR ROUT	M	36	O+	Peon	50/168	17.7	130/80	76	Normal	Fit
633	1118050	SAROJ KUMAR ROUT	M	41	A+	Asst. Mgr (Electrica	65/163	24.4	120/80	76	Normal	Fit
634	5106005	RABINARAYAN MISHRA	M	53	A+	Sr. Manager	58/169	20.3	140/90	84	Normal	Fit
635	11180081	NIRAKAR ROUL	M	45	O+	AGM - SMS	69/169	24.1	110/70	84	Normal	Fit
636	11060057	MANAS RANJAN JENA	M	48	O+	Manager (Survey)	75/171	25.6	120/80	82	Normal	Fit
637	11180258	DEBABRATA MISRA	M	53	O+	Sr. G.M. (Project)	100/180	30.0	140/90	84	Normal	Fit
638	11170067	DEBANATH PADHI	M	47	B+	Manager (Purchase	75/178	24.6	140/90	84	Normal	Fit
639	11040076	MANAS RANJAN TRIPATHY	M	49	O+	DGM -Civil	66/168	23.9	120/80	84	Normal	Fit
640		PRATIK PATTANAYAK	M	23	O+	GET	85/180	26.0	130/80	96	Normal	Fit
641	11190089	DEBABRATA MOHANTY	M	47	O+	Manager (Mechani	65/178	20.5	126/88	78	Normal	Fit
642	11190088	ANADI BEHERA	M	42	A+	Dy. Manager	64/164	23.7	130/80	78	Normal	Fit
643		SHIVJEE THAKUR	M	59	O+	Supervisor	50/159	19.7	128/88	80	Normal	Fit
644		DEBASIS NAYAK	M	27	B+	Engineer	67/169	23.4	130/80	84	Normal	Fit
645		DILLIP KUMAR MISHRA	M	48	B+	DGM(Mechanical)	85/173	28.4	130/90	76	Normal	Fit
646		DEBABRATA DHAL	M	48	AB+	Sr. Manager (Safety	84/182	25.3	120/80	84	Normal	Fit
653		PRADEEP KUMAR CHATURVEDI	M	61	B+	Jt. V.P (Project)	98/185	28.6	140/90	84	Normal	Fit
DATE : 15/11/2019												
CONTRACTOR : NETRANANDA PRADHAN												
647		BINAYA SAHOO	M	32	B+	Supervisor	60/169	21.0	110/60	76	Normal	Fit
648		OM PRAKASH SAHOO	M	30	O+	Mason	70/178	22.0	134/84	76	Normal	Fit
DATE : 13/11/2019												
CONTRACTOR : DEBABRATA BHATTA												
649		PRATAP BISWAL	M	36	B+	Asst. Cook	57/160	22.2	140/80	84	Normal	Fit
DATE : 13/11/2019												
CONTRACTOR : KARTAVYA SECURITY												
650		Sanatan Pradhan	M	20	O+	Security Guard	46/160	16.2	130/66	76	Normal	Fit
DATE : 15/11/2019												
CONTRACTOR : SSS SECURITY												
651		RAMESWAR DEHURY	M	29	O+	Security Guard	62/166	22.4	140/80	78	Normal	Fit
652		SALIN KUMAR MISHRA	M	32	B+	Security	60/174	19.8	112/62	78	Normal	Fit

ANNEXURE : XXIII Contd..

National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)

NABL

CERTIFICATE OF ACCREDITATION

MIN MEC R & D LABORATORY

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2017

"General Requirements for the Competence of Testing & Calibration Laboratories"

for its facilities at

A- 121, PARYAVARAN COMPLEX, IGNOU ROAD, NEW DELHI, SOUTH WEST, DELHI, INDIA

in the field of

TESTING

Certificate Number: TC-6357

Issue Date: 29/11/2019 Valid Until: 28/11/2021

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.

(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Signed for and on behalf of NABL

N. Venkateswaran
Chief Executive Officer

National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)

NABL

29.09.2020

Extension in Validity of Accreditation

NABL Policy: It is decided to extend the validity of accreditation for a period of one year to all conformity assessment bodies (CABs) whose renewal of accreditation is to take place and accreditation validity date is between 01.01.2020 and 30.09.2020 **subject to the following**:

1. Providing satisfactory documents based on NABL-218 w/r compliance to the requirements of the relevant Standard and NABL requirements.
2. The CABs are required to conduct additional internal audit to ensure compliance with the standard requirements (by increasing the existing frequency of their audit plan) and submit the document.
3. The CABs are required to provide control charts and trends for assuring the validity of results.
4. CABs are required to provide an undertaking to undergo unannounced assessment (onsite and/or remotely, depending on the situation) and actions as per NABL 216 thereof, at any point of time during the validity period.
5. Making payment of **annual accreditation fee** for the extended period

Examples:

- Accredited CABs with date of issue 15.01.2018 and valid till 14.01.2020, then their Accreditation validity will be extended till 14.01.2021.

- Accredited CABs with date of issue 15.02.2019 and valid till 14.02.2021, then their Accreditation validity will be extended till 14.02.2022.

- Accredited CABs with date of issue 15.06.2020 and valid till 14.06.2022, then their Accreditation validity will be extended till 14.06.2023

NOTE:

1. The above will be applicable to the laboratories for which transition to ISO/IEC 17025:2017 version has been completed. For the laboratories which are accredited as per ISO/IEC 17025:2005 version, they have to undergo transition assessment (onsite and/or remotely, depending on the situation) and follow transition plan defined.
2. The above is not applicable to CABs where there will be a change in name of CAB and/or legal identity change and/or Premises change.
3. Also, **the above is not applicable to the CABs which are not registered in portal** (exemption- International accredited CABs).
4. Routine assessments will take place for any scope extension /addition.
5. Payment due to NABL can be deferred (postpone the payment) upto a period of Six (6) months. There will be no waive-off of any fee for any CABs. If payments are not made, then action as per procedure (NABL-216) will be initiated. There will be no relaxations w/r payment from 01.01.2021.

N.Venkateswaran
CEO, NABL

NABL House, Plot #5, Sector #6, Gurugram 122 002, Haryana, India.
Tel. No.: +91-124-4679700 (30 lines) • Fax: +91-124-4679799 • Website: www.nabl-india.org

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* **IN THE HIGH COURT OF DELHI AT NEW DELHI**

\+ W.P.(C) 3665/2016

MRS. RANI GUPTA & ANR. ..... Petitioners

Through: Mr. Yash Mishra with Ms Ruchi Kohli, Ms Srishty Kohli and Ms Nidhi Jaiswal, Advocates.

versus

MINISTRY OF ENVIRONMENT FOREST AND CLIMATE CHANGE & ANR. ..... Respondents

Through: Mr.Sanjay Jain, ASG and Mr.Rajesh Gogna, CGSC with Mr Tushar Sawai, Mr Sumit Misra, Ms Shreya Sinha and Mr.Shrishth Jain, Advocates

CORAM:
HON'BLE MR. JUSTICE MANMOHAN

O R D E R

% **03.05.2016**

C.M.No.15798/2016

Exemption allowed, subject to all just exceptions.

Application stands disposed of.

W.P.(C) No.3665/2016 & C.M.No.15699/2016

Present writ petition has been filed challenging Notification dated 3rd March, 2016 whereby an amendment has been made to the Environmental Impact Assessment Notification, 2006 stating that the Environmental Consultant Organizations which are accredited for a particular sector and category of project for that project with the Quality Council of India (QCI) or National Accreditation Board for Education and Training (NABET) or any other agency which may be notified by the Ministry of Environment Forest and Climate Change shall be allowed to prepare the Environmental Impact Assessment (EIA) report and Environmental Management Plan (EMP) of a project in that sector and to appear before the State or Central Expert Appraisal Committee.

Learned counsel for the petitioners states that the NABET had issued a scheme for accreditation of EIA Consultant organizations in January, 2010 and the respondent No.1 issued Office Memorandums dated 2nd December, 2009 and 18th March, 2010 stating that no final EIA or EMP prepared by non-accredited consultant would be entertained after 1st July, 2010.

He further states that petitioner No.1 submitted an application for accreditation in January, 2010. However, the same was rejected vide minutes of meeting dated 10th January, 2011 and petitioner No.1 challenged the said decision by virtue of a writ petition being W.P.(C) 7034/2012. However, the said writ petition was dismissed. The petitioner then preferred LPAs being LPA Nos.23/2014 and 110/2014, wherein the petitioners were allowed to prepare and present the Environmental Impact Assessment report to the Central and State Government Expert Appraisal Committee.

Learned counsel for the petitioners submits that the impugned notification dated 3rd March, 2016 is not only contrary to the aforesaid Division Order but also violative of Section 23 of the Environment Protection Act, 1986.

Issue notice.

Mr.Rajesh Gogna, CGSC accepts notice on behalf of the respondents. He prays for and is permitted to file a counter-affidavit within a period of four weeks. Rejoinder-affidavit, if any, be filed before the next date of hearing.

List on 12th August, 2016.

In the meantime, till the Division Bench varies, vacates or modifies the interim orders dated 17th January, 2014 and 5th February, 2014 passed in LPA Nos.28 of 2014 and 110 of 2014, the petitioners are allowed to prepare and present Environmental Impact Assessment report to the Central and State Government Expert Appraisal Committee.

Order dasti.

MANMOHAN, J

MAY 03, 2016
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* IN THE HIGH COURT OF DELHI AT NEW DELHI

\+ W.P.(C) 3665/2016

MRS. RANI GUPTA & ANR. .....Petitioners

Through: Mr Yash Mishra and Ms Srishty Kaul, Advocates

versus

MINISTRY OF ENVIRONMENT FOREST AND CLIMATE CHANGE & ANR. .....Respondents

Through: Mr Rajesh Gogna, Advocate for R-1.

CORAM:
HON'BLE MR. JUSTICE SANJEEV SACHDEVA

ORDER

%. 12.08.2016

W.P.(C) 3665/2016 & CM No.15699/2016(stay)

The counter-affidavits have not been filed. The respondents shall file their counter-affidavits within a period of four weeks. Rejoinders thereto, if any, be filed within four weeks thereafter.

Renotify on 14th March, 2017.

SANJEEV SACHDEVA, J

AUGUST 12, 2016
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ANNEXURE : XXIV Contd..

Subsequently the hearings at High Court of Delhi have been held on the following dates with the contents of the orders as follows:

Date	Content of order
14.03.2017	Hon'ble Judge was on leave. Renotified on 21.08.2017
21.08.2017	The learned counsel for the petitioner seeks some time to file a rejoinder. Let the same be filed within a period of four weeks from today. List on 23.03.2018. Interim order to continue
23.03.2018	1. There is no representation on behalf of the parties. Adverse orders are deferred. 2. Renotify the matter on 25.09.2018
25.09.2018	It is already 5.00 p.m. The petition cannot be taken up today due to paucity of time. List on 17.04.2019. Interim order to continue.
22.04.2019	1. The learned counsel appearing for the petitioner seeks final opportunity to file a rejoinder affidavit. It is seen more than sufficient time has been granted to the petitioner for doing so. Nonetheless, in the interest of justice, a final opportunity is granted to the petitioner to file a rejoinder affidavit 2. In the meanwhile, the petitioner shall also ascertain the status of other matters having a bearing on the controversy in the present petition. 3. List on 31.10.2019 4. Interim order to continue
31.10.2019	At the request of the learned counsel for the petitioners, relist on 27th April, 2020.
15.04.2020	Office Order from High Court of Delhi No. R-43/RG/DHC/2020, matter listed on 27.04.2020 adjourned to 26.06.2020
13.06.2020	Office Order from High Court of Delhi No. 15/DHC/2020, matter listed on 26.06.2020 adjourned to 21.08.2020
15.08.2020	Office Order from High Court of Delhi No. 288/RG/DHC/2020, matter listed on 21.08.2020 adjourned to 15.10.2020
08.10.2020	Office Order from High Court of Delhi No. 500/RG/DHC/2020, matter listed on 15.10.2020 adjourned to 21.12.2020
24.11.2020	Office Order from High Court of Delhi No. 577/RG/DHC/2020, matter listed on 21.12.2020 adjourned to 19.02.2021
14.01.2021	Office Order from High Court of Delhi No. 01/RG/DHC/2021, matter listed on 19.02.2021 adjourned to 14.04.2021
20.03.2021	Office Order from High Court of Delhi No. 190/RG/DHC/2021, matter listed on 14.04.2021 adjourned *en bloc* to 02.06.2021
15.05.2021	Office Order from High Court of Delhi No. 305/RG/DHC/2021, matter listed on 02.06.2021 adjourned *en bloc* to 17.08.2021
12.08.2021	Office Order from High Court of Delhi No. 471/RG/DHC/2021, matter listed on 17.08.2021 adjourned *en bloc* to 04.10.2021
30.09.2021	Office Order from High Court of Delhi No. 667/RG/DHC/2021, matter listed on 04.10.2021 adjourned en bloc to 02.12.2021

Date of passing of Interim Order : 1st March, 2013. In the Interim Order, scope of the consultancy work out of the filing of the case, the issues of public and locality concerned and urgency to deal with the short cause, the applicant was directed to prepare and submit Environment Impact Assessment (EIA) report to the Central and State Government Environmental Appraisal Committee [illegible] March, 2014.

Post Order Status of the Court Master

CHIEF JUSTICE

RAJIV SAHAI ENDLAW, J

FEBRUARY 05, 2014
'aa'

Court Master
High Court of Delhi
New Delhi

Court Master
High Court of Delhi
New Delhi

ANNEXURE : XXIV Contd..

Subsequently the hearings at High Court of Delhi have been held on the following dates with the contents of the orders as follows:

Date	Content of order
14.03.2014	The Hon'ble Division bench could not assemble today. Renotify on 13.05.2014
13.05.2014	Re-notify for 14.08.2014,. Interim order to continue
14.08.2014	An adjournment slip is moved by the learned counsel for the appellant. Renotify on 13.11.2014.
13.11.2014	It is represented by the learned counsel for both the parties that transfer writ petitions are moved before the Supreme Court of India for the transfer of several cases pending before different High Courts in which an identical issue is raised. Hence, we deem it appropriate to adjourn the hearing. Re-notify on 06.02.2015. Interim orders to continue.
06.02.2015	It is represented that on 16.01.2015 notice has been ordered in the Transfer Petitions by the Supreme Court. Re-notify on 25.05.2015. Interim orders to continue.
25.05.2015	It is brought to our notice that the Transfer Petition before the Supreme Court of India stands posted to 11.08.2015. Hence, call on 04.09.2015
04.09.2015	Renotify on 01.12.2015
01.12.2015	On joint request, call on 23.02.2016
23.02.2016	It is brought to our notice that the Transfer Petition(s) (Civil) Nos. 1682-1722/2014 are still pending before the Hon'ble Supreme Court of India. List on 11th July 2016
11.07.2016	It is stated that the Transfer Petition(s) (Civil) Nos. 1682-1722/2014 before Supreme Court are still pending. Re-notify on 26.09.2016
26.09.2016	It is brought to our notice that the Transfer Petition(s) (Civil) Nos. 1682-1722/2014 are still pending before the Hon'ble Supreme Court of India. List on 20.01.2017
20.01.2017	Since the proceedings before the Supreme Court are still pending, renotify on 04.07.2017.
04.07.2017	Proceedings before the Supreme Court are still pending. Renotify on 04.12.2017.
04.12.2017	Learned counself or the appelant states that transfer petition is still pending consideration before the Supreme Court and its is listed today before the Registrar for completion of pleadings. List on 18th July, 2018 in the category of "directions" for reporting the orders passed by the Supreme Court. In the event, the petition before the Supreme Court is decided before the next date, a copy of the order shall be placed on record.
18.07.2018	1. Hon'ble Division Bench has not assembled today as Hon'ble Ms. Justice Hima Kohli is busy attending workshop "Environmental Adjudication for the Green Bench Judges of Bhutan" to be held in Thimpu, Bhutan. 2. List on 14.11.2018
14.11.2018	Learned counsel for the appellants seeks an adjournment . At request, adjourned to 29.04.2019
29.04.2019	In view of the fact that the transfer petition being Transfer Petition(s) (Civil) Nos. 1682-1722/2014 which were pending before the Hon'ble Supreme Court have been dismissed as withdrawn, this Court can now proceed with the matter. Accordingly, list the matter for hearing in the category of 'After Notice Miscellaneous Matters' on 8th August, 2019. In the meanwhile, pleadings to be completed. Interim orders to continue.

ANNEXURE : XXIV Contd..

Date	Content of order
08.08.2019	List on 3.03.2020
03.03.2020	Next date of hearing is 19.05.2020
16.06.2020	Office Order from High Court of Delhi No. R-201/RG/DHC/2020, matter listed on 19.05.2020 adjourned to 07.07.2020
29.06.2020	Office Order from High Court of Delhi No. R-21/DHC/2020, matter listed on 07.07.2020 adjourned to 01.09.2020
27.08.2020	Office Order from High Court of Delhi No. 418/RG/DHC/2020, matter listed on 01.09.2020 adjourned to 03.11.2020
19.10.2020	Office Order from High Court of Delhi No. 538/RG/DHC/2020, matter listed on 03.11.2020 adjourned to 08.01.2021
24.11.2020	Office Order from High Court of Delhi No. 577/RG/DHC/2020, matter listed on 08.01.2021 adjourned to 03.03.2021
20.02.2021	Office Order from High Court of Delhi No. 88/RG/DHC/2021, matter listed on 03.03.2021 adjourned to 27.04.2021
20.03.2021	Office Order from High Court of Delhi No. 190/RG/DHC/2021, matter listed on 27.04.2021 adjourned *en bloc* to 12.07.2021
28.06.2021	Office Order from High Court of Delhi No. 339/RG/DHC, matter listed on 12.07.2021 adjourned *en bloc* to 27.08.2021
12.08.2021	Office Order from High Court of Delhi No. 471/RG/DHC/2021, matter listed on 27.08.2021 adjourned *en bloc* to 18.10.2021
30.09.2021	Office Order from High Court of Delhi No. 667/RG/DHC/2021, matter listed on 04.10.2021 adjourned en bloc to 02.12.2021

Modelling for 3.55 MTPA ISP sanctioned in EC dated 15.02.2021

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CO STARTING
  TITLEONE DHENKANAL STEEL PLANT (3.55 MTPA)
  TITLETWO PM10 EMISSIONS FROM ALL STACKS
  MODELOPT DFAULT CONC ELEV
  AVERTIME 24 PERIOD
  POLLUTID PM10
  RUNORNOT RUN
 CO FINISHED
ME STARTING
  SURFFILE
ORI\DSP\Oct21\753\WithCM\DSP21S.SFC
  PROFFILE
ORI\DSP\Oct21\753\WithCM\DSP21S.PFL
  SURFDATA 99999 2021 XXX
  UAIRDATA 99999 2021 XXX
  WDROTATE 180
ME FINISHED
OU STARTING
OU RECTABLE 24 FIRST
OU MAXTABLE 24 50
OU PLOTFILE 24 ALL FIRST
ORI\DSP\Oct21\355\355PM10.PLT
OU FINISHED
**********************************
*** SETUP Finishes Successfully ***
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*** POINT SOURCE DATA ***

SOURCE ID	NO. PART. CATS.	EMISSION RATE (GRAMS/SEC) PM_{10}	$PM_{2.5}$	SO_2	NO_2	X (M)	Y (M)	BASE ELEV. (M)	STACK HEIGHT (M)	STACK TEMP. (°K)	STACK EXIT VEL. (M/SEC)	STACK DIA. (M)	BUILDING EXISTS
S-001	0	1.37250	0.78919	15.95400	0.07961	322232	2296476	93	85	423	15.83	3.90	NO
S-002	0	0.12500	0.07188			322080	2296591	88	30	323	16.75	1.00	NO
S-003	0	0.18750	0.10781			322260	2296443	93	30	323	17.44	1.20	NO
S-004	0	0.07813	0.04492			322225	2296729	85	30	323	16.35	0.80	NO
S-005	0	0.01875	0.01078			322220	2296650	87	30	323	20.51	0.35	NO
S-006	0	0.01875	0.01078			322224	2296576	91	30	323	20.51	0.35	NO
S-007	0	0.23438	0.13477			322216	2296706	85	30	323	17.23	1.35	NO
S-008	0	0.23438	0.13477			322212.7	2296770	84	30	323	17.23	1.35	NO
S-009	0	0.15625	0.08984			322225.9	2296755	84	30	323	20.93	1.00	NO
S-010	0	0.15625	0.08984			322283	2296779	86	30	323	20.93	1.00	NO
S-011	0	0.31250	0.17969			322137	2296629	88	30	323	2.34	1.55	NO
S-012	0	1.64700	0.94703	17.58200	0.08773	322381	2296471	92	90	423	18.06	4.00	NO
S-013	0	0.82350	0.47351	8.79120	0.04387	322527.4	2296470	94	90	423	16.05	3.00	NO
S-014	0	2.47050	1.42050	26.37400	0.13160	322676.1	2296468	91	95	423	19.62	4.70	NO
S-015	0	0.37500	0.21563			322475.5	2296329	95	35	323	12.56	2.00	NO
S-016	0	0.20312	0.11680			322555.4	2296657	87	30	373	9.70	1.80	NO
S-017	0	0.37500	0.21563			322551.3	2296739	87	35	323	12.56	2.00	NO
S-018	0	0.45312	0.26055			322818.9	2296323	89	35	323	12.54	2.20	NO
S-019	0	0.25000	0.14375			322816.3	2296654	86	30	373	9.67	2.00	NO
S-020	0	0.45312	0.26055			322810.4	2296727	86	35	323	12.54	2.20	NO
S-021	0	2.93750	1.68910	0.83380	0.26609	321945	2296659	84	90	440	12.69	6.50	NO
S-022	0	2.93750	1.68910	0.83380	0.26609	321937	2296469	87	90	440	12.69	6.50	NO
S-023	0	2.93750	1.68910	0.83380	0.26609	320735	2296535	81	90	440	12.69	6.50	NO
S-024	0	2.93750	1.68910	0.83380	0.26609	320734	2296370	83	90	440	12.69	6.50	NO
S-025	0	2.93750	1.68910	0.83380	0.26609	320153	2296370	92	90	440	12.69	6.50	NO
S-026	0	0.28125	0.16172			322086.9	2296539	88	30	373	13.43	1.80	NO
S-027	0	0.28125	0.16172			321933.5	2296592	85	30	373	13.43	1.80	NO
S-028	0	1.35590	0.77964	0.22235	0.07096	321691	2296712	84	60	440	15.47	4.00	NO
S-029	0	1.35590	0.77964	0.22235	0.07096	321688	2296617	84	60	440	15.47	4.00	NO
S-030	0	1.35590	0.77964	0.22235	0.07096	321684	2296519	84	60	440	15.47	4.00	NO
S-031	0	1.35590	0.77964	0.22235	0.07096	321680	2296428	81	60	440	15.47	4.00	NO
S-032	0	1.35590	0.77964	0.22235	0.07096	320655	2296587	81	60	440	15.47	4.00	NO
S-033	0	1.35590	0.77964	0.22235	0.07096	320652	2296500	83	60	440	15.47	4.00	NO
S-034	0	1.35590	0.77964	0.22235	0.07096	320652	2296413	85	60	440	15.47	4.00	NO

Modelling for 3.55 MTPA ISP sanctioned in EC dated 15.02.2021

SOURCE ID	NO. PART. CATS.	EMISSION RATE (GRAMS/SEC) PM_{10}	$PM_{2.5}$	SO_2	NO_2	X (M)	Y (M)	BASE ELEV. (M)	STACK HEIGHT (M)	STACK TEMP. (°K)	STACK EXIT VEL. (M/SEC)	STACK DIA. (M)	BUILDING EXISTS
S-035	0	1.35590	0.77964	0.22235	0.07096	320649	2296330	85	60	440	15.47	4.00	NO
S-036	0	1.35590	0.77964	0.22235	0.07096	320372	2296395	87	60	440	15.47	4.00	NO
S-037	0	1.35590	0.77964	0.22235	0.07096	320370	2296332	89	60	440	15.47	4.00	NO
S-038	0	0.13125	0.07547			321055	2296475	78	30	373	6.27	1.80	NO
S-039	0	0.04688	0.02695			320706.5	2296455	83	30	373	2.24	1.80	NO
S-042	0	0.08333	0.04792	4.44440	3.33330	321975	2297061	76	47	423	13.54	1.80	NO
S-043	0	0.29063	0.16711			322105	2297034	78	30	313	11.65	1.80	NO
S-044	0	0.14583	0.08385	7.77780	5.83330	320094	2297203	77	47	423	15.86	2.20	NO
S-045	0	0.50938	0.29289			319855	2297254	71	30	313	13.66	2.20	NO
S-046	0	2.70310	1.55430	14.34400	0.05446	321905	2296841	81	55	423	18.97	5.00	NO
S-047	0	0.50000	0.28750			322047	2296874	82	45	313	16.23	2.00	NO
S-048	0	3.70000	2.12750	10.27200	0.03900	320130	2296905	77	80	423	15.36	6.50	NO
S-049	0	0.85313	0.49055			319954	2296941	74	55	313	17.72	2.50	NO
S-050	0	0.54688	0.31445	1.21430	0.19314	319742	2296765	77	85	493	17.89	2.50	NO
S-051	0	0.90625	0.52109	1.94290	0.30902	323045.1	2297138	81	100	493	18.10	3.20	NO
S-052	0	0.90625	0.52109	2.04000	0.32447	323028.9	2296971	82	100	493	18.10	3.20	NO
S-053	0	0.13021	0.07487			322617.5	2296925	85	30.5	373	15.11	2.00	NO
S-054	0	0.13021	0.07487			322697.9	2296920	85	30.5	373	15.11	2.00	NO
S-055	0	0.13021	0.07487			322771.5	2296916	85	30.5	373	15.11	2.00	NO
S-056	0	0.09375	0.05391			322846.5	2296910	86	30.5	373	13.43	1.80	NO
S-057	0	0.13021	0.07487			322916.4	2296906	83	30.5	373	15.11	2.00	NO
S-058	0	0.16667	0.09583			322993.3	2296903	83	30.5	373	19.34	2.00	NO
S-059	0	0.16667	0.09583			323066.9	2296898	83	30.5	373	19.34	2.00	NO
S-060	0	0.16667	0.09583			323144.5	2296895	84	30.5	373	19.34	2.00	NO
S-061	0	0.65313	0.37555			322233	2296864	83	60	403	20.47	4.00	NO
S-062	0	0.79792	0.45880			322312	2296837	85	70	403	16.01	5.00	NO
S-070	0	0.09656	0.05552	5.99700	3.54170	320242	2296838	81	60	638	5.92	3.60	NO
S-071	0	0.21771	0.12518	1.17590	0.69444	320246.3	2296716	80	80	638	10.80	4.00	NO
S-073	0	0.05794	0.03331	1.17590	0.69444	320052	2297459	70	60	638	5.11	3.00	NO
S-078	0	0.24531	0.14106			322727	2297581	78	30	318	14.37	1.50	NO
S-079	0	0.06250	0.03594			322725	2297475	80	45	393	10.18	1.00	NO
S-080	0	1.48440	0.85352			322782	2297704	74	60	336	22.97	3.00	NO
S-081	0	0.09375	0.05391			322813	2297472	77	35	351	13.64	1.00	NO
S-082	0	0.24531	0.14106			322914	2297575	75	30	318	14.37	1.50	NO
S-083	0	0.06250	0.03594			322913	2297468	75	45	393	10.18	1.00	NO
S-084	0	1.48440	0.85352			322965	2297701	73	60	336	22.97	3.00	NO
S-086	0	0.71094	0.40879	5.97870	6.00350	322307	2296473	94	85	423	23.58	2.30	NO
S-087	0	0.71094	0.40879	6.31940	6.31940	322454	2296471	93	85	423	23.58	2.30	NO
S-088	0	0.71094	0.40879	6.31940	6.31940	322600.2	2296471	93	85	423	23.58	2.30	NO
S-089	0	0.71094	0.40879	6.31940	6.31940	322749	2296467	89	85	423	23.58	2.30	NO
S-090	0	0.71094	0.40879	6.31940	6.31940	323065.6	2296721	86	85	423	23.58	2.30	NO
S-091	0	0.36969	0.21257	3.28610	3.28610	323148	2296717	87	90	423	16.22	2.00	NO
S-092	0	1.42190	0.81758	12.63900	12.63900	322937.5	2296427	88	110	423	17.28	3.80	NO
S-093	0	0.71094	0.40879	6.31940	6.31940	323086.8	2296422	92	110	423	17.11	2.70	NO
S-094	0	0.42188	0.24258			323062.7	2296652	86	45	323	9.04	2.50	NO
S-095	0	0.42188	0.24258			323150.9	2296648	88	45	323	9.04	2.50	NO
S-096	0	0.42188	0.24258			322940.4	2296495	87	45	323	9.04	2.50	NO
S-097	0	0.42188	0.24258			323089	2296490	89	45	323	9.04	2.50	NO

ANNEXURE : XXV(a) Contd..

Modelling for 3.55 MTPA ISP sanctioned in EC dated 15.02.2021

*** AREA SOURCE DATA ***

Source	No part Cats.	Emission rate (g/s/m2)		Co-ordinates (SW corner) (m)		Base elev.	Rel. Height	Dim of area (m)		Orient, of area	Init. SZ
ID	SPM	PM_{10}	$PM_{2.5}$	X	Y	(m)	(m)	X	Y	(deg)	(m)
A-1	0	1.98E-05	1.14E-05	322428.1	2296095	94	1	273.84	76.66	0	2
A-2	0	1.97E-05	1.13E-05	319461	2295530	83	1	108.67	44.22	3	2
A-3	0	2.95E-06	1.69E-06	321545.2	2297637	71	1	17.22	41.09	0	2
A-4	0	7.60E-08	1.15E-08	320936.5	2295891	80	1	46.48	90.53	0	2
A-5	0	4.69E-06	1.13E-06	323590.6	2297282	80	1	60	349.62	1	2

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

Surface file: ORI\DSP\Oct2021\753\DSP21S.SFC **Met Version: 18081**
Profile file: ORI\DSP\Oct2021\753\DSP21S.PFL
Surface format: FREE
Profile format: FREE
Surface station no.: 99999 **Upper air station no.: 99999**
Name: XXX **Name: XXX**
Year: 2021 **Year: 2021**

First 24 hours of scalar data

YR	MO	DY	JDY	HR	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS	WD	HT	REF TA	HT
21	03	01	60	01	-18.2	0.318	-9.000	-9.000	-999.	431.	161.0	1.00	4.00	0.16	4.54	308.	6.1	297.8	5.5
21	03	01	60	02	-24.7	0.431	-9.000	-9.000	-999.	678.	294.4	1.00	4.00	0.16	3.51	289.	6.1	297.9	5.5
21	03	01	60	03	-34.7	0.607	-9.000	-9.000	-999.	1134.	584.7	1.00	4.00	0.16	2.01	310.	6.1	296.9	5.5
21	03	01	60	04	-31.5	0.552	-9.000	-9.000	-999.	989.	484.9	1.00	4.00	0.16	1.79	276.	6.1	297.3	5.5
21	03	01	60	05	-27.8	0.486	-9.000	-9.000	-999.	818.	375.8	1.00	4.00	0.16	2.59	262.	6.1	296.4	5.5
21	03	01	60	06	-21.4	0.375	-9.000	-9.000	-999.	561.	223.6	1.00	4.00	0.16	1.66	280.	6.1	297.6	5.5
21	03	01	60	07	-27.8	0.486	-9.000	-9.000	-999.	812.	375.8	1.00	4.00	0.16	1.25	276.	6.1	298.2	5.5
21	03	01	60	08	-23.9	0.609	-9.000	-9.000	-999.	1140.	860.4	1.00	4.00	0.16	0.47	321.	6.1	299.2	5.5
21	03	01	60	09	6.7	0.724	0.294	0.005	137.	1476.	-5134.7	1.00	4.00	0.16	0.34	256.	6.1	299.3	5.5
21	03	01	60	10	18.7	0.672	0.616	0.005	455.	1328.	-1477.2	1.00	4.00	0.16	0.49	273.	6.1	302.6	5.5
21	03	01	60	11	27.6	0.504	0.728	0.014	509.	889.	-421.6	1.00	4.00	0.16	1.06	276.	6.1	305.3	5.5
21	03	01	60	12	32.9	0.350	0.800	0.026	566.	520.	-118.7	1.00	4.00	0.16	0.38	290.	6.1	305.7	5.5
21	03	01	60	13	34.9	0.251	0.828	0.026	592.	309.	-41.4	1.00	4.00	0.16	4.25	265.	6.1	306.4	5.5
21	03	01	60	14	33.3	0.250	0.820	0.025	601.	301.	-42.9	1.00	4.00	0.16	2.24	259.	6.1	306.2	5.5
21	03	01	60	15	28.2	0.298	0.779	0.025	609.	390.	-85.0	1.00	4.00	0.16	2.04	255.	6.1	308.7	5.5
21	03	01	60	16	19.7	0.345	0.694	0.025	614.	486.	-188.8	1.00	4.00	0.16	0.38	268.	6.1	306.8	5.5
21	03	01	60	17	8.1	0.287	0.517	0.025	618.	371.	-264.5	1.00	4.00	0.16	2.49	265.	6.1	307.3	5.5
21	03	01	60	18	-10.5	0.326	-9.000	-9.000	-999.	446.	300.1	1.00	4.00	0.16	2.29	215.	6.1	307.1	5.5
21	03	01	60	19	-11.6	0.201	-9.000	-9.000	-999.	225.	63.3	1.00	4.00	0.16	5.05	243.	6.1	304.5	5.5
21	03	01	60	20	-11.6	0.201	-9.000	-9.000	-999.	216.	63.4	1.00	4.00	0.16	3.93	307.	6.1	302.0	5.5
21	03	01	60	21	-21.6	0.315	-9.000	-9.000	-999.	424.	131.0	1.00	4.00	0.16	4.03	260.	6.1	301.8	5.5
21	03	01	60	22	-18.4	0.318	-9.000	-9.000	-999.	431.	159.2	1.00	4.00	0.16	3.68	280.	6.1	300.3	5.5
21	03	01	60	23	-11.6	0.201	-9.000	-9.000	-999.	223.	63.3	1.00	4.00	0.16	2.84	306.	6.1	300.1	5.5
21	03	01	60	24	-6.8	0.099	-9.000	-9.000	-999.	81.	13.0	1.00	4.00	0.16	0.00	285.	6.1	298.1	5.5

First hour of profile data

YR	MO	DY	HR	HEIGHT	F	WDIR	WSPD	AMB_TMP	sigmaA	sigmaW	sigmaV
21	03	01	05	6.1	1	82.	1.73	-999.0	99.0	-99.00	-99.00

F indicates top of profile (=1) or below (=0)

Modelling for 3.55 MTPA ISP sanctioned in EC dated 15.02.2021

RECEPTOR WISE GROUND LEVEL CONCENTRATIONS (µg/m³)

Receptor	X	Y	Elev (m)	GLCs (µg/m³) PM_{10}	$PM_{2.5}$	SO_2	NO_2
**	AT	100	m				
N	319741	2297853	71	3.681	2.111	6.065	2.969
NNE	320226	2297862	72	3.817	2.187	7.426	3.818
NE	320539	2297489	78	4.859	2.788	9.604	5.024
ENE	320825	2297140	83	6.690	3.843	10.021	3.949
E	323618	2296687	118	10.216	5.874	13.108	7.160
ESE	321245	2296068	81	5.433	3.120	11.807	5.058
SE	320915	2295517	83	4.422	2.536	7.238	2.731
SSE	320086	2295858	93	3.800	2.180	6.220	2.727
S	319741	2295374	92	7.531	4.330	4.986	2.334
SSW	319007	2294919	89	2.482	1.419	4.534	2.063
SW	316360	2293310	104	1.417	0.815	3.689	1.733
WSW	317855	2295910	89	2.474	1.419	4.245	1.911
W	318436	2296691	85	2.270	1.292	4.866	2.103
WNW	318158	2297347	82	3.035	1.743	4.391	2.065
NW	318742	2297690	74	3.875	2.225	5.532	2.704
NNW	319276	2297815	72	3.386	1.943	6.067	3.075
ENE	320940	2297188	80	6.789	3.899	10.426	4.269
ENE	322316	2297758	88	6.793	3.905	12.185	5.977
WSW	316768	2295459	119	1.483	0.852	3.924	1.692
WSW	316207	2295227	103	1.448	0.832	3.783	1.611
**	AT	200	m				
N	319743	2297954	73	3.471	1.989	5.692	2.716
NNE	320265	2297955	74	3.511	2.009	7.647	3.815
NE	320646	2297596	77	4.363	2.502	8.761	4.563
ENE	323105	2298084	72	8.019	4.607	10.383	4.275
E	323741	2296690	168	9.953	5.723	14.778	8.867
ESE	321334	2296021	81	5.705	3.275	11.466	5.068
SE	320986	2295446	85	4.585	2.616	7.977	2.928
SSE	320133	2295744	94	3.489	2.000	5.922	2.640
S	319741	2294850	94	2.725	1.565	4.919	2.288
SSW	318966	2294821	90	2.401	1.371	4.494	2.042
SW	316225	2293185	102	1.399	0.804	3.626	1.707
WSW	317754	2295868	92	1.926	1.105	4.238	1.897
W	318312	2296691	87	2.189	1.246	4.640	2.018
WNW	318065	2297385	82	2.976	1.710	4.289	2.074
NW	318659	2297773	74	3.655	2.099	5.234	2.551
NNW	319237	2297908	71	3.137	1.800	5.652	2.971
NE	320814	2297764	80	5.248	3.017	7.949	3.948
NE	321236	2298186	72	3.952	2.271	7.755	4.771
WSW	316863	2295499	126	1.504	0.863	3.934	1.700
WSW	316063	2295168	102	1.434	0.824	3.736	1.588
**	AT	300	m				
N	319741	2298058	75	3.262	1.875	5.383	2.511
NNE	320303	2298048	76	3.484	2.003	8.009	3.904
NE	321319	2298269	70	3.462	1.990	7.077	4.218
ENE	323252	2298144	71	7.439	4.263	10.667	4.430
ESE	321432	2295991	80	5.823	3.340	11.074	5.084
SE	321057	2295375	87	6.673	3.837	8.543	3.254
SSE	320176	2295641	95	3.206	1.837	5.564	2.642
S	319741	2294723	97	3.468	1.994	4.805	2.218
SSW	318922	2294714	91	2.324	1.325	4.448	2.018

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Receptor	X	Y	Elev (m)	GLCs (µg/m³) PM_{10}	$PM_{2.5}$	SO_2	NO_2
SW	315691	2292641	93	1.469	0.838	3.425	1.629
WSW	317647	2295828	96	1.860	1.067	4.208	1.875
W	318187	2296691	90	2.106	1.199	4.440	1.939
WNW	317972	2297424	82	2.919	1.677	4.201	2.080
NW	318575	2297857	77	3.460	1.987	5.145	2.472
NNW	319198	2298002	72	2.933	1.682	5.441	3.035
ESE	322344	2295613	117	6.078	3.491	11.976	4.613
ESE	322664	2295480	114	5.854	3.362	14.700	5.773
WSW	316956	2295537	137	1.530	0.878	3.936	1.706
WSW	315947	2295119	102	1.420	0.816	3.693	1.566
**	AT	400	m				
N	319741	2298162	74	3.120	1.792	5.096	2.331
NNE	320341	2298141	77	3.977	2.287	8.417	4.049
NE	321397	2298347	68	3.175	1.824	7.342	3.687
ENE	323414	2298212	73	6.814	3.810	10.906	4.823
E	324874	2296691	105	5.845	3.301	10.968	6.099
ESE	321525	2295952	82	5.806	3.327	11.070	4.987
SE	321128	2295304	90	4.842	2.771	8.870	3.510
SSE	320241	2295485	93	3.084	1.771	5.707	2.727
S	319741	2294612	96	2.874	1.649	4.709	2.160
SSW	318545	2293804	96	2.240	1.286	4.002	1.875
SW	315590	2292540	96	1.457	0.831	3.367	1.599
WSW	317542	2295780	102	1.793	1.029	4.175	1.852
W	318068	2296691	92	2.035	1.159	4.271	1.873
WNW	317879	2297462	81	2.864	1.645	4.180	2.081
NW	318492	2297940	78	3.275	1.880	5.028	2.402
NNW	319159	2298096	74	2.756	1.579	5.298	3.051
ESE	322012	2295750	94	15.074	8.640	13.578	7.167
ESE	322811	2295419	112	4.971	2.856	15.808	5.999
WSW	317048	2295576	141	1.560	0.895	3.952	1.718
WSW	315840	2295075	103	1.406	0.808	3.652	1.546
**	AT	500	m				
N	319740	2298266	71	2.955	1.693	4.847	2.182
NNE	320380	2298233	77	4.268	2.454	8.809	4.222
NE	321475	2298425	68	2.964	1.702	7.538	3.426
ENE	323644	2298308	76	5.621	3.152	10.864	4.956
E	325015	2296691	94	5.645	3.211	10.826	5.982
ESE	322927	2295371	108	4.291	2.467	15.971	6.246
SE	321198	2295234	91	4.671	2.661	8.901	3.671
SSE	320325	2295282	85	3.278	1.881	5.633	2.661
S	319741	2294506	95	2.921	1.675	4.606	2.100
SSW	318483	2293655	100	2.252	1.293	3.936	1.872
SW	315506	2292456	97	1.453	0.828	3.330	1.582
WSW	317443	2295739	108	1.734	0.995	4.134	1.826
W	317725	2296691	90	1.898	1.083	3.894	1.732
WNW	317786	2297501	80	2.808	1.613	4.164	2.076
NW	318409	2298023	78	3.104	1.781	4.904	2.330
NNW	319120	2298189	76	2.589	1.482	5.279	3.010
WSW	317141	2295614	131	1.592	0.913	3.996	1.743
WSW	315738	2295033	103	1.393	0.800	3.614	1.528
**	AT	600	m				
N	319741	2298369	69	2.792	1.593	4.886	2.308
NNE	320419	2298329	75	4.199	2.414	9.075	4.378

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Receptor	X	Y	Elev (m)	GLCs (µg/m^3) PM_{10}	$PM_{2.5}$	SO_2	NO_2
NE	321554	2298504	69	2.829	1.626	7.646	3.284
ENE	323817	2298379	74	4.822	2.721	10.430	4.972
E	325137	2296691	97	5.363	3.065	10.538	5.795
ESE	323033	2295327	106	4.099	2.356	15.626	6.508
SE	321269	2295163	90	5.391	3.020	8.607	3.713
SSE	320395	2295113	87	3.591	2.064	5.420	2.508
S	319741	2294402	95	2.948	1.690	4.500	2.042
SSW	318422	2293532	100	2.260	1.297	3.894	1.864
SW	315426	2292377	100	1.442	0.821	3.290	1.561
WSW	317347	2295699	113	1.683	0.966	4.094	1.801
W	317576	2296691	87	1.845	1.054	3.765	1.685
WNW	317692	2297540	78	2.750	1.580	4.139	2.066
NW	318326	2298106	79	2.948	1.692	4.781	2.261
NNW	319082	2298283	72	2.414	1.381	5.150	2.893
ENE	324440	2298637	77	4.142	2.096	7.752	3.980
ENE	324983	2298862	79	3.709	2.009	5.585	2.860
WSW	317234	2295652	120	1.631	0.936	4.048	1.772
WSW	315637	2294991	101	1.385	0.795	3.585	1.514
**	**AT**	**800**	**m**				
N	319741	2298573	68	2.981	1.714	5.555	2.549
NNE	320501	2298525	70	3.727	2.142	9.009	4.507
NE	321708	2298658	68	3.219	1.851	7.597	3.188
ENE	324065	2298482	73	3.937	2.209	9.458	4.713
E	325362	2296691	101	4.993	2.861	10.106	5.508
ESE	323481	2295142	108	4.466	2.568	11.319	6.001
SE	321411	2295021	87	3.877	2.229	7.235	3.451
SSE	320504	2294848	90	3.705	2.121	5.877	2.415
S	319741	2294198	95	2.952	1.689	4.295	1.940
SSW	317638	2291613	154	2.090	1.196	4.248	2.069
SW	315275	2292225	100	1.436	0.818	3.237	1.536
WSW	315437	2294908	99	1.361	0.782	3.517	1.482
W	317327	2296691	76	1.690	0.966	3.565	1.608
WNW	317505	2297617	75	2.642	1.518	4.085	2.040
NW	318159	2298273	75	2.654	1.522	4.522	2.120
NNW	319004	2298470	74	2.171	1.245	5.024	2.731
ENE	324127	2298508	74	3.874	2.100	9.196	4.619
ENE	325341	2299011	76	3.148	1.743	5.138	2.768
**	**AT**	**1000**	**m**				
N	319741	2298775	68	3.357	1.930	6.165	2.729
NNE	320606	2298779	66	3.327	1.911	7.882	4.218
NE	321861	2298811	69	3.562	2.048	7.280	3.152
ENE	325606	2299120	76	2.815	1.557	5.007	2.703
E	325575	2296691	105	4.710	2.699	9.738	5.257
ESE	323828	2294998	108	5.053	2.901	9.751	4.621
SE	321552	2294880	89	3.120	1.792	5.352	2.851
SSE	320599	2294619	97	3.543	2.029	5.611	2.425
S	319741	2293995	97	2.893	1.654	4.111	1.907
SSW	317482	2291238	122	1.881	1.076	3.746	1.891
SW	315128	2292078	98	1.438	0.819	3.200	1.522
WSW	315239	2294826	98	1.335	0.767	3.446	1.449
W	317093	2296691	79	1.640	0.937	3.437	1.557
WNW	317319	2297694	73	2.537	1.457	4.020	2.007
NW	318000	2298432	72	2.410	1.381	4.289	1.997

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Receptor	X	Y	Elev (m)	GLCs (µg/m^3) PM_{10}	$PM_{2.5}$	SO_2	NO_2
NNW	318926	2298657	79	2.204	1.267	4.959	2.596
**	**AT**	**1500**	**m**				
N	319741	2299278	72	3.034	1.743	6.735	3.081
NNE	320884	2299450	67	2.294	1.314	4.284	2.417
NE	322249	2299199	69	3.773	2.169	5.848	2.749
ENE	326155	2299348	74	2.474	1.382	4.639	2.503
E	326093	2296691	111	4.186	2.396	8.978	4.736
ESE	324414	2294755	123	3.479	2.000	8.041	4.137
SE	322025	2294408	92	3.367	1.925	5.854	2.255
SSE	320815	2294098	138	2.294	1.302	4.233	2.202
S	319741	2293491	102	2.509	1.433	3.734	1.755
SSW	317219	2290603	124	1.604	0.917	3.456	1.755
SW	314758	2291708	101	1.409	0.803	3.096	1.472
WSW	314752	2294624	92	1.272	0.731	3.281	1.387
W	315785	2296691	77	1.341	0.768	3.010	1.377
WNW	316855	2297886	75	2.335	1.341	3.890	1.935
NW	317625	2298807	82	2.006	1.148	3.834	1.768
NNW	318733	2299126	74	2.416	1.389	4.898	2.494
**	**AT**	**2000**	**m**				
N	319741	2299780	81	2.704	1.549	5.957	2.887
NNE	321105	2299984	77	1.680	0.964	3.899	1.863
NE	322950	2299900	61	2.986	1.703	5.052	2.332
ENE	326654	2299555	69	2.170	1.225	4.202	2.255
E	326674	2296691	108	3.779	2.162	8.373	4.330
ESE	324926	2294543	130	3.197	1.838	7.224	3.498
SE	322653	2293779	138	2.644	1.519	5.297	2.640
SSE	321026	2293589	108	1.877	1.079	2.880	1.469
S	319741	2292733	125	1.871	1.065	3.239	1.637
SSW	317001	2290077	118	1.385	0.792	3.154	1.610
SW	314393	2291343	113	1.354	0.772	2.984	1.403
WSW	314276	2294427	85	1.208	0.694	3.110	1.345
W	314973	2296691	79	1.356	0.777	2.878	1.310
WNW	316392	2298078	79	2.167	1.244	3.746	1.961
NW	317261	2299171	89	1.678	0.959	3.443	1.860
NNW	318539	2299594	79	2.666	1.532	5.099	2.643
**	**AT**	**2500**	**m**				
N	319741	2300281	85	2.222	1.271	4.684	2.370
NNE	321313	2300485	71	1.665	0.957	3.636	1.580
NE	323418	2300368	71	2.667	1.530	5.614	2.627
ENE	327137	2299755	65	1.890	1.074	3.778	2.010
E	327273	2296691	93	3.494	2.000	8.001	4.071
ESE	325416	2294340	119	2.756	1.584	6.389	3.097
SE	323108	2293324	128	2.221	1.277	4.091	1.839
SSE	321230	2293095	100	1.914	1.095	2.507	1.226
S	319741	2291893	125	1.107	0.627	2.257	1.235
SSW	316796	2289580	112	1.324	0.757	2.925	1.518
SW	314032	2290982	100	1.327	0.758	2.970	1.409
WSW	313795	2294228	89	1.140	0.655	2.961	1.307
W	314305	2296691	83	1.245	0.713	2.788	1.262
WNW	315930	2298270	83	2.031	1.166	3.608	1.982
NW	316901	2299531	88	1.569	0.902	3.640	1.917
NNW	318345	2300062	89	2.926	1.681	5.201	2.700

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Receptor	X	Y	Elev (m)	GLCs (µg/m^3) PM_{10}	$PM_{2.5}$	SO_2	NO_2
**	**AT**	**3000**	**m**				
N	319741	2300782	87	1.857	1.055	4.152	2.175
NNE	321514	2300972	80	1.989	1.143	3.421	1.522
NE	324240	2301190	65	2.264	1.298	4.846	2.443
ENE	327613	2299952	65	1.648	0.940	3.414	1.798
E	327832	2296691	97	3.193	1.827	7.486	3.747
ESE	325896	2294141	111	2.418	1.389	5.683	2.767
SE	323520	2292912	113	1.956	1.124	4.081	1.592
SSE	321430	2292613	109	1.589	0.913	2.971	1.325
S	319741	2290731	164	1.213	0.696	1.821	0.962
SSW	316595	2289096	119	1.270	0.726	2.730	1.413
SW	313674	2290624	98	1.276	0.729	2.939	1.394
WSW	313297	2294043	87	1.080	0.621	2.815	1.262
W	313701	2296691	92	1.060	0.607	2.707	1.216
WNW	315467	2298461	93	1.931	1.109	3.613	2.007
NW	316543	2299889	93	1.604	0.922	3.781	1.940
NNW	318151	2300530	95	2.805	1.611	5.083	2.572
**	**AT**	**4000**	**m**				
N	319741	2301783	72	1.107	0.632	2.756	1.512
NNE	321910	2301927	75	2.303	1.323	3.069	1.446
NE	325298	2302248	56	1.848	1.060	4.671	2.170
ENE	328554	2300342	62	1.270	0.727	2.853	1.419
E	328912	2296691	82	2.777	1.592	6.737	3.301
ESE	326910	2293721	95	2.008	1.152	4.569	2.261
SE	324389	2292043	110	1.424	0.812	3.349	1.403
SSE	321823	2291664	135	1.731	0.995	3.747	1.736
S	319741	2289196	139	1.045	0.599	2.252	1.178
SSW	316201	2288144	109	1.121	0.641	2.393	1.233
SW	312962	2289912	104	1.235	0.710	2.845	1.333
WSW	312097	2293525	99	0.964	0.554	2.483	1.152
W	312582	2296691	92	1.001	0.573	2.559	1.142
WNW	314525	2298851	88	1.720	0.987	3.470	1.948
NW	315831	2300601	94	1.673	0.962	3.924	1.955
NNW	317763	2301466	83	2.209	1.264	4.421	2.144
**	**AT**	**5000**	**m**				
N	319741	2302784	69	0.883	0.505	1.917	1.040
NNE	322300	2302868	65	2.075	1.188	3.125	1.316
NE	326178	2303128	51	1.515	0.869	4.101	1.889
ENE	329488	2300728	56	1.025	0.588	2.464	1.175
E	329958	2296691	77	2.436	1.397	6.075	2.919
ESE	327966	2293284	103	1.724	0.990	3.969	1.932
SE	325194	2291239	130	1.255	0.722	3.042	1.229
SSE	322212	2290725	131	1.572	0.902	3.719	1.885
S	319741	2287937	148	0.880	0.505	2.273	1.211
SSW	315811	2287204	114	1.022	0.585	2.023	1.033
SW	312251	2289201	114	1.203	0.691	2.765	1.276
WSW	311010	2293075	97	0.898	0.516	2.242	1.069
W	311511	2296691	92	0.948	0.542	2.424	1.077
WNW	313414	2299312	98	1.562	0.896	3.299	1.834
NW	315121	2301311	85	1.736	0.998	3.914	1.922
NNW	317375	2302403	78	1.735	0.990	3.560	1.705
**	**AT**	**7000**	**m**				
N	319741	2304830	76	0.811	0.466	1.840	0.825

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Receptor	X	Y	Elev (m)	GLCs (µg/m^3) PM_{10}	$PM_{2.5}$	SO_2	NO_2
NNE	323206	2305055	60	1.204	0.692	2.690	1.184
NE	327772	2304722	62	1.398	0.802	3.182	1.480
ENE	331347	2301499	53	0.753	0.432	1.918	0.900
E	332009	2296691	74	1.966	1.129	5.088	2.380
ESE	329951	2292462	81	1.348	0.771	3.036	1.440
SE	326709	2289723	102	1.351	0.777	3.281	1.420
SSE	323106	2288568	139	0.845	0.484	2.275	1.201
S	319741	2285662	140	0.789	0.454	1.769	0.963
SSW	315039	2285338	161	0.881	0.503	1.877	0.875
SW	310833	2287783	126	1.157	0.665	2.661	1.205
WSW	308996	2292240	106	0.771	0.443	1.957	0.919
W	309434	2296691	100	0.844	0.483	2.156	0.957
WNW	311370	2300158	103	1.309	0.750	2.932	1.590
NW	313703	2302729	86	1.732	0.995	3.735	1.800
NNW	316600	2304273	95	1.153	0.655	2.681	1.284
**	**AT**	**10000**	**m**				
N	319741	2307878	65	0.835	0.480	1.623	0.816
NNE	324533	2308259	66	1.048	0.600	2.436	1.079
NE	330017	2306967	70	1.323	0.759	2.977	1.508
ENE	334128	2302650	55	0.600	0.344	1.589	0.731
E	335047	2296691	125	1.444	0.829	3.893	1.750
ESE	332820	2291273	111	0.945	0.540	2.214	1.064
SE	328903	2287529	120	1.227	0.706	3.213	1.417
SSE	324420	2285395	116	0.614	0.351	1.253	0.646
S	319741	2282477	139	0.786	0.452	1.925	0.827
SSW	313876	2282532	165	0.535	0.306	1.368	0.646
SW	308709	2285659	136	1.087	0.625	2.544	1.132
WSW	306107	2291044	183	0.614	0.353	1.580	0.721
W	306374	2296691	105	0.727	0.416	1.866	0.829
WNW	308444	2301371	115	1.014	0.581	2.391	1.233
NW	311580	2304853	105	1.573	0.904	3.328	1.588
NNW	315444	2307064	82	0.786	0.449	1.770	0.842
	AAQ	**Stations**					
Core zone (existing plant)	323771	2297233	91	7.962	3.955	10.931	6.873
Beruanpal	320789	2297683	81	4.793	2.755	7.489	4.079
Mahalunda	316341	2291800	108	1.869	1.073	3.540	1.651
Narendrapur	318939	2304540	84	0.708	0.406	1.570	0.803
Nimabahali village	324237	2299170	73	3.394	1.936	8.005	3.851
Benipathar village (Core zone expn. area)	319345	2296734	78	3.983	2.289	7.650	3.469
Kankalu village	319438	2298218	76	2.698	1.550	5.073	2.730
Patala	316122	2292319	101	1.624	0.933	3.420	1.599
Barhamunda	319780	2294831	97	2.796	1.608	4.910	2.278
	FOREST						
Jharbandh RF	322964	2295968	106	11.932	6.861	19.792	8.919
Nimidha RF	327318	2297870	94	2.747	1.560	5.583	2.800
Ganthigarhia RF	317855	2300531	94	2.801	1.610	4.863	2.655
Kansara RF	306435	2291218	149	0.630	0.362	1.638	0.752
Ambithi RF	307969	2289688	149	1.057	0.602	1.565	0.705
Kai RF	319326	2285280	139	0.678	0.390	1.915	1.009
		MAX		**15.074**	**8.640**	**19.792**	**8.919**

ANNEXURE : XXV(a) Contd..

Modelling for 3.55 MTPA ISP sanctioned in EC dated 15.02.2021

Revised Modelling consideration with respect to stacks considered for 3.55 MTPA ISP

- ✓ Since one 1x500 TPD Kiln has been established and another 1X500 TPD kiln is under construction, the stack height have been increased from 80 m to 85 m as per actual implementation. The other DRIs have also been revised accordingly, commensurate with their capacities.
- ✓ The configuration of the cement plant sanctioned in EC dated 15.02.2021 has been revised from 1X2600 TPD + 1X2300 TPD to 2X2500 TPD. Hence, the corresponding stack data has also been revised.
- ✓ Since one 125 TPH boiler has been established and another 125 TPH boiler is under construction, the stack data has been revised as per actual implementation
- ✓ The location of several of the units that are yet to be established has been revised within the layout sanctioned in EC dated 15.02.2021. Hence, the coordinates of the stacks have change and the previous model results do not hold good for the revised layout.

ANNEXURE : XXV(b)

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks

```
CO STARTING
  TITLEONE EXPANSION OF DHENKANAL STEEL
PLANT (3.55 MTPA to 7.53 MTPA)
  TITLETWO PM10 EMISSIONS FROM ALL STACKS
  MODELOPT DFAULT CONC ELEV
  AVERTIME 24 PERIOD
  POLLUTID PM10
  RUNORNOT RUN
 CO FINISHED
ME STARTING
  SURFFILE
ORI\DSP\Oct21\753\WithCM\DSP21S.SFC
  PROFFILE
ORI\DSP\Oct21\753\WithCM\DSP21S.PFL
  SURFDATA 99999 2021 XXX
  UAIRDATA 99999 2021 XXX
  WDROTATE 180
ME FINISHED
OU STARTING
OU RECTABLE 24 FIRST
OU MAXTABLE 24 50
OU PLOTFILE 24 ALL FIRST
ORI\DSP\Oct21\753\WithCM\753PM10.PLT
OU FINISHED
**********************************
 *** SETUP Finishes Successfully ***
 **********************************
```

*** POINT SOURCE DATA ***

SOURCE ID	NO. PART. CATS.	EMISSION RATE (GRAMS/SEC) PM_{10}	$PM_{2.5}$	SO_2	NO_2	X (M)	Y (M)	BASE ELEV. (M)	STACK HEIGHT (M)	STACK TEMP. (°K)	STACK EXIT VEL. (M/SEC)	STACK DIA. (M)	BUILDING EXISTS
S-001	0	1.37250	0.78919	15.95400	0.07961	322232	2296476	93	85	423	15.83	3.90	NO
S-002	0	0.12500	0.07188			322080	2296591	88	30	323	16.75	1.00	NO
S-003	0	0.18750	0.10781			322260	2296443	93	30	323	17.44	1.20	NO
S-004	0	0.07813	0.04492			322225	2296729	85	30	323	16.35	0.80	NO
S-005	0	0.01875	0.01078			322220	2296650	87	30	323	20.51	0.35	NO
S-006	0	0.01875	0.01078			322224	2296576	91	30	323	20.51	0.35	NO
S-007	0	0.23438	0.13477			322216	2296706	85	30	323	17.23	1.35	NO
S-008	0	0.23438	0.13477			322212.7	2296770	84	30	323	17.23	1.35	NO
S-009	0	0.15625	0.08984			322225.9	2296755	84	30	323	20.93	1.00	NO
S-010	0	0.15625	0.08984			322283	2296779	86	30	323	20.93	1.00	NO
S-011	0	0.31250	0.17969			322137	2296629	88	30	323	2.34	1.55	NO
S-012	0	1.64700	0.94703	17.58200	0.08773	322381	2296471	92	90	423	18.06	4.00	NO
S-013	0	0.82350	0.47351	8.79120	0.04387	322527.4	2296470	94	90	423	16.05	3.00	NO
S-014	0	2.47050	1.42050	26.37400	0.13160	322676.1	2296468	91	95	423	19.62	4.70	NO
S-015	0	0.37500	0.21563			322475.5	2296329	95	35	323	12.56	2.00	NO
S-016	0	0.20312	0.11680			322555.4	2296657	87	30	373	9.70	1.80	NO
S-017	0	0.37500	0.21563			322551.3	2296739	87	35	323	12.56	2.00	NO
S-018	0	0.45312	0.26055			322818.9	2296323	89	35	323	12.54	2.20	NO
S-019	0	0.25000	0.14375			322816.3	2296654	86	30	373	9.67	2.00	NO
S-020	0	0.45312	0.26055			322810.4	2296727	86	35	323	12.54	2.20	NO
S-021	0	2.93750	1.68910	0.83380	0.26609	321945	2296659	84	90	440	12.69	6.50	NO
S-022	0	2.93750	1.68910	0.83380	0.26609	321937	2296469	87	90	440	12.69	6.50	NO
S-023	0	2.93750	1.68910	0.83380	0.26609	320735	2296535	81	90	440	12.69	6.50	NO
S-024	0	2.93750	1.68910	0.83380	0.26609	320734	2296370	83	90	440	12.69	6.50	NO
S-025	0	2.93750	1.68910	0.83380	0.26609	320153	2296370	92	90	440	12.69	6.50	NO
S-026	0	0.28125	0.16172			322086.9	2296539	88	30	373	13.43	1.80	NO
S-027	0	0.28125	0.16172			321933.5	2296592	85	30	373	13.43	1.80	NO
S-028	0	1.35590	0.77964	0.22235	0.07096	321691	2296712	84	60	440	15.47	4.00	NO
S-029	0	1.35590	0.77964	0.22235	0.07096	321688	2296617	84	60	440	15.47	4.00	NO
S-030	0	1.35590	0.77964	0.22235	0.07096	321684	2296519	84	60	440	15.47	4.00	NO
S-031	0	1.35590	0.77964	0.22235	0.07096	321680	2296428	81	60	440	15.47	4.00	NO
S-032	0	1.35590	0.77964	0.22235	0.07096	320655	2296587	81	60	440	15.47	4.00	NO
S-033	0	1.35590	0.77964	0.22235	0.07096	320652	2296500	83	60	440	15.47	4.00	NO

ANNEXURE : XXV(b) Contd.

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks

SOURCE ID	NO. PART. CATS.	EMISSION RATE (GRAMS/SEC) PM_{10}	$PM_{2.5}$	SO_2	NO_2	X (M)	Y (M)	BASE ELEV. (M)	STACK HEIGHT (M)	STACK TEMP. (°K)	STACK EXIT VEL. (M/SEC)	STACK DIA. (M)	BUILDING EXISTS
S-034	0	1.35590	0.77964	0.22235	0.07096	320652	2296413	85	60	440	15.47	4.00	NO
S-035	0	1.35590	0.77964	0.22235	0.07096	320649	2296330	85	60	440	15.47	4.00	NO
S-036	0	1.35590	0.77964	0.22235	0.07096	320372	2296395	87	60	440	15.47	4.00	NO
S-037	0	1.35590	0.77964	0.22235	0.07096	320370	2296332	89	60	440	15.47	4.00	NO
S-038	0	0.13125	0.07547			321055	2296475	78	30	373	6.27	1.80	NO
S-039	0	0.04688	0.02695			320706.5	2296455	83	30	373	2.24	1.80	NO
S-042	0	0.08333	0.04792	4.44440	3.33330	321975	2297061	76	47	423	13.54	1.80	NO
S-043	0	0.29063	0.16711			322105	2297034	78	30	313	11.65	1.80	NO
S-044	0	0.14583	0.08385	7.77780	5.83330	320094	2297203	77	47	423	15.86	2.20	NO
S-045	0	0.50938	0.29289			319855	2297254	71	30	313	13.66	2.20	NO
S-046	0	2.70310	1.55430	14.34400	0.05446	321905	2296841	81	55	423	18.97	5.00	NO
S-047	0	0.50000	0.28750			322047	2296874	82	45	313	16.23	2.00	NO
S-048	0	3.70000	2.12750	10.27200	0.03900	320130	2296905	77	80	423	15.36	6.50	NO
S-049	0	0.85313	0.49055			319954	2296941	74	55	313	17.72	2.50	NO
S-050	0	0.54688	0.31445	1.21430	0.19314	319742	2296765	77	85	493	17.89	2.50	NO
S-051	0	0.90625	0.52109	1.94290	0.30902	323045.1	2297138	81	100	493	18.10	3.20	NO
S-052	0	0.90625	0.52109	2.04000	0.32447	323028.9	2296971	82	100	493	18.10	3.20	NO
S-053	0	0.13021	0.07487			322617.5	2296925	85	30.5	373	15.11	2.00	NO
S-054	0	0.13021	0.07487			322697.9	2296920	85	30.5	373	15.11	2.00	NO
S-055	0	0.13021	0.07487			322771.5	2296916	85	30.5	373	15.11	2.00	NO
S-056	0	0.09375	0.05391			322846.5	2296910	86	30.5	373	13.43	1.80	NO
S-057	0	0.13021	0.07487			322916.4	2296906	83	30.5	373	15.11	2.00	NO
S-058	0	0.16667	0.09583			322993.3	2296903	83	30.5	373	19.34	2.00	NO
S-059	0	0.16667	0.09583			323066.9	2296898	83	30.5	373	19.34	2.00	NO
S-060	0	0.16667	0.09583			323144.5	2296895	84	30.5	373	19.34	2.00	NO
S-061	0	0.65313	0.37555			322233	2296864	83	60	403	20.47	4.00	NO
S-062	0	0.79792	0.45880			322312	2296837	85	70	403	16.01	5.00	NO
S-070	0	0.09656	0.05552	5.99700	3.54170	320242	2296838	81	60	638	5.92	3.60	NO
S-071	0	0.21771	0.12518	1.17590	0.69444	320246.3	2296716	80	80	638	10.80	4.00	NO
S-073	0	0.05794	0.03331	1.17590	0.69444	320052	2297459	70	60	638	5.11	3.00	NO
S-078	0	0.24531	0.14106			322727	2297581	78	30	318	14.37	1.50	NO
S-079	0	0.06250	0.03594			322725	2297475	80	45	393	10.18	1.00	NO
S-080	0	1.48440	0.85352			322782	2297704	74	60	336	22.97	3.00	NO
S-081	0	0.09375	0.05391			322813	2297472	77	35	351	13.64	1.00	NO
S-082	0	0.24531	0.14106			322914	2297575	75	30	318	14.37	1.50	NO
S-083	0	0.06250	0.03594			322913	2297468	75	45	393	10.18	1.00	NO
S-084	0	1.48440	0.85352			322965	2297701	73	60	336	22.97	3.00	NO
S-086	0	0.71094	0.40879	5.97870	6.00350	322307	2296473	94	85	423	23.58	2.30	NO
S-087	0	0.71094	0.40879	6.31940	6.31940	322454	2296471	93	85	423	23.58	2.30	NO
S-088	0	0.71094	0.40879	6.31940	6.31940	322600.2	2296471	93	85	423	23.58	2.30	NO
S-089	0	0.71094	0.40879	6.31940	6.31940	322749	2296467	89	85	423	23.58	2.30	NO
S-090	0	0.71094	0.40879	6.31940	6.31940	323065.6	2296721	86	85	423	23.58	2.30	NO
S-091	0	0.36969	0.21257	3.28610	3.28610	323148	2296717	87	90	423	16.22	2.00	NO
S-092	0	1.42190	0.81758	12.63900	12.63900	322937.5	2296427	88	110	423	17.28	3.80	NO
S-093	0	0.71094	0.40879	6.31940	6.31940	323086.8	2296422	92	110	423	17.11	2.70	NO
S-094	0	0.42188	0.24258			323062.7	2296652	86	45	323	9.04	2.50	NO
S-095	0	0.42188	0.24258			323150.9	2296648	88	45	323	9.04	2.50	NO
S-096	0	0.42188	0.24258			322940.4	2296495	87	45	323	9.04	2.50	NO
S-097	0	0.42188	0.24258			323089	2296490	89	45	323	9.04	2.50	NO
S-098	0	2.47050	1.42050	26.40400	0.13175	319155	2296881	79	95	423	19.62	4.7	NO
S-099	0	2.47050	1.42050	26.40400	0.13175	319393	2296874	77	95	423	19.62	4.7	NO

ANNEXURE : XXV(b) Contd.

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks

SOURCE ID	NO. PART. CATS.	EMISSION RATE (GRAMS/SEC) PM_{10}	$PM_{2.5}$	SO_2	NO_2	X (M)	Y (M)	BASE ELEV. (M)	STACK HEIGHT (M)	STACK TEMP. (°K)	STACK EXIT VEL. (M/SEC)	STACK DIA. (M)	BUILDING EXISTS
S-100	0	1.23520	0.71027	13.20200	0.06587	319577	2296866	75	95	423	18.75	3.4	NO
S-101	0	0.37500	0.21563			319161	2297100	80	35	323	12.56	2.00	NO
S-102	0	0.20312	0.11680			319400	2297092	76	30	373	9.70	1.80	NO
S-103	0	0.37500	0.21563			319580	2297084	73	35	323	12.56	2.00	NO
S-104	0	0.16667	0.09583	8.88890	6.66670	317034	2294322	92	47	423	16.58	2.30	NO
S-105	0	0.58125	0.33422			317404	2294304	87	30	313	15.59	2.20	NO
S-106	0	0.16667	0.09583	8.88890	6.66670	316685	2294868	100	47	423	18.13	2.20	NO
S-107	0	0.58125	0.33422			316769	2294559	95	30	313	15.59	2.20	NO
S-108	0	3.75000	2.15620	12.13800	0.04608	317119	2293492	104	80	423	21.74	5.50	NO
S-109	0	0.87500	0.50313			316970	2293498	101	55	313	18.17	2.50	NO
S-110	0	3.75000	2.15620	12.13800	0.04608	317111	2293313	106	80	423	21.74	5.50	NO
S-111	0	0.87500	0.50313			316966	2293310	104	55	313	18.17	2.50	NO
S-112	0	5.93750	3.41410	19.60800	0.07444	316788	2293562	97	100	423	28.92	6.00	NO
S-113	0	1.40620	0.80859			316783	2293367	101	55	313	20.27	3.00	NO
S-114	0	1.90310	1.09430	2.04000	0.32482	316839	2292694	103	100	493	19.22	4.50	NO
S-115	0	1.90310	1.09430	2.04000	0.32482	316840	2292513	100	100	493	19.22	4.50	NO
S-116	0	0.16667	0.09583			318229	2295520	83	30.5	373	19.34	2.00	NO
S-117	0	0.16667	0.09583			318401	2295511	80	30.5	373	19.34	2.00	NO
S-118	0	0.16667	0.09583			318586	2295504	80	30.5	373	19.34	2.00	NO
S-119	0	0.16667	0.09583			318755	2295496	82	30.5	373	19.34	2.00	NO
S-120	0	0.16667	0.09583			318911	2295494	84	30.5	373	19.34	2.00	NO
S-121	0	0.16667	0.09583			318234	2295656	82	30.5	373	19.34	2.00	NO
S-122	0	0.16667	0.09583			318404	2295650	79	30.5	373	19.34	2.00	NO
S-123	0	0.16667	0.09583			318582	2295637	81	30.5	373	19.34	2.00	NO
S-124	0	0.09375	0.05391			318759	2295630	82	30.5	373	19.34	1.50	NO
S-125	0	0.09375	0.05391			318910	2295624	84	30.5	373	19.34	1.50	NO
S-126	0	1.22250	0.70295			318516	2295409	80	70	403	20.26	5.50	NO
S-127	0	0.84636	0.48666			318515	2295307	82	70	403	16.97	5.00	NO
S-128	0	0.84636	0.48666			318515	2295200	83	70	403	16.97	5.00	NO
S-129	0	0.10625	0.06109	9.35990	5.52780	318236	2295831	82	60	638	6.51	3.60	NO
S-136	0	0.14719	0.08463			323102	2297564	75	30	318	13.48	1.20	NO
S-137	0	0.03750	0.02156	0.02567	0.04107	323101	2297456	78	45	393	9.55	0.80	NO
S-138	0	0.89063	0.51211			323148	2297691	73	60	336	23.45	2.30	NO
S-139	0	0.16875	0.09703			323187	2297453	78	35	351	10.91	1.50	NO
S-140	0	0.14719	0.08463			323280	2297557	76	30	318	13.48	1.20	NO
S-141	0	0.03750	0.02156	0.02567	0.04107	323283	2297451	77	45	393	9.55	0.80	NO
S-142	0	0.89063	0.51211			323335	2297686	75	60	336	23.45	2.30	NO
S-143	0	0.14719	0.08463			323468	2297550	76	30	318	13.48	1.20	NO
S-144	0	0.03750	0.02156	0.02567	0.04107	323469	2297445	78	45	393	9.55	0.80	NO
S-145	0	0.89063	0.51211			323521	2297678	77	60	336	23.45	2.30	NO
S-146	0	0.73938	0.42514	6.57220	6.57220	318857	2296142	78	110	423	29.42	2.10	NO
S-147	0	0.73938	0.42514	6.57220	6.57220	319186	2296133	81	110	423	29.42	2.10	NO
S-148	0	0.51188	0.29433	4.55000	4.55000	319474	2296119	78	110	423	20.36	2.10	NO
S-149	0	0.42188	0.24258			319642	2296281	77	45	323	9.04	2.50	NO
S-150	0	0.42188	0.24258			319639	2296081	80	45	323	9.04	2.50	NO

ANNEXURE : XXV(b) Contd.

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks

*** AREA SOURCE DATA ***

Source	No part Cats.	Emission rate (g/s/m2)		Co-ordinates (SW corner) (m)		Base elev.	Rel. Height	Dim of area (m)		Orient, of area	Init. SZ
ID	SPM	PM_{10}	$PM_{2.5}$	X	Y	(m)	(m)	X	Y	(deg)	(m)
A-1	0	1.976E-05	1.136E-05	320420.1	2296004.9	89	1	220.27	95.98	0	2
A-2	0	1.976E-05	1.136E-05	318812.6	2295070.6	85	1	162.47	85.63	3	2
A-3	0	3.014E-06	1.733E-06	321545.2	2297636.9	71	1	29.89	68.49	0	2
A-4	0	9.099E-08	1.378E-08	320936.5	2295891.1	80	1	46.48	90.53	0	2
A-5	0	4.691E-06	1.135E-06	323590.6	2297282.2	80	1	60.00	349.62	1	2
A-6	0	4.691E-06	1.135E-06	319532.9	2295944.4	77	1	349.62	60.00	2	2

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

Surface file: ORI\DSP\Oct2021\753\DSP21S.SFC **Met Version: 18081**
Profile file: ORI\DSP\Oct2021\753\DSP21S.PFL
Surface format: FREE
Profile format: FREE
Surface station no.: 99999 **Upper air station no.: 99999**
Name: XXX **Name: XXX**
Year: 2021 **Year: 2021**

First 24 hours of scalar data

YR	MO	DY	JDY	HR	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS	WD	HT	REF TA	HT
21	03	01	60	01	-18.2	0.318	-9.000	-9.000	-999.	431.	161.0	1.00	4.00	0.16	4.54	308.	6.1	297.8	5.5
21	03	01	60	02	-24.7	0.431	-9.000	-9.000	-999.	678.	294.4	1.00	4.00	0.16	3.51	289.	6.1	297.9	5.5
21	03	01	60	03	-34.7	0.607	-9.000	-9.000	-999.	1134.	584.7	1.00	4.00	0.16	2.01	310.	6.1	296.9	5.5
21	03	01	60	04	-31.5	0.552	-9.000	-9.000	-999.	989.	484.9	1.00	4.00	0.16	1.79	276.	6.1	297.3	5.5
21	03	01	60	05	-27.8	0.486	-9.000	-9.000	-999.	818.	375.8	1.00	4.00	0.16	2.59	262.	6.1	296.4	5.5
21	03	01	60	06	-21.4	0.375	-9.000	-9.000	-999.	561.	223.6	1.00	4.00	0.16	1.66	280.	6.1	297.6	5.5
21	03	01	60	07	-27.8	0.486	-9.000	-9.000	-999.	812.	375.8	1.00	4.00	0.16	1.25	276.	6.1	298.2	5.5
21	03	01	60	08	-23.9	0.609	-9.000	-9.000	-999.	1140.	860.4	1.00	4.00	0.16	0.47	321.	6.1	299.2	5.5
21	03	01	60	09	6.7	0.724	0.294	0.005	137.	1476.	-5134.7	1.00	4.00	0.16	0.34	256.	6.1	299.3	5.5
21	03	01	60	10	18.7	0.672	0.616	0.005	455.	1328.	-1477.2	1.00	4.00	0.16	0.49	273.	6.1	302.6	5.5
21	03	01	60	11	27.6	0.504	0.728	0.014	509.	889.	-421.6	1.00	4.00	0.16	1.06	276.	6.1	305.3	5.5
21	03	01	60	12	32.9	0.350	0.800	0.026	566.	520.	-118.7	1.00	4.00	0.16	0.38	290.	6.1	305.7	5.5
21	03	01	60	13	34.9	0.251	0.828	0.026	592.	309.	-41.4	1.00	4.00	0.16	4.25	265.	6.1	306.4	5.5
21	03	01	60	14	33.3	0.250	0.820	0.025	601.	301.	-42.9	1.00	4.00	0.16	2.24	259.	6.1	306.2	5.5
21	03	01	60	15	28.2	0.298	0.779	0.025	609.	390.	-85.0	1.00	4.00	0.16	2.04	255.	6.1	308.7	5.5
21	03	01	60	16	19.7	0.345	0.694	0.025	614.	486.	-188.8	1.00	4.00	0.16	0.38	268.	6.1	306.8	5.5
21	03	01	60	17	8.1	0.287	0.517	0.025	618.	371.	-264.5	1.00	4.00	0.16	2.49	265.	6.1	307.3	5.5
21	03	01	60	18	-10.5	0.326	-9.000	-9.000	-999.	446.	300.1	1.00	4.00	0.16	2.29	215.	6.1	307.1	5.5
21	03	01	60	19	-11.6	0.201	-9.000	-9.000	-999.	225.	63.3	1.00	4.00	0.16	5.05	243.	6.1	304.5	5.5
21	03	01	60	20	-11.6	0.201	-9.000	-9.000	-999.	216.	63.4	1.00	4.00	0.16	3.93	307.	6.1	302.0	5.5
21	03	01	60	21	-21.6	0.315	-9.000	-9.000	-999.	424.	131.0	1.00	4.00	0.16	4.03	260.	6.1	301.8	5.5
21	03	01	60	22	-18.4	0.318	-9.000	-9.000	-999.	431.	159.2	1.00	4.00	0.16	3.68	280.	6.1	300.3	5.5
21	03	01	60	23	-11.6	0.201	-9.000	-9.000	-999.	223.	63.3	1.00	4.00	0.16	2.84	306.	6.1	300.1	5.5
21	03	01	60	24	-6.8	0.099	-9.000	-9.000	-999.	81.	13.0	1.00	4.00	0.16	0.00	285.	6.1	298.1	5.5

First hour of profile data

YR	MO	DY	HR	HEIGHT	F	WDIR	WSPD	AMB_TMP	sigmaA	sigmaW	sigmaV
21	03	01	05	6.1	1	82.	1.73	-999.0	99.0	-99.00	-99.00

F indicates top of profile (=1) or below (=0)

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks

RECEPTOR WISE GROUND LEVEL CONCENTRATIONS (µg/m³)

Receptor	X	Y	Elev (m)	GLCs (µg/m³) PM_{10}	$PM_{2.5}$	SO_2	NO_2
**	AT	100	m				
N	319741	2297853	71	4.963	2.841	12.113	3.928
NNE	320226	2297862	72	6.184	3.540	16.048	5.746
NE	320539	2297489	78	6.746	3.749	16.006	7.102
ENE	320825	2297140	83	7.010	4.025	11.924	4.753
E	323618	2296687	118	10.811	6.206	17.078	8.751
ESE	321245	2296068	81	8.913	5.102	11.953	5.126
SE	320915	2295517	83	7.817	4.484	9.479	3.859
SSE	320086	2295858	93	16.599	9.491	10.054	4.301
S	319741	2295374	92	10.217	5.865	9.196	4.300
SSW	319007	2294919	89	14.649	8.422	7.481	3.639
SW	316360	2293310	104	5.533	3.171	7.352	2.957
WSW	317855	2295910	89	3.669	2.094	10.241	5.690
W	318436	2296691	85	4.199	2.409	12.549	3.234
WNW	318158	2297347	82	4.904	2.811	10.693	3.067
NW	318742	2297690	74	4.827	2.768	8.323	3.538
NNW	319276	2297815	72	4.480	2.566	9.966	4.277
ENE	320940	2297188	80	7.158	4.110	11.375	5.072
ENE	322316	2297758	88	6.841	3.929	12.660	6.146
WSW	316768	2295459	119	3.779	2.167	7.098	3.516
WSW	316207	2295227	103	2.639	1.512	6.869	3.853
**	AT	200	m				
N	319743	2297954	73	4.789	2.740	11.487	3.761
NNE	320265	2297955	74	5.460	3.123	15.318	5.467
NE	320646	2297596	77	7.388	4.131	14.859	6.488
ENE	323105	2298084	72	9.135	5.247	11.616	4.671
E	323741	2296690	168	10.922	6.270	19.230	10.491
ESE	321334	2296021	81	12.643	7.238	11.604	5.131
SE	320986	2295446	85	8.305	4.764	9.212	3.830
SSE	320133	2295744	94	20.276	11.634	10.040	4.471
S	319741	2294850	94	6.256	3.587	8.170	3.633
SSW	318966	2294821	90	4.875	2.783	7.262	3.498
SW	316225	2293185	102	4.934	2.826	7.356	2.878
WSW	317754	2295868	92	3.555	2.037	10.405	5.743
W	318312	2296691	87	3.922	2.251	12.150	3.262
WNW	318065	2297385	82	4.767	2.733	10.226	3.069
NW	318659	2297773	74	4.568	2.620	8.148	3.374
NNW	319237	2297908	71	4.215	2.414	9.626	4.194
NE	320814	2297764	80	4.504	2.518	12.614	5.413
NE	321236	2298186	72	4.612	2.644	9.724	5.275
WSW	316863	2295499	126	3.754	2.153	7.151	3.586
WSW	316063	2295168	102	2.486	1.424	6.771	3.236
**	AT	300	m				
N	319741	2298058	75	4.599	2.631	10.809	3.559
NNE	320303	2298048	76	4.941	2.830	14.554	5.186
NE	321319	2298269	70	4.398	2.521	9.171	4.875
ENE	323252	2298144	71	9.133	5.236	11.871	4.867
ESE	321432	2295991	80	11.362	6.472	11.203	5.143
SE	321057	2295375	87	8.819	5.060	8.957	3.865
SSE	320176	2295641	95	8.041	4.615	9.975	4.545
S	319741	2294723	97	4.248	2.438	7.890	3.468

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks

Receptor	X	Y	Elev (m)	GLCs (µg/m³) PM_{10}	$PM_{2.5}$	SO_2	NO_2
SSW	318922	2294714	91	4.196	2.404	7.071	3.338
SW	315691	2292641	93	3.926	2.247	6.794	2.685
WSW	317647	2295828	96	3.567	2.044	10.049	5.428
W	318187	2296691	90	4.188	2.394	11.534	3.393
WNW	317972	2297424	82	4.633	2.656	9.788	3.066
NW	318575	2297857	77	4.343	2.491	8.008	3.230
NNW	319198	2298002	72	4.012	2.297	9.288	4.170
ESE	322344	2295613	117	5.617	3.213	12.060	4.938
ESE	322664	2295480	114	5.264	3.023	16.094	5.816
WSW	316956	2295537	137	3.627	2.080	7.581	3.836
WSW	315947	2295119	102	2.407	1.378	6.697	3.292
**	AT	400	m				
N	319741	2298162	74	4.393	2.521	10.042	3.335
NNE	320341	2298141	77	4.701	2.699	13.748	4.892
NE	321397	2298347	68	4.198	2.406	9.335	4.563
ENE	323414	2298212	73	9.135	5.143	12.084	5.129
E	324874	2296691	105	7.267	4.110	15.223	7.649
ESE	321525	2295952	82	8.484	4.730	11.261	5.041
SE	321128	2295304	90	8.921	5.120	9.166	3.809
SSE	320241	2295485	93	4.965	2.836	9.833	4.554
S	319741	2294612	96	4.267	2.449	7.658	3.335
SSW	318545	2293804	96	3.412	1.957	6.572	2.971
SW	315590	2292540	96	3.860	2.208	6.700	2.676
WSW	317542	2295780	102	3.593	2.060	9.485	4.989
W	318068	2296691	92	4.425	2.531	10.925	3.483
WNW	317879	2297462	81	4.506	2.584	9.379	3.056
NW	318492	2297940	78	4.125	2.365	7.830	3.077
NNW	319159	2298096	74	3.834	2.194	8.976	4.107
ESE	322012	2295750	94	5.647	3.170	13.858	7.357
ESE	322811	2295419	112	5.147	2.957	17.199	6.387
WSW	317048	2295576	141	3.531	2.025	8.069	4.133
WSW	315840	2295075	103	2.355	1.349	6.620	3.328
**	AT	500	m				
N	319740	2298266	71	4.243	2.431	9.636	3.199
NNE	320380	2298233	77	4.341	2.487	12.992	5.043
NE	321475	2298425	68	4.066	2.319	9.475	4.303
ENE	323644	2298308	76	7.985	4.510	11.984	5.392
E	325015	2296691	94	7.009	3.989	15.095	7.537
ESE	322927	2295371	108	4.809	2.743	17.361	6.836
SE	321198	2295234	91	8.708	5.000	9.217	3.876
SSE	320325	2295282	85	4.664	2.672	9.368	4.316
S	319741	2294506	95	5.922	3.400	7.433	3.209
SSW	318483	2293655	100	3.430	1.967	6.595	2.966
SW	315506	2292456	97	3.791	2.168	6.618	2.675
WSW	317443	2295739	108	3.611	2.070	8.966	4.558
W	317725	2296691	90	4.438	2.541	9.467	3.405
WNW	317786	2297501	80	4.385	2.514	8.994	3.039
NW	318409	2298023	78	3.924	2.250	7.643	2.933
NNW	319120	2298189	76	3.658	2.093	8.643	3.991
WSW	317141	2295614	131	3.538	2.029	8.122	4.113
WSW	315738	2295033	103	2.312	1.324	6.551	3.317
**	AT	600	m				

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks

Receptor	X	Y	Elev (m)	GLCs (µg/m³) PM_{10}	$PM_{2.5}$	SO_2	NO_2
N	319741	2298369	69	4.073	2.328	9.552	3.228
NNE	320419	2298329	75	4.073	2.333	12.255	5.172
NE	321554	2298504	69	3.986	2.256	9.527	4.058
ENE	323817	2298379	74	6.935	3.935	11.498	5.377
E	325137	2296691	97	6.673	3.811	14.779	7.334
ESE	323033	2295327	106	4.707	2.705	17.017	7.112
SE	321269	2295163	90	8.610	4.945	8.936	3.930
SSE	320395	2295113	87	4.792	2.747	8.834	4.004
S	319741	2294402	95	5.297	3.039	7.221	3.095
SSW	318422	2293532	100	3.428	1.966	6.657	2.959
SW	315426	2292377	100	3.717	2.126	6.548	2.677
WSW	317347	2295699	113	3.617	2.074	8.568	4.290
W	317576	2296691	87	4.169	2.383	8.960	3.270
WNW	317692	2297540	78	4.257	2.441	8.615	3.016
NW	318326	2298106	79	3.742	2.145	7.458	2.800
NNW	319082	2298283	72	3.455	1.976	8.212	3.800
ENE	324440	2298637	77	4.865	2.770	8.660	4.279
ENE	324983	2298862	79	4.253	2.396	6.756	3.383
WSW	317234	2295652	120	3.594	2.061	8.240	4.134
WSW	315637	2294991	101	2.278	1.305	6.505	3.291
**	AT	800	m				
N	319741	2298573	68	3.732	2.123	9.610	3.383
NNE	320501	2298525	70	3.936	2.259	11.370	5.250
NE	321708	2298658	68	4.259	2.444	9.362	3.753
ENE	324065	2298482	73	5.463	3.104	10.454	5.068
E	325362	2296691	101	6.247	3.576	14.303	7.024
ESE	323481	2295142	108	4.292	2.458	12.725	6.644
SE	321411	2295021	87	7.902	4.541	7.768	3.682
SSE	320504	2294848	90	4.760	2.726	7.957	3.563
S	319741	2294198	95	6.146	3.527	6.852	2.908
SSW	317638	2291613	154	2.883	1.650	6.198	2.586
SW	315275	2292225	100	3.584	2.049	6.536	2.689
WSW	315437	2294908	99	2.190	1.254	6.404	3.182
W	317327	2296691	76	3.566	1.994	8.244	2.969
WNW	317505	2297617	75	4.027	2.309	7.923	2.958
NW	318159	2298273	75	3.402	1.949	7.047	2.571
NNW	319004	2298470	74	3.200	1.832	7.649	3.518
ENE	324127	2298508	74	5.247	2.997	10.177	4.964
ENE	325341	2299011	76	3.839	2.143	6.460	3.243
**	AT	1000	m				
N	319741	2298775	68	3.312	1.890	9.705	3.557
NNE	320606	2298779	66	3.722	2.136	10.059	4.907
NE	321861	2298811	69	4.410	2.531	8.945	3.681
ENE	325606	2299120	76	3.548	1.977	6.267	3.149
E	325575	2296691	105	5.953	3.408	13.885	6.749
ESE	323828	2294998	108	4.250	2.417	11.210	5.061
SE	321552	2294880	89	7.257	4.171	7.262	3.175
SSE	320599	2294619	97	4.384	2.506	7.273	3.139
S	319741	2293995	97	3.910	2.238	6.556	2.776
SSW	317482	2291238	122	2.575	1.473	5.523	2.356
SW	315128	2292078	98	3.469	1.983	6.551	2.703
WSW	315239	2294826	98	2.110	1.209	6.312	3.077

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks

Receptor	X	Y	Elev (m)	GLCs (µg/m³) PM_{10}	$PM_{2.5}$	SO_2	NO_2
W	317093	2296691	79	3.294	1.791	7.721	2.838
WNW	317319	2297694	73	3.826	2.193	7.339	2.892
NW	318000	2298432	72	3.112	1.783	6.674	2.421
NNW	318926	2298657	79	3.243	1.849	7.237	3.281
**	AT	1500	m				
N	319741	2299278	72	3.237	1.860	9.332	3.734
NNE	320884	2299450	67	3.177	1.819	8.009	2.928
NE	322249	2299199	69	4.443	2.551	8.141	3.225
ENE	326155	2299348	74	2.965	1.663	5.779	2.895
E	326093	2296691	111	5.434	3.108	13.008	6.176
ESE	324414	2294755	123	3.916	2.248	10.339	4.519
SE	322025	2294408	92	5.171	2.973	7.244	2.829
SSE	320815	2294098	138	2.787	1.602	6.052	2.644
S	319741	2293491	102	3.239	1.852	6.065	2.572
SSW	317219	2290603	124	2.165	1.239	4.952	2.143
SW	314758	2291708	101	3.171	1.813	6.606	2.752
WSW	314752	2294624	92	1.984	1.137	6.111	2.826
W	315785	2296691	77	2.093	1.148	5.357	2.115
WNW	316855	2297886	75	3.489	2.001	6.739	2.750
NW	317625	2298807	82	2.905	1.658	6.003	2.158
NNW	318733	2299126	74	2.768	1.582	6.552	2.837
**	AT	2000	m				
N	319741	2299780	81	3.157	1.813	7.945	3.413
NNE	321105	2299984	77	2.618	1.502	7.606	2.813
NE	322950	2299900	61	4.036	2.304	7.722	3.121
ENE	326654	2299555	69	2.525	1.429	5.302	2.605
E	326674	2296691	108	5.045	2.885	12.311	5.722
ESE	324926	2294543	130	3.672	2.110	9.395	4.168
SE	322653	2293779	138	3.575	2.044	6.470	2.674
SSE	321026	2293589	108	3.164	1.818	5.685	2.465
S	319741	2292733	125	2.137	1.225	5.380	2.209
SSW	317001	2290077	118	1.863	1.066	4.449	1.946
SW	314393	2291343	113	3.031	1.737	6.603	2.760
WSW	314276	2294427	85	1.921	1.101	5.865	2.605
W	314973	2296691	79	1.731	0.982	5.281	2.253
WNW	316392	2298078	79	3.183	1.825	6.392	2.613
NW	317261	2299171	89	2.753	1.573	5.447	2.072
NNW	318539	2299594	79	2.598	1.493	6.358	2.726
**	AT	2500	m				
N	319741	2300281	85	2.968	1.703	6.200	2.913
NNE	321313	2300485	71	2.718	1.560	7.245	2.743
NE	323418	2300368	71	3.489	1.989	6.954	2.817
ENE	327137	2299755	65	2.205	1.255	4.970	2.327
E	327273	2296691	93	4.753	2.720	11.879	5.425
ESE	325416	2294340	119	3.423	1.967	8.490	3.759
SE	323108	2293324	128	3.380	1.938	6.248	2.135
SSE	321230	2293095	100	3.203	1.836	5.695	2.509
S	319741	2291893	125	2.231	1.281	4.382	1.678
SSW	316796	2289580	112	1.623	0.929	4.018	1.765
SW	314032	2290982	100	2.983	1.709	6.604	2.826
WSW	313795	2294228	89	1.864	1.069	5.628	2.480
W	314305	2296691	83	1.660	0.951	4.832	2.026

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks

Receptor	X	Y	Elev (m)	GLCs (µg/m³) PM_{10}	$PM_{2.5}$	SO_2	NO_2
WNW	315930	2298270	83	2.867	1.644	6.091	2.482
NW	316901	2299531	88	2.647	1.513	5.379	2.134
NNW	318345	2300062	89	2.744	1.577	6.177	2.776
**	AT	3000	m				
N	319741	2300782	87	2.637	1.503	5.484	2.667
NNE	321514	2300972	80	2.899	1.664	7.109	2.767
NE	324240	2301190	65	3.025	1.735	6.985	2.805
ENE	327613	2299952	65	1.968	1.124	4.667	2.089
E	327832	2296691	97	4.408	2.523	11.246	5.046
ESE	325896	2294141	111	3.180	1.825	7.728	3.412
SE	323520	2292912	113	3.268	1.873	6.311	2.143
SSE	321430	2292613	109	2.829	1.621	5.431	2.497
S	319741	2290731	164	2.411	1.384	4.421	1.721
SSW	316595	2289096	119	1.431	0.819	3.630	1.577
SW	313674	2290624	98	2.878	1.649	6.560	2.841
WSW	313297	2294043	87	1.765	1.012	5.401	2.354
W	313701	2296691	92	1.569	0.899	4.464	1.772
WNW	315467	2298461	93	2.597	1.487	5.838	2.365
NW	316543	2299889	93	2.559	1.463	5.309	2.167
NNW	318151	2300530	95	2.712	1.558	5.863	2.643
**	AT	4000	m				
N	319741	2301783	72	1.743	0.997	4.217	1.908
NNE	321910	2301927	75	2.970	1.703	6.442	2.578
NE	325298	2302248	56	2.506	1.437	6.517	2.688
ENE	328554	2300342	62	1.612	0.923	4.089	1.778
E	328912	2296691	82	3.905	2.238	10.335	4.515
ESE	326910	2293721	95	2.896	1.663	6.509	2.865
SE	324389	2292043	110	2.600	1.483	6.164	2.112
SSE	321823	2291664	135	1.846	1.061	4.389	2.050
S	319741	2289196	139	1.909	1.095	3.930	1.640
SSW	316201	2288144	109	1.294	0.742	3.012	1.291
SW	312962	2289912	104	2.687	1.540	6.374	2.771
WSW	312097	2293525	99	1.537	0.881	4.906	2.126
W	312582	2296691	92	1.653	0.946	4.129	1.605
WNW	314525	2298851	88	2.247	1.287	5.334	2.219
NW	315831	2300601	94	2.464	1.410	5.222	2.213
NNW	317763	2301466	83	2.449	1.402	4.962	2.217
**	AT	5000	m				
N	319741	2302784	69	1.494	0.850	3.671	1.496
NNE	322300	2302868	65	2.695	1.540	5.692	2.316
NE	326178	2303128	51	2.188	1.243	5.762	2.349
ENE	329488	2300728	56	1.359	0.780	3.587	1.528
E	329958	2296691	77	3.475	1.992	9.491	4.045
ESE	327966	2293284	103	2.440	1.400	5.514	2.419
SE	325194	2291239	130	2.165	1.241	5.858	2.089
SSE	322212	2290725	131	1.736	0.996	4.067	1.968
S	319741	2287937	148	1.487	0.854	3.510	1.584
SSW	315811	2287204	114	1.216	0.697	2.507	1.133
SW	312251	2289201	114	2.519	1.444	6.179	2.665
WSW	311010	2293075	97	1.466	0.842	4.542	1.948
W	311511	2296691	92	1.477	0.846	3.952	1.524
WNW	313414	2299312	98	2.018	1.156	4.819	2.136

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks

Receptor	X	Y	Elev (m)	GLCs (µg/m³) PM_{10}	$PM_{2.5}$	SO_2	NO_2
NW	315121	2301311	85	2.432	1.393	5.029	2.225
NNW	317375	2302403	78	2.084	1.196	4.091	1.789
**	AT	7000	m				
N	319741	2304830	76	1.379	0.787	3.348	1.271
NNE	323206	2305055	60	1.784	1.023	4.345	1.724
NE	327772	2304722	62	2.146	1.222	5.643	2.165
ENE	331347	2301499	53	1.101	0.627	3.065	1.285
E	332009	2296691	74	2.866	1.644	8.163	3.358
ESE	329951	2292462	81	1.909	1.089	4.226	1.853
SE	326709	2289723	102	1.988	1.141	5.917	2.261
SSE	323106	2288568	139	1.491	0.857	3.540	1.470
S	319741	2285662	140	1.120	0.642	3.059	1.270
SSW	315039	2285338	161	1.028	0.587	2.300	0.996
SW	310833	2287783	126	2.274	1.304	5.849	2.473
WSW	308996	2292240	106	1.310	0.753	3.861	1.638
W	309434	2296691	100	1.171	0.671	3.609	1.385
WNW	311370	2300158	103	1.708	0.978	4.019	1.930
NW	313703	2302729	86	2.337	1.339	4.992	2.177
NNW	316600	2304273	95	1.506	0.858	3.245	1.418
**	AT	10000	m				
N	319741	2307878	65	1.271	0.727	3.036	1.143
NNE	324533	2308259	66	1.578	0.904	3.864	1.523
NE	330017	2306967	70	2.002	1.142	5.442	2.041
ENE	334128	2302650	55	0.907	0.518	2.591	1.039
E	335047	2296691	125	2.185	1.254	6.473	2.526
ESE	332820	2291273	111	1.379	0.790	3.375	1.490
SE	328903	2287529	120	1.786	1.026	5.476	2.133
SSE	324420	2285395	116	1.226	0.703	2.766	1.177
S	319741	2282477	139	1.082	0.621	3.099	1.164
SSW	313876	2282532	165	0.859	0.494	2.311	0.971
SW	308709	2285659	136	2.013	1.154	5.425	2.226
WSW	306107	2291044	183	1.054	0.606	3.069	1.250
W	306374	2296691	105	1.033	0.592	3.181	1.209
WNW	308444	2301371	115	1.365	0.782	3.298	1.617
NW	311580	2304853	105	2.105	1.207	4.667	2.040
NNW	315444	2307064	82	1.005	0.576	2.504	1.035
	AAQ	Stations					
Core zone (existing plant area)	323771	2297233	91	8.681	4.482	11.408	6.993
Beruanpal	320789	2297683	81	4.966	2.761	12.850	5.553
Mahalunda	316341	2291800	108	2.828	1.620	5.519	2.219
Narendrapur	318939	2304540	84	1.346	0.763	3.004	1.238
Nimabahali village	324237	2299170	73	4.614	2.636	9.330	4.294
Benipathar village (Core zone expansion area)	319345	2296734	78	5.007	2.854	9.480	4.549
Kankalu village	319438	2298218	76	3.905	2.242	9.632	3.811
Patala	316122	2292319	101	3.232	1.845	6.543	2.364
Barhamunda	319780	2294831	97	5.200	2.979	8.128	3.601
	FOREST						
Jharbandh RF	322964	2295968	106	7.626	4.372	21.182	9.315
Nimidha RF	327318	2297870	94	3.765	2.152	8.794	3.694

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks

Receptor	X	Y	Elev (m)	GLCs (µg/m³) PM_{10}	$PM_{2.5}$	SO_2	NO_2
Ganthigarhia RF	317855	2300531	94	2.702	1.553	5.596	2.727
Kansara RF	306435	2291218	149	1.082	0.622	3.083	1.308
Ambithi RF	307969	2289688	149	1.937	1.107	3.008	1.164
Kai RF	319326	2285280	139	1.058	0.607	2.978	1.317
		MAX		**20.276**	**11.634**	**21.182**	**10.491**
Alternate scenarios:							
(1) Max incremental values by replacing 5x900 TPD kilns with 6x650 TPD + 1x600 TPD in expansion phase				**20.317**	**11.657**	**21.281**	**10.493**
Difference w.r.t. 5X900 TPD				**-0.040**	**-0.023**	**-0.098**	**-0.002**
(2) Air Pollution Control Equipment of pellet plant stops working or is not installed				**4775.15**	**2745.70**		

THE MAXIMUM 10 24-HR AVERAGE CONCENTRATION (WITH CONTROL MEASURES)

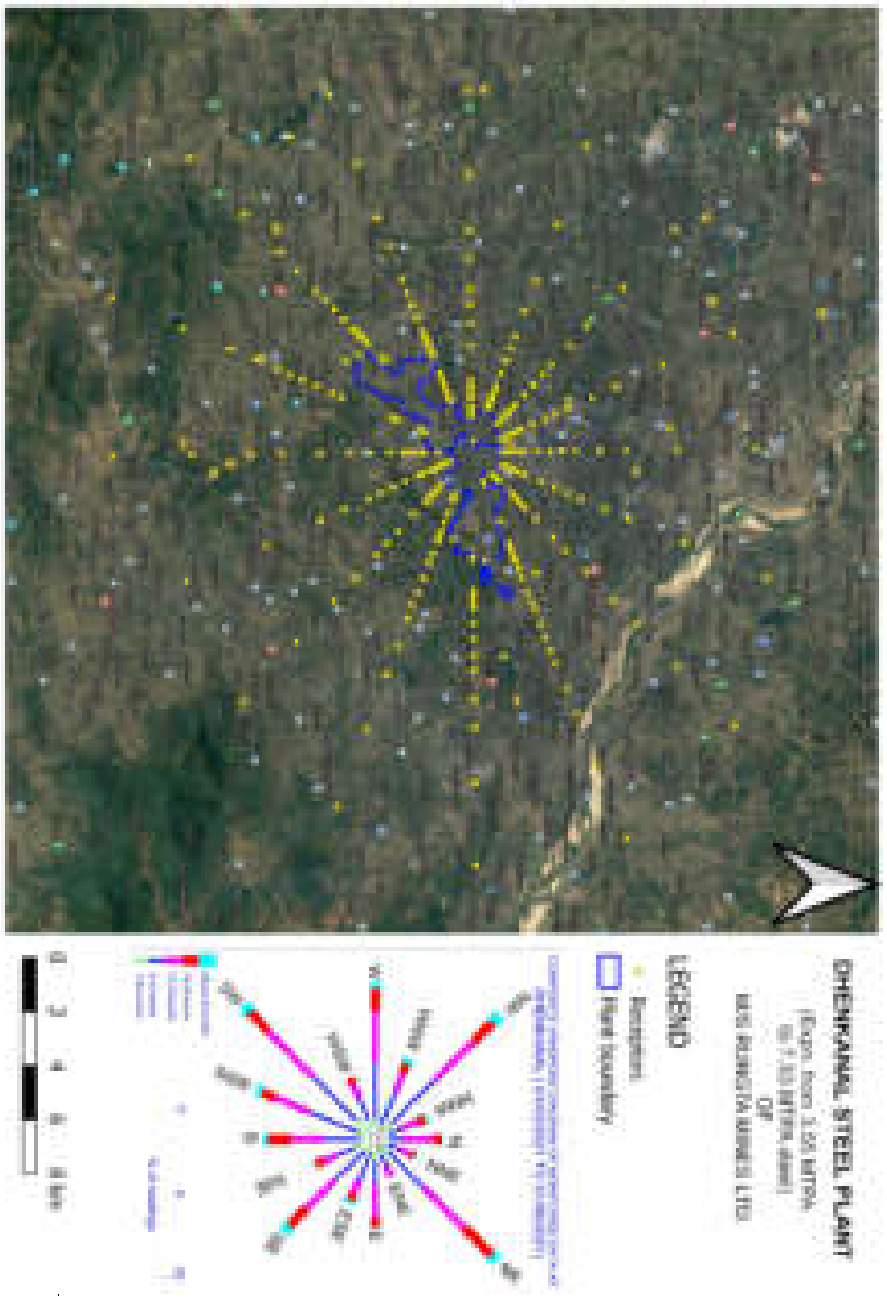
Receptor	Co-ordinates		GLC (µg/m³)		Receptor	Co-ordinates		GLC (µg/m³)	Receptor	Co-ordinates		GLC (µg/m³)
Location	X	Y	PM_{10}	$PM_{2.5}$	Location	X	Y	SO_2	Location	X	Y	NO_2
SSE	320133	2295744	20.276	11.634	Jharbandh RF	322964	2295968	21.182	E	323741	2296690	10.491
SSE	320086	2295858	16.599	9.491	E	323741	2296690	19.230	Jharbandh RF	322964	2295968	9.315
SSW	319007	2294919	14.649	8.422	ESE	322927	2295371	17.361	E	323618	2296687	8.751
ESE	321334	2296021	12.643	7.238	ESE	322811	2295419	17.199	E	324874	2296691	7.649
ESE	321432	2295991	11.362	6.472	E	323618	2296687	17.078	E	325015	2296691	7.537
E	323741	2296690	10.922	6.270	ESE	323033	2295327	17.017	ESE	322012	2295750	7.357
E	323618	2296687	10.811	6.206	ESE	322664	2295480	16.094	E	325137	2296691	7.334
S	319741	2295374	10.217	5.865	NNE	320226	2297862	16.048	ESE	323033	2295327	7.112
ENE	323414	2298212	9.135	5.143	NE	320539	2297489	16.006	NE	320539	2297489	7.102
ENE	323105	2298084	9.135	5.247	NNE	320265	2297955	15.318	E	325362	2296691	7.024

Revised Modelling consideration with respect to stacks considered for 3.55 MTPA ISP

- ✓ Since one 1x500 TPD Kiln has been established and another 1X500 TPD kiln is under construction, the stack height have been increased from 80 m to 85 m as per actual implementation. The other DRIs have also been revised accordingly, commensurate with their capacities.
- ✓ The configuration of the cement plant sanctioned in EC dated 15.02.2021 has been revised from 1X2600 TPD + 1X2300 TPD to 2X2500 TPD. Hence, the corresponding stack data has also been revised.
- ✓ Since one 125 TPH boiler has been established and another 125 TPH boiler is under construction, the stack data has been revised as per actual implementation
- ✓ The location of several of the units that are yet to be established has been revised within the layout sanctioned in EC dated 15.02.2021. Hence, the coordinates of the stacks have change and the previous model results do not hold good for the revised layout.

Revised Modelling consideration with respect to stacks considered for 7.53 MTPA ISP

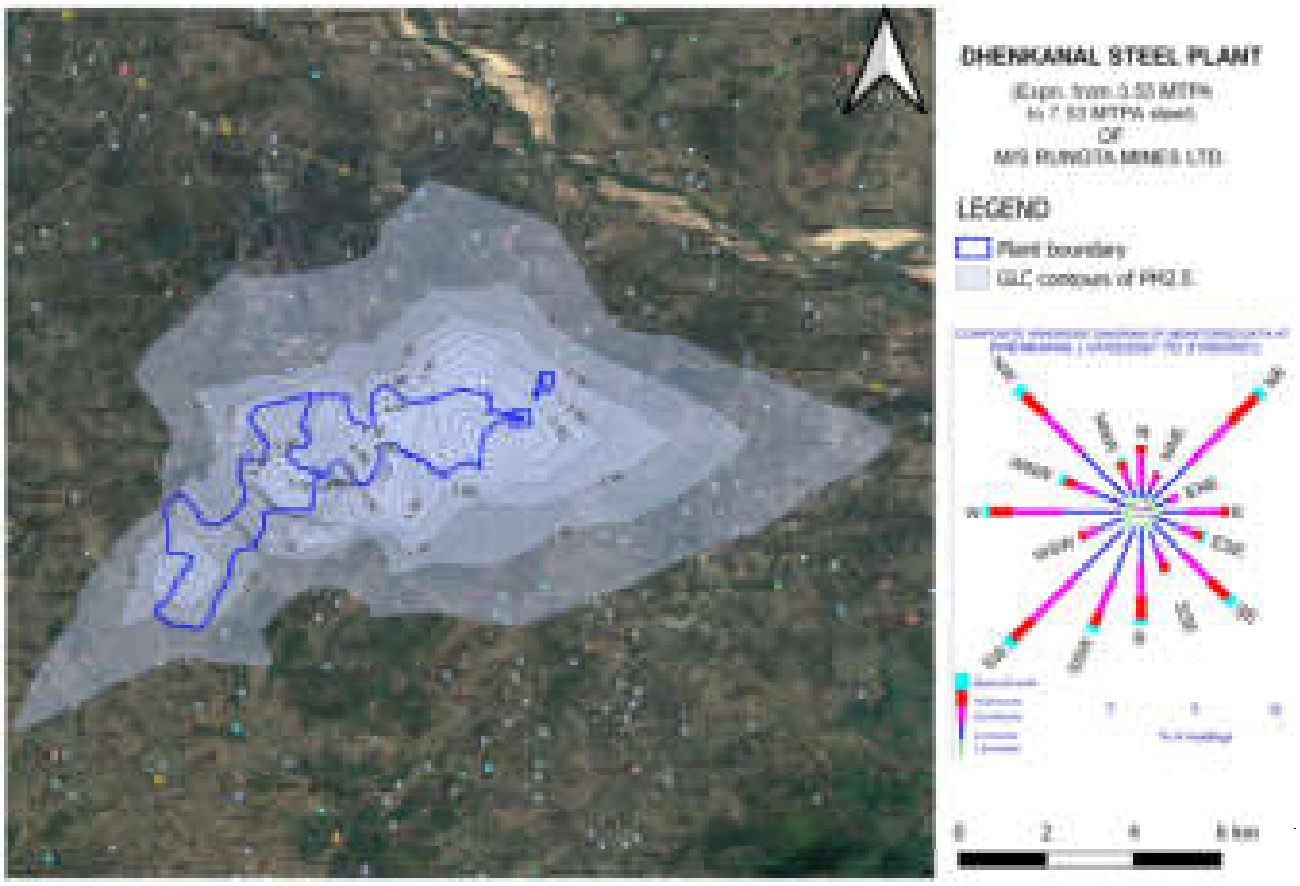
- ✓ In case, Indian coal is used, then only the washery will operate and will release PM to the atmosphere @ 30 mg/Nm³. In the model, currently it has been assumed to be non operational due to availability of imported coal.
- ✓ Only few reheating furnaces will be operational at any given time. All reheating furnace operation cannot occur simultaneously. Hence, a reheating furnace of 0.5 MTPA rolling mill, 0.3 MTPA in strip mill, 0.25 MTPA in DPP (sanctioned in EC dated 15.02.2021) as well as proposed 0.55 MTPA rolling mill has been considered in modelling to represent a likely operational scenario.
- ✓ The producer gas shall be sent to the pellet plant, hence, exhaust from producer gas plant has not been considered



Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks

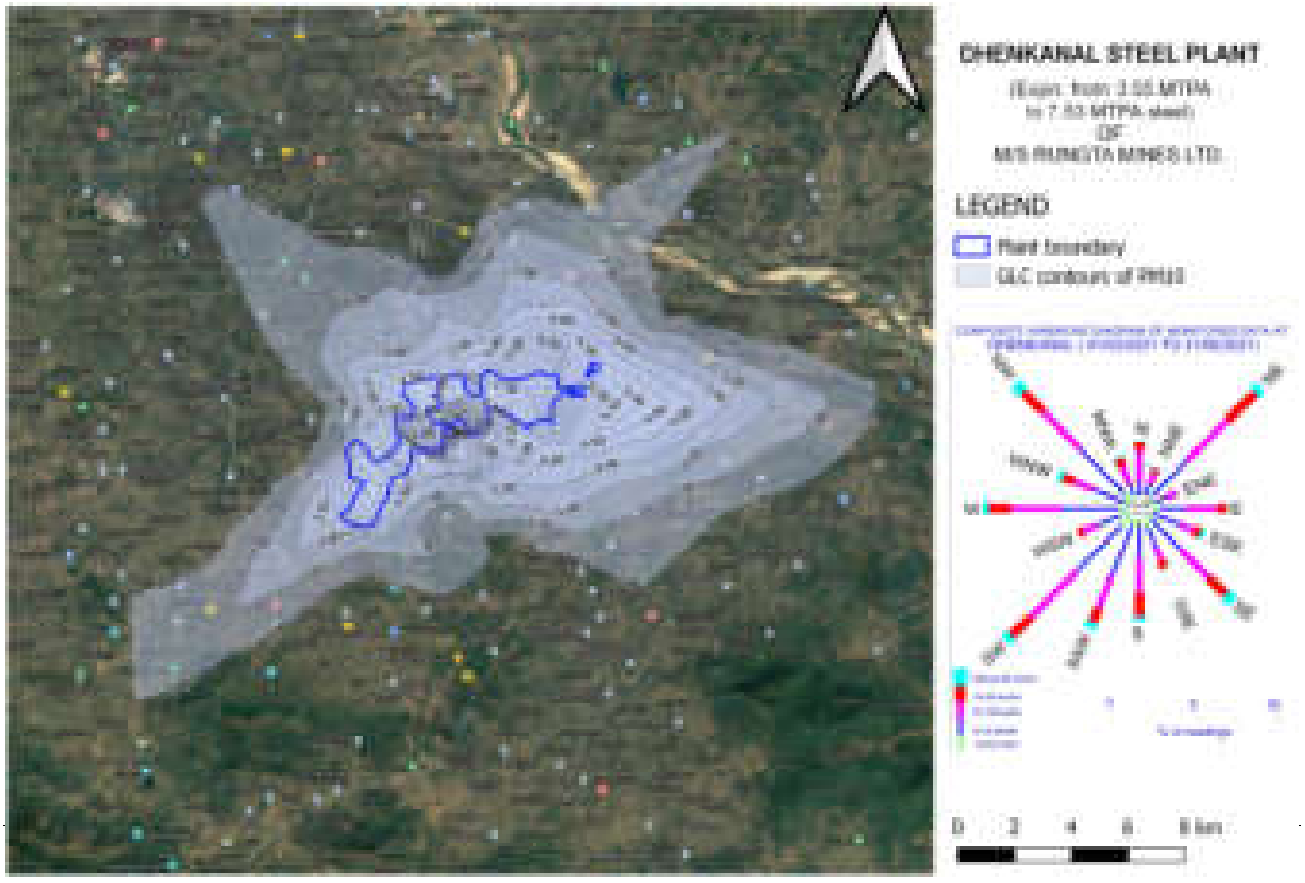
ANNEXURE : XXV(b) Contd.

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks



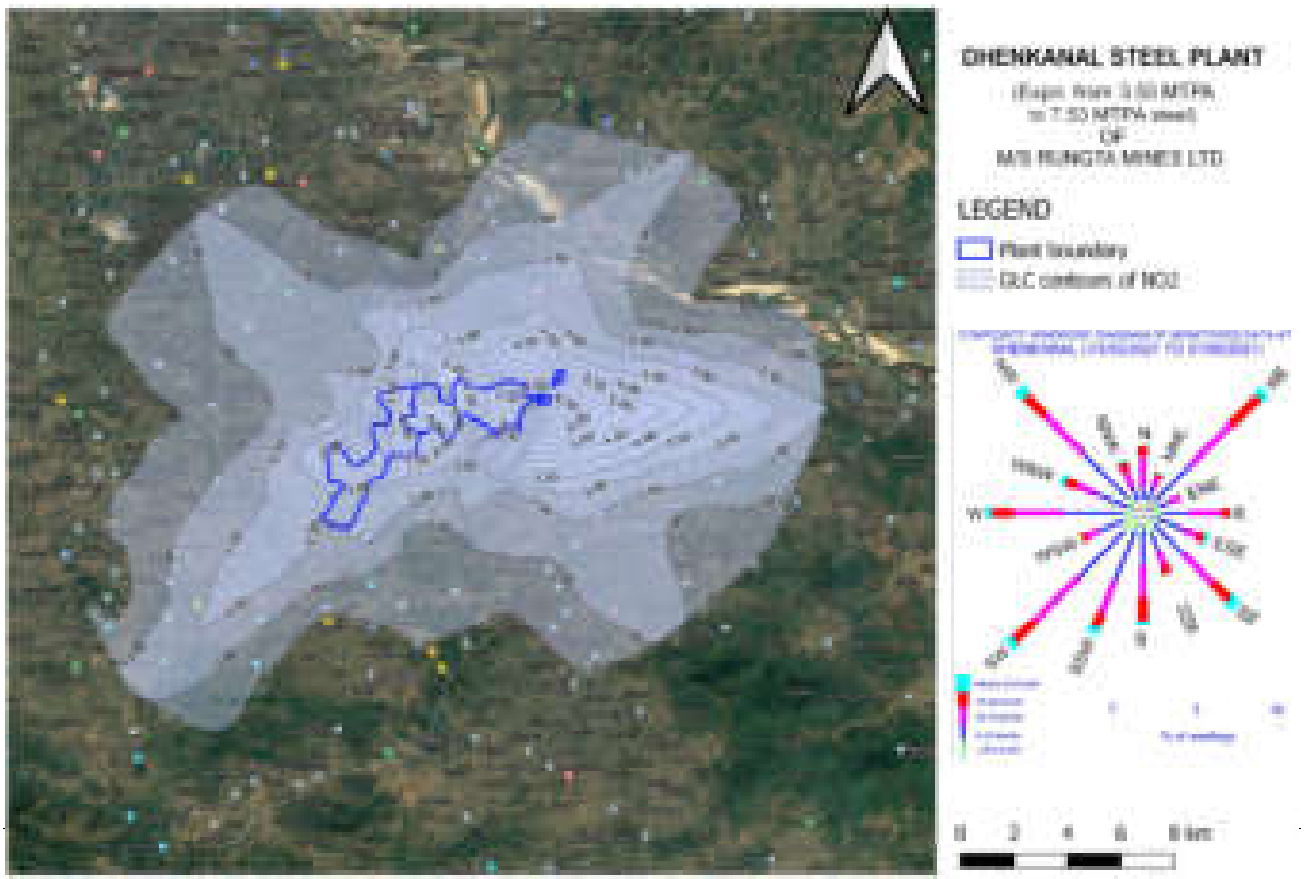
ANNEXURE : XXV(b) Contd.

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks



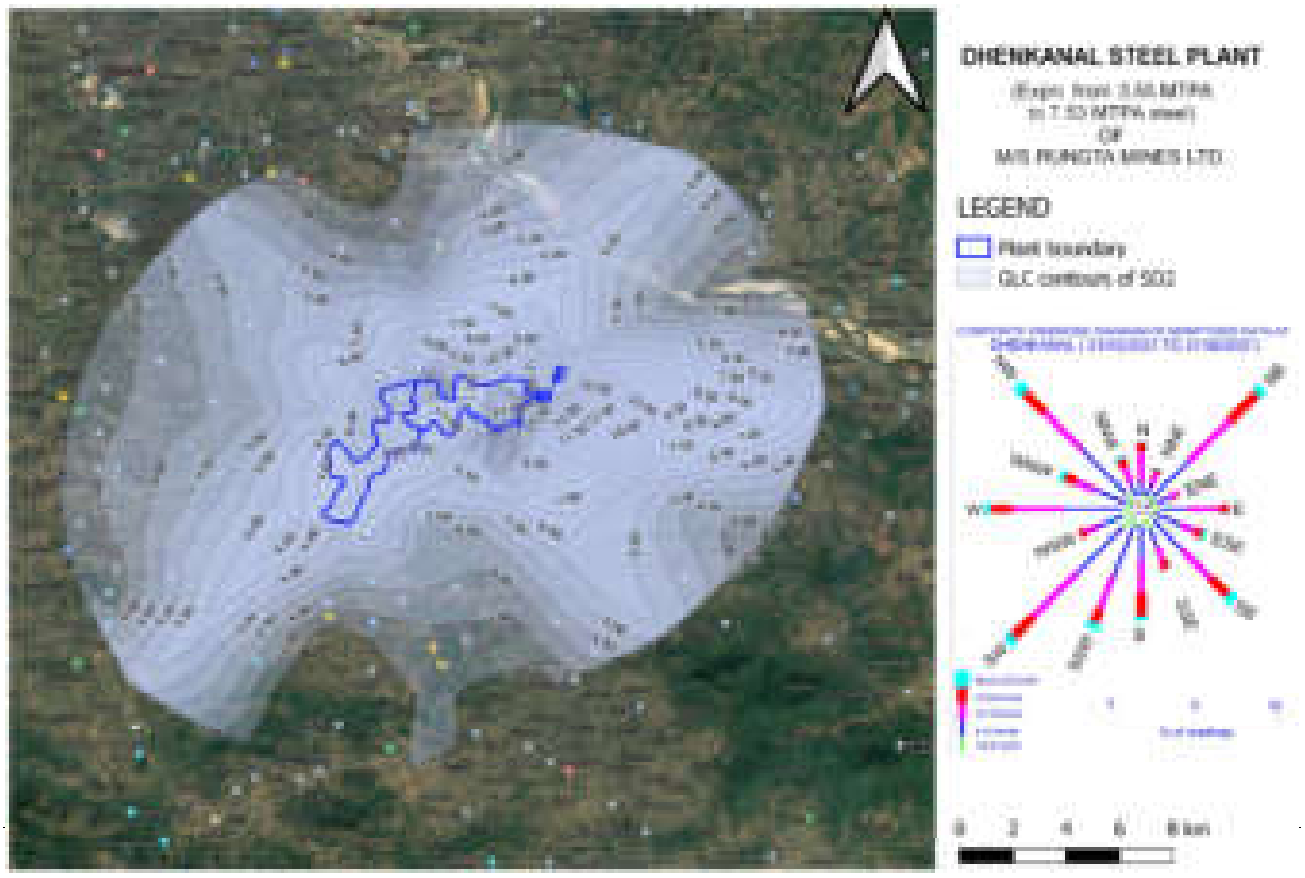
ANNEXURE : XXV(b) Contd.

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks



ANNEXURE : XXV(b) Contd.

Modelling for 7.53 MTPA ISP including all existing, sanctioned and proposed stacks



AIR QUALITY PREDICTION MODELLING DUE TO TRANSPORTATION OF MATERIAL BY ROAD FOR DHENKANAL STEEL PLANT (7.53 MTPA) USING CALINE4 (CALIFORNIA LINE SOURCE DISPERSION MODEL - VERSION 2.1, DATED JUNE 1989)

I. SITE VARIABLES

U= 2.82 M/S Z0= 10. CM ALT= 0. (M) BRG= 225.0 DEGREES VD= 0.0 CM/S CLAS= 2 (B) VS= 0.0 CM/S
MIXH= 773. M AMB= 0.0 PPM SIGTH= 10. DEGREES TEMP= 32.78 DEGREE (C)

II. LINK VARIABLES

The entire route within the study area of 10 km has been divided in 6 sections (S01 to S06) for modelling purpose as shown in Fig 1. All raw material, finished products and waste material will be transported by road through route 1 and 2 seen in Fig 1. The number of trucks have been calculated for them individually as follows:

	Raw material			**Finished product**			**Solid waste**		
	Route 1	**Route 2**	**Total**	**Route 1**	**Route 2**	**Total**	**Route 1**	**Route 2**	**Total**
1. Material to be transported (TPD)	71,707	1,14,012	1,85,720	51,536	51,536	1,03,072	6,930	6,930	13,860
2. Trucks	2,869	4,560	**7,429***	2,062	2,061	4,123	278	277	555
3. Trucks (to & fro)	5,738	9,120	**14,858***	4,124	4,122	8,246	556	554	1,110

**** max considered for modelling***

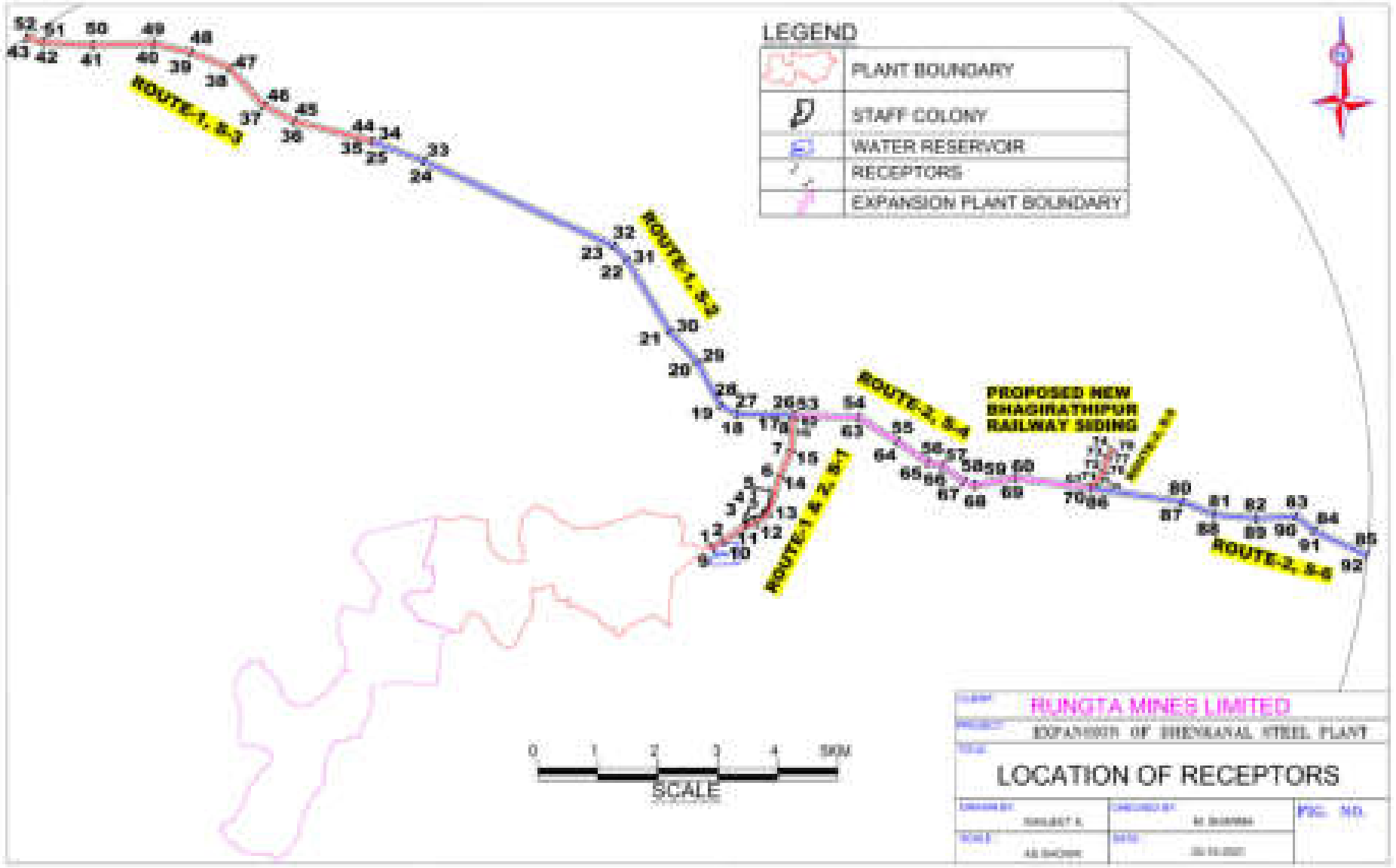
However, in practice, trucks bringing in raw material will not return empty but instead carry solid waste/ finished product. Similarly, empty trucks usually do not arrive to take away the finished product or solid waste. Hence, the maximum possible traffic will be for raw material and the same trucks will again get loaded with product/ waste and move out. Thus, maximum truck load considered for modelling is **7,429** trucks/ day. Out of this 2869 trucks per day will use Route-1 (S02 & S03) and 4560 trucks per day will use Route-2 (S04 to S06). Total 7429 truck load shall be there on the road connecting the plant to National Highway (S01). It is assumed that the finished product & waste will be transported in the same trucks used in raw material, hence, no additional trucks will be required for finishes products & waste. The material coming/ going to/ from the plant will be transported by trucks of Euro VI technology base engines of average 25 T capacity. Size of trucks will vary from 10 to 30 trucks in practice.

The emissions considered with control measures (70% for PM by plantation, wheel washing, water sprinkling and maintenance) are as follows:

- PM_{10} & $PM_{2.5}$ includes wheel disturbed road silt
- The MODE has been set CO for calculating SO_2 concentrations.

PM_{10}	0.6117	g/mile/truck
$PM_{2.5}$	0.1548	g/mile/truck
SO_2	0.0544	g/mile/truck
NO_X	2.1888	g/mile/truck

FIG. 1 : RECEPTOR MAP



The details of each section (S01 to S06) is given below:

Sec.	Link	Link Coordinates (m)				Type	VPH	Emission Factor (g/mile/truck)				H	W
		X1	Y1	X2	Y2		CB	PM_{10}	$PM_{2.5}$	SO_2	NO_X	(m)	(m)
S01	A.	324176	2297282	324365	2297372	AG	620	0.61	0.15	0.05	2.19	0	10
	B.	324365	2297372	324737	2297645	AG	620	0.61	0.15	0.05	2.19	0	10
	C.	324737	2297645	324905	2297673	AG	620	0.61	0.15	0.05	2.19	0	10
	D.	324905	2297673	325110	2297831	AG	620	0.61	0.15	0.05	2.19	0	10
	E.	325110	2297831	325311	2298461	AG	620	0.61	0.15	0.05	2.19	0	10
	F.	325311	2298461	325500	2298885	AG	620	0.61	0.15	0.05	2.19	0	10
	G.	325500	2298885	325545	2299477	AG	620	0.61	0.15	0.05	2.19	0	10
S02	A.	325545	2299477	324592	2299503	AG	240	0.61	0.15	0.05	2.19	0	10
	B.	324592	2299503	324324	2299636	AG	240	0.61	0.15	0.05	2.19	0	10
	C.	324324	2299636	323938	2300363	AG	240	0.61	0.15	0.05	2.19	0	10
	D.	323938	2300363	323473	2300885	AG	240	0.61	0.15	0.05	2.19	0	10
	E.	323473	2300885	322758	2302086	AG	240	0.61	0.15	0.05	2.19	0	10
	F.	322758	2302086	322538	2302319	AG	240	0.61	0.15	0.05	2.19	0	10
	G.	322538	2302319	319377	2303725	AG	240	0.61	0.15	0.05	2.19	0	10
	H.	319377	2303725	318517	2304056	AG	240	0.61	0.15	0.05	2.19	0	10
S03	A.	318517	2304056	317228	2304386	AG	240	0.61	0.15	0.05	2.19	0	10
	B.	317228	2304386	316708	2304651	AG	240	0.61	0.15	0.05	2.19	0	10
	C.	316708	2304651	316144	2305280	AG	240	0.61	0.15	0.05	2.19	0	10
	D.	316144	2305280	315491	2305535	AG	240	0.61	0.15	0.05	2.19	0	10
	E.	315491	2305535	314871	2305682	AG	240	0.61	0.15	0.05	2.19	0	10
	F.	314871	2305682	313857	2305653	AG	240	0.61	0.15	0.05	2.19	0	10
	G.	313857	2305653	313037	2305699	AG	240	0.61	0.15	0.05	2.19	0	10
	H.	313037	2305699	312740	2305772	AG	240	0.61	0.15	0.05	2.19	0	10
S04	A.	325545	2299477	326622	2299447	AG	380	0.61	0.15	0.05	2.19	0	10
	B.	326622	2299447	327267	2299045	AG	380	0.61	0.15	0.05	2.19	0	10
	C.	327267	2299045	327777	2298691	AG	380	0.61	0.15	0.05	2.19	0	10
	D.	327777	2298691	328019	2298648	AG	380	0.61	0.15	0.05	2.19	0	10
	E.	328019	2298648	328372	2298371	AG	380	0.61	0.15	0.05	2.19	0	10
	F.	328372	2298371	328564	2298313	AG	380	0.61	0.15	0.05	2.19	0	10
	G.	328564	2298313	329225	2298435	AG	380	0.61	0.15	0.05	2.19	0	10
	H.	329225	2298435	330498	2298266	AG	380	0.61	0.15	0.05	2.19	0	10
S05	A.	330498	2298266	330711	2298534	AG	380	0.61	0.15	0.05	2.19	0	10
	B.	330711	2298534	330770	2298778	AG	380	0.61	0.15	0.05	2.19	0	10
	C.	330770	2298778	330860	2298917	AG	380	0.61	0.15	0.05	2.19	0	10
S06	A.	330498	2298266	332016	2298039	AG	380	0.61	0.15	0.05	2.19	0	10
	B.	332016	2298039	332548	2297826	AG	380	0.61	0.15	0.05	2.19	0	10
	C.	332548	2297826	333252	2297758	AG	380	0.61	0.15	0.05	2.19	0	10
	D.	333252	2297758	333907	2297797	AG	380	0.61	0.15	0.05	2.19	0	10
	E.	333907	2297797	334213	2297552	AG	380	0.61	0.15	0.05	2.19	0	10
	F.	334213	2297552	335102	2297144	AG	380	0.61	0.15	0.05	2.19	0	10

RECEPTOR WISE RESULTS

The receptors have been assumed at a distance of 50 m from the center of the road and receptor wise results are listed below:

Sec. No.	Receptor No	Coordinates (m)			Incremental GLC (µg/m³)			
		X	Y	Z	PM_{10}	$PM_{2.5}$	SO_2	NO_2
S01	1	324152	2297332	1.5	0.00	0.00	0.00	0.00
	2	324337	2297419	1.5	1.77	0.45	0.14	0.67
	3	324715	2297698	1.5	1.98	0.50	0.28	0.67
	4	324883	2297725	1.5	2.45	0.62	0.28	0.90
	5	325063	2297864	1.5	1.44	0.36	0.14	0.45

Sec. No.	Receptor No	Coordinates (m)			Incremental GLC (µg/m³)			
		X	Y	Z	PM_{10}	$PM_{2.5}$	SO_2	NO_2
	6	325259	2298480	1.5	0.11	0.03	0.00	0.00
	7	325446	2298899	1.5	0.02	0.00	0.00	0.00
	8	325485	2299424	1.5	0.00	0.00	0.00	0.00
	9	324199	2297233	1.5	0.00	0.00	0.00	0.00
	10	324393	2297324	1.5	0.00	0.00	0.00	0.00
	11	324759	2297593	1.5	0.02	0.01	0.00	0.00
	12	324928	2297621	1.5	0.00	0.00	0.00	0.00
	13	325158	2297798	1.5	0.00	0.00	0.00	0.00
	14	325362	2298441	1.5	2.56	0.65	0.28	0.90
	15	325554	2298871	1.5	2.38	0.60	0.28	0.67
	16	325596	2299421	1.5	2.08	0.53	0.28	0.67
	AQ1	323771	2297233	1.5	0.00	0.00	0.00	0.00
S02	17	325485	2299424	1.5	0.00	0.00	0.00	0.00
	18	324578	2299449	1.5	0.00	0.00	0.00	0.00
	19	324284	2299595	1.5	0.00	0.00	0.00	0.00
	20	323892	2300332	1.5	0.00	0.00	0.00	0.00
	21	323428	2300853	1.5	0.00	0.00	0.00	0.00
	22	322714	2302052	1.5	0.00	0.00	0.00	0.00
	23	322505	2302273	1.5	0.00	0.00	0.00	0.00
	24	319356	2303674	1.5	0.00	0.00	0.00	0.00
	25	318500	2304003	1.5	0.00	0.00	0.00	0.00
	26	325546	2299532	1.5	0.84	0.21	0.14	0.22
	27	324605	2299558	1.5	0.67	0.17	0.14	0.22
	28	324364	2299678	1.5	0.66	0.17	0.14	0.22
	29	323983	2300395	1.5	0.67	0.17	0.14	0.22
	30	323517	2300918	1.5	0.66	0.17	0.14	0.22
	31	322802	2302119	1.5	0.66	0.17	0.14	0.22
	32	322570	2302365	1.5	0.68	0.17	0.14	0.22
	33	319398	2303776	1.5	0.68	0.17	0.14	0.22
	34	318534	2304108	1.5	0.00	0.00	0.00	0.00
	AQ5	324237	2299170	1.5	0.00	0.00	0.00	0.00
S03	35	318500	2304003	1.5	0.00	0.00	0.00	0.00
	36	317209	2304334	1.5	0.00	0.00	0.00	0.00
	37	316674	2304607	1.5	0.00	0.00	0.00	0.00
	38	316112	2305233	1.5	0.00	0.00	0.00	0.00
	39	315475	2305482	1.5	0.00	0.00	0.00	0.00
	40	314865	2305627	1.5	0.00	0.00	0.00	0.00
	41	313856	2305598	1.5	0.00	0.00	0.00	0.00
	42	313029	2305645	1.5	0.00	0.00	0.00	0.00
	43	312727	2305719	1.5	0.00	0.00	0.00	0.00
	44	318534	2304108	1.5	0.73	0.18	0.14	0.22
	45	317248	2304438	1.5	0.66	0.17	0.14	0.22
	46	316742	2304696	1.5	0.65	0.16	0.14	0.22
	47	316176	2305326	1.5	0.69	0.18	0.14	0.22
	48	315508	2305587	1.5	0.73	0.19	0.14	0.22
	49	314877	2305737	1.5	0.84	0.21	0.14	0.22
	50	313858	2305708	1.5	0.82	0.21	0.14	0.22
	51	313045	2305754	1.5	0.72	0.18	0.14	0.22
	52	312753	2305826	1.5	0.00	0.00	0.00	0.00
	AQ4	318939	2304540	1.5	0.09	0.02	0.00	0.00
S04	53	325546	2299532	1.5	0.00	0.00	0.00	0.00
	54	326638	2299501	1.5	1.32	0.33	0.14	0.45

Sec. No.	Receptor No	Coordinates (m) X	Y	Z	Incremental GLC (µg/m³) PM_{10}	$PM_{2.5}$	SO_2	NO_2
	55	327297	2299091	1.5	1.03	0.26	0.14	0.45
	56	327799	2298743	1.5	1.02	0.26	0.14	0.22
	57	328043	2298700	1.5	1.17	0.30	0.14	0.45
	58	328397	2298420	1.5	1.04	0.26	0.14	0.45
	59	328567	2298369	1.5	1.11	0.28	0.14	0.45
	60	329224	2298490	1.5	1.36	0.34	0.14	0.45
	61	330474	2298324	1.5	1.22	0.31	0.14	0.45
	62	325596	2299421	1.5	0.00	0.00	0.00	0.00
	63	326606	2299392	1.5	0.00	0.00	0.00	0.00
	64	327237	2298999	1.5	0.00	0.00	0.00	0.00
	65	327756	2298639	1.5	0.00	0.00	0.00	0.00
	66	327996	2298596	1.5	0.00	0.00	0.00	0.00
	67	328346	2298321	1.5	0.00	0.00	0.00	0.00
	68	328561	2298256	1.5	0.00	0.00	0.00	0.00
	69	329227	2298379	1.5	0.00	0.00	0.00	0.00
	70	330490	2298211	1.5	0.00	0.00	0.00	0.00
S05	71	330474	2298324	1.5	0.00	0.00	0.00	0.00
	72	330660	2298558	1.5	0.01	0.00	0.00	0.00
	73	330718	2298800	1.5	0.00	0.00	0.00	0.00
	74	330814	2298947	1.5	0.00	0.00	0.00	0.00
	75	330600	2298306	1.5	0.00	0.00	0.00	0.00
	76	330762	2298509	1.5	0.61	0.16	0.00	0.22
	77	330821	2298756	1.5	1.42	0.36	0.14	0.45
	78	330906	2298887	1.5	0.98	0.25	0.14	0.22
S06	79	330600	2298306	1.5	1.20	0.30	0.14	0.90
	80	332031	2298093	1.5	1.19	0.30	0.14	0.22
	81	332561	2297880	1.5	1.07	0.27	0.14	1.12
	82	333253	2297813	1.5	1.26	0.32	0.14	1.12
	83	333925	2297853	1.5	1.29	0.33	0.14	1.12
	84	334242	2297599	1.5	1.03	0.26	0.14	0.90
	85	335125	2297194	1.5	1.05	0.27	0.14	0.67
	86	330490	2298211	1.5	0.00	0.00	0.00	0.00
	87	332002	2297986	1.5	0.00	0.00	0.00	0.00
	88	332535	2297772	1.5	0.00	0.00	0.00	0.00
	89	333251	2297703	1.5	0.00	0.00	0.00	0.00
	90	333889	2297741	1.5	0.00	0.00	0.00	0.00
	91	334184	2297505	1.5	0.00	0.00	0.00	0.00
	92	335079	2297094	1.5	0.00	0.00	0.00	0.00
	Maximum				**2.56**	**0.65**	**0.28**	**1.12**
	At Air Quality Stations							
	AQ1	323771	2297233	1.5	0.00	0.00	0.00	0.00
	AQ4	318939	2304540	1.5	0.09	0.02	0.00	0.00
	AQ5	324237	2299170	1.5	0.00	0.00	0.00	0.00

SUMMARY OF MAXIMUM RESULTS (at 50 m from road)

Pollutant	Maximum incremental GLC (µg/m³) Incremental GLC (µg/m³)	Receptor No.	Section
PM_{10}	2.56	14	S1
$PM_{2.5}$	0.65	14	S1
SO_2	0.28	14	S1
NO_X	1.12	14	S1

ANNEXURE : XXV(c) Contd.

BACKGROUND NOTES

Emissions from trucks as per norms

Emission standards for new heavy-duty engines—applicable as per Bharat Stage VI (applicable nation wide since 1st April 2020).

EU Emission Standards for Heavy-Duty Diesel Engines: Steady-State Testing

Stage	Date	Test	CO g/kWh	HC	NOx	PM	PN 1/kWh	Smoke 1/m
Euro IV	2005.1		1.5	0.46	3.5	0.02		0.5
Euro V	2008.1		1.5	0.46	2	0.02		0.5
Euro VI	**2013.01**	**WHSC**	**1.5**	**0.13**	**0.4**	**0.01**	**8.0×1011**	

a- PM = 0.13 g/kWh for engines < 0.75 dm3 swept volume per cylinder and a rated power speed > 3000 min-1

Calculation for Emission from tipping trucks of 25T capacity which will be plying

vehicle speed 40 Km/hr 180 HP/truck

	Units	NOx	PM	SO_2
Capacity of Diesel Engine		g/kWh (Stage : Euro IV)		
Emission permitted		0.4	0.01	
Resultant KWH	KWH	136.8	136.8	136.8
Emission from one truck	g/truck/hour	54.72	1.368	0.00136
Emission from 1 truck/km	g/km	1.368	0.0342	0.03402
Emission from 1 truck/mile	g/mile	2.1888	0.05472	0.054432

As per AP-42, 5th Edition of US EPA, Section 13.2.1.3, the quantity of particulate emissions from re-suspension of loose material on the road surface due to vehicle travel on a dry paved road may be estimated using the following empirical expression:

$E = [k\ (sL)^{0.91} \times (W)^{1.02}] \times (1\text{-}P/4N)$

where: E = particulate emission factor (having units matching the units of k),
sL = road surface silt loading (grams per square meter) (g/m^2). The average silt content has been taken as 0.06 g/m^2 as per Table 13.2.1-2 of AP-42, US EPA..
W = average weight (tons) of the vehicles travelling the road, which is 24.5T (average of loaded and empty trucks) for the traffic.
P = Total wet days with at least 0.254 mm (0.01 in) of precipitation during the averaging period which is 8.1 days at IMD Angul (avg. from 1981-2010), and
N = Number of days in the averaging period which is 92 days

Average vehicle weight	24.5 T	Total number of days	92
Silt load (g/m^2)	0.06	Total number of wet days	8.1
Emission factor (PM_{10})	0.6117 g/VKT		
Emission factor ($PM_{2.5}$)	0.1548 g/VKT		

Standards for Ambient air quality (MoEF Notification G.S. R 826(E) dated 16/11/2009)

Pollutants	Concentration of ambient air (All concentrations are micro g/m³) for 24 hours average: Industrial area, Residential, Rural and Other areas	Ecologically sensitive area (Notified by Central Govt.)
Sulphur Dioxide (SO_2)	80	80
Oxides of Nitrogen as NO_2	80	80
Particulate Matter (size ≤10µm)	100	100
Particulate Matter (size ≤2.5µm)	60	60

ANNEXURE : XXVI

ACTION PLAN FOR CORPORATE RESPONSIBILITY FOR ENVIRONMENTAL PROTECTION (CREP) IN PROPOSED CEMENT PLANT IN DHENKANAL STEEL PLANT

Sl. No.	CREP Recommendation	Action Plan
1.	Cement Plants, which are not complying with notified standards, shall do the following to meet the standards: Augmentation of existing Air Pollution Control Devices - by July 2003 Replacement of existing Air Pollution Control Devices - by July 2004	The cement plant is yet to be installed and will be installed in compliance to the emission limits prescribed in the environmental clearance by MoEF&CC and SPCB in CTO.
2.	Cement Plants located in critically polluted or urban areas (including 5 km distance outside urban boundary) will meet 100 mg/Nm^3 limit or particulate matter by December 2004 and continue working to reduce the emission of particulate matter to 50 mg/Nm^3.	The plant is located in a critically polluted industrial cluster of Angul-Talcher. Hence, the emissions from the proposed cement plant shall be lower than 30 mg/Nm^3.
3.	The new cement kilns to be accorded NOC/Environmental Clearance w.e.f 01.04.2003 will meet the limit of 50 mg/Nm^3 for particulate matter emissions.	Clinker kiln is to be installed in the project and will have emissions lower than 30 mg/Nm^3.
4.	CPCB will evolve load based standards by December 2003.	Not applicable on Project Proponent
5.	CPCB and NCBM will evolve SO_2 and NOx emission standards by June 2004.	Not applicable on Project Proponent
6.	The Cement industries will control fugitive emissions from all the raw material and products storage and transfer points by December 2003. However, the feasibility for the control of fugitive emissions form limestone and coal storage areas will be decided by the National Task Force (NTF). The NTF shall submit its recommendations within three months.	Will be followed along with any additional directions given at a later date
7.	CPCB, NCBM, BIS and Oil refineries will jointly prepare the policy on use of petroleum cokes as fuel in cement kiln by July 2003.	Not applicable on Project Proponent
8.	After performance evaluation of various types of continuous monitoring equipment and feedback form the industries and equipment manufactures, NTF will decide feasible unit operations/ sections for installation of continuous monitoring equipment. The industry will install the continuous monitoring systems (CMS) by December 2003	Continuous ambient air quality monitoring systems are already installed in the existing integrated steel plant complex and no separate monitoring equipment are proposed for the proposed cement plant, which is one of sub-units of the integrated steel plant
9.	Tripping in kiln ESP to be minimized by July 2003 as per the recommendations of NTF.	Measures will be taken to minimise tripping in proposed clinker unit
10.	Industries will submit the target date to enhance the utilization of waste material by April, 2003.	Waste material will be used in proposed clinker unit as approved by SPCB
11.	NCBM will carry out a study on hazardous waste utilization in cement kiln by December 2003.	Not applicable on Project Proponent
12.	Cement industries will carry out feasibility study and submit target dates to CPCB for co-generation of power by July 2003.	Waste heat recover from clinker kiln waste gases shall be done and 25 MW shall be generated
13.	Non complying units shall given bank guarantee to respective SPCBs.	Any BG will be submitted, if required by SPCB. However, there is no intent of non compliance.