ESSAR STEEL

ESSAR STEEL INDIA LIMITED

PRE FEASIBILITY REPORT

FOR

EXPANSION OF BENEFICIATION PLANT (10.70 TO 16 MTPA)

AT

VILLAGE – DABUNA, TEHSIL – BARBIL, DISTRICT – KEONJHAR, STATE – ODISHA.

DOCUMENT NUMBER

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ABBREVIATIONS

CHC	Community health center
CPP	Captive Power Plant
Cusec	Measure of flowrate, cubic feet per second
CWC	Central Water Commission
EC	Environmental Clearance
EPC	Engineering, Procurement & Construction
ESIL	Essar Steel India Limited
Fe	Chemical symbol for metallic Iron
GDP	Gross Domestic Product
Ha	Unit of Area, Hectare
HGMS	High Gradient Magnetic Separator
IOF	Iron Ore Fines
ISP	Integrated Steel Plant
KIDCO	Keonjhar Infrastructure Development Company Limited
Km	Unit of Length, kilometer
kV	Unit of Voltage, Kilo voltage
kW	Unit of Power, Kilowatt
M	Unit of Length, Meter
MTPA	Unit of mass Throughput, Millions of tonnes per annum
MW	Unit of Power, Megawatt
NH	National Highway
OPTCL	Odisha Power Transmission Corporation Limited
P80	80% of the product passing by weight
ROM	Run of Mine

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1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

Essar Group maintains a very balanced portfolio of assets in the manufacturing and services sectors of Steel, Oil & Gas, Power, Communications, Shipping ports & logistics, and Construction. The group has operations in more than 25 countries and employs over 60,000 people.

Essar Steel is a global producer of Steel with a footprint in India, Canada, USA, the Middle East and Asia. The company is totally integrated from raw material to finished products and operating in the areas that includes Iron Ore beneficiation, Pelletization, Iron and Steel, Steel processing and distribution etc.

Essar Steel Orissa Limited was incorporated on 14th June 2006 with the Registrar of Companies" Mumbai Maharashtra as a wholly owned subsidiary of Essar Steel India Limited (hereafter referred as ESIL) - the flagship company of Essar Group with main objective, of setting up a Steel plant in the State of Odisha.

In the Financial year 2009-10, as part of the Essar Group's expansion and product diversification strategy, Essar Steel India Limited planned additional capacities for manufacture of Pellets, Slabs, Hot Rolled Coils, Plates and Pipes in the project companies wholly owned by it viz., Essar Steel Orissa Limited, Essar Steel Hazira Limited ,Hazira Plate Limited and Hazira Pipe Mill Limited. Accordingly, the said project companies amalgamated with the parent company i.e. EStIL.

Essar Steel Orissa Ltd., now known as ESIL has commissioned an Iron Ore Beneficiation Plant of 10.70 MTPA (throughput) capacity along with tailing disposal and 253 km long 12 MTPA Slurry Pipeline facility from Dabuna to Paradeep Pellet Plant.

With reference to the EC no J-11011/129/2007 – IA II (I) dated 29th May, 2008 for Integrated Steel Plant (6.00 MTPA) at Paradeep, Dist- Jagatsingpur, Odisha, Essar has been granted the environmental clearance of 12 MTPA Pellet Plant as Phase-I. The Pellet Plant receives Iron Ore Concentrate feed through 12 MTPA capacity slurry pipeline from Dabuna Beneficiation Plant. To match the capacity of Dabuna Beneficiation Plant with Pellet Plant of Paradeep, it is essential to enhance the capacity of present Beneficiation Plant of 10.7 MTPA throughput (8 MTPA beneficiated Concentrate) to 16 MTPA through put (12 MTPA beneficiated Concentrate).

With reference to the EC No.J-11015/876/2007 – IA II (M)., dated 4th May, 2009 with amendment dated 22nd May, 2009 Essar Steel Orissa Ltd. has been granted environmental clearance for 10.7 MTPA throughput capacity Beneficiation Plant at Dabuna. As per the EC, a tailing pond was

supposed to be located at village Basantpur in 87.0105 ha of land having 83.711 ha of forest land. Essar had to surrender this land application to Government of Odisha because Patta was issued to the forest dwellers under Forest Right Act 2006 and this forest land was no more contiguous land and hence not suitable for any industrial use. Therefore a land 164.467 ha (406.408 acre) at village Dhanurjapur, Kaliapal & Malda under Tehsil Jhumpura, district Keonjhar is identified for construction of tailing pond. This land consists of 159.248 ha of forest land. This is approximately at a distance of 9 km from the Dabuna Beneficiation Plant. It is proposed to construct a Tailing Pond in the identified location and lay a Tailing Pipeline along with Return Water Pipeline connecting Dabuna plant and Tailing Pond. Necessary communication/electrical cables will be laid along the Pipeline.

At present Dabuna Beneficiation Plant receives Iron Ore Fines from various merchant miners through road transport. Recently Government of Odisha has awarded the Letter of Intent for grant of mining lease in favor of Essar Steel India Limited for “Ghoraburhani – Sagasahi Iron ore block”. The above block has been allotted through competitive bidding under captive category for use in company’s ISP at Hazira. The Iron ore block is spread over an area of 139.165 ha. (90.629 ha area of Mineralized area and 48.536 ha of Non-Mineralized area) situated in village Ghoraburhani, Kalamang and Sagasahi under Koira Tehsil of Sundargarh District. This Iron Ore block is situated at a distance of 28 km from Beneficiation Plant, Dabuna (by road) and is well connected by NH 215 and additional vehicular roadways to the plant at Dabuna.

It is proposed to transport the Iron Ore Fines(IOF) from Ghoraburhani – Sagasahi Iron ore block through Slurry Pipeline as well as through trucks covered with tarpaulin to Dabuna Beneficiation Plant. Slurry Pipeline transportation is selected and preferred based on the consideration that it is the most efficient and cost effective transportation solution compared to conveyor and road transportation system. For this purpose, a Slurry Pipeline of 6 MTPA capacity along with Water Pipeline and communication/electrical cables will be laid from Dabuna Beneficiation Plant to Ghoraburhani – Sagasahi Iron ore block.

The existing and final configuration of Beneficiation Plant is as follows:

Existing Plant Configuration

a) 10.7 MTPA throughput (8 MTPA beneficiated Concentrate) Iron Ore Beneficiation Plant.
b) 253 Km long 12 MTPA slurry pipeline from Dabuna to Paradeep Pellet Plant.

The Tailing Pond at Basantpur could not be constructed because of the reason stated above.

Final Plant Configuration

a) Iron Ore Beneficiation Plant of total 16 MTPA throughput capacity (12 MTPA Concentrate) at Dabuna
b) Relocating the Tailing pond from Basantpur village to village Dhanurjapur, Kaliapal & Malda under Tehsil Jhumpura, district Keonjhar along with Tailing & Return Water Pipeline with the communication/electrical cables connecting Dabuna Beneficiation Plant to Tailing Pond
c) Slurry pipeline of 6 MTPA capacity along with Water Pipeline and communication/electrical cables connecting Ghoraburhani - Saghasahi Iron ore block and Dabuna Beneficiation Plant.
d) Additional Truck Unloading Facility to take care of handling of IOF being received through Road.

1.2 DESIGN CRITERIA

Presently plant is operating with maximum capacity of 8 MTPA DR/BF grade Concentrate which will be enhanced to a maximum capacity of 12 MTPA DR/BF grade Concentrate. The design criteria for the beneficiation circuit of Dabuna plant are as below:

The Concentrate quality for the Pellet Plant feed is 80% of -45 micron size at minimum 63.5% Fe for production of BF grade Pellets production & minimum 66% Fe for production of DR grade Pellets. To obtain 63.5 % Fe Concentrate, Iron Ore Fines with 58-61% Fe would be used as feed. To obtain 66% Fe Concentrate, Iron Ore Fines with 62-64 % Fe would be used as feed in Beneficiation Plant. To produce 12 MTPA DR/BF grade Concentrate, requirement of Iron Ore Fines feed quantity is worked out to be in the range of 12-16 MTPA depending upon the quality of the IOF fed to the plant. Maximum IOF feed is required in the worst case scenario[1] considering 75% weight recovery of the Plant.

The plant has also been optionally designed to produce a maximum of 12 MTPA DR/BF grade Concentrate using suitable Iron Ore Fines by operating grinding circuit within existing plant facility, achieving a maximum plant yield of up to 100%.

1.3 TAILING DISPOSAL

The generation of Tailing quantity from the Beneficiation Plant will vary from 0-4 MTPA depending on the feed quality of IOF. The Tailing from the Plant would be pumped in the form of slurry having 50 % solids (by weight) via under laid Pipeline. The Tailing pumped from Beneficiation Plant to

[1] The worst case scenario is defined as the enrichment of IOF from 58% Fe to 63.5% Fe Concentrate in case BF Grade Pellet quality and the enrichment of IOF from 62 % Fe to 66 % Fe Concentrate in case of DR Grade Pellet quality.

tailing pond will be 0 to 4 MTPA. Maximum Tailings will be generated in worst case scenario (2 million cubic meter by volume), when operating at full rated capacity with the designed feed quality of Iron Ore Fines.

Therefore to handle the Plant Tailing, a land of 164.467 ha (406.408 acres) at village Dhanurjapur, Kaliapal & Malda under Tehsil Jhumpura, district Keonjhar has been identified for constructing a tailing pond. This land consists of 159.248 Ha of forest land, 1.709 Ha of Govt. Land and 3.510 Ha Private Land. It is located at a distance of approximately 9 km from Beneficiation Plant. It is proposed to construct a tailing dam, with under laid Tailing Pipeline and Return Water Pipeline with communication/electrical cables connecting Dabuna Plant to Tailing Pond. The tailing pond will be designed as per the guidelines of CWC as well as the conditions specified in previous environmental clearance accorded by Ministry of Environment & Forests, Government of India. The safe disposal of generated tailings to tailing pond would be ensured that the tailings shall not be discharged anywhere other than tailing pond.

The tailing pond is sufficient to handle the plant tailing generation for more than 30 years considering initial storage volume of 100 million cubic meter.

1.4 LAND AVAILABILITY AND CONNECTIVITY

The existing Beneficiation Plant is located on KIDCO expressway from Joda to Palasponga and well connected with NH-215 through Joda Junction to expressway & various roads. Part of the expansion project in the Beneficiation Plant will be accommodated within the existing plant boundary. However additional land of 1.92 Ha(4.75 Ac.) will be required for Truck Unloading Station adjacent to the boundary of Beneficiation plant. For Tailing disposal 164.467 Ha (406.408 acres) land has been identified at village Dhanurjapur, Kaliapal & Malda under Tehsil Jhumpura. The land is located at a distance of 9 km from the Dabuna Beneficiation Plant.

1.5 INFRASTRUCTURE

Existing plant infrastructures are sufficient for capacity expansion. The existing rail and KIDCO road network is good enough to cater the present requirement. Additional 6 MTPA Slurry Pipeline from Sagasahi has been proposed in this project, and also Truck Unloading Station (TUS) is being considered for the expansion.

1.6 WATER REQUIREMENT

The water requirement for beneficiation process (wet grinding system), slurry transportation and flushing of the slurry pipeline will be met from the Baitarani River through existing 9 km water pipe line. There is no additional water requirement for this expansion. Permission has been obtained for drawl of 11.77 Cusecs (@1200m3/hr) water from Baitarani River, considering production of 12

MTPA Concentrate in the form of slurry.

1.7 POWER REQUIREMENT

At present the Beneficiation Plant is consuming maximum power of 21.5 MW for processing 10.7 throughput of Iron Ore Concentrate. The estimated power requirement for Grinding and Beneficiation process for production and pumping of 12 MTPA Slurry Concentrate including Tailing disposal and Iron Ore Fines Slurry Pipeline Transportation is about 29.5 MW. This power demand is met by Odisha Power Transmission Corporation Limited (OPTCL), with sanctioned operation power of 30 MW from 132/33 kV grid sub-station, Palaspanga. In case of any additional power requirement during the expansion shall be met from both OPTCL and CPP at Paradeep.

1.8 GREEN BELT

About 29.67 (33%Total Land) Acres of land will be developed as green belt during the expansion phase, and as per the CPCB guidelines a green belt of adequate width and density will also be developed. A thick green belt is already developed inside the plant and additional plantation shall be further undertaken by planting local species like Neem, Karanja, Chattiana, Jamun, Radhachuda etc. The plantation will be done on the both sides of the internal plant roads and other remaining open areas in consultation with Forest Department. As a CSR activity, plantation is also being undertaken in the peripheral villages.

1.9 PROJECT SCHEDULE AND COST ESTIMATE

The completion of Engineering, Procurement and Construction activities for expansion will take around 30 months after getting all statutory clearances from various government agencies.

The capital cost for Beneficiation Plant expansion for ramp up from 10.7 MTPA to 16 MTPA will be around ₹ 357.62 crores. The summary of capital cost estimate is described in chapter - 7 under table 7.2

1.10 FINAL RECOMMENDATIONS

Keeping in view of the realities of existing Beneficiation Plant as well as financial analysis of proposed project, it can be concluded that the proposed expansion is economically viable. It is therefore recommended to expand the Beneficiation Plant capacity from the existing 10.7MTPA (throughput) to 16MTPA (throughput) at Dabuna, Tehsil – Barbil, District – Keonjhar, State - Odisha.

2 INTRODUCTION OF THE PROJECT / BACKGROUND INFORMATION

2.1 IDENTIFICATION OF THE PROJECT PROPONENT AND PROJECT

Essar Steel is a global integrated Steel producer with an annual capacity of 14 million tonnes with a strong presence in intensive Steel consuming markets of Asia and North America. Essar Steel's manufacturing facility comprises Iron ore beneficiation, Pellet making, Iron making, Steel making, and downstream facilities including cold rolling mill, galvanizing, pre-coated facility, Steel processing facility, extra wide plate mill and a pipe mill. With a focus on value added products, it produces over 300 grades of Steel. The company is totally integrated from raw material to finished products adding value at every phase of the manufacturing process. The areas of operation in India include:

Iron Ore Beneficiation

An 8 MTPA plant at Bailadilla (Chhattisgarh) and 8 MTPA(output) Plant at Dabuna (Odisha), both strategically established to leverage the rich Iron Ore deposits in the respective states. The Plant uses the wet grinding and beneficiation technology to upgrade the Iron Ore Fines into a beneficiated iron ore slurry concentrate which is used to make Iron Oxide Pellets. Iron Ore Slurry Concentrate is pumped from Beneficiation Plant at Bailadila to Essar Steel Pellet Plants at Visakhapatnam (Andhra Pradesh) via 267 km Slurry Pipeline and from Beneficiation Plant at Dabuna to Essar Steel Pellet Plant, Paradeep (Odisha) via 253 km underground Slurry Pipeline.

Iron and Steel

A fully integrated world-class facility is at Hazira, housing the world's fourth largest single-location Steel plant. It has a Steel-making capacity of 10 MTPA. The facility also houses a 6.8 MTPA Sponge Iron Plant; a 1.5 MTPA plate mill; a 0.6 MTPA pipe mill and a 1.4 MTPA cold rolling and 6.1 Hot Roll Coil mill complexes.

The proposed project configuration is:

Iron Ore Beneficiation Plant of total 16 MTPA throughput capacity (12 MTPA Concentrate) at Dabuna

a) Relocating the Tailing Pond from Basantpur village to village Dhanurjapur, Kaliapal & Malda under Tehsil Jhumpura, district Keonjhar along with Tailing & Return Water Pipeline with the communication/electrical cables connecting Dabuna Beneficiation Plant to Tailing Pond
b) Slurry pipeline of 6 MTPA capacity along with return water pipeline and communication/electrical cables connecting Dabuna Beneficiation Plant to Ghoraburhani – Saghasahi Iron ore block.
c) Additional Truck Unloading Facility to handle of IOF received from various mines through road.

2.2 BRIEF DESCRIPTION OF THE NATURE OF THE PROJECT

The proposed beneficiation project is the expansion of existing production capacity from 10.70 MTPA (throughput) to 16 MTPA(throughput) and is brown field in nature.

2.3 NEED FOR THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY / REGION

Currently the company is having a Beneficiation Plant of 10.70 MTPA capacity, which can produce only 8 MTPA Concentrate used for Pellet making. To meet out the current demand of 12 MTPA Pellet feed, it is necessary to expand the Dabuna Beneficiation Plant capacity from 10.70 MTPA to 16 MTPA which will produce 12 MTPA iron ore concentrate. The proposed expansion of beneficiation project is of great significance looking towards considerable demand of Iron Ore Pellet in the Steel making.

Based on 2015 data of World Steel Association, India is the 3rd largest producer of crude Steel in the world and its capacity is around 89.6 MTPA. The Steel production contributes about 2% of India's Gross Domestic Product (GDP) and employs over 6 lakh people. The proposed expansion of the project utilizes beneficiation technology and produces a Concentrate of 63.5% to 66% Fe from Iron Ore Fines of average grade 60 to 64% Fe. This Concentrate could be made as Pellet and could be fed to Blast furnace or DR Plants directly. This project can produce 12 MTPA Concentrate and Pellets successively, from which approximately 7 - 8 MTPA Steel can be produced. This plant could contribute to increase the country's Steel production by approximately 7-8% and thereby increase our country's GDP by approximately 0.1 to 0.2 %. The proposed expansion will be managed in an environment friendly manner according to the regulatory requirements and best industrial practices, while ensuring economic viability.

Moreover, majority of the population in nearby local area is tribal like Mundas, Nayaks etc. The major benefit due to proposed project will be in the shape of generating additional direct/indirect employment for this tribal population. Therefore, the proposed project will improve living standard of local inhabitants and properly address community concerns.

2.4 DEMAND – SUPPLY GAP

World crude Steel production stood at 1622.8 million tonnes during 2015, a decrease of 2.8% over 2014 based on provisional data released by World Steel Association (WSA). During 2015, Chinese crude Steel production reached 804 million tonnes, registering a decline of 2.3% over the previous year. China remained the largest crude Steel producer in the world, accounting for 73% of Asian and 50% of world crude Steel production during 2015. India was the 3rd largest crude Steel producer during 2015 in 89.69 MTPA and recorded a growth of 2.6% over 81.69 MTPA in 2014.

Considering the domestic scenario, demand-supply gap will only widen in the coming year, since domestic Steel demand is expected to rise next year while Iron Ore supplies would pick up only a year or two from now. According to Business Monitor International, Iron Ore output is expected to increase at an annual average rate of 0.5% only, reaching 156 million tonnes by 2017.

Besides achieving the rank of the 3rd largest global crude Steel producer in 2015 (provisional), India has also made a mark globally in the production of sponge Iron/direct reduced Iron (DRI). Courtesy a mushrooming growth of coal-based Sponge Iron units in key mineral-rich pockets of the country, domestic production of Sponge Iron increased rapidly, enabling the country to achieve and maintain the number one position in the global market. With a series of mega projects, either being implemented or at the proposal phase, which once operational will re-write the structure of the Steel industry and its dynamics; and a domestic economy carrying forward the reform process further, the future of the Indian Steel industry is definitely optimistic.

The World Steel Association had forecast India's Steel demand to grow at rate of 5.6% in last year 2015. Recovery in the global economy too, even though modest, will boost Steel production. With capacity expansions (aggregate capacity to rise by 24 Million tonnes. by 2017-18 from the current 90 Million tonnes) lined up by Indian Steel makers, demand for Iron Ore is only expected to trend further upwards.

The expansion plans of ESIL in India will also contribute in fulfilling the captive demand of Pellet feed material for Integrated Steel Plant of 10 MTPA capacity at Hazira, Gujarat and to the country as a whole by expansion of Iron Ore Beneficiation Plant at Dabuna, Odisha.

2.5 IMPORTS VS INDIGENOUS PRODUCTION

Domestic Pellet Production capacities by major merchant plants in eastern sector comes to around 34 Million tonnes (i.e excluding SAIL,TATA, JSW), out of which 20 million capacity is mostly for integrated steel production(Like Essar, JSW, JSPL, Bhushan steel, Bhushan Power) & remaining 14 million ton capacity is available for domestic DRI units. India's DRI making capacity is around 35 Million Tons, out of which 24 Million tonnes is of eastern sector units & 11 Million tonnes is of rest of India.

Considering the capacity utilization of 80% of these units, there will be a production of 28 Million tonnes of DRI/Sponge iron which will require a feed of 42 Million tonnes of Pellets or 50 Million tonnes of Sized Ore.

As long as production of sized ore from Easter sector is considered it is 19 Million tonnes, out of which integrated steel players share is around 4-5 Million tonnes, balance 15 million ton is only available for DRI makers.

Above illustration gives us a deficit of (50- 15) = 35 Million ton of sized ore, for which the best alternative is pellet, which gives better quality sponge with less cost, thus 32 Million tonnes of pellet

is required to run the secondary steel plants, but available pellet is 14 Million tonnes.

Thus, there is a direct shortfall of 18 Million tonnes of pellets in the market, due to which there is an underutilization of DRI plant capacity & some coastal region plants are running with imported material.

Below Table 2.1 are the details of some of the major Players in Eastern sector with their pellet making capacities.

Table 2.1 – List of Major Pellet Producer

Pellet Producers	Processing Plant Location	Installed Capacity (MTPA)		
		Sinter	Pellet	BF
Jindal Steel And Power	Deojhar	-	10	-
Essar Steel	Paradip	-	6	-
Bhushan Power And Steel	Sambalpur	1	3.5	2.5
Electrosteel Steels	Bokaro,JH	3	1.2	1.59
Brahmani River Pellets	Tanto	-	4	-
Jindal Steel And Power	Raigarh, CG	2.3	-	2.4
Godawari Power And Ispat	Raipur, CG	-	2.1	-
Bhushan Steel	Dhenkanal	1.88	-	2.5
Rashmi Metaliks	Medinipur, WB	0.6	1.2	0.17
Neelachal Ispat Nigam	Kalinga Nagar	1.71	-	0.25
Arya Iron And Steel	Barbil	-	1.2	-
Orissa Manganese	TILOPODA, JH	-	1.2	-
Pro Minerals	Bambari	-	1	-
Monnet Ispat And Energy	Raigarh, CG	0.93	-	0.3
Jayaswal Neco Industries	Raipur, CG	0.91	-	0.65
Mesco	Kalinga Nagar	0.72	-	0.46
Atibir	Giridih	0.34	0.3	0.3
Shyam Sel And Power	Sambalpur	-	0.6	-
Ardent Steel	PHULJHARA	-	0.6	-
Sarda Energy And Minerals	Raipur, CG	-	0.6	-
Electrosteel Castings	Kolkata(WB)	0.36	-	0.7
Neo Metaliks	Durgapur, WB	0.3	-	0.15
Adhunik Metaliks	Sundargarh	0.27	-	0.21
Rashmi Cement	Medinipur, WB	-	0.15	-
Grand Total		**14.32**	**33.65**	**12.18**

2.6 EXPORT POSSIBILITY

India has enormous potential, necessary resources and capabilities to become a global supplier of quality Steel. Also, there exists ample market opportunities in the neighboring regions of Asia, Africa and the Middle East. The policy framework while according top priority to meet domestic demand should also take into account the large export possibilities.

A strong Steel industry can emerge only if it can take on international competition and develop

overseas markets. Keeping this in view, net exports of 2 million tonnes has been assumed in 12th plan. Accordingly assessment of finished Steel of production has been worked out at 115.3 Million tonnes in 2016-17.

China's Steel Making capacity is around 1000 Million tonnes & production is around 800 Million tonnes, their annual demand for steel is 700 Million ton & rest 100 Million ton is getting exported to various countries.

China's domestic iron ore production is around 1400 Million tonnes with Fe grade of 30-35% and imports around 1000 Million ton of High grade Iron ore in various forms like fines, lumps & pellets from Australia, Brazil, South Africa, India and small quantities from other countries.

Iran, the biggest steel producer in Middle East and world's 2nd largest DRI producer, has emerged as a potential market for Indian pellets, and is expected to hold its position this fiscal too. In the FY14-15, Iran occupied a major share of 70% out of total pellet exports from India.

Iran has an installed DRI capacity of 24.7 MTPA and expects to expand its capacity to 36 MTPA by the end of 2016. Since, Iran has a pellet production capacity of 22 MTPA and falls shortfall of remaining quantity and is compelled to import around 8-9 MTPA pellets to compensate for the shortfall. Thus, there is an opportunity for Indian pellet makers to cater the demand.

As Iron ore Pellet is a value added product, Indian government has reduced export duty on pellets to zero in order to encourage its exports. Indian pellet makers are able to compete with the big four giants (Vale, Rio Tinto, Fortescue, Anglo American & others). In terms of logistical advantage which India is having compared to other countries, the freight costs are also less to china compared to Brazil & South Africa.

Therefore, Essar steel with its most economical downstream facility (pipe line from Dabuna – Paradeep complex) & conveyor belt to port & berth terminal will be easily able to export pellets to china, Iran & other countries.

Although, the facility will primarily fulfill the captive demand of Pellet feed material for Integrated Steel Plant of 10 MTPA capacity at Hazira, Gujarat, export would be done as when there is surplus Pellets available.

2.7 DOMESTIC MARKET

The demand for Steel has been worked out on the basis of observed relationship between Steel consumption and selected macro-economic variables under four scenarios of GDP growth (i.e. of 8%, 8.5%, 9% and 9.5%) by 2016-17. The Draft Approach paper of the Twelfth Five Year Plan envisages a GDP growth of 9% per annum. In the Most Likely growth scenario i.e. 9% GDP growth, the demand for Steel works out to be 113.3 Million tonnes by 2016-17. Therefore, it is likely that in the next five years, demand will grow at a considerably higher annual average rate of 10.3% as compared to around 8.1% growth achieved during the last two decades (1991-92 to 2010-11).

Steel demand in India remained sluggish in 2015 amidst weak activity and poor sentiment; however, activity is expected to accelerate modestly in the coming years. Strengthening domestic consumption and improving external conditions will help underpin the growth of Steel using sectors. During 2015, India maintained its ranking as the 3rd largest Steel producing country in the world behind China, and Japan with a crude Steel production of 803.83 and 105.20.2 Million tonnes respectively. The Indian Steel industry continued to showcase trends of higher consumption of finished Steel and continued to be a net importer on account of increased demand for special grades of Steel in the country. India's current per capita finished Steel consumption at 57 kg is well below the world average of 217 kg. With rising income levels expected to make Steel increasingly affordable, there is vast scope for increasing per capita consumption of Steel.

2.8 EMPLOYMENT GENERATION (DIRECT AND INDIRECT)

The proposed expansion project will generate employment for about 100 people, overall total 450 people will be employed, out of which 350 skilled laborers will be on contract basis during construction and operational phase and 100 will be on permanent basis. Also there is an indirect employment opportunities will also be generated due to secondary developments in the area.

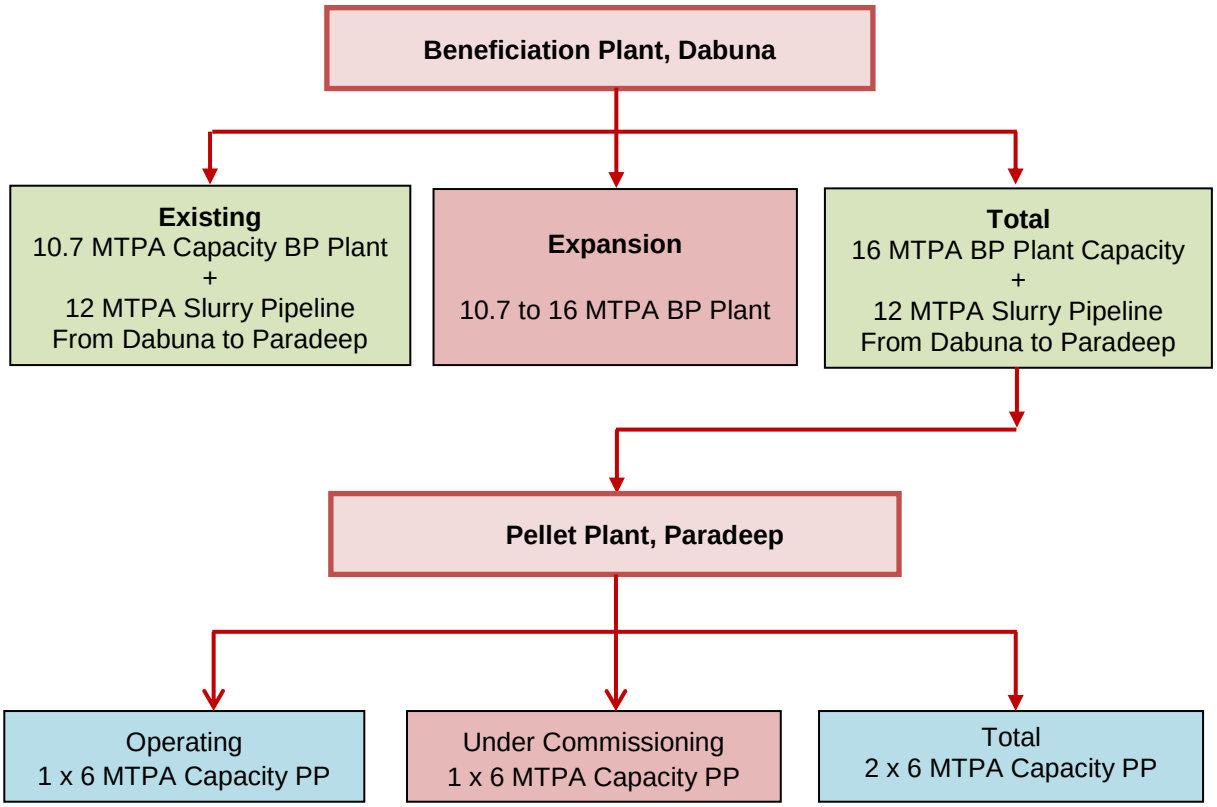
3 PROJECT DESCRIPTION

3.1 TYPE OF PROJECT & INTERLINKED/INTERDEPENDENT PROJECTS

Essar Steel India Ltd, Odisha is having a Pellet Plant with capacity of 12 MTPA consisting of two modules of 6.0 MTPA capacity each. Out of these two modules, one module (1 x 6 MTPA) is already in operation and the second module (1 x 6 MTPA) is under commissioning. This Pellet Plant receives material from existing Beneficiation Plant at Dabuna through 253 km long slurry pipeline. To meet out this Pellet Plant production capacity, additional Pellet feed material is required. Therefore, it is necessary to expand the capacity of existing Beneficiation Plant from 10.7 to 16 MTPA throughput capacity to produce 12 MTPA Concentrate as Pellet feed.

The proposed expansion project is a brown field project and Interlinking of the proposed project is described in figure 3.1 by block diagram.

Figure 3.1: Interlinked/Interdependent Project - Block Diagram

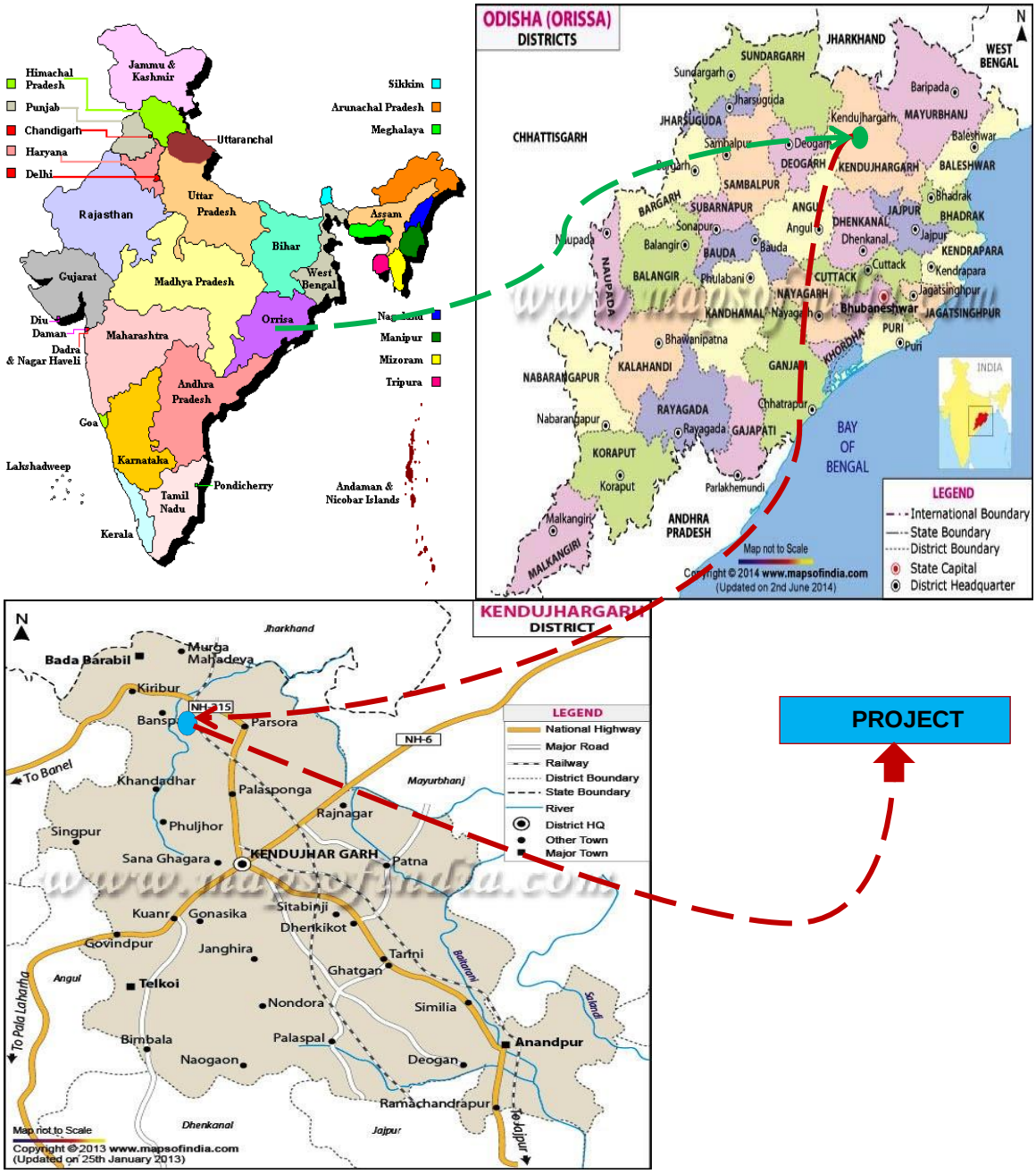


3.2 LOCATION WITH COORDINATES

The proposed expansion will be implemented in the Iron Ore Beneficiation Plant of EStIL which is located at Dabuna in Keonjhar District of Odisha. The coordinates of the Beneficiation Plant are as

follows: Latitude 21°51'30" N and Longitude 85°24'15" E, at an elevation of about 500m, above mean sea level. Most of the expansions are within the existing boundary which is briefed in the respective chapters of this report. However Truck Unloading station will be located in adjacent land of 1.92 Ha. The layout of the capacity upgraded Beneficiation Plant is enclosed as Annexure –I. The location of the Project is shown in Figure 3.2

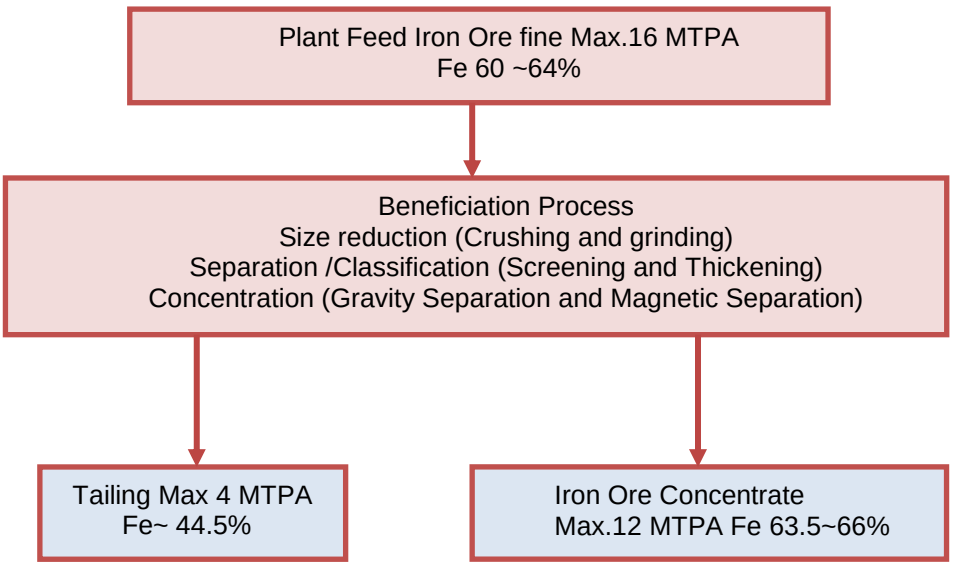
Figure 3.2: Location of the Project



3.3 SIZE / MAGNITUDE OF OPERATION

To achieve 12 MTPA production, the existing beneficiation plant facility would be operated to treat maximum of 16 MTPA of iron ore fines in the worst case scenario. Plant will accept Iron Ore Fines in the range of 55 to 66% Fe grade The overall plant yield would be minimum 75% depending on the feed quality of the incoming iron ore. The plant will be operated to produce the same in 330 working days/year and 24 hours/day. The annual operating hours of the Plant would be 7920 hrs. Iron ore concentrate with 66% Fe DR grade and 63.5% Fe BF grade could be produced from the feed ore containing average grade of 60 to 64% Fe.

Iron Ore Quantity & Flow – (Different Grade for DR & BF)



3.4 PROJECT DESCRIPTION WITH PROCESS DETAILS

3.4.1 Technological Considerations

The major technological process involved in the Iron Ore Beneficiation are size reduction / comminution as grinding, size separation as classification, and Iron Ore up-gradation as concentration/beneficiation, thickening of slurry and pumping of slurry.

a) Size Reduction

The Iron Ore in the form of fines (99% passing 10 mm size) has to be ground to the desired size. Suitable grinding mills and screens are envisaged for size reduction of fines to the desired size for feeding the concentration equipment. Iron ore have unwanted gangue materials with valuable Iron

mineral. For up gradation of Iron Ore, Fe minerals are liberated from the gangue materials by grinding. Grinding of Iron Ores fines can be done in wet process.

Since the downstream of the grinding process, like beneficiation and slurry transportation to Pellet Plant, are carried out with wet process, wet grinding process is considered to be most suitable instead of dry grinding.

b) Size Separation

The final product Concentrate should be of size 100 % passing 100 mesh (150 micron) and 80 % passing 325 mesh (45 micron) for long distance slurry pumping and making Pellets. Hydro cyclone and vibratory screens are the most suitable and efficient equipment for the size classification due to their operational ease and economic considerations, and therefore they have been envisaged in the process flow scheme.

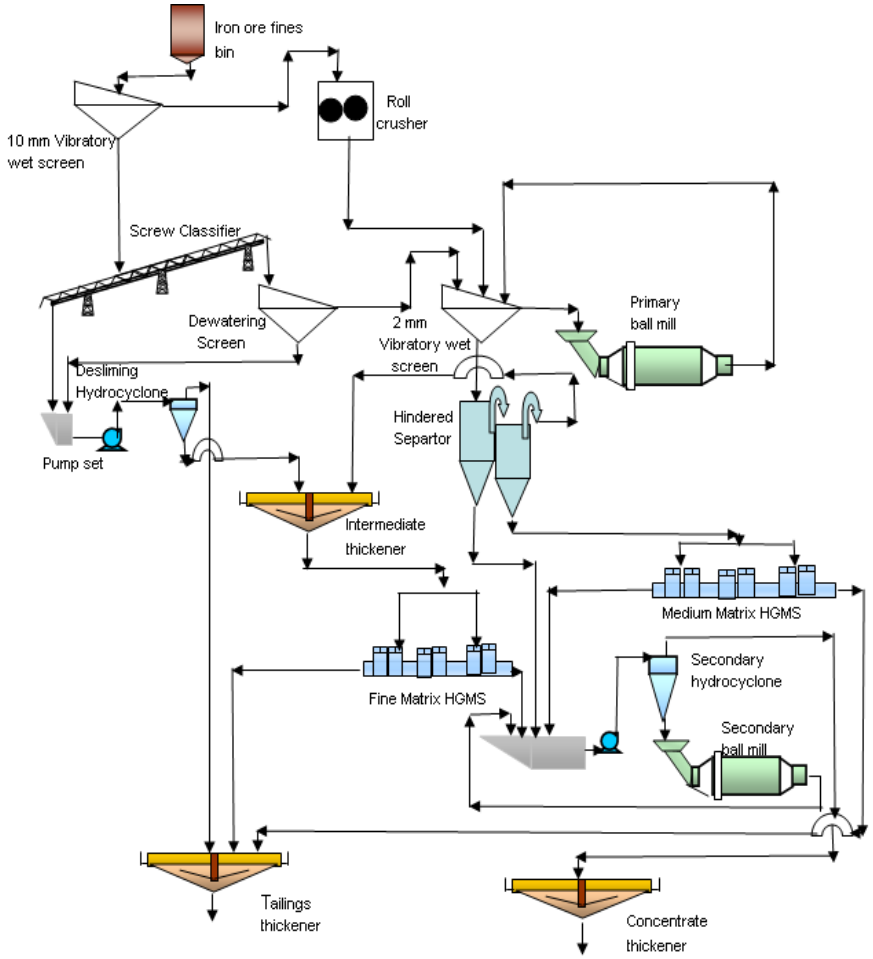
c) Beneficiation and Concentration

To achieve and maintain the desired quality of Concentrate in terms of Fe% content, the ground /classified material is upgraded by removing the gangue materials. Hindered separators and High Gradient Magnetic separators (HGMS) are the most suitable equipment for beneficiation of Hematite Iron Ore, which are efficient and economical. These technologies have better operational control over the process and the higher metallurgical efficiencies in terms of grade and mass recovery.

3.4.2 Process Description

The basic process flow for the capacity enhanced beneficiation plant of 12 MTPA (Maximum) Concentrate will be same as the process being followed presently. However to handle the larger volumes of Iron Ore fines receipt and subsequent beneficiation process, additional optimal facilities are proposed within the existing plant and process circuit in order to meet the target capacity of 12 MTPA concentrate slurry. The additional facilities are proposed based on the present plant operating conditions and ore characteristics. However these modifications will be executed upon necessary test works and proper validation. The existing process facilities along with the changes required in the process circuit are explained in the below chapters. The material flow diagram of Dabuna Beneficiation Plant is shown the Figure 3.3

Figure 3.3: Material Flow Diagram of Dabuna Beneficiation Plant



Present Raw Material Characteristics and Concentrate Chemical Composition

The Iron Ore feed fines from various Mines and its chemical composition constituents are given in Table 3.1.

Table 3.1 Chemical analysis of IOF Samples

Iron Ore Fines	Chemical Composition %				
	Fe	SiO_2	Al_2O_3	LOI	Moisture
IP Mines	62.56	3.67	3.41	2.97	9.69
OMC	63.06	3.15	3.01	3.00	9.25
RML	64.36	2.69	2.34	2.44	8.95
Serajuddin	64.05	1.58	3.05	3.22	8.03
KISA	63.42	2.33	2.84	3.67	9.63
MESCO	63.73	2.66	3.00	2.67	8.32

Table 3.2 Chemical Composition of Iron Ore Concentrate

Description	Fe%(total)	SiO_2	Al_2O_3	LIO	Particle Size
BF grade	63.50	2.2	2.4	4.2	80%< 45 mic
DRI Grade	66.00	2.05	1.03	1.8	80%< 45 mic

Table 3.3 Chemical Composition of Tailings

Description	Fe%(Total)	SiO_2	Al_2O_3	LOI	Particle Size
BF/DR Grade	44-45%	9-12%	6-9%	4.7%	100% < 75 mic

3.4.3 Raw Material Handling and Linkages:

a) Truck Unloading Station

The total requirement of iron ore fines to be handled is estimated as 16 MTPA (Maximum). To handle this large volume of Iron Ore Fines , an automated Truck/Dumper Unloading Station (hereafter referred as TUS) is envisaged near the Beneficiation Plant at Dabuna which will be connected to stacker in the IOF storage yard. This TUS will be capable of sourcing 6.5 MTPA IOF to the Plant. Required IOF will be sourced from private merchant Miners to this TUS. Existing stacker will be commissioned to match the capacity of TUS. Necessary capacity audit will be carried out for the existing twin bucket blender reclaimer so as to enhance the existing capacity of 2250 TPH to 2600 TPH. Existing yard conveying system connecting TUS and Bins is adequate for the enhanced plant capacity. However due to limited storage capacity of Bins frequent changeover of feed from one bin to the other is required for upgraded capacity. In this scenario existing shuttle conveyor will be replaced by tripper conveyor with subsequent changes in the existing belt conveying system for feeding material to tripper conveyor.

b) Road Transportation via Trucks

The raw materials are further sourced from private merchant Miners to the tune of 6 MTPA and are transported via trucks having dalla covered with tarpaulin and dumped in the Dabuna Plant IOF storage yard and rest 6 MTPA will be received from Ghoraburhani- Sagasahi. captive mine as a standby measure (ie,. when the slurry pipeline is out of operation. Transport network map showing Iron Ore Mines in the Joda –Barbil Region is enclosed at Annexure VII showing various Mines situated in and around Beneficiation Plant for sourcing raw material. The list of merchant Miners are shown in the Table 3.4

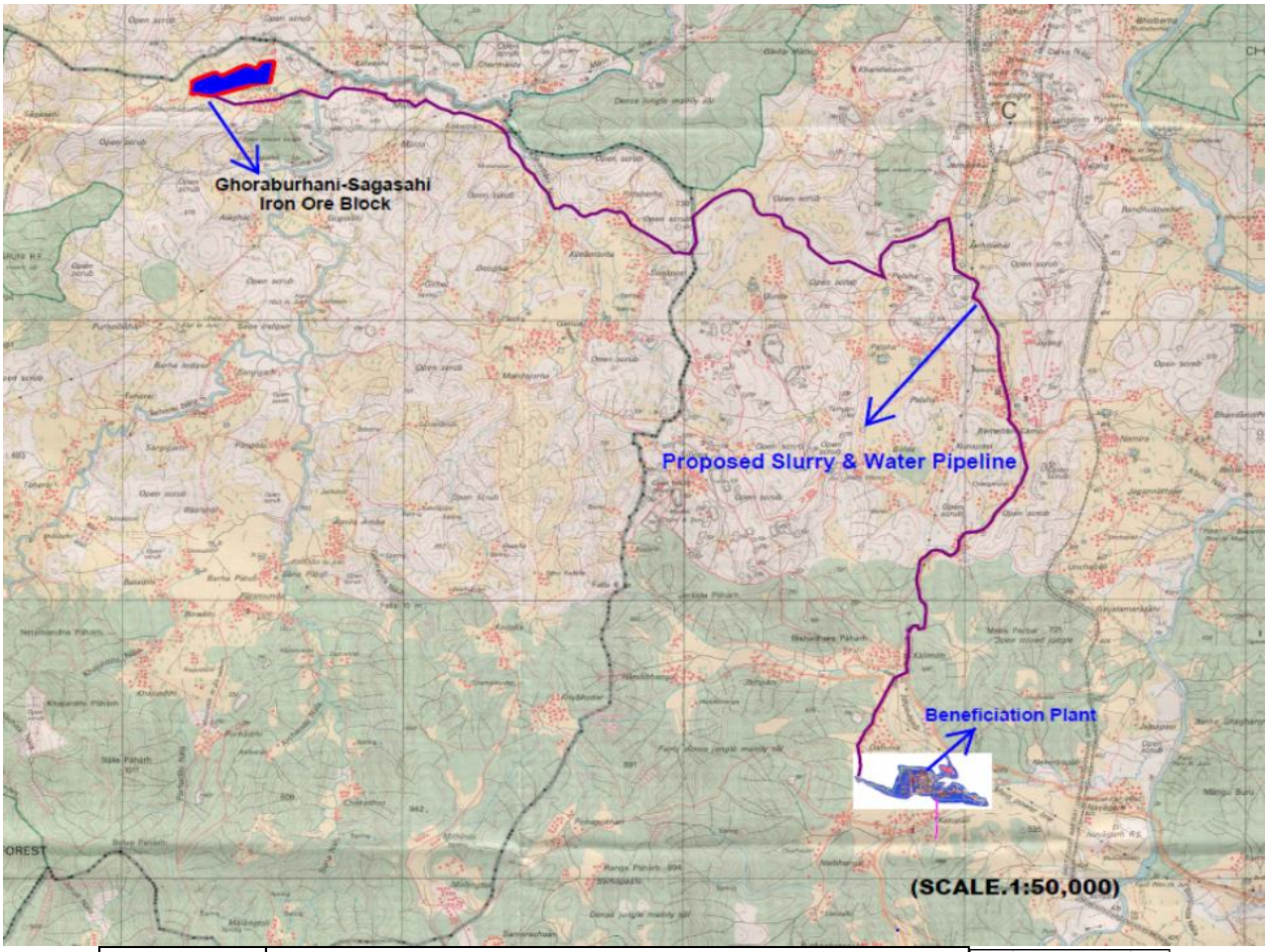
Table 3.4 - List of Merchant Miners

Sl. No.	Name of Mine	Mining Circle	Environmental Clearance		Lease Area (Ha)	Distance From Plant
			Present	% of Fines		
			MTPA	MTPA		
1	Essar Steel India Limited	Joda	7.16		139.165	30
2	Indrani Patnaik (Unchabali)	Do	4.00	2.80	106.113	7
3	Serajuddin (Balda)	Do	15.15	10.6	335.374	6
4	KJS Ahluwalia (Nuagaon)	Do	5.60	3.92	767.280	38
5	Kaypee (KJSA)	Do	5	3.5	228.040	49
6	Rungta Mines (Jajang)	Do	16.0	11.2	666.150	14
7	Essel Mining (Jilling)	Do	4.20	2.94	456.100	17
8	MESCO (Roida)	Do	3.00	2.10	104.680	38
9	KN RAM (Roida)	Do	2.20	1.54	74.870	38
10	RP SAO (Guali)	Do	5.70	4.00	365.437	41
11	KMC (Jururi)	Do	0.60	0.42	135.570	18
12	Patnaik Minerals (P) Ltd. (Jaribahal)	Do	0.998	0.60	106.535	12
13	Rungta sons (Oraghat)	Koira	5.0	3.5	82.960	44
14	Rungta sons (Sanindpur)	Do	4.5	3.15	147.100	43
15	Feegrade & Co. (Rengalbera)	Do	2.6		121.410	46
16	BICO (Nadidih)	Do	2.0		73.855	48
17	A M T C (Narayanposhi)	Do	4.5	3.15	349.250	52
18	Essel Mining (Koira)	Do	1.5		90.140	55
19	National Enterprises (Raikela)	Do	1.0		116.850	56
20	OMC Ltd (Kurmitar Pahar)	Do	2.4		1212.47	65
21	M G Mohanty (Patabeda)	Do	0.18		19.425	19
22	Penguin Trading Agency (Raikela)	Do	1.08		49.370	55
23	S N Mohanty (Raikela)	Do	0.3		18.310	59
24	Geetarani Mohanty (Raikela)	Do	0.864		67.586	56
25	OMC Ltd. (Gandhamardan-B)	Keonjhar	9.12	6.00	1590.87	55

c) Slurry Pipeline transportation from Ghoraburhani-Sagasahi to Dabuna

To meet the balance raw material requirement of 6 MTPA for capacity enhancement, Iron Ore Fines will be sourced from Ghoraburhani-Sagasahi (Latitude 21° 56' 08.83896" to 21° 57' 09.61956"N and Longitude 85° 17' 02.52096" to 85° 17' 48.99336"E) Iron Ore captive mine to Dabuna Beneficiation Plant. Slurry transportation via pipeline being the most efficient and cost effective transportation solution, it is proposed to install 6 MTPA rated capacity Slurry Pipeline from Ghoraburhani-Sagasahi to Dabuna along with Water Pipeline for about 26.2 km. The Slurry Pumping Station with necessary facilities will be installed at Ghoraburhani-Sagasahi. The Water Pumping Station with necessary facilities and Water Storage Reservoir will be installed at Dabuna. The Iron Ore Fines are ground at mine head and pumped in the slurry form and the water required for Slurry Concentrate would be pumped in the Water Pipeline from Dabuna to Ghoraburhani-Sagasahi and the same water would be back to Dabuna along with Iron Ore slurry. The proposed Slurry Pipeline and Water Pipeline transportation route map is shown in the Figure 3.4.

Figure 3.4 - The Pipeline Route Map



Dscription	Ghoraburhani-Sagasahi Iron Ore Block
Latitude	21° 56' 08.83896" to 21° 57' 09.61956"N
Longitude	85° 17' 02.52096" to 85° 17' 48.99336"E

LEGEND
- Iron Ore Block
- Beneficiation Plant
- Slurry Pipeline

The detailed route map of Slurry Pipeline from Ghoraburhani – Sagasahi to Beneficiation Plant is attached as Annexure – III.

The main technological facilities envisaged for Slurry and Water Transportation system from Sagasahi to Beneficiation Plant are shown in the Table 3.5.

Table 3.5 – Technological Facilities for Slurry and Water Transportation System

Sl. No.	Description	Capacity	Configuration
1	Slurry Pumping Station, Sagasahi	6 MTPA	Slurry tank 01 No. 03 No. PD pumps (2W + 1S)
2	Slurry Pipeline	6 MTPA	12.75 inch diameter pipe line
3	Terminal Station, Dabuna	6 MTPA	Slurry tank 01 No
4	Water Pumping Station, Dabuna	1400m^3/h	03 No water pumps (2W + 1S)
5	Water pipe line	1400m^3/h	20 inch diameter pipe line
6	Water Storage Reservoir	30000 m^3	01 No.
7	Slurry Storage Tank	2500 m^3	01 No.

Handling of receipt of ground IOF from Ghoraburhani-Sagasahi at Dabuna Beneficiation Plant:

Based on the prima-facie analysis for treating the ground IOF slurry from Ghoraburhani-Sagasahi Mine head received in the Slurry Pipeline, a feasible process flow[2] in Dabuna Plant is derived and briefed below.

The ground IOF slurry received from the Pipeline is stored in the new Slurry Tank at Dabuna Plant. The ground IOF will be coarser in nature with a limiting size of –150 µm. The coarser slurry will be equally pumped to the regrinding circuit of Line 1 to achieve a final product size of P80 -45 µm. The fine Concentrate will be thickened in Concentrate thickener and stored in Slurry tanks for further pumping to Paradeep.

During beneficiation, the coarser slurry will be treated in single process line (Line 1) and accordingly pumped to existing screw classifier for desliming. The coarse concentrate from screw classifier will be distributed to Medium and Fine matrix SLon Magnetic Separator wherein the recovered magnetic concentrate is ground in the regrinding circuit to achieve a final product size of P80 -45 µm. The rejects from the SLon Separator is collected in the Tailing thickener.

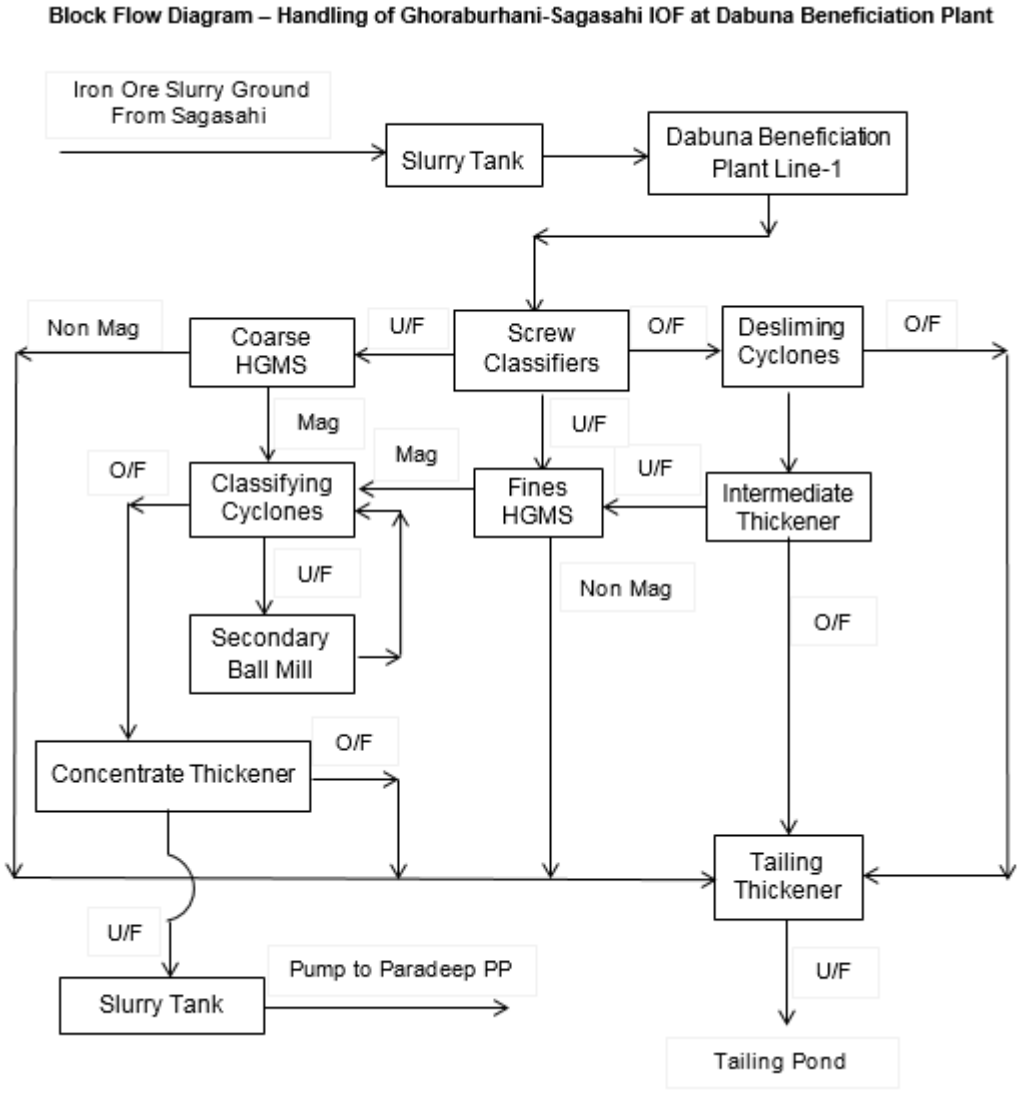
The fine stream overflow from the screw classifier is pumped to Line 1 desliming Hydro-cyclone (2 cluster having 24 hydro cyclones in each cluster) for further separation. This Hydro-cyclone removes the slimes of -10 microns with the overflow. The overflow is fed to the Tailings thickener and the underflow is fed to the Intermediate thickener. The intermediate slurry from the thickener will be treated in the Fine matrix SLon Separator from which magnetic concentrate is recovered and

[2] This process flow will be developed based on further validation by necessary test works and plant performance.

in turn ground in the regrinding circuit to achieve a final product size of P80 -45 µm.

The fine concentrate from the regrind circuit cyclone overflow will be thickened in the Concentrate thickener to a suitable pumping density and stored in the Slurry Storage Tanks for further pumping to Paradeep. The rejects form the Magnetic Separator and Desliming Hydro-cyclone collected in the Tailing thickener will be thickened and then pumped to the Tailing Pond. Indicative block flow diagram for handling the receipt of IOF from Ghoraburhani-Sagasahi IOF at Dabuna Beneficiation Plant is shown in the Figure 3.5.

Figure 3.5 – Block Flow Diagram



d) Summary of projected mode of transportation of ore fine to Dabuna Plant

As briefed in this chapter above, the overall requirement of 16 MTPA (Maximum) IOF to Beneficiation Plant through various mode of transportation and the corresponding capacity to source the same is summarized in Table 3.6.

Table 3.6 – Various Modes of Iron Ore Sourcing and its Capacity

Sl.No	Mode of Transportation	Capacity
1	Through Truck Unloading Station	6.0 MTPA
2	Road Transportation	6.0 MTPA
3	Slurry Pipeline Transportation	6.0 MTPA

3.4.4 Process Facilities

The present process facilities and the additional facilities with modifications required for enhanced plant capacity of 12 MTPA (Maximum) Concentrate production is explained in this chapter.

The iron ore fines from each bin are drawn out by respective a belt weigh feeder which feeds the material to a 5 mm vibratory wet screen. The oversize (+5 mm) would be fed to 1 mm screen (on the conveyor carrying screw classifier raked material after dewatering). The screen undersize (-5 mm) would be fed to a screw classifier by gravity, which is placed below the vibratory 5 mm wet screen. The screw diameter of the classifier is about 183 cm (72 inch). The cut size of the screw classifier is 150 µm in the process line; the coarser stream from the 3 parallel screw classifiers is collected on a common single belt conveyor, which feeds the dewatering screen. The finer stream slurry from 3 parallel screw classifiers would be collected in a common pump box which is located below the screw classifiers in bin building. The dewatering screen undersize fines is collected in a pump box and pumped to the pump box of screw classifier rejects. The slurry from this pump box is pumped to the desliming hydro-cyclone near intermediate thickener. This reduces the load on Ball mill and partially removes Al_2O_3.content The dewatered coarser material is collected on a conveyor and fed to 1 mm wet screen of 1000 t/h rated capacity, located in beneficiation building. The screen oversize is fed to the primary ball mill.

a. Primary Grinding Circuit

The primary ball mill is of size 4.72 m (dia.) x 8.23m (length) and of capacity 550 t/h. It is designed to grind particles of -10 mm size to a product of 90 % - 2 mm. The motor power rating for primary mill is 3000 kW. There is one primary ball mill for each process line which is sufficient for enhanced capacity considering the present operating conditions. Based on the present rich ore availability the primary ball mill circuit is modified such that the discharge is collected in a pump box and provision is provided to pump equally to the hindered separators for beneficiation or regrinding circuit for direct size reduction. Presently, by operating just primary mill and one regrind mill 850 TPH is possible to be ground to achieve desired grind size of P80 -45 µm. Thus by operating all three mills it is implied to achieve a feed rate of (~) 1000 TPH for processing 16 MTPA Iron Ore Fines.

Hindered Separation

There are two hindered separator for each process line at rated capacity 325 t/h solids with feed percentage solids of 35 %. The hindered separator uses fluidized bed technology & principle of hindered and differential gravity settling classification of fines. There are three different settling zones in the hindered separator. The coarse and heavy particles are separated in the coarse section at the center. It is fed to the secondary hydro cyclone feed pump box by gravity. Fine material and low-density particles overflow from the coarse separation section into the next peripheral section where some of the light particles get separated. These middling are collected in a pump box and pumped to medium matrix HGMS through rotary screen. Particles of a specific gravity lower than the fluidized bed in the hindered separator will remain above the fluidized bed and will overflow with most of the process water to the overflow chute in the end section of the hindered separator. These fines / tails from the hindered separator would be fed to intermediate thickener through an intermediate launder.

b. Intermediate Thickener

The feed to the intermediate thickener is a mixture of de-sliming cyclone underflow & hindered Separator fines. The underflow of intermediate thickener is then pumped to a static pulp distributor and latter fed to fines matrix HGMS for concentration process. There are total 2 no's of intermediate thickener, each size 55 m diameter and 1 no's thickener considered for each the process line.

c. High Gradient Magnetic Separator (HGMS)

There are 4 HGMS (2 medium matrixes & 2 fine matrixes) in total for each process lines. Capacity of each HGMS is about 120 t/h with magnetic intensity of 1 Tesla. HGMS tails (from both medium matrix & fine matrix) are sent to the tailings thickener by gravity/pump and the tailing thickener underflow is pumped to the tailings pond by the slurry pumps. The HGMS Concentrate (from both medium matrix & fine matrix) is sent to secondary hydro cyclone pump box by launder / pipeline.

d. Secondary Grinding & Hydro-Cyclones

Hindered Separator Concentrate, HGMS Concentrate and Secondary Ball Mill discharge are collected in the pump box and pumped to the secondary hydro cyclone through slurry pump. The secondary hydro cyclone consists of two clusters with 3 hydro cyclones in each cluster, for each process line. The hydro cyclone is of 66 cm (26 inch) diameter and operates at an inlet pressure of 0.98 - 1.05 kg/cm2. This secondary hydro cyclones overflow is fed to the Concentrate thickener & the underflow is fed to two parallel secondary ball mills. The ball mill discharge is collected in a pump box for feeding secondary hydro cyclone, thus forming a closed circuit. There are two number of secondary ball mills for each process line. The ball mill is designed to grind particles of -2 mm size to a product of 80 % - 45 micron. This mill is of size 4.72 m (dia.) x 8.23 m (length) with a motor power rating of 3000 kW.

e. Concentrate Thickener

Each process line is having a separate Concentrate thickener. The overflow from the regrind cyclones are collected in the thickener from which underflow at about 65 % solids is pumped to the Concentrate Slurry tanks (Total - 2 No's existing) considered for the project. The existing thickeners are adequate to handle the enhanced capacity. The overflow from the Concentrate thickener, tailing thickener and intermediate thickener would be clear water and would be recycled in the process.

f. Tailing Thickener

The rejects from the Magnetic separators and desliming cyclone overflow is collected in the Tailing thickener. Presently one tailing thickener of 65 m diameter is considered for both the process lines. The tailing thickener underflow slurry with 50 - 60 % solids by weight and a slurry density of 1.5 t/m3 would be pumped to the tailing pond / dam through slurry pipeline. The tailing pond is located at Lunagarhia village, approximately 9 km away from Dabuna Beneficiation Plant. About 80 % of tailing water from tailing pond would be recovered after the plant process stabilization.

g. Slurry Transportation

The slurry transportation pipeline has been designed for transporting 12 MTPA beneficiated Concentrate Slurry. Therefore the existing Slurry Pipeline and Pumping System does not require any additional facility or modifications.

3.5 RESOURCE OPTIMIZATION/RECYCLING AND REUSE

Iron Ore Utilization

The Beneficiation Plant is designed to beneficiate the available Iron Ore Fines to Concentrates of BF/DR grade using latest beneficiating technology, which intern can be converted into Pellets of respective grades and utilized directly into Blast Furnace or DR Plants.

Tailings would be generated having less than 45% Fe, which would be pumped to the tailing pond located at village Dhanurjapur, Kaliapal & Malada. Care would be taken to reduce the tailing percentage as much as possible to have maximum possible yield of usable Concentrate.

Water Utilization

The water disposed as part of tailings is about 338 m3/h in the worst case scenario and about 287 m3/h of decant water shall be reclaimed for reutilization in Beneficiation Plant. This would considerably reduce the fresh make-up water consumption.

3.6 WATER AND POWER REQUIREMENT WITH THEIR SOURCE

3.6.1 Water Requirement and Source

In the Beneficiation Plant, the water is used for process operation, slurry and tailings transportation, flushing, firewater and drinking purpose. Drinking water requirement will be met from the raw water after necessary treatment within plant facility.

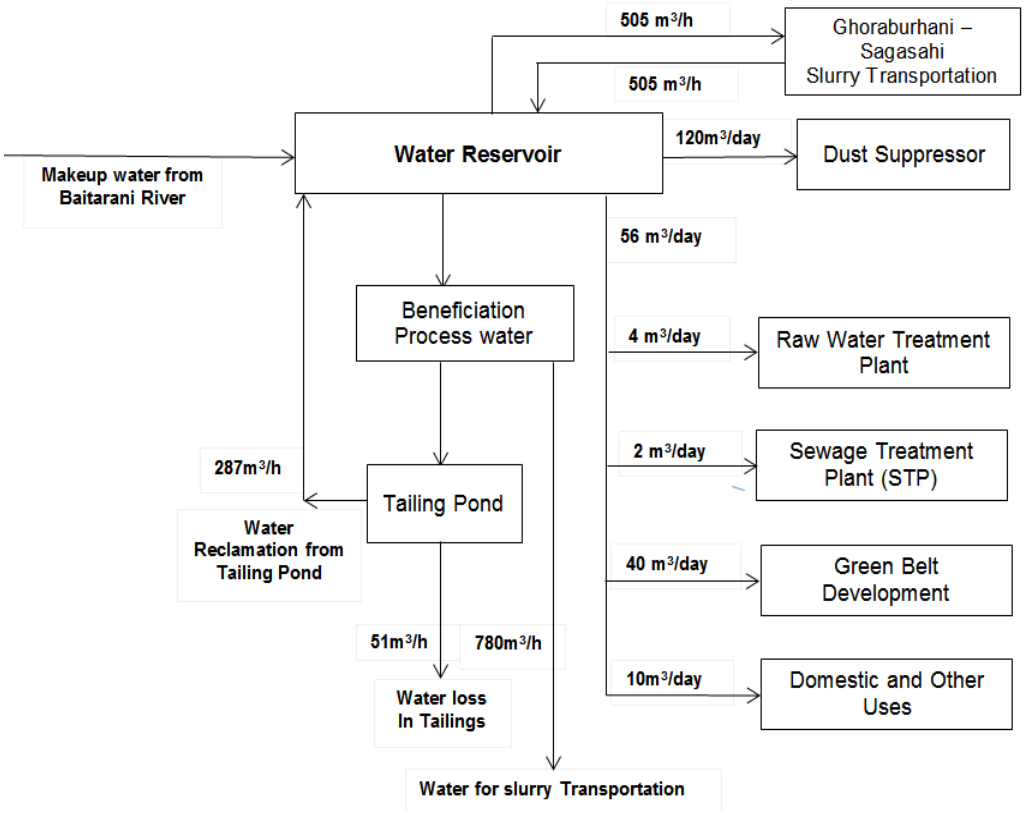
The total water requirement for processing plant is sourced from Baitarani River through a 9km long water pipeline and the total quantity is 11.77 cusecs water (about 1200 m3/hr). The breakup of the water requirement is mentioned in Table 3.7.

Table 3.7 - Water Requirement

Process	Water requirement
Water transported to Paradeep along with Concentrate in the Slurry Pipeline	780 m^3/h
Water consumed for Pelletization at Paradip	450 m^3/h
Water consumed in CPP at Paradip	350 m^3/h
Beneficiation process water sent to tailing dam along with Tailing Pipeline	338 m^3/h
Water reclamation from the Tailing Pond	287 m^3/h
Water loss at Tailing Pond	51 $m^{3/}$/h
Water Pumped for Ghoraburhani – Sagasahi Slurry Transportation	505 m3/ /h
Water Pumped back to Dabuna along with Slurry Transportation	505 m3/ /h
Other Uses	176 m^3/day
Total water requirement initial stage	1126 m^3/h

Water facilities including necessary storage reservoirs were already implemented and therefore the available facilities will meet the entire water requirement for the expansion. A detailed water balance diagram in proposed Beneficiation Plant with water consumption break up is shown in the Figure 3.6.

Figure 3.6: Water Balance Diagram



3.6.2 Power Requirement and Source

The existing plant operation was closely observed and overall present plant power consumption is estimated to be 21.5 MW and are evidenced from the below Load List Table 3.8

Table 3.8 – Load list

Total Beneficiation Plant, Dabuna	
Plant Area	Present Power Consumption (kW)
Raw Material Hanadling System	711.4
Bin Building	1077.1
Ball Mill Area	11558.1
Water Pump House	2803.5
Thickener Area	679.4
Lightings	800.0
Office & Barrack	100.0
Beneificiation Plant	17729.6
In-take Pump House	757.2
Slurry Pump House	3000.0
Total Beneficiaiton Plant (MW)	**21.5**

Total power requirement considering the upgraded plant capacity, Tailing disposal system and IOF Slurry transportation is estimated as 29.5 MW. The existing facilities for sourcing the power from GRIDCO 132kV Substation through a Single circuit line available at MRSS Dabuna sanctioned for 27 /30 MW along with the in house DG sets of (2 X 2020 kVA) is conservatively adequate to cater the power requirement for the expansion. Provisionally. In case of any further additional power requirement during the expansion shall be met from both OPTCL and CPP at Paradeep.

The overall power requirement is shown in Table 3.9.

Table 3.9 – Power Requirement

Process	Power requirement MW (PF* 0.9)
Beneficiation Process	19.3
Tailing Discharge and return water	1.2
Truck Unloading Station (TUS)	2.5
Slurry Transportation	6.5
Total	**29.5**

*PF Power Factor

3.7 QUANTITY OF WASTE GENERATED AND SCHEME FOR DISPOSAL

3.7.1 Waste generated

Wastes generated from the proposed Beneficiation Plant will be collected and treated according to the nature of the waste. Treated water will be utilized for green belt development, Fire Water and dust suppression purpose within plant area. No trade effluent will be discharged outside the plant boundary. During monsoon, the surplus water, if any shall be discharged out after suitable treatment and after conforming to the prescribed standards of CPCB. The lists of waste generated from the plant area are as below;

a) Oil wastes from Transformer & Switch Yard Areas,
b) Oil/grease wastes from Pump area, Workshop, DG room etc.
c) Waste water from Chemical Laboratory

Table 3.10 shows the handling of hazardous waste for which the permission has been already obtained from the State Pollution Control Board vide Grant of Authorization Certificate No. IND-IV-HW-1185/7383 dated 30.04.2015.

Table 3.10 – Waste Management

Waste Description	Total Quantity Per Year	Waste Management
Used Oil	40 KL	Storage in impervious pits/containers under covered shed followed by sale to Authorized Recycler / Re-processor
Waste/Residue containing Oil	5 KL	Storage in impervious pits/containers under covered shed following by final disposal in Authorized HW incinerator / Common Hazardous Waste Treatment Storage Disposal Facility, Jajpur

Beneficiation Plant after requisite expansion will duly comply with the provisions of Hazardous and Other Wastes (Management & Trans-boundary Movement) Amendment Rules, 2016 and amendments made thereafter. Renewal of authorization for disposal of Hazardous waste in Form-1 will be applied 120 days before expiry of this authorization order.

3.7.2 Tailing generated from Beneficiation Plant

The tailing generation from the Beneficiation Plant will vary from 0 to 4 MTPA depending on the quality of Iron ore

3.7.3 Tailing Management

The Tailings generated from the Dabuna Beneficiation Plant will be disposed of in the Tailing Pond via Tailing Pipeline in the form of slurry containing 50 – 60 % by weight. The Tailing Pond will be

constructed such that the solids in the slurry is allowed to settle and after natural settling the decanted water will be reclaimed and reutilized in the Beneficiation Plant. To facilitate the water transportation, a return water pipe line from tailing pond to plant will be laid parallel to Tailing Pipeline along with communication cables for monitoring purpose. About 287 m3/hr decanted water will be recovered from the tailing pond after the stabilization of tailing discharge process.

3.7.4 Tailing Pond

As per the existing EC, a tailing pond was supposed to be located at village Basantpur in 87.0105 ha of land having 83.711 ha of forest land. Essar had to surrender this land application to Government of Odisha because Patta was issued to the forest dwellers under Forest Right Act 2006 and this forest land was no more contiguous land and hence not suitable for any industrial use. This necessitated the relocation of Tailing Pond by find suitable land for it.

EStIL approached an external consultancy and carried out required studies for the identification of a suitable site for the disposal of Tailings generated from the Beneficiation Plant. Subsequently various sites were analyzed and recommendation was provided. The detailed report on the site identification, selection criteria, analysis and final recommendation is attached as Annexure – IV. The proposed Tailing Pond will be situated in Dhanurjaypur, Kaliapal & Malda under Tehsil Jhumpura, district Keonjhar, and it is located at a distance of 9 km from Beneficiation Plant. About 164.467 ha (406.408 acres) of land has been identified for construction of tailing pond out of which 159.248 Ha of land falls under forest land, 1.709 Ha of Govt. Land and 3.510 Ha of Private Land. The tailing dam will be constructed by using natural available land terrain advantage which maximizes the life span of tailing dam. The initial survey estimated that the proposed tailing dam can accommodate a total of at least 100 million cubic meter of tailing.

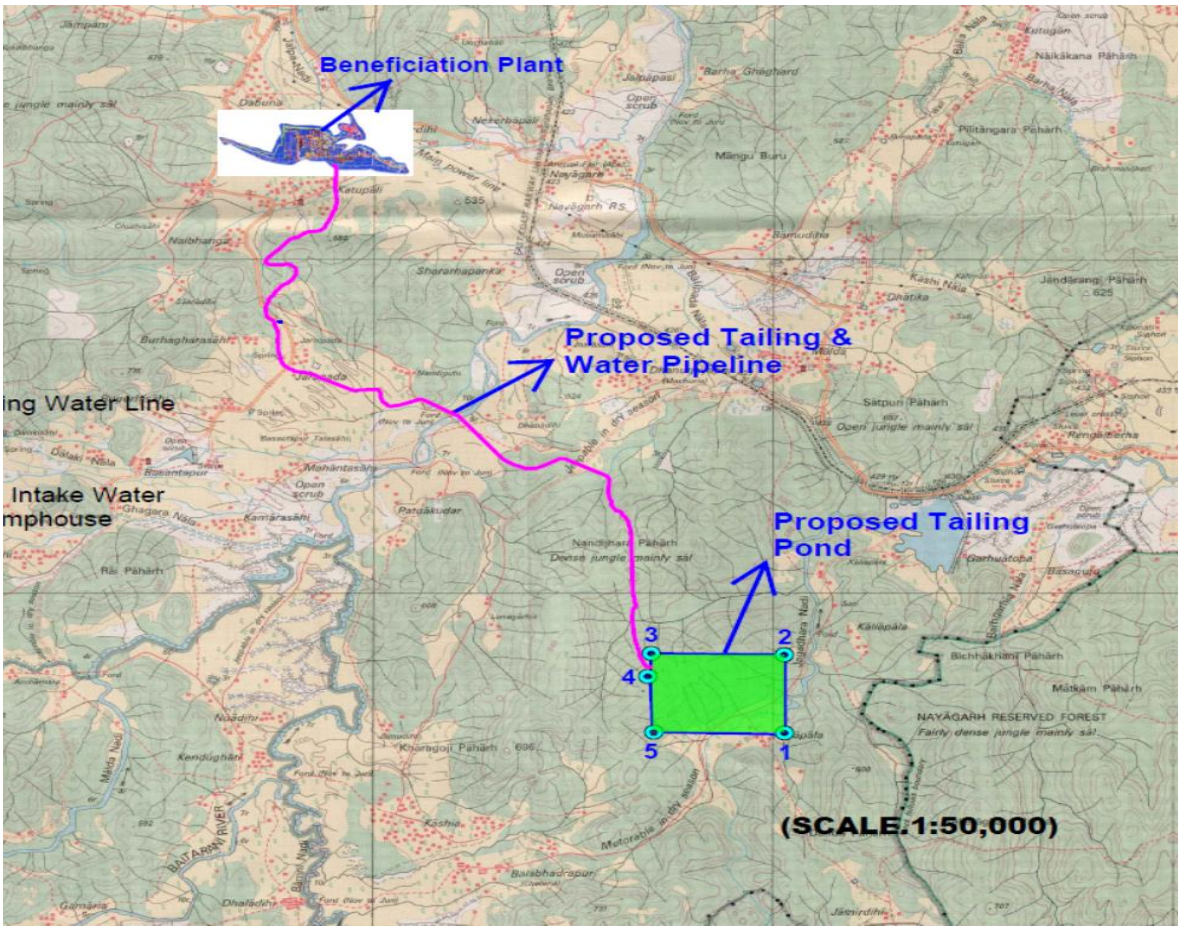
The following points will be considered during the construction of tailing pond:

a) Tailings receipt ,distribution and environmental considerations
b) Water pumping station for the reclaimed water from tailing pond
c) Return water pipeline.
d) Bunds/roads
e) Garland drains
f) Tailings properties and stability foundation conditions.
g) Hydrological conditions,
h) The local climate conditions.
i) The control of seepage water to protect the quality of surface and groundwater hence seepage study of the proposed for design of dam.
j) All dam safety measures shall be considered during construction and operation
k) Suitable geomorphology
l) Structural Geology to eliminate geo-technically risky zones

The proposed location of the Tailing Pond with reference to the Beneficiation Plant and the corresponding pillar co-ordinates is given in Figure 3.7. The detailed route map of Tailing & Water

Pipeline is attached as Annexure – V.

Figure 3.7 - Proposed Tailing Dam Map with Co-ordinates



Tailing Dam ID	UTM Co-ordinates		Ge-graphical Co-ordinates	
	Easting	Northing	Longitude	Latitude
1	340494.336	2409677.235	85º 27' 25.8482772"	21º 47' 1.133106"
2	340492.646	2410779.109	85º 27' 25.4059164"	21º 47' 36.958272"
3	339013.580	2410788.425	85º 26' 33.9109152"	21º 47' 36.7279948"
4	339006.666	2410349.930	85º 26' 33.8312544"	21º 47' 22.5189348"
5	339034.234	2409698.119	85º 26' 35.0129004"	21º 47' 1.3354296"

LEGEND
- Tailing Dam Boundary
- Beneficiation Plant
- Forest
- Tailing and WaterPipeline

3.7.5 Tailing Generation and Life of Tailing pond Calculations

The Plant Tailing generation rate is estimated to be a maximum of 2.02 million cubic meter annually. The ballpark value of the Tailing Pond storage volume is approximately 100 million cubic meter. Therefore estimated life span of tailing dam is considerably more than 30 years. The yearly Plant Tailing generation and the Life of Tailing Pond is calculated and shown in the Table 3.11

Table 3.11 - Tailing Pond Life Calculation

Sl No	Year	Tailing Generation Per Year in million m3	Cumulative Tailing Generation in million m3	Volume of Tailng Pond in million m3	Remaining Volume of Tailing Pond in million m3
1	1	2.02	2.02	100	97.98
2	2	2.02	4.04	97.98	95.96
3	3	2.02	6.06	95.96	93.94
4	4	2.02	8.08	93.94	91.92
5	5	2.02	10.10	91.92	89.90
6	6	2.02	12.12	89.90	87.88
7	7	2.02	14.14	87.88	85.86
8	8	2.02	16.16	85.86	83.84
9	9	2.02	18.18	83.84	81.82
10	10	2.02	20.20	81.82	79.80
11	11	2.02	22.22	79.80	77.78
12	12	2.02	24.24	77.78	75.76
13	13	2.02	26.26	75.76	73.74
14	14	2.02	28.28	73.74	71.72
15	15	2.02	30.30	71.72	69.70
16	16	2.02	32.32	69.70	67.68
17	17	2.02	34.34	67.68	65.66
18	18	2.02	36.36	65.66	63.64
19	19	2.02	38.38	63.64	61.62
20	20	2.02	40.40	61.62	59.60
21	21	2.02	42.42	59.60	57.58
22	22	2.02	44.44	57.58	55.56
23	23	2.02	46.46	55.56	53.54
24	24	2.02	48.48	53.54	51.52
25	25	2.02	50.50	51.52	49.50
26	26	2.02	52.52	49.50	47.48
27	27	2.02	54.54	47.48	45.46
28	28	2.02	56.56	45.46	43.44
29	29	2.02	58.58	43.44	41.42
30	30	2.02	60.60	41.42	39.40

4 SITE ANALYSIS

4.1 CONNECTIVITY

The plant is located on KIDCO expressway connecting Joda - Palasponga and is also connected with NH-215 and various other connecting roads. One of the major interconnecting roads from Rugdi (NH-215) to Bambebari has been widened and strengthened (from single lane to intermediate/double lane).

Villages namely Purunadihi, Khajuridihi, Dabuna, Katupali and OMC Colony are situated near the proposed site location.

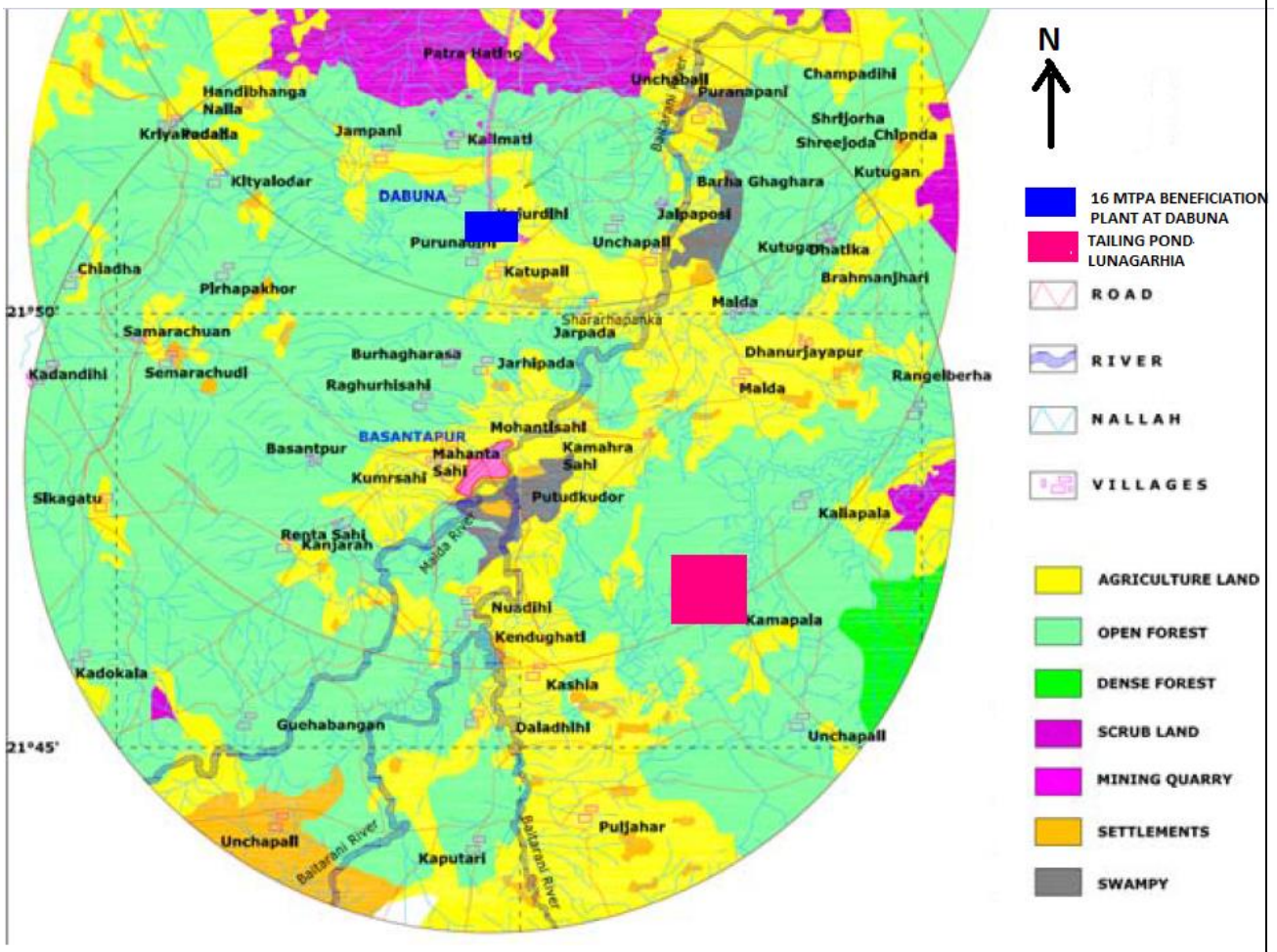
4.2 LAND FORM, LAND-USE AND LAND OWNERSHIP

The land use survey was carried out on the basis of interpretation of Survey of India Topo sheet (73G/5 & 73G/6) in the scale of 1:50,000 and field survey. Based on the interpretation of the Topo sheet and field survey, the present distribution of land use unit of the study area is classified into Agricultural Land, Dense Forest, Open Forest, River, Sandy Land, Scrub ,Settlement, Swampy, Water Bodies and Mining Quarry.

The additional land identified for the Tailing Pond is over an area of 164.467 ha., out of which 159.248 ha. is Forest Land, 1.709 Ha is Govt. Land and 3.510 Ha is Private Land. The Truck Unloading Station will be constructed over an area of 1.92 Ha (4.75 acres). Slurry and water pipeline between Beneficiation Plant at Dabuna and Sagasahi Iron Ore Mine will require 23.90 Ha (59.063 acres) and tailing pipeline with return water pipeline will involve 10.607 Ha(26.21 Acres) of land.

The land has sparse vegetation in plant area and the tailing pond area is an open forest. There are no existing/proposed National Parks/Wildlife sanctuaries within the 10 km radius of the project site. Facsimile of land use map identifying Beneficiation Plant and Tailing Pond is shown in Figure 4.1

Figure 4.1 – Land Use Map



Interpretation

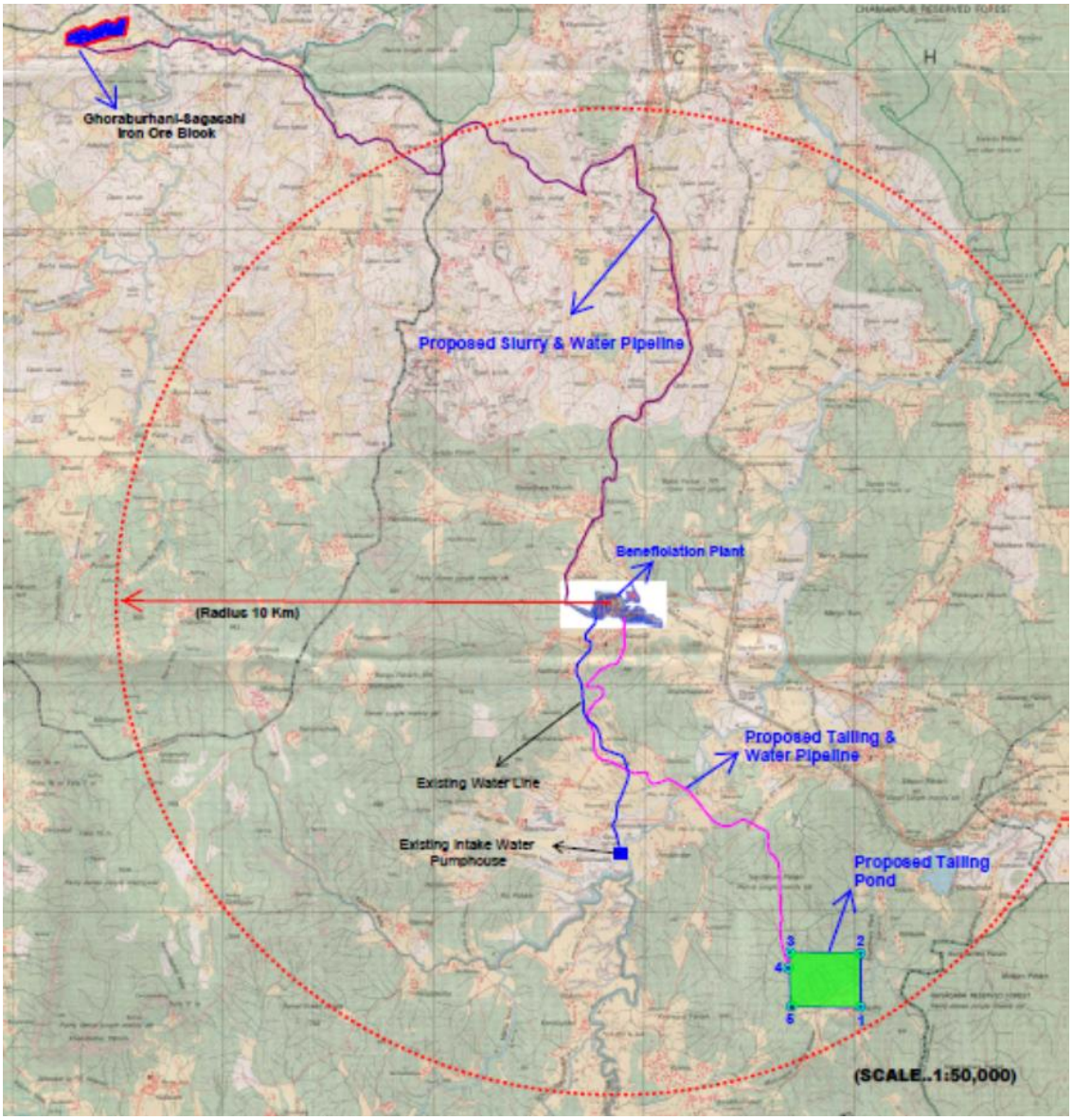
The total area identified for the proposed Tailing Pond is 164. 467 Ha(406.408 acres) . This area is nominal as compared to the total land area. Hence the impact on land use in future scenario may be considered as insignificant. It is interpreted that the proposed site as such would not cause any significant adverse impact on the prevailing environmental setting.

4.3 TOPOGRAPHY

The existing plant is located within Latitude 21_51'30"N and Longitude 85_24'15"E, at an elevation of about 500 m above mean sea level, in the Keonjhar district of Odisha. The land is almost flat terrain with an elevation of about 480 m above MSL. Figure 4.2 replicates the topo sheet No. F45N5 (Scale 1:50,000) depicting Dabuna Beneficiation Plant, Tailing Pond with Pipeline/Water Line Route, Sagasahi Mine Slurry Transportation Pipeline/Water Line Route and Existing Intake

Water Pump house and Water Line Route. The detailed topo sheet is attached as Annexure – VI.

Figure 4.2 – Topography of Beneficiation Plant



LEGEND			
	Iron Ore Block		Tailing Dam Boundary
	Intake Water Pipeline		Beneficiation Plant
	Slurry Pipeline		Forest
			Tailing and WaterPipeline

The proposed Tailing Pond is located at a crow flight distance of 9 km from Dabuna, to the east of the village Lunagarhia. Gradient is 120/1000m or 1:8.3. The site has the advantage of having natural enclosure on three sides and the fourth side is open and the drainage grades towards ENE which meets the Jagadhara Nadi two kilometers away. The depth of the valley is 140m with reference to the 620m contour as per the S O I topo sheet 73 G/5. Average gradient is 1:8.3. The country rock is sandstone, which is leucocratic, medium grained and it is to some extent crudely laminated which masks the bedding plane. However at places the trend is found to be horizontal to sub horizontal. There is no indication of Iron Ore or manganese mineralized zone in the area. The area is also free from conventional agricultural land and habitats. As per Survey of India topo sheet it is covered by open forest. It does not come within any reserved or protected forest.

4.4 EXISTING LAND CONDITION & RELATIVE LOCATION OF PROTECTED AREAS

The buffer zones of Beneficiation Plant and proposed tailing pond are free of protected areas Biosphere reserve, National Park, Wildlife Sanctuary, Tiger Reserve, Elephant Reserve and wildlife corridor) and eco-sensitive areas.

4.5 EXISTING INFRASTRUCTURE

The existing facility includes all necessary infrastructures and is well connected with road and rail networks.

4.6 SOIL CLASSIFICATION

Existing soil investigation summary of Beneficiation Plant indicates that the top soil is mostly red and brownish red in colour and lateritic in nature up to an average bed depth of 4-5 m which is followed by a layer of moorum / moorum with boulder. Below that there lies a layer of soft rock and hard rock. The lateritic soils are mostly poor in organic contents and moisture retaining capacity. The analysis of the samples are indicated in Table 4.2

Table 4.2 - Chemical Analysis of Soil Samples

Parameters	Units	S_1	S_2	S_3	S_4
pH	—	7.35	7.85	7.52	7.65
E.C	mohs/cm	104	90	115	100
Sodium as Na	PPm	45	43	40	33
Bulk density	gtn/c.c	2.5	1.8	2.5	2.0
Organic matter	%	0.5	0.6	0.8	0.7
Chloride	%	0.025	0.01	03	0.04
Sand	%	12	25	20	20
Salt	%	43	45	40	36
Clay	%	45	30	40	44
Texture	-	Clayee	Clayee	Clayee	Clayee
Porosity	%	43	44	42	46
Water holding	%	40	40	41	40
C.E.C	meq/100gm	1.2	1.4	1.6	1.47
Organic carbon	%	0.3	0.35	0.40	0.4
N	ppm	12	15	10	15
P	ppm	14	8	15	12
K	ppm	17	18	15	11
S	ppm	9	5	10	8

S_1: Nayagarh, S_2: Unchabali, S_3: Jalpaposi, S_4: Balda

4.7 CLIMATIC CONDITION

The climate of the area is of subtropical type and is characterized by an oppressive hot summer, a mild winter and well distributed rainfall during the southwestern monsoon season.

The year is divided into four seasons, the summer season is from March to May and rainy season is from the period of June to September. October and November constitute the post monsoon season. The winter season is from December to February. The nearest meteorological station of IMD, where climatological data are available, is at district headquarters – Keonjhar.

Meteorological parameters like temperature, relative humidity, rainfall, wind flow pattern, cloudiness etc. for the area are gathered from IMD and the salient observations drawn from long term data of these different climatological parameters are briefly discussed in the following paragraphs.

a) Temperature

The month wise average maximum and minimum temperature observed in the Keonjhar District is presented in the Table 4.3

Table 4.3 - Average Temperature and Relative Humidity

Month	Temperature		Relative Humidity	
	Mean Daily Max °C	Mean Daily Min °C	08:30%	17:30%
Jan	25.4	11.7	62	51
Feb	28.3	14.4	59	43
Mar	33.2	18.6	51	36
Apr	36.9	22.7	53	41
May	38.2	24.6	56	42
Jun	34.2	24.7	70	65
Jul	29.7	23.1	82	80
Aug	29.6	23.6	83	81
Sep	29.8	22.5	82	81
Oct	29.2	20.2	77	70
Nov	27.0	14.8	64	55
Dec	25.1	11.7	63	54
Annual Mean	**30.5**	**19.4**	**67**	**58**

b) Relative Humidity

It is observed from above table that high humidity of 70 to 83 % prevails in the morning from June to October. The humidity is about 51 to 56 % in the morning and 36 to 42 % in the afternoon from March to May. March is the driest month where the relative humidity drops down to 36 % during afternoon.

c) Rainfall

The rainfall data recorded at Joda block headquarter; district Keonjhar for the period of 1998-2007 is tabulated below in Table 4.4. The rainfall data does not show any cyclic occurrences and show erratic variations, ranging from as low as 909.13 mm in the year 2002-03 to 2049.54 mm in the year 2007-08. The average annual rainfall for the period 1998 to 2008 was 1339.30 mm. The monsoon season is spread over the months from June to September.

Table 4.4 - Yearly Rainfall (1998 – 2007)

Year	Rainfall (mm)	Year	Rainfall (mm)
1998-1999	1071.20	2007-2008	2049.54
1999-2000	1428.40	2008-2009	
2000-2001	1277.50	2009-2010	
2001-2002	1153.07	2010-2011	
2002-2003	909.13	2011-2012	

2003-2004	1324.24	2012-2013	
2004-2005	1348.45	2013-2014	
2005-2006	1313.00	2014-2015	
2006-2007	1521.38		

d) Wind flow pattern

The wind rose of Keonjhar district for the period 1976-1991 are shown in Figure 4.5 and Figure 4.6 recorded at 8:30 hrs and 17:30 hrs respectively. It is clear from the figures that for Keonjhar, the predominant wind directions are generally Northeasterly from October to March and Southwesterly from October to December.

Figure 4.5 – Wind Rose, Keonjhar District - (0830 HRS IST)

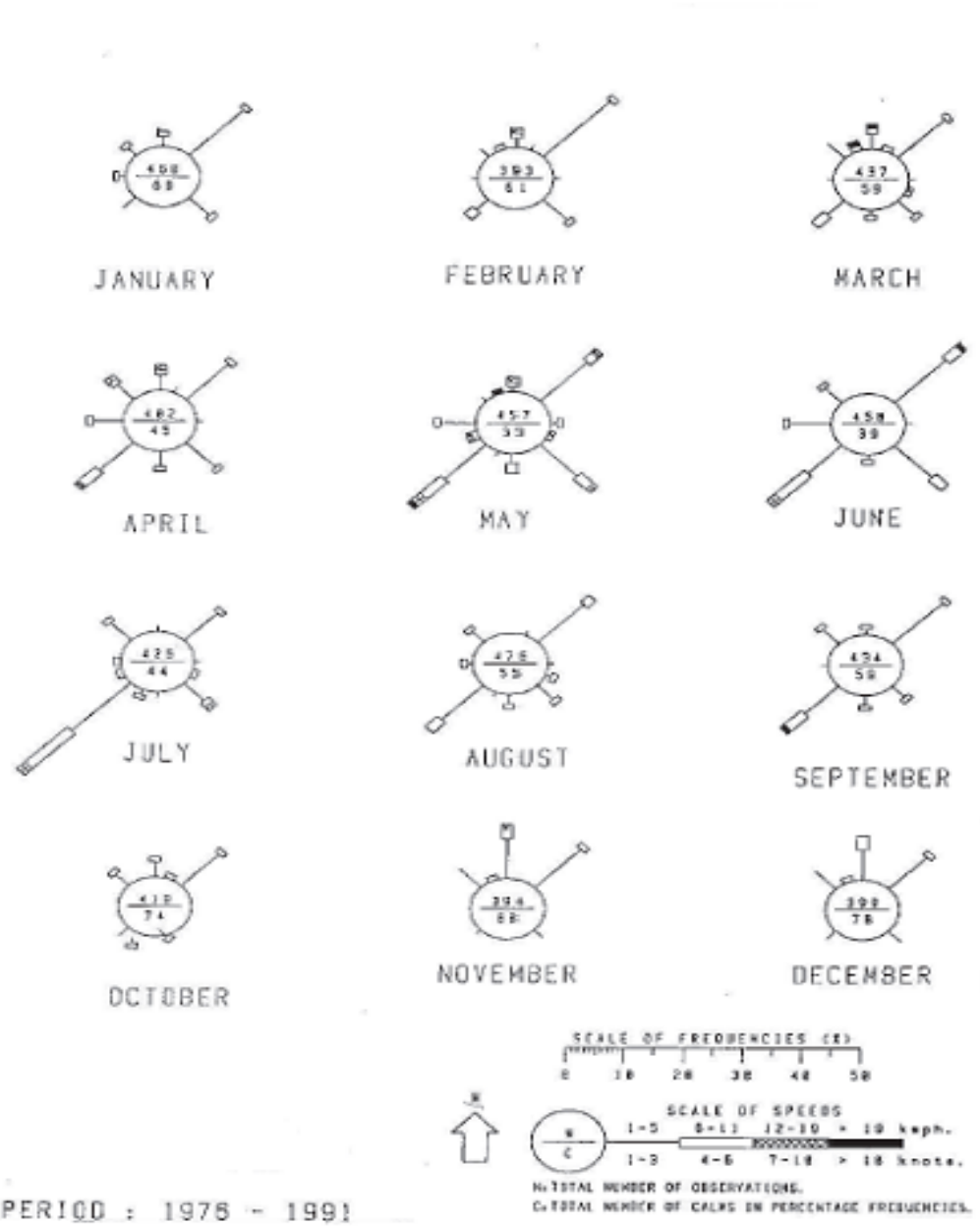
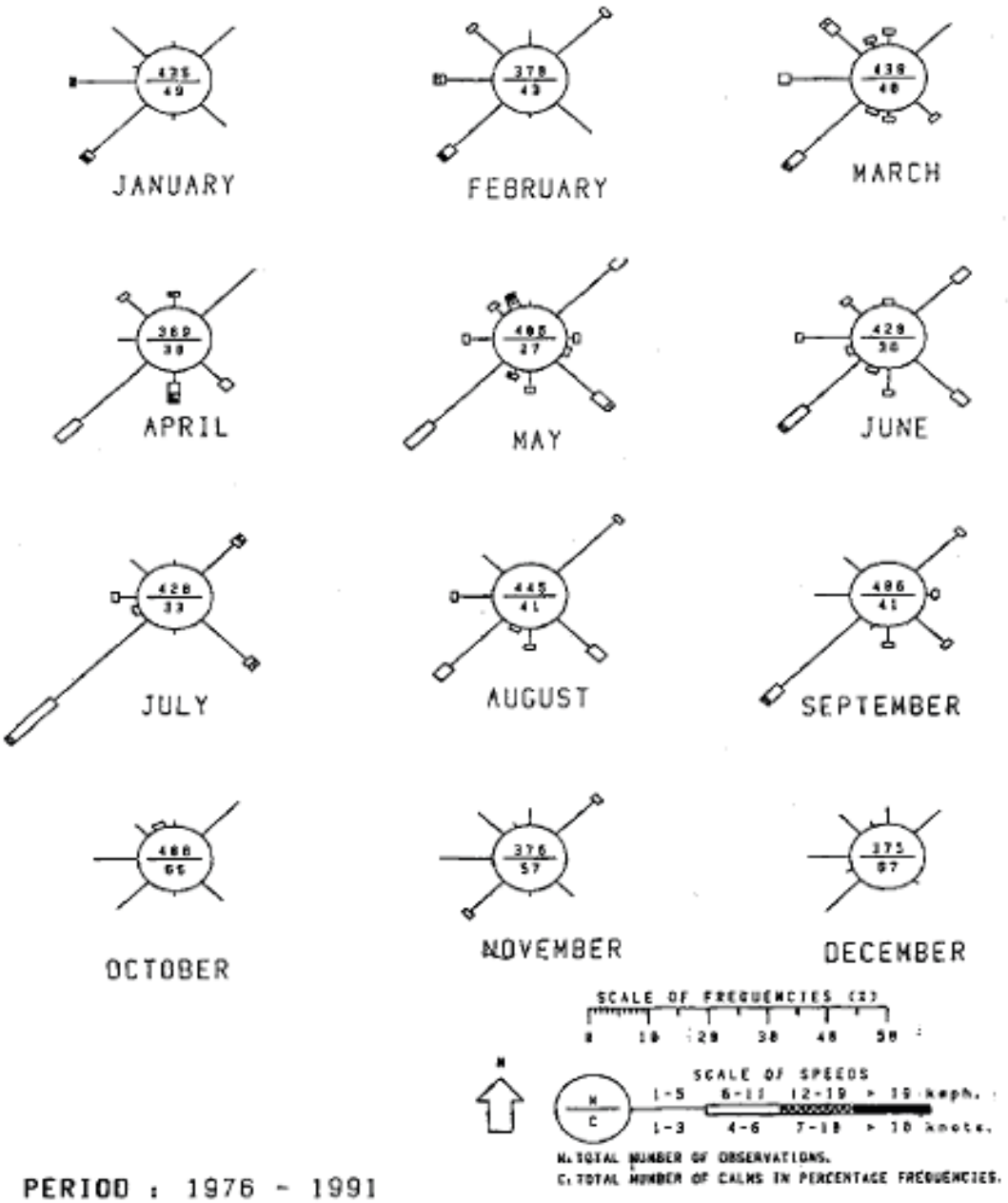


Figure 4.6 – Wind Rose, Keonjhar District (1730 HRS IST)



e) Cloudiness

Skies are generally moderate to heavily cloud during northeastern monsoon, being overcast on some days. During the rest of the year, the skies are normally clear to lightly cloud. During the months of July-August, the mean cloudiness (in Oktas) is usually more than 6.5, being generally higher in the evenings than the mornings.

4.8 SOCIAL INFRASTRUCTURE AVAILABLE

The identified area falls under Joda Block of Keonjhar District of Odisha. The social infrastructure such as water facilities (wells, tanks, hand pumps and canals), communication facilities (post office, post & telegraph office and telephone connections), transportation facilities (bus and train), medical facilities (hospitals/first aid dispensaries, public health sub centers), education facilities (primary, middle and sr. secondary schools and college) and power supply is available in the nearby villages.

5 PLANNING BRIEF

5.1 PLANNING CONCEPT

Essar Steel India Limited had implemented an Iron ore Beneficiation Plant of 10.7 MTPA capacity at Dabuna. The plant utilizes (-) 10 mm size and 58-64 % Fe grade IOF from merchant miners from the nearby area.

The infrastructure facility for raw material, land, transportation, and more notably best possible utilization of physical & social infrastructure, amenities/facilities will be extended for the proposed expansion.

5.2 POPULATION PROJECTION

The semiskilled/unskilled personnel available in the nearby areas will be employed during construction and operation phase. However skilled personnel will be called from the outside area. Therefore migration of semiskilled/unskilled personnel in the area is not expected on mass level and demographic profile of the area will not be changed. It is also not expected to have additional burden on the physical and social infrastructure like housing facility, education, medical facility, drinking water supply, transportation, and bank facilities available in the area for local population.

Moreover, the infrastructure facilities considered during 10.7 MTPA of the project will cater residential needs of the permanent personnel's and their families. It is expected that the population in the nearby area will be marginally increased.

It is envisaged that the expansion project would provide direct and indirect employment to 100 peoples respectively. Based on that, it is assumed that the population in the nearby area will increase by around maximum 300 people.

5.3 LAND- USE PLANNING

Most of the expansion part would be accommodated within the existing plant boundary. However additional land of 1.92 Ha(4.75 acres) is identified near the east side of existing Plant boundary for the installation of Truck Unloading Station. Apart from this 164.467 ha (406.408 acres) of land is identified for construction of tailing pond. The land utilization pattern is given in Table 5.1

Table 5.1 - Land Use Breakup

LAND USE PLANNING FOR PROPOSED BENEFICIATION PLANT & TAILING POND			
UNIT	**EXISTING BENEFICIATION PLANT**	**TRUCK UNLOADING STATION**	**TAILING POND**

AREA IN ACRES	**85**	**4.75**	**406.408**

5.4 ASSESSMENT OF INFRASTRUCTURE DEMAND

a) Water requirement for the expansion of Plant capacity will be met from the existing water intake system.

b) The power requirement for the expansion of Plant capacity will be met from the existing 132/33 kV grid sub-station, Palaspanga.

c) Apart from existing infrastructure, new facilities like Thickeners, Truck unloading station, Slurry Pipeline, Tailing pipeline, water pipeline and associated infrastructure will be constructed for the expansion of Plant capacity.

5.5 AMENITIES/FACILITIES

No new amenities are proposed and existing facilities will cater to the additional requirement.

6 PROPOSED INFRASTRUCTURE

6.1 INDUSTRIAL AREA

To enhance the plant production capacity from 8 MTPA (output) to 12 MTPA (output) the additional process equipment or facilities required as explained in the chapter is consolidated and listed below.

a) Truck Unloading System

EStIL has taken on lease M/s. Jaiswal crusher area located towards North-East side of Dabuna Plant to construct Truck Unloading Station(TUS) for Iron ore handling and plan a new conveyor connecting to existing stock yard / junction houses to meet requirement of raw material. This conveyor system from TUS will enter the plant near existing Tailing thickener and will be routed along the plant boundary wall i.e. towards north side of existing facilities. The length of proposed conveyor is (~) 1200 m with multiple transfer houses.

b) Raw Material Handling

i. Commissioning of Stacker
ii. Capacity Audit of Twin Bucket Reclaimer
iii. Installation of Tripper Conveyor at Bin Top and necessary changes in the feed conveyor

c) Slurry Pipeline with Water pipeline

New slurry pipeline along with water pipeline and associated electrics and communication system will be constructed connecting Sagasahi and Dabuna Beneficiation Plant.

d) Tailing Pond near Lunagarhia

New tailing pond will be constructed near Lunagarhia for handling plant tailings.

e) Tailing Pipeline with Return water pipeline

New Tailing pipeline along with return water pipeline and associated electrics and communication system will be constructed connecting Dabuna Beneficiation Plant and Tailing pond.

6.2 RESIDENTIAL AREA

Residential facility with all the basic amenities established already is sufficient to cater additional manpower requirement.

6.3 GREEN BELT DEVELOPMENT

As per the CPCB guidelines, for Green belting an area of approx.30 Acres (33% of plant area) will be considered possessing adequate width and density. Basis for estimation of Green Belt area is shown in the Table 6.1

Table 6.1 – Green Belt

LAND DETAILS OF GREEN BELT DEVELOPMENT		
SL.	**Land Description**	**Area in Acres**
01	**Existing Land(Beneficiation Plant)**	**85.0 acres**
02	**Truck Unloading Station**	**4.75 cares**
03	**Total area involved**	**89.75 acres**
33% of the total area		**30 acres(aaprox.)**

The plantation will be done on the both sides of the internal plant roads. Wherever tree plantations will not be feasible, unpaved land shall be covered with grass and small height bushes. Moreover, special care shall be taken for planting shrubs/trees along the roadside.

6.4 SOCIAL INFRASTRUCTURE

For the benefit of the local community, company is working closely with the local community towards improving social infrastructure in the nearby area. The company is improving drinking water facility by putting tube wells in nearby villages. Also company is adopting the local community health centers, providing mobile medical units to improve health conditions. Moreover company has started Industrial Training Center in the area to develop the educational skills of the locals.

6.5 CONNECTIVITY

The existing plant is well connected with road, rail, water and power facilities. This facilities will be extended within the plant boundary to cater the expansion.

6.6 DRINKING WATER

Existing plant incorporates a water treatment facility to treat and distribute drinking water within plant premises. This facility is adequate for the proposed expansion.

6.7 SEWERAGE SYSTEM

The Plant has septic tanks and soak pits adequate to take care of the waste water of Canteen, Toilets and Transit Camp.

6.8 INDUSTRIAL WASTE MANAGEMENT

The waste oil/grease is collected in closed MS barrels with caps intact and the barrels are kept on impervious floors with shed and oil catch pit.

6.9 SOLID WASTE MANAGEMENT

Industrial solid wastes such as rubber, scrap metal etc, will be collected and disposed-off suitably.

6.10 POWER REQUIREMENT & SOURCE

The total power requirement after expansion is estimated as 29.5 MW and the existing power source from OTPCL, 132/33 kV grid is sufficient to cater this requirement. As an adequate measure, if required, Power would be wheeled from Paradeep 2 x 30 MW capacity Captive Power Plant.

7 REHABILITATION AND RESETTEMENT (R&R) PLAN

There is zero displacement in the Project area. All the Land sellers come under the project affected category and since no one is parting with 100% land, therefore there is no entitlement for job. However, company will follow the R & R Policy of Govt. of Odisha towards Rehabilitation.

8 PROJECT SCHEDULE & COST ESTIMATE

8.1 PROJECT SCHEDULE

The schedule for completion of Engineering, Procurement and Construction activities for expansion of Beneficiation Plant will be about 30 months after getting all statutory clearances from various government agencies. The breakup of activities is given in below table.8.1

Table 8.1: Project Schedule for expansion

Description	Periods (Months)	Cumulative Schedule (Months)
Basic Engineering	3	3
Detail Engineering	3	6
Procurement	6	12
Construction	12	24
Erection and Commissioning	6	30

8.2 PROJECT COST ESTIMATION

8.2.1 General

Dabuna Beneficiation Plant is proposed to expand from its present beneficiation capacity of 10.7 MTPA throughput (8 MTPA beneficiated Concentrate) to 16 MTPA throughput (12 MTPA Beneficiated Concentrate) to match the capacity of Paradeep Pellet Plant.

8.2.2 Summary of Capital Cost Estimate

The capital cost for Beneficiation Plant expansion is given in Table-8.2.

Table 8.2 - EPC Cost for expansion of Beneficiation plant

Capex Estimate				
				Crores
No.	**Particulars**	**Imported**	**Indigenous**	**Total**
A	**EPC Cost**			
1	Engineering **(I)**	**00**	**2.56**	**2.56**
2	Procurement			
	Tailing Dam	00	2.04	2.04
	Tailing Pipeline from Beneficiation Plant to Tailing Dam	00	10.01	10.01
3	Return Water Pipeline from Tailing Pond to Beneficiation Plant at Dabuna	00	5.46	5.46
4	Slurry Pipeline from Sagasahi Iron Ore Mine to Beneficiation Plant (28km)	00	60.71	60.71
5	Return Water Pipeline from Beneficiation Plant, Dabuna to Sagasahi Iron Ore Mine	00	35.63	35.63
6	Truck Unloading Station	00	21.12	1.12
	Total (II)	**00**	**134.97**	**134.97**
	Construction :			
	Erection			

1	Tailing Dam	00	43.88	43.88
2	Laying of tailing pipeline from Beneficiation Plant to Tailing Dam	00	20.17	20.17
3	Laying of water line from Tailing Dam to Beneficiation Plant	00	6.61	6.61
4	Laying of slurry pipeline from Sagasahi Iron Ore Mine to Beneficiation Plant(28km)	00	18.09	18.09
5	Laying of water pipeline from Beneficiation Plant to Sagasahi Mine (28km)	00	17.55	17.55
6	Construction of Truck Unloading Station	00	30.06	30.06
	Total (III)	**00**	**136.36**	**136.36**
	Total (I) +(II)+(III)	**00**	**273.89**	**273.89**
B	**Owner's cost (IV)**			
	Land acquisition	00	33.32	33.32
	Pre-operative expenses	00	8.21	8.21
	Contingencies	00	19.48	19.48
	Interest during construction	00	22.82	22.82
	Margin Money	xx	00	00
	Total Investment (I)+(II)+(III)+(IV)		**357.62**	**357.62**

8.2.3 Methodology

The costs have been worked out on the basis of prices prevailing during 2nd Quarter 2016 and do not include any provision for future escalation in costs during implementation period.

The cost estimates are generally based on available in-house information, current budgetary quotations and costs extracted from similar projects after suitable adjustment to reflect current prices. The estimate is based on as erected cost of plant and machinery including applicable statutory duties & taxes for various schemes as mentioned above and include financing cost during implementation/construction period.

100% new equipment has been envisaged for procurement and use in the project. No second hand and revamped equipment is envisaged while estimating the project cost.

8.2.4 Basis of Estimate

The basis of the capital cost estimate is elaborated in the following sub-sections.

8.2.5 Land and Site Development

Land acquisition for Expansion facilities is considered as 4.75 Acres for Truck unloading station. Further, Cost of site development includes the cost of cutting and filling, grading, approach roads, tailing pond construction, pipelines etc.

8.2.6 Plant and Machinery

Main technological units for the project consist of Pumps, Motors, Pipeline, Pipe fittings, Thickeners, Material handling equipment. Screen, load cell mounted hopper, belt feeders, collecting conveyor,

metal detector, electrical & automation system, PLC system, firefighting system, weigh bridge transfer houses, water sprinkler for road for pollution controls, hoisting & handling arrangements and equipment. Cost of plant & machinery includes the FOB/ ex-works cost of equipment, initial spares, ocean & inland transportation and handling costs, transit insurance, port clearance, taxes & duties, and installation charges for the technological and associated auxiliary equipment as well as technological structures.

8.2.7 Civil & Structural Works

This includes all civil works and building structures for plant buildings, equipment and column foundations, open yards, conveyor galleries and junction houses, project office, non-factory buildings and other miscellaneous civil engineering/structural works.

8.2.8 Engineering

The cost estimated under this head includes engineering and consultancy charges which mainly comprise of basic and detailed engineering, preparation of technical specifications, contracting and procurement services, supervision of erection, testing and commissioning, etc.

8.2.9 Pre-operative expenses

This includes costs towards establishment charges, rents & taxes, travelling expenses, communication, legal expenses, and insurance during construction including erection insurance, start-up expenses, salaries and training of operational & maintenance staff inducted before commencement of production as well as that of owners' team, and other miscellaneous expenses including corporate social responsibilities likely to be incurred during implementation of the project.

8.2.10 Contingencies

Contingencies at the rate of 10% of the capital costs have been provided to cover unforeseen aspects of the estimate.

8.2.11 Interest during Construction (IDC)

The project has been envisaged to be commissioned in different phases from the date of clearance of the project and appointment of the project consultant. It has been assumed that the project would be financed in the D:E ratio of 2:1. Interest on loan capital has been considered at the rate of 13.5%. Interest during construction (IDC) has been worked out based on construction schedule, interest rate on long-term loans and withdrawal pattern of fund. Project will be implemented in 30 months from the date of the financial closure.

9 ANALYSIS OF PROPOSAL

9.1 FINANCIAL & SOCIAL BENEFITS

Essar is a large player in the diversified sectors and making noteworthy contribution in Indian economy. The proposed expansion of Beneficiation Plant will help the company in attaining

operational efficiency of interlinked existing Steel plant. The annual revenue generation in the form of taxes from the proposed project will go to the district exchequer and can be spent in developmental activities in the region.

The majority of the population in the nearby area is tribal like Mundas, Nayaks etc. The major benefit due to proposed project will be in the shape of generating direct/indirect employment in substantial number for this tribal population. The unskilled/semiskilled personnel utilized in different areas like horticulture, site clearing, construction activities etc. will be hired from the nearby areas to the extent possible. Further, there will be scope for lot of small contracts, which will benefit the local contractors/material suppliers and local tribal population in general and at the same time it will reduce the need for additional infrastructure. Also, due to secondary development in the region, employment opportunities are generating through setting up of many guest houses/hotels, restaurants, utility shops, new schools, transport operators etc. All these factors are beneficial to the locals residing in the nearby area.

Additionally, the company is implementing many community development activities through Essar Foundation. The Foundation's activities divided across six focus areas like livelihoods and entrepreneurship, women's empowerment, health, education, infrastructure and Ecology & environment. In line with these activities, Essar Steel India Ltd. is working towards improvement in the living conditions of tribal population near the project, particularly in the areas of health & hygiene, civic amenities, infrastructure, education & training, water supply etc.

Few initiatives being undertaken in the region are described below;

a) Organized health camps over 450 villagers from tribal communities who lived in remote areas benefited from the health camps. The camps were organized as part of Essar's commitment to providing continuous healthcare services in remote locations adjoining Essar facilities.
b) Adopting the community health centers (CHC's) in one of the poorest and tribal dominated blocks in Keonjhar, providing mobile Medicare unit, the tele-opthalmic vision center and organizing the specialized health camps are significant step taken towards making quality healthcare services available to the communities of one of the poorest blocks of Odisha.
c) Around 11 schools near Beneficiation Plant are extended support through provision of community teachers, teaching learning materials and school uniforms to students.
d) An Industrial Training Centre (ITC) was established under the program called 'Technical education to empower rural youth'. It is one of the most successfully managed initiative for empowerment of the local community and to make the youth employable in one of the most under developed areas in the country.
e) The foundation is also working on an agriculture improvement program where tribal villagers are trained in innovation in agricultural practices. A series of training programs were initiated

under which local agriculture experts guided the villagers in the use of modern agricultural techniques to grow vegetables and other crops which can be easily sold in the market.

f) The foundation is also extending the support towards effectively implementing various government schemes/missions in the region. The company has placed experienced professionals to help reach out to more than 10,000 women and self-help group members in 13 blocks of the district.

The company will keep on contributing into community welfare, public infrastructure improvement and employment generation. And therefore proposed expansion project will significantly contribute in improving the socio economic condition of locals.

Keeping in view of the realities of existing Beneficiation Plant as well as financial analysis of proposed project, it can be concluded that the proposed expansion is economically viable. It is therefore recommended to expand the Beneficiation Plant capacity near the village - Dabuna, Tehsil – Joda, District – Keonjhar, State - Odisha.