

## 1.0 **Executive Summary**

### 1.1 **Introduction**

M/s. Vedanta Limited (Formerly Sesa Goa Limited) proposes for product diversification / change in product mix by converting 0.3 MTPA hot liquid metal, out of 0.45 MTPA hot liquid metal from blast furnace to ductile iron spun pipe at Navelim village, Bicholim taluka, North Goa district, Goa.

As per Environmental Impact Assessment (EIA) Notification dated 14<sup>th</sup> September, 2006 and 01.12.2009, the proposed project falls under category 'A', of Schedule 3(a) and requires Environmental Clearance (EC) to be obtained from Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India before the commencement of ground activity.

The EIA report has been prepared based on the Terms of Reference (TOR) conditions prescribed by MoEF&CC vide letter No. F.No.J-11011/946/2007.IA.II (I) dated 10.08.2016 and baseline environmental studies were conducted during 1<sup>st</sup> March 2016 to 31<sup>st</sup> May 2016 representing pre-monsoon season, 2016 and additional one month i.e June 2016 as per the ToR.

#### 1.1.1 Existing Facilities of Overall Pig Iron Plant Complex at Amona & Navelim

- Two blast furnaces BF#1, BF#2 having production capacity of 2,92,000 TPA operational since more than 20 years;
- BF#3 and sinter plant having capacity of 5,40,000 TPA and 1 MTPA, respectively, operational since 2012 non recovery coke oven plant i.e. battery-I having production capacity of 3,22,000 TPA, operational since more than 20 years;
- Non recovery coke oven plant i.e. battery-II having production capacity of 3,00,000 TPA, operational since 2011;
- 33 MW of waste heat recovery power plant aligned to BF# 1 & BF# 2 and battery-I, operational since 2006; and
- 30 MW waste heat recovery power plant aligned to BF#3 and battery-II, operational since 2012. The existing production capacity of the project is mentioned in **Table-1**.

**TABLE-1**  
**EXISTING PRODUCTION CAPACITY**

Sr. No	Facility	Production Capacity	Remarks
1	Pig iron plant with 2 mini blast furnaces (Operational since last 20+years)	2,92,000 TPA	TOR obtained and EIA has been prepared for expansion to 3,50,000 TPA hot metal production
2	Non recovery coke oven plant (operational since last 20+years)	3,22,000 TPA	-
3	Waste heat recovery power plant (operational since 2006)	33 MW	-
4	Pig iron plant with mini blast furnace (operational since 2012)	5,40,000 TPA	Recommendation from EAC obtained for Extension of validity of EC F.No. J-11011/946/2007IA.II(I) for Phase II: 3,60,000 TPA hot metal,
5	Sinter plant (Operational since 2012)	10,00,000 TPA	

Sr. No	Facility	Production Capacity	Remarks
6	Non recovery coke oven plant (operational since 2011-12)	3,00,000 TPA	10,00,000 TPA sinter, 3,00,000 TPA coke Plant and 30 MW WHR power plant till June 2019
7	Waste heat recovery power plant (operational since 2012)	30 MW	

Source: Vedanta Ltd

## 1.2 Environmental Setting

The environmental settings of the project are given in **Table-2**. The study area of the project is shown in **Figure-1**.

**TABLE-2**  
**DETAILS OF ENVIRONMENTAL SETTING**

Sr. No	Particulars	Details		
1	Location	Navelim village, Bicholim taluka, North Goa district, Goa		
2	Coordinates	<b>Sr. No</b>	<b>Latitude</b>	<b>Longitude</b>
		A	15° 30' 52.89" N	74° 00' 09.47" E
		B	15° 30' 55.70" N	74° 00' 15.40" E
		C	15° 30' 44.75" N	74° 00' 22.70" E
		D	15° 30' 42.10" N	74° 00' 16.87" E
3	Toposheet No	48 E/14,E/15,& I/2, I/3		
4	Elevation	About 44 m above MSL		
5	Nearest village	Mayni ward of Navelim village (0.3 km, SSW)		
6	Nearest town & district	Sankhali town (5.0 km, N) Mapusa (21.0 km, NW)		
7	Nearest highway	NH-4A (5.3 km, WSW)		
8	Nearest railway line	Carambolim (Karmali) railway station (8.5km, WSW)		
9	Nearest airport	Dabolim airport (21.0 km, SW)		
10	Nearest seaport	Mormugao port (22 km, SW)		
11	Interstate boundary	Goa - Maharashtra (9.8 km, N)		
12	Sensitive areas	Old Goa church- Approx. 6 km Mhadei WLS boundary- 10.2 km (ESZ -9.0 km, NE) Bondla WLS -11.1 km (ESZ-10.2 km, SE ) Dr.Salim Ali Bird Sanctuary -14.3 km (ESZ-14.1 km,W)		
13	Water bodies	Mandavi river (0.5 km, W) Kudne river (1.5 km, N) Karmali lake (7.6 km, SW) Arabian sea (15.0 km, SW)		
14	List of other industries	Desai cement plant (0.3 km, SSE) Amiantit fiber glass factory (0.3 km, E) Hegemon Ispat (0.9 km, NE) Alcon cement plant (3.4 km, SE) Surla-Sonshi iron ore mine (3.7 km, ENE) Sanquelim iron ore mine (4.6 km, N) Gaval Sonshi Iron ore mine (5.1 km, ENE) Kundaim industrial estate (5.6 km, SSW) Mareta Sodo iron ore mine(6.0 km, ENE) Syngenta pesticide plant (6.7 km, WSW) Corlim industrial estate (7.0 km, W) Nestle India Ltd (9.5 km, SE)		

Sr. No	Particulars	Details
15	Reserve forest	Reserve Forest (4.0 km, E) Reserve Forest (5.0 km, E) Reserve Forest (R.F) near Salili (9.2 km, NE)
16	Seismicity	Seismic zone- III

\*Note : All distances mentioned above are in '( )' aerial distance from the plant boundary

### 1.3 Project Details

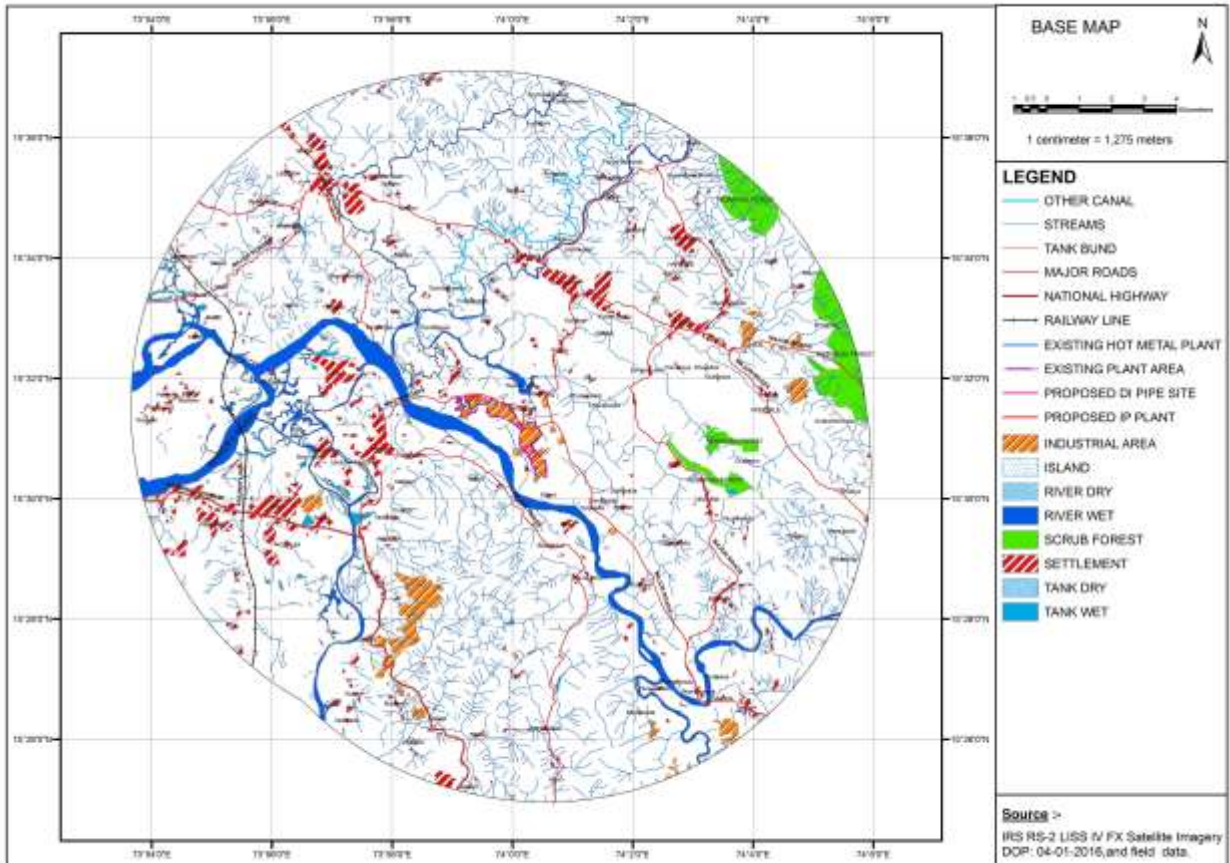
The salient features and raw materials required for the proposed DI pipe project are given below in **Table-3** and **Table-4**.

**TABLE-3**  
**SALIENT FEATURES OF PROPOSED PROJECT**

Sr. No.	Particulars	Details
1	Production of ductile iron spun pipes	300 KTPA (Product diversification of hot metal/pig iron into ductile iron pipes)
2	DI pipes having a size range	DN 80 mm to DN 1200 mm
3	Land area	20 acres (within the plant premises)
4	Water requirement & source	Total water requirement: Make up water : 960 m <sup>3</sup> /day Source : Bandhara dam which is about 10 km away from the plant/ rainwater harvested in the company's mine site
5	Power requirement & source	12 MW-Captive power generation
6	Manpower	Direct: 400 persons Indirect: 300 persons
7	Capital project cost & schedule	Cost : Rs. 550 crores Schedule : 24 months after obtaining statutory Clearance.

**TABLE-4**  
**RAW MATERIALS REQUIREMENT & SOURCE**

Sr. No.	Raw Material	Total Requirement, t/year	Source
1	Hot metal	3,24,900	From in house production
2	Scrap/pipe rejects	32,100	
3	Ferro Silicon	3000	Maharashtra Electros melt Limited/Others
4	Zinc	520	PME, France / Hindustan Zinc
5	Bitumen coal tar	640	Shalimar Tar Products Ltd, Indian Oil Corporation Ltd.
6	Magnesium	400	Minex, Snam alloys
7	Sand for core making	16000	Local market
8	Graphite powder	200	Karnataka
9	Binder	400	Foseco/Imported
10	Catalyst	80	
11	BF gas	1,70,000	From in house production
12	Cement	8,800	ACC / Birla / Ultratech Cement
13	Calcium carbide	3000	Karnataka
14	Sand for lining	50,000	Local market



**FIGURE-1**  
**STUDY AREA MAP OF 10 KM RADIUS**

### 1.3.1 Process Description

The manufacturing process of DI pipe is a continuous sequential process involving several sub-processes. The process starts with receipt of hot metal from blast furnace, desulphurization, scrap charging and super heating of molten metal in induction furnace; pipes are centrifugally cast using molten metal; heat treatment follows in annealing furnace to give ductility to the pipes cast; lining and coatings are carried out to manufacture finished pipes.

## 1.4 **Baseline Environmental Status**

The baseline data monitoring studies have been carried out for four months representing covering pre-monsoon season (March to May 2016) and during June 2016. The details are as follows:

### 1.4.1 Land Use

As per satellite imagery for the study area of 10 km radius, the built-up land is 9.8%, forest land occupies 2.7%, agricultural land is about 5.6 %, water body is 8.1 % and remaining land is either area available for cultivation or cultivable waste land.

### 1.4.2 Soil Characteristics

#### *Pre-Monsoon Season (March-May 2016)*

The pH of the soil in the study area ranged from 5.3 to 7.8. The electrical conductivity was observed to be in the range of 28.7  $\mu$ mhos/cm to 183.3  $\mu$ mhos/cm. The nitrogen values range between 109.9 to 548.1 kg/ha. The phosphorus values range between 40 to 59 kg/ha. The potassium values range between 65.8 – 317.5 kg/ha.

#### *June 2016*

The pH of the soil in the study area ranged from 6.3 to 7.5. The electrical conductivity was observed to be in the range of 32.3  $\mu$ mhos/cm to 163.3  $\mu$ mhos/cm. The nitrogen values range between 89.4 to 476.4 kg/ha. The phosphorus values range between 41.2 to 64.3 kg/ha. The potassium values range between 52.3 – 316.4 kg/ha.

### 1.4.3 Meteorology

Temperature ranged from 24<sup>o</sup>C to 39<sup>o</sup>C and the relative humidity recorded in the range of 42% to 79%. Total rainfall observed was 61.5 mm during the study period. Predominant winds are mostly from NW (29.1%) followed by W (25.2%) and WNW (10.7%) direction.

#### 1.4.4 Ambient Air Quality

##### *Pre-Monsoon Season (March-May 2016)*

Ten ambient air quality monitoring locations were monitored in and around project site. The minimum and maximum concentrations for PM<sub>10</sub> were recorded as 50.0 µg/m<sup>3</sup> and 71.3 µg/m<sup>3</sup>. The minimum and maximum concentrations for PM<sub>2.5</sub> were recorded as 21.1 µg/m<sup>3</sup> and 33.8 µg/m<sup>3</sup> respectively.

##### *June 2016*

The minimum and maximum values of PM<sub>10</sub> and PM<sub>2.5</sub> were observed in the range of 48.1 µg/m<sup>3</sup> and 68.4 µg/m<sup>3</sup>. The minimum and maximum concentrations for PM<sub>2.5</sub> were recorded as 20.0 µg/m<sup>3</sup> and 29.6 µg/m<sup>3</sup> respectively.

#### 1.4.5 Water Quality

The baseline water quality status in the region is established by analysing samples collected from 16 locations consisting of eight ground water samples and eight surface water samples. The ground and surface water samples were analysed and found that ground water quality is well within the drinking water quality limits and surface water has been found to be suitable for drinking after the conventional treatment followed by disinfection.

#### 1.4.6 Noise Levels

The noise monitoring has been conducted for determination of noise levels at ten locations in the study area. Noise monitoring results reveal ambient noise levels in all the locations are well within the limits as per CPCB Ambient noise standards.

#### 1.4.7 Flora and Fauna

There is no presence of Schedule-I mammals in the study area. However, there are Schedule-II, III, IV and V species listed in the Indian Wildlife (Protection) Act, 1972.

Incidentally, there is no presence of endangered botanical flora reported in the study area, which is listed in the Schedule VI of the Indian Wildlife (Protection) Act, 1972.

Mangrove species are found in the creeks, along with halophyte species such as *Pandanus tectorius* –Kewda species.

#### 1.4.8 Social Environment

The study area (10 km radius) area has a total population of 147353 persons according to 2011 census. The configuration of male and female indicates that the males constitute to about 50.97% and females to 49.03% of the total population. The total literacy rate is 88.66 % in the region.

## 1.5 Anticipated Environmental Impacts and Mitigation Measures

The identification of impacts, appraisal of various impacts and its mitigation measures to control pollution are given below:

### 1.5.1 Air Pollution & its Mitigation Measures

The sources of air pollution and its mitigation measures are given in **Table-5**.

**TABLE-5**  
**SOURCES OF AIR POLLUTION AND ITS MITIGATION MEASURES**

Sr. No.	Source	Type of Emissions	Mitigation Measures
1	<b>DI plant</b>		
	Holding induction furnace	Emission of dust and metallic fumes	Appropriate furnace hood system to capture furnace dust, cover extraction for induction furnace to reduce fugitive emissions and fume extraction system.
	Magnesium treatment	Particulate matter	Bag filter
	Zinc coating machine	Particulate matter	Use of dust control technologies, typically including installation of bag filters to control emissions from melting processes.
	Barrel grinding and dusting	Particulate matter	Cyclone separator and bag filter.
	Annealing	Particulate matter, SO <sub>2</sub> and NO <sub>x</sub>	Annealing furnace will be provided with minimum chimney height of 50 m to control SO <sub>2</sub> , NO <sub>x</sub> .  Hot flue gases from annealing furnace will be discharged through chimney as per GSPCB norms.
	Core Shop & socket cleaning, Trigrinding	Particulate matter	Bag filter to keep PM within the limits with minimum chimney height of 30 m.
	Operation of D.G sets	PM, SO <sub>2</sub> , NO <sub>x</sub>	Adequate stack height will be provided.
2	Construction activities: During the levelling, grading, earthworks, foundation works and other construction related activities	Fugitive dust	Sprinkling of water will be done continuously on the site and periodically on the roads where vehicle movement is more.
3	Exhaust emissions from vehicles and equipment	Marginal increase in the levels of NO <sub>x</sub> , PM, CO	Greenbelt development, emissions from diesel vehicles in use will be checked on monthly basis and brought to the required levels of emission standards.

### 1.5.2 Water Pollution & its Mitigation Measures

In order to conserve precious fresh water demand, the plant water system will be designed based on 100% recirculation system and thus effective discharge outside the plant will be zero. Hence, there will be no impact on the external water regime due to the effluents from the plant.

Most of the water is used for cooling purposes and dust conditioning. The wastewater arising from the plant will be routed to effluent treatment plant and will be re-utilized for the plant purposes.

### 1.5.3 Solid/Hazardous Waste Management

Waste oil, used oil and other hazardous wastes will be safely stored in drums/tanks/covered shed and sold to authorized recyclers. Organic waste will be used as organic manure in the green areas. The municipal waste will be given to authorized agencies for suitable disposal. The details of waste generation and management are given in **Table-6**.

**TABLE-6  
WASTE GENERATION & DISPOSAL**

Sr. No.	Waste Product	Proposed (TPA)	Disposal Scheme
1	Iron scrap	25,000	Will be reused in induction furnace
2	Slag	3000	Used for road laying
3	Waste core sand	15,000	Construction fill/Road bases/ Land fill
	<b>Hazardous Waste</b>		
4	Zinc dust	60	Sold to authorized agents
5	Used oil	2000	Sold to authorized agents
6	Magnesium oxide waste	20	Re-used in the plant

### 1.5.4 Noise Level Management

Manufacturers and suppliers of noise generating devices/machines like compressor house, mould shop and in finishing areas (cement lining, grinding etc) will provide acoustic enclosures for noise control by adopting appropriate design and state of art technology for fabricating/assembling machines. Proper noise barriers/ shields etc. will be provided around the equipment wherever required. Noise from equipment will be adequately attenuated by providing soundproof enclosure and insulation to minimize the noise level.

## 1.6 **Hazard Identification and Risk Assessment**

Following are the main hazards involved in DI pipes manufacturing:

1. Operational hazard of induction furnace;
2. Health hazards – Heat stress due to handling of molten metal at high temperature;
3. Heat and hot liquid splashes;
4. Electrical hazards; and
5. Explosion and fire hazards.

### 1.6.1 Risk Analysis for Induction Furnace

The induction holding furnace will consist of three nos. of 20 MT steel frame crucibles with one electrical. Following operational safety measures will be taken for induction furnace.

Door open: This indicates either an open door or a failing capacitor. The circuit breaker opens when one of these faults occurs.



Furnace water valves: These valves turn on supply water to the furnace. Associated with each valve is a position action flow switch, interlocked through the circuit monitor, to shut down the power supply if there is no flow in an active furnace.

Ground leak detector: Used to detect low ground resistance in the electrical system. It is also used to give an indication of a molten metal leak from the furnace to an electrical conductor.

### 1.6.2 Occupational Health Measures

Occupational health of the workers is looked after by occupational health centre which is managed by medical officer and medical staff. Occupational health service activities being followed in the existing plant as follows:

- Pre-employment medical examination of employees. Employees recruited for employment undergoes necessary pre-employment medical examination for fitness for the job. In this way, right persons are selected for right job;
- Periodical medical examination of employees;
- Periodic medical examination of employees is being conducted regularly and necessary feedback is being provided to individuals. They undergo audiometry test, Radiograph of chest, Verna test, Pulmonary function test, E.C.G., blood & urine examination and clinical examination; and
- Eye check-up for the employees.

### 1.7 Post Project Monitoring Plan

Monitoring schedule is very important in order to ensure that emissions and noise levels conform to the standard for which control measures have been designed. A comprehensive monitoring program is suggested in **Table-7**.

**TABLE-7**  
**MONITORING SCHEDULE FOR ENVIRONMENT PARAMETERS**

Sr. No.	Particulars	Monitoring Frequency	Duration of Sampling	Important Monitoring Parameters	
<b>1</b>	<b>Air Pollution and Meteorology</b>				
	Air Quality				
	a)	Ambient air quality monitoring			
		Existing six ambient air quality monitoring stations in and around plant as approved by GSPCB	Twice in a week	24 hr continuously	PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>2</sub> and other parameters as per CPCB norms.
	b)	Stack gas analysis in major stacks	As specified by GSPCB	One time	Specified as per State Pollution Control Board
	c)	Fugitive dust sampling at work zone as per CPCB or SPCB guidelines	Once in a year	24 hr continuously	Particulate matter
	Meteorology				
a)	Meteorological data to be monitored	Daily	Continuous monitoring	Wind speed, direction, temperature, relative humidity and rainfall.	

Sr. No.	Particulars	Monitoring Frequency	Duration of Sampling	Important Monitoring Parameters	
2	<b>Industrial Noise Levels</b>				
	a)	Major noise generating sources	Every month	24 hr continuous with 1 hr interval	Noise level in dB(A)
	Ambient Noise Levels				
b)	6 Locations around Sesa's iron & coke making facilities	Monthly	24 hr continuous with one hr interval	Noise levels in dB(A)	

## 1.8 CSR Activities

M/s Vedanta Ltd is committed to CSR activities through its group of companies. The existing CSR programs implemented has covered the following programs for the socio-economic development in surrounding villages near the project. The budget expenditure from 2011-17 spent so far towards CSR programs and activities are given in **Table-8**.

**TABLE-8**  
**CSR EXPENDITURE DETAILS (RS. IN LAKHS)**

CSR Activities	Years					
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Education	14.21	8.99	10.93	13.52	10.17	6.25
Health	14.06	19.15	32.66	29.22	16.68	20.10
Infra	55.60	14.05	28.29	61.52	43.09	39.87
Livelihood & Agriculture	39.55	24.15	16.05	24.59	25.03	18.45
Sport & Culture & others	2.27	2.05	2.07	0.62	0.55	0.80
Women Empowerment & others	2.39	0.74	0.53	0.00	0.00	0.00
<b>Grand Total</b>	<b>128.09</b>	<b>69.12</b>	<b>90.54</b>	<b>129.48</b>	<b>95.53</b>	<b>85.47</b>

## 1.9 Project Benefits

- Generation of employment and improved standard of living;
- Establishment of small and medium scale engineering ancillaries;
- Revenue to Government;
- Change in the socio-economic scenario of the area;
- Direct and in direct employment during construction and in operation phases;
- Employment for the unskilled and semiskilled workers during construction and operation phase of the proposed project will be from the nearby villages;
- Development of the basic amenities viz. roads, transportation, electricity, drinking water, proper sanitation, educational institutions, medical facilities, entertainment; and
- Overall the project will change living standards of the people and improve the socio-economic conditions of the area.

Thus, in view of considerable benefits from the project without any adverse environmental impact, the proposed project is most advantageous to the region as well as to the nation.



## **1.10 Conclusions**

The proposed project will have certain level of marginal impacts on the local environment, which will be mitigated by an effective EMP. However, development of this project has certain beneficial impact/effects in terms of providing the employment opportunities that the same will create during the course of its construction as well as during operational phase of the project.

Thus, it can be concluded that with the judicious and proper implementation of the pollution control and mitigation measures, the proposed project will be beneficial to the society and will help to reduce the demand – supply gap of DI pipes and will contribute to the economic development of the region in particular and country in general.