APPLICATION FOR PRIOR ENVIRONMENTAL CLEARANCE

PRE-FEASIBILITY REPORT

BAMEBARI IRON & MANGAESE MINE
TATA STEEL LTD.

MINING LEASE AREA – 464.0 HECT.
(LEASE VAIDITY TILL 31.03.2030)

FOR

A) **Ratification of EC granted by MoEF's *letter no. J-11015/85/2003-IA. II (M), dt.17.11.2005 under the provisions of EIA Notification, 2006.* *(As per MoEF Notification S.O 1530, dtd 6th April 2018)***

B) Expansion of Mining Project for the Production of-

B1) Manganese Ore (ROM) – From 0.832 LTPA (ROM-0.978 LTPA) To 5.756 LTPA(ROM)

&

B2) Iron Ore (ROM) –3.0LTPA with with overburden generation of 44.18 LTPA (Peak) & total excavation of 49.94 LTPA (Peak)

Village(s)- PALSA (Ka), KUNDAPOSI, JORIBAHAL, JAJANG, KHANDBONDH
KEONJHAR DISTRICT OF ODISHA

Submitted by:

TATA

Bamebari Iron & Mn. Mine,
Barbil Tehsil, Keonjhar District Odisha-758034

Submitted to:
Ministry of Environment, Forest & Climate Change (MoEF&CC)
New Delhi

Environment Consultant
Vimta Labs Ltd., Hyderabad
NABET Accreditation No. NABET/EIA/1922/RA0226,
Valid Till-May 27, 2023
Email- janardhan@vimta.com

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1.0 EXECUTIVE SUMMARY –

This proposal of Bamebari Iron and Manganese Mines of M/S Tata Steel is submitted as per the MoEF & CC Notification S.O. 1530 (E), Dated 06.04.2018 and the minutes of the meeting of **EAC** (Non-Coal) dtd. 3rd April 2021. The project proponent vide this proposal seeks Ministry's approval for the Ratification of existing Environment Clearance from the regime of EIA notification 1994 to EIA Notification 2006 and Expansion of the mining project by enhancing the production of Manganese Ore from ***0.832LTPA (0.978LTPA-RoM) to 5.756LTPA (RoM) and inclusion of Iron Ore (as new product) for 3.0 LTPA (RoM) with peak overburden generation of 44.18LTPA and peak total excavation of 49.94 LTPA from the existing mine lease area of 464.0ha.*** It is envisaged that with the proposed expansion of the project, existing fleet size of Heavy Earth Moving Machineris and others ancillary services would be revised; however the technology of mining/production shall remain same opencast mining with shovel dumper combination. The enhanced production shall be realised from the existing mine lease area of 464.0Ha.

With the Ministry's approval in favour of this proposal, Tata Steel Ltd. (herein after referred to as the Project Proponent) shall cater to the enhanced demand of raw materials for it's Ferro Alloys Plant(s) which in turn would enhance company's net steel production potential. The Project Proponent has a century of experience in scientific and sustainable mining of various minerals, mine planning, development and research. The Company's long-term strategy has been designed to have greater control over raw material resources and achieve its security across global operations. Tata Steel's Bamebari Iron & Manganese Mines at Joda, Odisha produces manganese ore since 1930 and is recognized as one of the major suppliers of the mineral to the company's Ferro Alloys Plant. Further, Ferro Manganese is an essential raw material for our all steel plants, namely Tata Steel Kalinganagar, Tata Steel Jamshedpur, Tata Steel Long Products and Tata Steel Meramandli for production of stainless Steel. The company has its future proposal to make use of low grade manganese ore at its other projects like Ferro Alloys Plant, Gopalpur.

In line with its corporate vision of value creation and corporate citizenship, Tata Steel has placed equal emphasis on augmenting economic, environmental and social capital – a process that is more inclusive, equitable and ensures long term sustainability of the interventions.

Tata Steel Growth plan has increased from 18.5 MTPA to 30.0 MTPA of steel production. Recent exploration studies indicate the availability of huge manganese reserve. Owing to the increase in the demand for steel production, Manganese ore and Iron ore requirement has increased. This proposal aims to supply to Tata Steel (End User) through FAP Joda and FPCs. The Project Proponent seeks to revise the production from mines and supply desired grade ore to FPCs, to reduce the imported High-grade ore for Silico Manganese Production.

The Project Proponent (earstwhileTata Iron & Steel Co. Ltd) was granted with a mining lease from the then Raja of Keonjhar State with effect from 01.04.1930 for 30 years over an area of 1150.550 hectares in Palasa (Ka), Kundaposi, Jadibahal, Khandbondh & Bonaikela, villages in Keonjhar District in the state of Odisha. The lease area is consisting with three discontinuous blocks as Bamebari, Joribar and Bonaikela.

The mining lease (ML) was renewed over same ML area of 1150.550ha for a period of 20 years each during the first and second renewal stages. The first renewal was for the period from 01.04.1960 to 31.03.1980, followed by the second renewal i.e from 01.04.1980 to 31.03.2000.

During the third renewal, The PP had applied for the renewal of lease over reduced area of 464.0ha. Considering this renewal application, State Govt. (GoO) has passed the express order vide letter no. 4076/SM-III(A)SM-06/2006, dated 31.05.2014 for renewal of the mining lease in favour of the company.

The company has surrendered balance area of 686.550 ha after implementing the provisions of Final Mine Closure Plan (FMCP) as per the Rule 23C of the MCDR, 1988, which was approved by Indian Bureau of Mines (IBM), Bhubaneswar Region vide letter no. FMCP/FM/04-ORI/BHU/2014-15, dated 20.01.2015. The certificate of compliance in this regard has also been granted by IBM vide letter no. T/FMCP/C/01/BHU/2011/267, dated 31.05.2016.

In the meanwhile, subsequent to enactment of the MMDR (Amendment) Act, 2015, the lease was extended till 31.03.2030 and Supplementary lease deed (SLD) was executed and registered on 08.05.2015.
The Bamebari mining lease is located at Bamebari, Boneikela and Joribar villages at Barbil tahasil in Champua sub-division of Keonjhar district in the state of Odisha. The entire lease of 464.0 ha consists of three discrete blocks viz. Bamebari (140 ha) i.e bounded within Latitude from $21^0$53'38.89" to $21^0$54'44.02" & Longitude from $85^0$25'23.37" to $85^0$25'52.06", Boneikela (233 ha) i.e bounded within Latitude from $22^0$02'00.42" to $22^0$03'21.47" & Longitude from $85^0$24'36.41" to $85^0$25'47.40" and Joribar (91 ha) i.e bounded within Latitude from 21055'41.52" to 21056'25.84" & Longitude from 85024'10.74" to 85025'06.64". The area falls under survey of India Topo sheet Nos. 73 G/5 & 73 F/8 (**New Topo sheet Nos. F 45N5 & F45H8**).

The project falls under Category A as per Schedule-I of the EIA Notification, 2006, since the Mining lease is more than 50 ha. The deposit at Bamebari is located at about 20 km from Barbil town. Nearest railhead is at Banspani at a distance of 4.5 km (SE), 7 km(NE) and 10 km(SE) from Boneikela, Joribar and Bamebari block respectively, which is connected by Tata-Barbil branch line of South Eastern Railway at Padapahar.

The project area of 464.0ha consists of448.395ha of forest land and 15.605ha of non-forest land. Out of which the company has alredy diverted an area of 145.329ha of forest land vide Stage-II Forest clearance granted by the earstwhile Ministry of Environment & Forest, Govt. of India vide letter no. 8-72/2004-FC, Dt.25.01.2007. The PP has also applied for the diversion of balance forest area within Bamebari Iron & Manganese Mine i.e. over an area of 303.066 ha of balance forest land. On 19-06-2016 and the said proposal is currently under active consideration of the state forest department.

The PP is presently operating the Bamebari Iron & Mn Mine over an area of 464.0ha in line with the provisions of the mine plan approved by Indian Bureau of Mines (IBM) vide letter

no. RMP/A/08-ORI/BHU/2020-21,Dt.03.08.2020. The present scheme of mine plan is approved for the period of five years i.e from 2020-25.

The mine has obtained Consent to Operate (CTO) from State Pollution Control Board, Odisha vide OSPCB's letter No. 544/IND-I-CON-189, dtd 07-01-2022 (Consent Order No. 117) with validity till 31.03.2025 for an annual production of 0.832 LTPA of manganese ore with 75 TPH mobile screening plant.

2.0 INTRODUCTION OF PROJECT/ BACKGROUND INFORMATION –

(i) Identification of Project & Project Proponent –

About Project Proponent: Tata Steel Group is among the top global steel companies with an annual crude steel capacity of 27.5 million tonnes per annum (MTPA) as on March 31, 2017. It is the world's second-most geographically-diversified steel producer, with operations in 26 countries and a commercial presence in over 50 countries. Tata Steel Group is spread across five continents with an employee base of nearly 74,000. Having bagged the Deming Application Prize and Deming Grand Prize for continuous improvement in 2008 and 2012 respectively, Tata Steel has now been recognised as the global 'Industry Leader' in 'Steel category' by Dow Jones Sustainability Index (2015). Besides being a member of the World Steel Climate Action Programme, Tata Steel has also been felicitated with several awards including the Prime Minister's Trophy for the best performing integrated steel plant for 2013-14 (received in 2017), Best Risk Management by CNBC TV18 (2016), 'Best-in-class Manufacturing' award from TIME India (2016) and the 'Most Ethical Company' award from the Ethisphere Institute (2016), IIM Sustainability Award (2015), Tata Steel Limited and Tata Steel Europe recognised by worldsteel as 2019 Steel Sustainability Champions, Receives the global recognition for the third year in a row in June 2020 and Tata Steel declared as one of the joint winners as Top Innovative Company (Large) in Manufacturing category at CII Industrial Innovation Awards 2021 among several others.

Tata Steel Ltd (TSL) was established in India as Asia's first integrated private steel company in 1907. Established in 1907, the Group's vision is to be the world steel industry benchmark in "Value Creation" and "Corporate Citizenship" through the excellence of its people, its innovative approach and overall conduct. The Company has also adopted a holistic business model that looks at the entire value chain comprising of:

- Steel Value Chain: From captive mining to downstream steel businesses.
- Raw Materials Value Chain: The mining of chrome and manganese ore to production and sale of ferro-alloys & minerals.
- Other Businesses: Such as equipment manufacturing, bearings and agricultural equipment manufacturing.

Responsible mining as a policy is the single most important reason for the sustained growth and prosperity of Tata Steel for over a century. Tata Steel's Raw Material operations are spread across India and Canada and helps the company to be self- sufficient in steel production and operating captive mines that help to maintain cost- competitiveness and production efficiencies through an uninterrupted supply of raw materials.

Tata Steels Raw Materials operations in India are mainly spread in four broad areas – Iron ore, Chromite, Manganese and Coal. The chromite and manganese mines and associated alloy making operations. Iron-ore and coal being the two key raw materials for steel making, efficient and scientific mining operations give us a competitive edge in steel production. As a global and diversified mining business, TSL is committed to ensuring sustainable mining through all of our operations spread over the world. All key mining sites are certified under Environmental Management System ISO 14001:2015, the international Environmental Management System standard apart from SA800 (Social Accountability) and ISO 45001:2018 for Occupational Health & Safety Management Systems.

With a century of experience in sourcing raw material through scientific research and development and sustainable mining, TSL long-term strategy has been designed to develop the existing raw material resources and achieve its security across global operations. Iron Ore mining is an integral part of steel making at Tata Steel. The steel company's iron ore units produce various grades of high quality Iron ore including rich blue dust ore. Operations at the mines, including services are managed by Integrated Management Systems.

Identification of the Project (Bamebari Iron & Manganese Mine)

The Tata Steel Limited (earstwhileTata Iron & Steel Co. Ltd) granted with a mining lease from the then Raja of Keonjhar State with effect from 01.04.1930 for 30 years over an area of 1150.550 hectares in Palasa (Ka), Kundaposi, Jadibahal, Khandbondh & Bonaikela, villages in Keonjhar District in the state of Odisha. The lease area is consisting of three discontinuous blocks such as Bamebari, Joribar and Bonaikela.

The first renewal was was executed for a period of 20 years from 01.04.1960 to 31.03.1980 followed by second renewal over an area of 1150.550 ha. for 20 years from 01.04.1980 to 31.03.2000.

During the third renewal, The company had applied for the renewal of lease over reduced area of 464.0ha. Considering this renewal application, State Govt. (GoO) has passed the express order vide letter no. 4076/SM-III(A)SM-06/2006, dated 31.05.2014 for renewal of the mining lease in favour of the company.

The company has surrendered balance area of 686.550 ha after implementing the provisions of Final Mine Closure Plan (FMCP) as per the Rule 23C of the MCDR, 1988, which was approved by Indian Bureau of Mines (IBM), Bhubaneswar Region vide letter no. FMCP/FM/04-ORI/BHU/2014-15, dated 20.01.2015. The certificate of compliance in this regard has also been granted by IBM vide letter no. T/FMCP/C/01/BHU/2011/267, dated 31.05.2016

In the meanwhile, subsequent to enactment of the MMDR (Amendment) Act, 2015, the lease was extended till 31.03.2030 and Supplementary lease deed (SLD) was executed and registered on 08.05.2015.

The Bamebari Iron & Manganese Mine is an opencast mechanised metal mine operational since 1930**.** The company has been producing the manganese ore from the mine by using

shovel-dumper combinations which is used for the making of ferro-manganese at the Ferro Alloys Plant based at Joda which is ultimately used by the company's steel operation for the making of steel. The company has been granted with Environmental Clearance under EIA Notification 1994 in the year 2005. During the mining of manganese ore, the company had also produced some Iron Ore which was not under the purview of the approved Environmental Clearance and accordingly violation was acknowledged and credible action under the provision of Environmental Protection Act,1986 has been initiated against the project proponent.

The current proposal is under the Ministry's notification vide S.O. 1530(E), 6th Apr 2018 for ratification of the existing environmental clearance from EIA 1994 regime to EIA 2006 regime along with the Expansion of the production for the manganese ore from 0.832 LTPA (ROM-0.978 LTPA) To 5.756 LTPA(ROM) & Production of Iron Ore for 3.0 LTPA (ROM) with with overburden generation of 44.18 LTPA (Peak) & total excavation of 49.94 LTPA (Peak) from the existing Mine Lease area of 464.0 Ha.

(ii) Brief Description of Nature of Project–

The Bamebari mining lease in located at Bamebari, Boneikela and Joribar villages at Barbil tahasil in Champua sub-division of Keonjhar district in Orissa. The entire lease of 464 ha is spread in three discrete blocks in three different blocks viz. Bamebari(140 ha), Boneikela (233 ha) and Joribar (91 ha). The area falls under survey of India Topo sheet Nos. 73 G/5 & 73 F/8 (New Topo sheet Nos. F 45N5 & F45H8). The Joribar block is bounded between latitudes 21055'00''N to 21057'00''N and between longitudes 85024'00''E to 85026'00''E. The Boneikela block is bounded between latitudes 22001'00''N to 22004'00''N and between longitudes 85024'00''E to 85026'00''E.

The Bamebari Iron & Manganese Mine is a fully mechanized opencast mine and excavation is done with shovel-dumper combination. As the Mine is operated with the deployment of heavy machineries for deep hole drilling, excavation, loading and transport and average employment exceeding one hundred and fifty, the mine is being categorised as "A- Category" in accordance to the Rule 55 (2) (a) of MCDR, 2017.

Status of Mining Plan –

The Scheme of Mining along with the Progressive Mine Closure Plan was submitted under the Rule 12 & 23(B) of the MCDR, 1988 for the period 2015-20 and approval obtained from IBM vide letter no. MS/OTFM/32-ORI/BHU/2014-15, dated. 26.03.2015. Further it was modified for the period 2018-20 and approval obtained from IBM vide letter no. MSM/FM/05-ORI/BHU/2018-19, Dt. 04.05.2018.
The company has subsequently got it's review of mine plan approved by the Indian Bureau of Mines, Bhubaneswar. The plan approved and currently being implemented i.e Approved Review of Mine Plan of Bamebari Iron & Manganese Mine has been approved vide IBM's letter no. RMP/A/08-ORI/BHU/2020-21 dtd 03-08-2020. The Plan is valid till 31-03-2025.

Status of Environment Clearance –
The mine has already obtained the Environmental Clearance (EC) in accordance to EIA Notification, 1994 by the earstwhile Ministry of Environment & Forest vide letter no. J-11015/85/2003-IA. II(M), Dt.17.11.2005 for production @ 0.832 LTPA of Manganese Ore.

As per MoEF & CC Notification No, S.O. 1530(E), 6th Apr 2018, it was notified to regularise the existing Environmental Clearance under EIA Notification, 2006. During the 32nd EAC (Non-coal) held on 3rd Feb 2021 it was clarified that the project proponent may seek both regularization as well as expansion of the existing mining projects.

Status of Forest Clearance –
The project area of 464.0ha consists of448.395ha of forest land and 15.605ha of non-forest land. Out of which the company has alredy diverted an area of 145.329ha of forest land vide Stage-II Forest clearance granted by the earstwhile Ministry of Environment & Forest, Govt. of India vide letter no. 8-72/2004-FC, Dt.25.01.2007.
The company has also applied for the diversion of balance forest area within Bamebari Iron & Manganese Mine i.e. over an area of 303.066 ha of balance forest land. On 19-06-2016 and the said proposal has been assigned State Serial No. OR-O59/2016, which is under active consideration of the State Government.

Status of Consent to Operate –
The mine has obtained Consent to Operate (CTO) from State Pollution Control Board, Odisha vide letter no. 544/IND-I-CON-189, dtd 07-01-2022 (Consent Order No. 117) with validity till 31.03.2025 for an annual production of 0.832 MTPA of manganese ore with 75 TPH mobile screening plant.

Status of permission under Rule 106 (2) (b) of MMR, 1961 from DGMS – The Director of Mines Safety, Chaibasa Region has approved vide letter no. NO: 380468|SEZ|Chaibasa Region|Perm|2021|194346, dated 28.09.2021 for deployment of Heavy Earth Moving Machineries with deep hole blasting within the Mining Lease.

(iii) Need for the Project and its importance to Country and or region –

Manganese ore is an important and indispensable input raw material for steel making and steel production and its consumption is among the key indicators of industrial development in any country. Manganese ore in the form of ferro and silicomanganese alloys are the most essential ingredients in the production of steel, both crude and stainless . It is used in the battery, ceramic, chemical and welding industries in addition to its vital use and functions in steel, aluminium and other non-ferrous metals and alloys.

Manganese ore is essential for production of all types of steel and cast iron. In addition to its general desulphurising, deoxidizing and conditioning effects, it imparts the qualities of strength, toughness, stiffness, wear resistance and hardness that make steel such a useful engineering material. In cast Iron production, manganese ore is principally used to counteract the deleterious effect of sulphur and as an alloying element in order to impart certain qualities to the finished steel.

Iron Ore is the basic raw material for steel making. The hematite is the most important Iron ore because of its high-grade quality and lumpy in nature, which is consumed by a large number of pig & Sponge Iron industries in the country. As Tata Steel Growth plan aims to increase steel production from 18.5 MTPA to 30 MTPA, raw material supply at increased rate from its own mines has been envisaged.

Moreever, in line with the country's National Steel Policy 2017 promulgated on 8th May, 2017 the domestic steel production shall aims to meet the entire demand of steel and high grade automotive steel, electrical steel, special steel and alloys for strategic applications. The policy projects crude steel capacity of 300 million tonnes (MT), production of 255 MT by 2030-31.

With the Ministry's approval in favour of this proposl, the company would produce Iron Ore (as new product) for 3.0 LTPA and enhance production of Manganese Ore from 0.832 LTPA (ROM-0.978 LTPA) to 5.756 LTPA (ROM) from the existing mine lease area of 464.0 ha to realize the vision of the company's growth plan for enhanced steel production of 30MTPA by 2025-26.

The Ministry may consider the mine's potential in terms of employment opportunities both direct and indirect and as a major contributor to the economic and social growth of the region. It also increases the revenue generation of the district/state as it adds to the revenue corpus of the state in the form of royalty and moreover as per the Pradhan Mantri Khanij Kshetra Kalyan Yojana (PMKKY) adds to District Mineral Fund enhancing the infrastructure facilities for uplifting local social and economic prosperity.

Tata Steel has a central Hospital at Joda providing medical facility to the local population. The company also extends support in building schools, bus shelters, housing and provides basic amenities under the company's CSR programme.

(iv) Demand- Supply Gap –

India is endowed with adequate resources of Iron & Manganese ore, but the grade of mineral produced in India is a matter of concern. The average grade of indigenously produced manganese ore has turned out to be lower and lower in the past years. To meet the industries' demand for required standard grades, the country imports high grade manganese ores for sweetening the domestic lean ores.

On account of rapid industrial development, from a small capacity of 22 MT in FY 1991-92 prior to deregulation, India has become the 3rd largest steel producer in the world with a production of 90 MT and a capacity of 122 MT in FY 2015-16. (Ref. The National Steel Policy 2017 (NSP 2017). India is well on track to emerge as the 2nd largest producer after China. There is significant potential for growth given the low per capita steel consumption of 61 Kg in India, as compared to world average of 208 Kg. Several initiatives mainly, affordable housing, expansion of railway networks, development of domestic shipbuilding industry,

opening up of defence sector for private participation, and the anticipated growth in the automobile sector, are expected to create significant demand for steel in the country.

By July 2015, prices had fallen by 50% compared to January 2011 - their lowest in decades, as cheap imports flooded world steel markets. This significant structural asymmetry between demand and supply also affected large number of Indian companies leading to surge in imports resulting in weak pricing conditions, low profitability, lower capacity utilization and even closure of capacities in some cases.

In 2015, India was the only large economy in the world where steel demand continued to demonstrate positive growth at 5.3 %, as against negative growth in China -5.4%, and Japan -7.0%. India's growing urban infrastructure and manufacturing sectors indicate that demand is likely to remain robust in the years ahead. The National Steel Policy of 2017 aims to domestically meet entire demand of high grade automotive steel, electrical steel, special steels and alloys for strategic applications by 2030-31.
As envisaged in the National Steel Policy of 2017, It is expected that at the current rate of GDP growth, the steel demand will grow threefold in next 15 years to reach a demand of 230 MT by 2030-31. It is anticipated that a crude steel capacity of 300 MT will be required by 2030-31, based on the demand projections as mentioned above. However, achieving crude steel capacity up to 300 MT will require extensive mobilization of natural resources, finances, manpower and infrastructure including land. (Ref. Table.below)

Table. Forecast of iron and steel demand and production by 2030-31

Sr.No	Parameter	Projections (2030 – 31)
01	Total crude steel capacity	300
02	Total crude steel demand/production	255
03	Total finished steel demand/production	230
04	Sponge iron demand/production3	80
05	Pig iron demand/ production	17
06	Per Capita Finished Steel Consumption in Kgs	158
Source: National Steel Policy, 2017. ***All values in MT***		

In accordance with the above projection the Ministry has estimated the raw material requirement by 2030-31 for the steel industry mentioned in the table below:

Sr.No	Parameter	Projections (2030 – 31)
01	Iron ore requirement	437
02	Manganese ore requirement	11
03	Ferro-alloys	4
Source: National Steel Policy, 2017. ***(All values in Million Tonnes)***		

The domestic demand and consumption of manganese ore has increased sharply because of increased production of manganese-based alloys which are consumed indigenously. However, suitable grade availability poses a challenge to the manganese-based alloy industry. The average grade of the domestically produced manganese ore has fallen to 33.43% Manganese from 38.70%, leading to increased imports of high grade manganese ore. Although the production of manganese ore in the country is on decline, the production of value added products namely, ferromanganese and silicomanganese has witnessed substantial increase. The higher demand of manganese ore for this sector is met through imports.

As Tata Steel Growth plan aims to scale up the current level of production capacity from 18.5 MTPA to 30 MTPA of steel production, Supply of Iron Ore, Manganese Ore and Ferro Alloys at increased rate from its own mines has been envisaged.

(v) Imports vs. Indigenous production –

The entire Manganese Ore produced from the mine has been consumed at own plants (Ferro Alloys Plant, Joda and other conversion agents). Small proportion of the requirement is also being fulfilled with imported ore having better quality to blend with own ore to achieve the required feed grade for making of alloys. Viewing the growth of alloy making capacities, the consistent supply of manganese ore from own mines is warranted.

As Tata Steel Growth plan has increased from 18.5 MTPA to 30 MTPA of steel production, by 2025-26, Iron Ore supply at increased rate from its own mines has been envisaged.

Indian manganese alloys producers are mostly dependent on imports for fulfilling their manganese ore requirements. Although the production of manganese ore has increased exponentially over the years, which has reduced the quantity of imports to some extent, it is still inadequate to fulfill the demands of Indian steel producers. Total volume of ore imports in H1 CY2019 was 1.30MnT which was almost stable compared to the year ago period. Exports from South Africa fell by 10% in the first half of CY2019. Exports from Cote D I'voire also fell significantly by 47%. (Ref. National Steel Policy, 2017)

(vi) Export Possibility –

The Iron & Manganese Ore produced from the mine will be consumed at own plants for making of steel and alloys (i.e Ferro Manganese & Silico-Manganese). However, surplus manganese ore will be sold in domestic market and opportunities for exports shall be explored looking at the favourable prevailing legal regime. As envisaged the company would

explore the possibilities of selling the surplus Ore (low grade Manganese Ores presently considered as subgraded Ore).

(vii) Domestic/ Export Markets -

TSL markets its value-added products in both India and overseas markets. The company has set up depots at several strategic locations such as Paradip, Haldia, Visakhapatnam and Dhamra ports to ensure consistent and regular supply of its products to all its customers.

(viii) Employment Generation (Direct and Indirect) due to the project -

Presently around **312** persons are employed directly by the company at Bamebari Iron & Manganese Mine. Subsequent to enhancement in the production of Manganese Ore and Iron Ore production, around **362** persons (50 additional) are likely to be directly employed in the mine. Apart from the above direct employment the proposed expansion would also generate indirect employment on contractual basis for approximately **100-200** persons round the year in all other support service related functions.
Details of statutory manpower for the proposed expansion is summarised as follows:

Category	Present			Future		
	Departmental	Contractual	Total	Departmental	Contractual	Total
Highly Skilled	12	0	12	15	0	15
Skilled	12	45	57	17	52	69
Semi-Skilled	8	28	36	11	32	43
Un-Skilled	0	207	207	0	235	235
Total	32	280	312	43	319	362

3.0 PROJECT DESCRIPTION –

(i) Type of Project including interlinked and independent project if any –

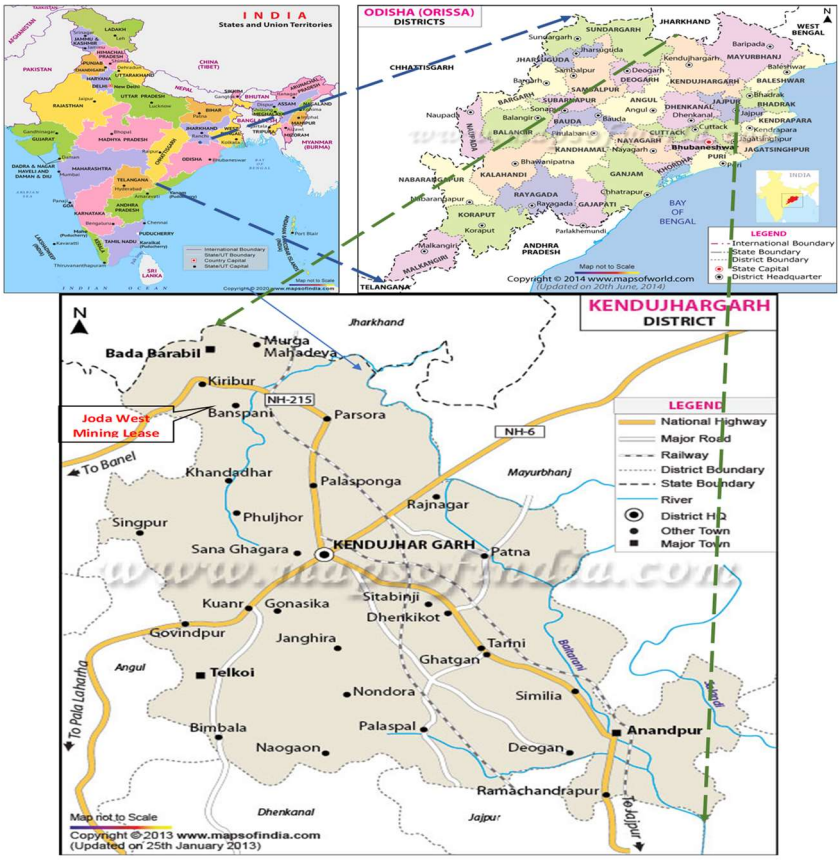
This project proposal is as per the MoEF & CC notification S.O 1530 (E) dated 06.04.2018 for the ratification of the existing EC granted in 2005 from the regime of EIA 1994 to EIA 2006 aong with the expansion of production capacity of **Manganese Ore** from ***0.832 LTPA (ROM-0.978 LTPA) To 5.756 LTPA(ROM) and Iron Ore (ROM) – for 3.0 LTPA with with overburden generation of 44.18 LTPA (Peak) & total excavation of 49.94 LTPA.***
There shall be no change in the technology and lease area for which the earlier EC was granted. *The* presently operational Bamebari Manganese Mine is a fully mechanized opencast mine and excavation is done with shovel-dumper combination. As the Mine is operated with the deployment of heavy machineries for deep hole drilling, excavation, loading and transport and average employment exceeding one hundred and fifty, the mine is being categorised as "A- Category" in accordance to the Rule 55 (2) (a) of MCDR, 2017.

The produced manganese ore shall be subsequently used for the making of ferro-manganese alloy as well as silico-manganese alloy and Iron ore shall be used for steel making at the copany's steel operations based at Jamshedpur, Jharkhand and Kalinganagar, Odisha.

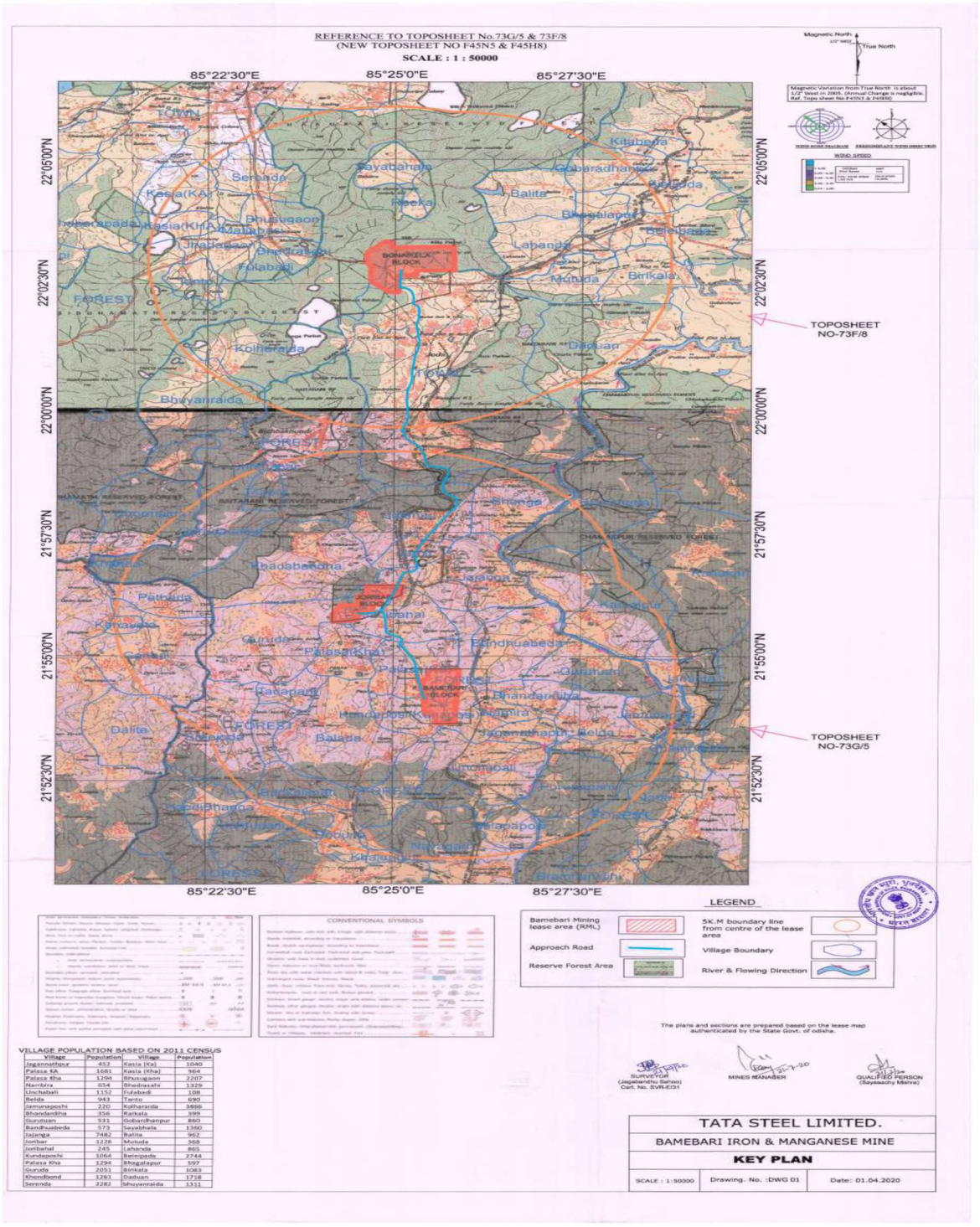
(ii) Location (map showing general location, specific location and project boundary & project site layout with coordinates –

The Bamebari mining lease in located at Bamebari, Boneikela and Joribar villages at Barbil tahasil in Champua sub-division of Keonjhar district in Orissa. The entire lease of 464 ha is spread in three discrete blocks viz. Bamebari (140 ha), Boneikela (233 ha) and Joribar (91 ha). The area falls under survey of India Topo Sheet Nos. 73 G/5 & 73 F/8 (New Topo sheet Nos. F 45N5 & F45H8). The Joribar block is bounded between latitudes 21055'00''N to 21^{0}57'00''N and between longitudes 85^{0}24'00''E to 85^{0}26'00''E. The Boneikela block is bounded between latitudes 22^{0}01'00''N to 22^{0}04'00''N and between longitudes 85^{0}24'00''E to 85^{0}26'00''E. The geographic location of the Bamebari Iron & Mn Mine is illustrated in the fig.1 (Index Map) and fig.2 (Key Plan) fig.3 buffer zone around project (Google Earth) as follows:

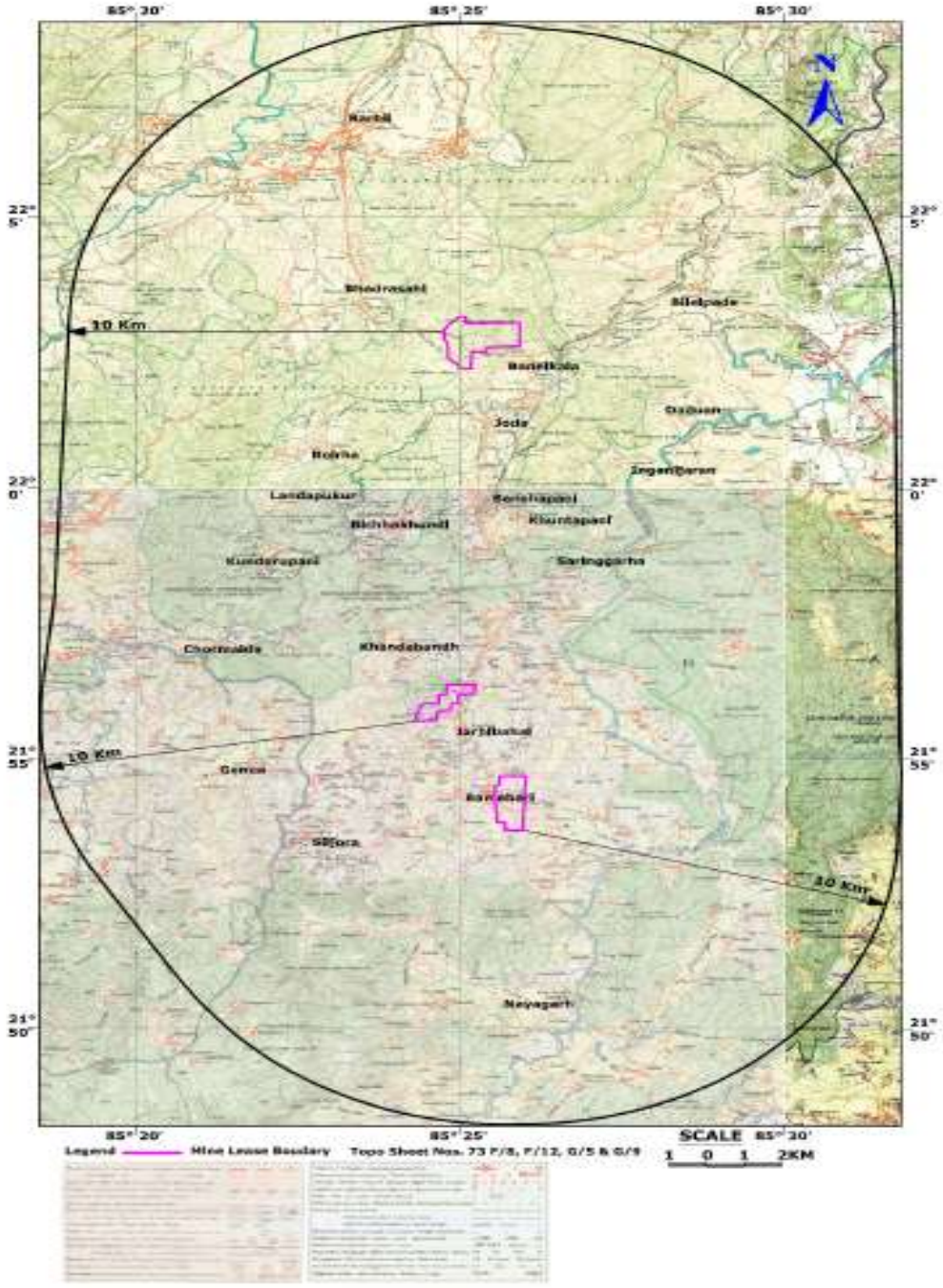
(Figure – 1 : INDEX MAP)



(Figure – 2 : KEY PLAN-Bamebari Iron & Mn Mine)



(Figure –3 : GOOGLE IMAGE WITH SHOWING ML (03 blocks) 10KM STUDY AREA)



The details of the lease boundary pillars has been surveyed using DGPS carried out by Odisha Remote Sensing Application Centre (ORSAC) in compliance with the Circular No. 02/2010 published by Indian Bureau of Mines. The co-ordinates of the lease pillars of Bamebari Iron and Manganese Mine is furnished below in Table No-3, 4 & 5

Table No. 3-Coordinates of Lease Boundary Pillar (Bamebari Block)

PILLAR NO.	LONGITUDE			LATITUDE			UTM CORDINATE	
	DEGREE	MINUTE	SECOND	DEGREE	MINUTE	SECOND	EASTING	NORTHING
A	85	25	25.30640	21	53	49.21724	2422262.43080	337160.43424
B	85	25	33.31078	21	53	49.59584	2422271.71827	337390.28725
C	85	25	33.55459	21	53	38.89263	2421942.47843	337393.91176
D	85	25	49.02085	21	53	39.07604	2421943.57672	337837.87486
E	85	25	52.06508	21	54	44.02186	2423940.03571	337945.65608
F	85	25	27.44405	21	54	43.74399	2423938.72776	337238.99610
G	85	25	27.24051	21	54	32.13894	2423581.88347	337229.49117
H	85	25	23.37681	21	54	31.15075	2423552.63101	337118.29616

Table No. 4-Coordinates of Lease Boundary Pillar (Joribar Block)

PILLAR NO.	LONGITUDE			LATITUDE			UTM CORDINATE	
	DEGREE	MINUTE	SECOND	DEGREE	MINUTE	SECOND	EASTING	NORTHING
A	85	24	38.99988	21	56	13.70247	2426719.68088	335877.40320
B	85	24	31.25737	21	56	13.66804	2426720.92613	335655.23562
C	85	24	31.16778	21	56	02.09988	2426365.18014	335648.97276
D	85	24	17.20393	21	56	03.04257	2426398.33514	335248.59879
E	85	24	10.75287	21	55	50.77322	2426022.92381	335059.56419
F	85	24	10.74840	21	55	44.63740	2425834.22097	335057.47103
G	85	24	10.75705	21	55	41.52593	2425738.52665	335056.72289
H	85	24	13.03205	21	55	41.52810	2425737.91383	335122.00461
I	85	24	17.65524	21	55	41.51955	2425736.27073	335254.66407
J	85	24	22.33099	21	55	42.15936	2425754.55304	335389.03887
K	85	24	30.45793	21	55	44.11580	2425812.30082	335622.86477
L	85	24	30.49499	21	55	53.63790	2426105.13681	335626.96706
M	85	24	42.66713	21	55	53.93844	2426110.75903	335976.33274
N	85	24	42.88652	21	56	02.89316	2426386.09115	335985.47988
O	85	24	49.65320	21	56	03.13534	2426391.52966	336179.71780
P	85	24	49.71465	21	56	14.32016	2426735.49406	336185.03938
Q	85	25	05.31172	21	56	14.14543	2426725.49688	336632.51066
R	85	25	05.18176	21	56	19.81415	2426899.87333	336630.58047
S	85	25	06.33924	21	56	21.31236	2426945.60721	336664.26698
T	85	25	06.64976	21	56	25.81947	2427084.12869	336674.60651
U	85	24	58.48801	21	56	25.82839	2427086.82055	336440.42960
V	85	24	51.66297	21	56	25.83472	2427089.03949	336244.60508
W	85	24	49.87205	21	56	25.84786	2427089.97518	336193.22351
X	85	24	44.88428	21	56	25.80808	2427090.23310	336050.09982
Y	85	24	38.34363	21	56	25.84139	2427093.20203	335862.44348

Table No. 5-Coordinates of Lease Boundary Pillar (Bamebari Block)

PILLAR NO.	LONGITUDE			LATITUDE			UTM CORDINATE	
	DEGREE	MINUTE	SECOND	DEGREE	MINUTE	SECOND	EASTING	NORTHING
A	85	24	57.15044	22	03	21.47087	2439870.14061	336534.47095
B/50	85	24	51.84629	22	03	21.31309	2439866.86804	336382.35519
C/49	85	24	49.79727	22	03	20.12892	2439831.05981	336323.23286
D/47	85	24	43.16887	22	03	12.90502	2439610.86697	336130.88907
E/46	85	24	40.77108	22	03	12.58878	2439601.85678	336062.04402
F/45	85	24	39.79990	22	03	08.91049	2439489.02148	336033.02240
G/44	85	24	37.85743	22	03	07.89387	2439458.33559	335977.00629
H/43	85	24	36.77018	22	03	02.49023	2439292.47220	335944.10323
J	85	24	36.41408	22	02	56.48620	2439107.92552	335931.96968
K	85	24	40.38543	22	02	51.23884	2438945.35785	336044.15023
L	85	24	40.39185	22	02	32.86527	2438380.28001	336038.45155
I/42	85	24	37.63504	22	03	00.42122	2439228.58176	335968.23605
M	85	24	55.55835	22	02	19.89420	2437976.83727	336469.16217
N	85	25	02.78051	22	02	19.83189	2437972.77280	336676.22012
O	85	25	02.92055	22	02	40.44433	2438606.66153	336686.80803
P	85	25	16.95709	22	02	40.37422	2438600.33736	337089.23267
Q	85	25	16.82056	22	02	46.07706	2438775.76709	337087.13246
R	85	25	47.40490	22	02	46.20109	2438770.53491	337964.05535
S/68	85	25	47.11042	22	03	15.25661	2439664.21397	337964.80858
T/52	85	24	57.23660	22	03	13.93958	2439638.49158	336534.53584

(iii) Details of alternate sites considered and the basis of selecting the proposed site, particularly the environmental considerations –

Mining is a site specific activity and has to be operational where mineral is economically extractable. Moreover, this Proposal is in respect of Bamebari Iron & Manganese Mine which is an operational opencast metal mine (operational since 1930). The proposed expansion shall be carried out over the existing Mine Lease area of 464.0ha thus no site alternative analysis has been considered.

(iv) Size or magnitude of operation –

Presently, Bamebari Iron and Manganese Mine is being operated for production of manganese ore @ 0.832 LTPA and has obtained Environmental Clearance (EC) from the MoEF & CC vide No. J-11015/85/2003-IA. II(M), Dt.17.11.2005.

The present proposal is as per the Ministry's notification no. S.O. 1530(E), 6th Apr 2018, for the ratification of existing EC from EIA 1994 regime to EIA 2006 regime and also to enhance the production level of Mn Ore from **0.832LTPA (0.978LTPA-RoM) to 5.756 LTPA (RoM)** ***and production of Iron Ore (new product) for 3.0 LTPA (ROM) with overburden generation of 44.18 LTPA (Peak) & total excavation of 49.94 LTPA (Peak).*** The scope of the present EC doesn't cover the production of Iron Ore; however after evidencing

predominant availability of Iron Ore from the existing lease area and it's subsequent requirement for the company's growth plan to enhance the steel production from 18.5 MTPA to 30 MTPA, the project proponent has plans to produce the Iron Ore from the same mine lease area of 464.0ha.

Presently the mine is operated in day-light hours however the company has plans to scale up the production for which necessery permission from the DGMS is currently being expedited for the initiating the beyond daylight hours. The table below summarises the deployment of HEMMs at the Bamebari Iron & Mn Mine to indicate the magnitude of operation.

Table. 4. Scale of HEMM deployment:

Equipment	Capacity	Existing Deployment (Present)	Proposed Deployment (Max. Nos.)
Shovel (Back Hoe)	1.8 CuM	2	0
Shovel (Back Hoe)	0.8 CuM	1	0
Shovel (Back Hoe)	2.1 CuM	0	5
Dumpers	25 T	20	30
Dumpers	16 T	1	1
Dumpers	13 T	2	2
Drills	110 mm	1	3
Front End Loader	2.00 Cum	1	2
Road Grader	200 HP	0	1
Jack Hammer drill	32-37 mm.	9	1
Compressor	365 cfm	0	2
Placer Dumper	3.00 Cu.m	0	2
Dozer	180 HP	1	3
Water Sprinkler	8000 litres	1	2
Water Sprinkler	15000 litres	1	3
Explosive Van	10 tonnes	1	2
Jeeps		3	5
Flat Body Truck		1	2
Ambulance		1	2
Crane	3 tonnes	1	2
Rock Breaker	-	0	2
Screen (75 Tph)		0	1
Feeding Shovel (PC 200)	0.9 Cum	0	1

Life of Mine –

Mn Ore- At the proposed average rate of ROM excavation during the plan period 2020-21 to 2024-25 (i.e. ~0.370 mtpa), with the total proven reserve of 2.923 Million Tonnes, the anticipated life of mine is about 8 years by considering the reserves and resources available as on 01.04.2020.

(v) Project description with process details (a schematic diagram / flow chart showing the project layout, components of the project etc should be given.

(a) Regional Geology with Reference to Location of Lease Area -

Bamebari Iron and Manganese deposit lies in the western portion of Singhbhum-Orissa craton. The Iron Ore Group (IOG) surrounds the batholithic complex and consists of low-grade meta-sediments, acid-intermediate and mafic volcanics and sills. The IOG rocks are exposed in three major basins around the Singhbhum granite batholith (Saha et. al., 1988).
The eastern basin extends from south of Jamshedpur through Gorumahisani-Badampahar and extends southward up to near Nausahi. The southern basin lies between Daitari – Tomka, while the northern-western basin is represented by the western Singhbhum-Bonai-Keonjhargarh Iron Ore basin which extends for about 100km in length and 20 to 30km width in NNE-SSW direction from Chakradharpur to south of Koira.
The generalized chronostratigraphic succession of Singhbhum–Orissa iron ore craton after Saha et. al., 1988.

Newer Dolerite dykes & Sills C1600 - 950 Ma
Mayurbhanj Granite C.2000-21000 Ma
Gabbro – anorthosite -ultrabasics
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~Un-conformity ~~~~~~~~~~~~~~~~~~~~~~
Jagannathpur Lavas Dhanjori – Simlipal lava Dhanjori Group
Quartzite conglomerate
~~~~~~~~~~~~~~~~~~~~~~~~~~~~ Un-conformity ~~~~~~~~~~~~~~~~~~~~~~~~
Singhbhum granite C.3100 Ma
Mafic lava, tuff, acidic volcanics,

Tuffaceous shales, BHJ & BHQ with Iron Ore Group
Iron Ores, Ferruginous chert, local
Dolomite, Quartzite & Sandstone
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~Un-conformity ~~~~~~~~~~~~~~~~~~~~~~~
Nilgiri Granite
Singhbhum Granite
Bonai Granite
~~~~~~
Folding and metamorphism of OMG & OMTG C.3400 – 3500 Ma
Older metamorphic tonalite gneiss (OMTG) C.3775 Ma
Older metamorphic group (OMG): Pelitic
Schist, quartzite, Para-amphibolite, Ortho-amphibolite C.4000 Ma
~~~~~~
~~~~~~

The rock formations of the area belong to the Iron ore group (earlier called as series) of Upper Dharwar age. In south Singhbhum, Bonai & Keonjhar district Manganese ore deposits are associated with Shales, Laterite, Chert & Quartzite of the Iron Ore Group & are distributed within the Horse shoe shaped synclinorium, plunging towards NNE over-folded towards SW. The shale formation occurs as a core of the synclinorium along Jamda-Koira valley overlying the Banded Iron Formation. The position of the Iron ore group and the rocks associated with it in the stratigraphic column is as follows:
The local stratigraphic succession of this Bonai area is given below (Saha 1990):

Upper lavas (Local)
Upper shale , Shale tuffaceous, ferruginous shale usually with fine laminations contain a few manganiferrous shale band. Banded Heamatite jasper with thin intercalations of tuffaceous shale and with supergene enrichment of iron ore bodies. Lower shale, which is tuffaceous along the eastern flank and slaty in the west.

Mafic Lavas (local)
The manganese ore deposits of the area occur within the weathered shale horizon (lower shale) of Iron ore group as tabular lenses & as irregular veins. Manganese ore also occurs in the form of Rugri & nodular masses and are formed by the process of leaching, replacement & concentration through the agencies of meteoric waters. The ore mineral are mainly oxides and generally occurs as Pyrolusite, Psilomelane & Wad.

(b) Geology description of lease area -

The local geology of the Bamebari Iron and Manganese Blocks as observed from different boreholes more or less confirms the fact that manganese mineralization is mainly confined to the weathered shale horizon (lower shale) of Iron Ore group. The deposits greatly vary in size & shape & range in length from about a meter to more than 200 mtrs. General strike of the formations is NS to NE-SW with dip varying from 10^0–30^0 towards west. All the litho units exposed in the area are highly weathered hence; measuring the actual structural data is very difficult. Few bedding plane data from shale exposed in quarry and nalla section have been collected and shown in the surface geological plan.

The different lithologies encountered in the area are: -

a) Soil / Alluvium with floats of Iron and Manganese ores
b) Laterite, manganiferous in places
c) Iron ore
d) Manganese Ore
e) Shale
f) Cherty and Jaspery quartzite

Manganese Ore: Manganese Ore occurs as lenses and pockets in association with laterite, cherty and jaspery quartzites, shale and Iron ores. Thickness of ore bodies varies from 2m to 49m with an average of around 7m. Dip and strike of the ore patches are not much in evidence. The solid ore patches at times have capping of soil of varying thickness with stray

pieces of manganese ores. The top layer of the ore is generally hard and massive and it passes on to spongy and porous varieties in depth.
The nodules of manganese or rugri ore usually occur in laterite and lateritic morrum and in places they are seen in the intervening portions of the ore lenses. The nodules are hard and do not appear to be contaminated except for a coating of clayey matter on individual nodules. The ore consists of a mixture of pyrolusite and psilomelane proportions of which vary from zone to zone.

Manganese Ore deposits are of secondary in nature and are derived from manganiferous shale of the Iron ore series by the processes of leaching, concentration and replacement giving rise to manganese deposits through the agency of circulating waters of meteoric origin, perhaps aided in some cases by hydrothermal action due to the igneous intrusions. Replacement of brecciated, cherty and jaspery quartzite by manganese is clearly noticed. Here the solutions appear to have followed certain definite planes of crushing and fracture of the country rocks in the zone of oxidation.

Iron Ore: Iron ore is mostly confined to the western part of the lease area. Iron ore is mostly lateritic, friable and flaky in nature. Lateritic ores are generally found in the upper part of the Iron ore horizon below the laterite zone. This type of Iron ore is partly laterised. It is hard, massive or laminated, porous, unevenly fractured. It consists of haematite with goethite and limonite. Minor quantities of clay minerals are also associated with it. Friable and Flaky Ore are thinly laminated, loosely packed, breaks down into flakes with little pressure and associated with powder. Sometimes, the flaky ore are intercalated with ferruginous shale. This type occurs in shades of dark grey to greyish brown powdery portion with high proportion of flat, tabular and angular ore chips and thin hard laminated ore flakes ranging from few millimeter to 3-4cm. Sometimes, the laminations are so thin that it appears as biscuits. Powdery portion occurs in shades of brown to reddish brown. It contains lesser proportion of ore chips, pieces and flakes. Sometimes ochre and shale are mixed in the powdery portion. Average thickness of Iron ore encountered in boreholes is around 5m.

Laterite: Extensive patches of laterite and lateritic soil are found in the area. Very often, lumps and nodules of manganese and iron ore are found to be irregularly distributed in the lateritic morrum. Also, composition of laterite varies at different places. At some places it is iron rich while at other places it is manganese rich. Average thickness of laterite encountered in boreholes is around 10m.

Quartzite: Large irregular patches of cherty and jaspery quartzite are encountered in the area while some of the biggest patches occur towards the northern portion of the property. The rock is usually bouldery, sometime massive and weathered in places. It is unbanded and no definite dip is observed. Stringers and veins of quartz, iron and manganese are at times seen to traverse the rock. Average thickness of quartzite encountered in boreholes is around 3m.
Shale: Shale found in the area are mostly lateritized; banded and unbanded varieties, which occur elsewhere in the district, are rare. Latertized shale grades from a few centimetres to several metres are encountered at places. Highly lateritized shales have also been marked on the geological map as lateritic. Average thickness of shale encountered in boreholes is around 15m.

STRUCTURE

General strike of the formations is NS to NE-SW with dip varying from 10^0–30^0 towards west which is congruent to the regional structure of the Singbhum Bonai Synclinorium. In some parts of the Joribar quarry, the dip is observed to be towards North West direction while in Bamebari, it is towards West. All the litho units exposed in the area are highly weathered hence; measuring the actual structural data is very difficult.

LOCAL STRATIGRAPHIC SEQUENCE

The local litho stratigraphic succession in the area on the basis of borehole data and study of exposures is given below:-

Soil	Top soil with lateritic moorum, floats of manganese and iron ore	↑ Younging direction
Laterite	Laterite of varying thickness and composition	
Shale of varying Thickness	1)Ferruginous lateritized shale and manganiferous shale containing Mn ore bodies of varying thickness and veins of secondary silica and chert 2)Grey, pink and white unaltered shale at bottom	

(c) Exploration Status -

Details of exploration carried out till 01-04-2020 at Bamebari Iron & Manganese Mines are given in Table No. 7 & 8 respectively.

Table 7a : Past Exploration at Bamebari Block

Location	Year	No. of Bore Holes	Meterage	Borehole Type	Expenditure Incurred (Rs. Lakhs)
Bamebari Block	1962-64	23	481.60	Core	NA
	1975-77	53	1275.46	Core	NA
	1988-91	149	5573.00	Core	NA
	1998-2001	74	3372.30	Core	NA
	2003-04	25	1181.35	Core	26.06
	2006-08	13	535.55	Core	11.81
	2009-10	19	1093.80	Core	32.57
	2010-11	14	597	Core	28.14
	2011-12	10	402.70	Core	20.03
	2012-13	5	226.50	Core	11.48

	2013-14	8	415.85	Core	23.83
	2015-16	3	143.40	Core	8.22
	2016-17	4	199.00	Core	11.40
	2017-18	5	261.85	Core	15.00
	Sub-Total	**405**	**15759.36**	**Core**	**188.56**
	2009-10	45	909	DTH	12.93
	2013-14	10	439	RC	9.08
	2015-16	2	108	RC	3.24
	2016-17	6	263	RC	7.89
	2017-18	5	215	RC	6.45
	Sub-Total	**68**	**1934**	**RC/DTH**	**39.59**
	Grand Total	**473**	**17693.36**	**Core/RC/DTH**	**228.15**

Table 7b : Past Exploration at Joribar Block

Location	Year	No. of Bore Holes	Meterage	Borehole Type	Expenditure Incurred (Rs. Lakhs)
Joribar Block	1957-1969	43	1047.00	Core	NA
	2002-2003	69	3448.40	Core	76.07
	2009-10	5	303.10	Core	9.03
	2010-11	18	1119.35	Core	52.77
	2011-12	20	1117.85	Core	55.61
	2012-13	22	1153.80	Core	58.47
	2013-14	10	522.60	Core	29.95
	2015-16	20	1016.25	Core	58.24
	2016-17	20	1183.90	Core	67.85
	2017-18	2	136.95	Core	7.85
	Sub-Total	**229**	**11049.20**	**Core**	**415.84**
	2010-11	20	361	DTH	5.14
	2011-12	15	629	RC	10.51
	2013-14	10	499	RC	10.32
	2016-17	5	208	RC	6.24
	2017-18	13	579	RC	17.37
	Sub-Total	**63**	**2276**	**RC/DTH**	**49.58**
	Grand Total	**292**	**13325.20**	**Core/RC/DTH**	**465.42**

Table 7c : Past Exploration at Boneikela Block

Location	Year	No. of Bore Holes	Meterage	Borehole Type	Expenditure Incurred (Rs. Lakhs)
Boneikela Block	1955-56	12	691.13	Core	NA
	1970-72	92	1751.02	Core	NA
	2011-12	5	215	Core	10.70
	2016-17	4	219.65	Core	12.59
	2017-18	3	156.6	Core	8.97
	Sub-Total	**116**	**3033.4**	**Core**	**32.26**
	2015-16	10	448	RC	13.44
	2016-17	6	289	RC	8.67
	2017-18	7	265	RC	7.95
	Sub-Total	**23**	**1002**	**RC/DTH**	**30.06**
	Grand Total	**139**	**4035.4**	**Core/RC/DTH**	**62.32**

Exploration data of the above boreholes has been already considered/furnished in the approved modification of mine plan for the period 2018-19 to 2019-20 and accordingly resource estimation was done.

Present Exploration:

Exploration carried out in the present modification of mine plan for the period 2018-19 to 2019-20 at Bamebari, Joribar and Boneikela is given in Table 7d,7e & 7f respectively

Table 7d : Present Exploration at Bamebari Block

Location	Year	No. of BHs proposed	No. of BHs drilled	Meterage drilled	Borehole Type	Expenditure Incurred (Rs. Lakhs)
Bamebari Block	2018-19	65	3	141.85	Core	8.13
	2018-19		28	1209	RC	36.27
	2019-20	40	10	421	RC	12.63
	Total	**105**	**41**	**1771.85**	**Core/RC**	**57.03**

Exploration proposed could not completed due to un availability of forest clearance.

Table 7e : Present Exploration at Joribar Block

Location	Year	No. of BHs proposed	No. of BHs drilled	Meterage drilled	Borehole Type	Expenditure Incurred (Rs. Lakhs)
Joribar Block	2018-19	58	12	568	RC	17.04
	2019-20	42	1	68.20	Core	3.91
	2019-20		4	174	RC	5.22
	Total	**100**	**17**	**810.20**	**Core/RC**	**26.17**

Exploration proposed could not completed due to un availability of forest clearance.

Table 7f : Present Exploration at Boneikela Block

Location	Year	No. of BHs proposed	No. of BHs drilled	Meterage drilled	Borehole Type	Expenditure Incurred (Rs. Lakhs)
Boneikela Block	2018-19	125	9	365	RC	10.95
	2019-20	159	0	0	-	0
	Total	**284**	**9**	**365**	**RC**	**10.95**

Exploration proposed could not completed due to un availability of forest clearance.

Cumulative exploration carried out in the 3 blocks of Bamebari lease is summarized in Table 7g.

Table 7g: Summary of Exploration in Bamebari Lease

Location	No. of Bore Holes	Meterage	Expenditure Incurred (Rs. Lakhs)
Bamebari	514	19465.21	285.18
Joribar	309	14135.40	491.59
Boneikela	148	4400.40	73.27
Total	**971**	**38001.01**	**850.04**

(d) Mineral Reserves & Resources –

The category wise resources and reserves as on 01-04-2020 of Bamebari lease within the lease area of 464.0 Ha are given in Table No. 8 (Manganese deposit) & in Table No. 9 (Iron deposit).

Category-Wise Reserves Indicated in the Approved Scheme of Mining:

Mineral Resource & Reserve of Manganese ore as on 01.04.2018 mentioned in approved modification of review of mine plan for the period 2018-19 to 2019-20 is given in the Table No. 8 & 9 below:

Table No. 8 (Manganese ore)

Classification	UNFC Code	Quantity (in Million Tonnes)				Grade
		Bamebari	Joribar	Boneikela	Total	
A. Mineral Reserve						
(1) Proved Mineral Reserve	111	0.045	1.056	0.264	1.365	Mn > 25%
(2) Probable Mineral Reserve	121 and 122	0	0.018	0	0.018	

Total Reserves		**0.045**	**1.074**	**0.264**	**1.383**	
B1. Remaining Ore Mineral Resources						Mn >10%
(1) Feasibility Mineral Resource	211	0	0	0	**0**	
(2) Pre-feasibility Mineral Resource	221 and 222	0.030	0.285	0	**0.314**	
(3) Measured Mineral Resource	331	0.384	4.525	0.617	**5.525**	
(4) Indicated Mineral Resource	332	0	0.042	0.207	**0.249**	
(5) Inferred Mineral Resource	333	0	0	0.726	**0.726**	
Total Ore Mineral Resources		**0.414**	**4.852**	**1.55**	**6.814**	

Table No. 9 (Iron ore)

Classification	UNFC Code	Quantity (in Million Tonnes)				Grade
		Bamebari	Joribar	Boneikela	Total	
A. Mineral Reserve						Fe > 58%
(1) Proved Mineral Reserve	111	0	0	0	**0**	
(2) Probable Mineral Reserve	121 and 122	0	0	0	**0**	
Total Reserves		**0**	**0**	**0**	**0**	
B1. Remaining Ore Mineral Resources						Fe > 45%
(1) Feasibility Mineral Resource	211	0	0	0	**0**	
(2) Pre-feasibility Mineral Resource	221 and 222	0	0	0	**0**	
(3) Measured Mineral Resource	331	0.284	1.750	0.075	2.109	
(4) Indicated Mineral Resource	332	0.482	0.266	0	0.749	
(5) Inferred Mineral Resource	333	0.362	0.005	0.025	0.393	
Total Ore Mineral Resources		**1.129**	**2.022**	**0.100**	**3.251**	

Note: It may not be possible to quantify grade wise reserves, as normally there is considerable variation in size and grade distribution within the ore zone, which results variable recovery factor and bulk density. Thus, tonnages arrived are tentative.

(e) Method of Mining –

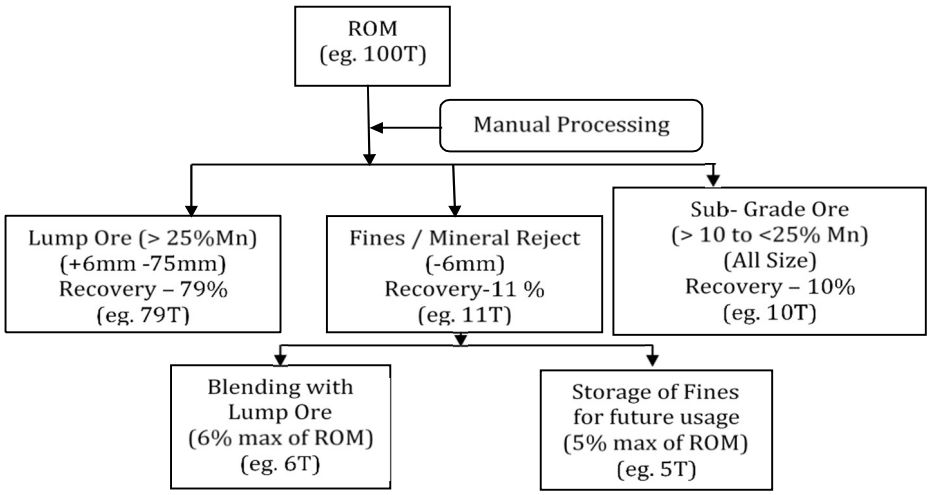
Existing method for excavation with design parameters:

The Bamebari Iron & Manganese Mine is a fully mechanized mine and excavation is done with shovel-dumper combination. Mine is operated over three discrete blocks viz. Bamebari Block, Joribar Block and Boneikala Block over 464.0ha. The mine is classified as category A mine as per the classification of IBM.

Overburden and ROM are removed by using shovel-dumper combination. Blast holes for both overburden and ore are drilled by 100mm diameter crawler drills with 365 cubic feet per minute (cfm) compressors.

In order to facilitate the deep hole blasting and safe movement of existing HEMM fleet, the bench angle normally maintained at 85^0 max and overall pit slope maintained at 35^0 max. Overburden and ROM are being removed by using shovel-dumper combination. The benches are being maintained with 8m high with width of 8-10 m. The haul road having width of 12m min. with gradient of 1:16. Horizontal curves are maintained to ensure the driver of the haul truck to negotiate the curve safely at given speed. Blast holes for both overburden and ore are drilled by 100mm diameter crawler drills.

The blasted ROM is carried up to sorting yards located at the top of the quarries. The dressing, sizing and sorting of ROM is done manually at sorting yard. A screening plant of up to 75 TPH has been installed to recover the manganese ore fines. The finished ore is then loaded manually to the dumpers and transported to stack yard. The finished ore is stacked in regular geometrical shapes. The samples are collected from the finished ore stacks and analysed at the company owned laboratory located at Joda. The grades are assigned to the finished ore stacks as per the analysis report. Dispatch of the finished ore is done to the concerned sites after stack removal permission is obtained from Mining & Geology Department of the State Government. The mineral reject is stacked separately at the designated mineral reject stacks. Some quantity of overburden is used for reclamation and backfilling of exhausted quarries. With the proposed expansion plan, project proponent shall explore the feasibility for installing dry magnetic separator for enrichment of low grade manganese ore. The schematic overview of the **M**aterial balance is illustrated in the fig. 5 as below.



While developing the manganese ore pits, Iron Ore having Fe content <58% is generated and being termed as Mineral Reject. These Iron Ore (Mineral Reject) are being stacked separately for future usage.

Miscellaneous operations in the mine includes maintenance of haul roads, dumping yard, managing with big boulders of mine faces, use of rock breakers, loading of hauling trucks at stack yard, HEMM maintenance activities, etc.

Proposed method for excavation with design parameters:

No change in method of excavation and design parameters are being proposed. It is proposed to continue production from existing manganese pits with enhancement in the production of Manganese ore from 0.832LTPA (0.978LTPA-RoM) to 5.756 LTPA (ROM) and production of Iron Ore (new product) for 3.0 LTPA (ROM) with overburden generation of 44.18 LTPA (Peak) & total excavation of 49.94 LTPA (Peak).

The proposed Iron ore quarry will have the maximum bench height of 10m & width of 10-12m during the mining plan period. The initial development of these ore bodies will include making approach roads and developing benches by mechanized open cast method of mining. Shovels of up to 1.6 Cu.M capacities and dumpers of up to 35 ton capacities are proposed to be deployed. Drilling will be done by 100 - 150 mm diameter drills and blasting will be done using conventional slurry and SME explosives. Electronic blasting technique and controlled blasting techniques will be used. The blasted ore shall be handled by Shovel-Dumper combination and transported to either ore stock piles or directly fed to the mobile crushing plant for dry processing. Similarly, the overburden will be stored in designated overburden dump. The excavation planning of Iron ore mining will be done at a rate of 3.0 LTPA(ROM) based on the long-term planning.

The Mineral Reject (45 - 58% Fe Content) of Iron ore excavated with ROM will be stacked at designated place. Similarly, the Mineral Reject (Iron ore fines) generated during dry processing will be stored at Mineral Storage area.

(f) Blasting Method:

The purpose of the blasting is to induce a heaving effect so that, excavator can load the blasted material easily into dumpers. The requirement of blasting is mainly to break the hard in-situ patches which otherwise cannot be removed. The blasting is carried out with large diameter (83mm) slurry explosive cartridges. Cap-sensitive slurry explosive cartridges are being used as base charge and non-cap sensitive are used as column charge. The blasting will therefore be scattered in the quarry. The details of burden, spacing and explosive consumption pattern for both overburden and ore are mentioned below.

Blasting Pattern Detail (Mn Part)
Depth of the hole = 8m (bench height) + 10% as sub grade drilling) = 8.8 m (max)
Spacing = 3.5m
Burden = 3m
Volume/ hole (in-situ) = 84 CuM
Specific Gravity = 2.5
Tonnage/ Hole = 210 Tonnes
Powder factor = 5.0 Kg/Tonne
So, Quantity of explosive/hole = 42 Kg.

Rock breaker is also being operated alternatively for breaking of boulders based on the requirement. Controlled blasting is done using bottom initiation pattern by using 250 ms delay Down-To-Hole (DTH) followed by connection of hole to hole with 17ms, 42 ms, 65ms

and 100ms Trunk Line Delay (TLD). The charge per delay in all cases is maintained within 42 Kg to minimize the ground vibration and noise caused due to blasting operation. The predicted peak particle velocity levels at various distances due to detonation of explosive weights per delay of 25Kg, 50kg, 75Kg & 100Kg has been studied by CIMFR, Dhanbad.

The explosives are stored at the central Magazine built at Joda West Iron & Mn Mine lease of the company. Blasting operation is carried out in different blocks in day time only. The copy of the Magazine License in favour of Joda West Manganese Mine, Tata Steel Ltd with validity till 31.03.2024 has been enclosed as **Annexure-9**. The copy of the certificates issued by the competent authority for carrying out blasting operations is enclosed as **Annexure-10**. The details of explosives presently used are furnished below in the Table No-12.

Table No. 12

DETAILS OF EXPLOSIVES PRESENTLY USED		
Class 2	Aquadyne 83mm	M/s. IDL Chemicals Ltd., Rourkela
	Emulboost 25mm	M/s. IDL Chemicals Ltd., Rourkela
	Energel 83mm	M/s. IDL Chemicals Ltd., Rourkela
	Superdyne 25mm	M/s. IDL Chemicals Ltd., Rourkela
	Supergel 83mm	M/s. IDL Chemicals Ltd., Rourkela
	Toeblast 83mm	M/s. IDL Chemicals Ltd., Rourkela
Class 6	D. Cord II	M/s. IDL Chemicals Ltd., Rourkela
	Detonating Fuse	M/s. IDL Chemicals Ltd., Rourkela
	Electric Detonator	M/s. IDL Chemicals Ltd., Rourkela
	Raydet (Nonel)	M/s. IDL Chemicals Ltd., Rourkela

Future Proposal for Blasting: In future, there is a plan to use site mixed emulsion (SME) which would replace explosive in cartridge form. The required permission and license as applicable will be obtained before using SME. The blasting parameters for proposed SME usage commensuration the present parameters are given below in Table No- 13.

Table No. 7

TABLE-2.6 : PROPOSED SME USAGE BASED ON EXISTING DATA		
Blasting Parameters (Overburden & Ore)	Existing (Cartridge form)	Proposed (SME)
Drill hole diameter[mm]	100	100
Bench height [m]	6-10	8-10
Burden[m]	2.75-3.0	2.75-3.0
Spacing[m]	2.75-3.0	3.0-3.5
Stemming[m]	3.0	3.0
Sub grade drilling[m]	0.4-0.6	0.8-1.0
Charge per hole[kg]	30-33	40-45
Booster[gm]	0	100

Blasting Pattern Detail (Iron Part)

Depth of the hole = 10m (bench height) + 10% as sub grade drilling)

= 10.1m (max)
Spacing = 3.5m
Burden = 3m
Volume/ hole (in-situ) = 105 CuM
Specific Gravity = 3
Tonnage/ Hole = 315 Tonnes
Powder factor = 4.5-5.0 Kg/Tonne
So, Quantity of explosive/hole = 63 to 70 Kg.

Controlled blasting will be carried out at both Manganese & Iron Pits using bottom initiation pattern by using 250 ms delay Down-To-Hole (DTH) followed by connection of hole to hole with 17ms, 42 ms, 65ms and100ms Trunk Line Delay (TLD). The charge per delay in all cases is maintained within 67 Kg to minimize the ground vibration and noise caused due to blasting operation.

(g) Mine Development & Production Proposal –

Yearly development program for Manganese Ore as well as Iron Ore during the plan period of 2020-21 to 2024-25 in terms of Tonnage is furnished in table no. 13

Table.13- YEAR WISE DEVELOPMENT PLAN (2020-2025)

Year	Pit	Total Tentative Excavation (Tonens)	Top Soil (Tonens)	OB/~~SB/IB~~ (Tonens)	ROM - Mn.Ore Total (Tonens)	ROM (Tonens) - Iron Ore (Mineral Reject)	ROM (Mn.+Iron) / Waste (OB) Ratio
2020-21	Bamebari Block	128436	0	127044	1392	11435	1: 9.90
2021-22		147799	0	140756	7043	2126	1 : 15.35
2022-23		803529	0	745490	58039	44514	1 : 7.27
2023-24		0	0	0	0	0	0
2024-25		2037429	12330	1933160	104269	0	1 : 18.54
Total		**3117193**	**12330**	**2946450**	**170743**	**58075**	**1 : 12.04**
2020-21	Joribar Block	532375	0	439226	93149	283146	1: 1.17
2021-22		549354	0	312620	236734	247489	1: 0.64
2022-23		790837	0	449788	341049	86922	1: 1.05
2023-24		1310081	0	863332	446749	26598	1:1.82
2024-25		2956503	3921	2485172	471331	0	1: 5.27
Total		**6139149**	**3921**	**4550138**	**1589011**	**644155**	**1 : 2.03**
2020-21	Bonaikela Block	39347	0	37488	1859	5420	1 : 5.15
2021-22		88409	0	56506	31903	385	1 : 1.75
2022-23		156342	0	120630	35712	18565	1 : 2.22
2023-24		426575	0	403324	23251	0	1 : 17.34
2024-25		0	0	0	0	0	0
Total		**710674**	**0**	**617948**	**92726**	**24371**	**1 : 5.27**
2020-21	Total	700158	0	603758	96400	300000	1 : 1.52
2021-22		785562	0	509882	275680	250000	1 : 0.97
2022-23		1750708	0	1315908	434800	150002	1 : 2.25
2023-24		1736656	0	1266656	470000	26598	1 : 2.55
2024-25		4993932	16251	4418332	575600	0	1 : 7.67
Grand Total		**9967016**	**16251**	**8114536**	**1852480**	**726600**	**1 : 3.14**

(h) Deployment of Machineries –

Considering the yearly handling of material (in-situ & dump re-handling) during plan period for Mn Ore & Iron Ore Mining the details of existing machineries and maximum requirement of machineries including ancillary equipment are furnished in Table No. 14.

Table No. 14

Equipment	Capacity	Existing Deployment As on 01.04.2020	Proposed Deployment (Max. Nos.)
Shovel (Back Hoe)	1.8 CuM	2	0
Shovel (Back Hoe)	0.8 CuM	1	0
Shovel (Back Hoe)	2.1 CuM	0	5
Dumpers	25 T	20	30
Dumpers	16 T	1	1
Dumpers	13 T	2	2
Drills	110 mm	1	3
Front End Loader	2.00 Cum	1	2
Road Grader	200 HP	0	1
Jack Hammer drill	32-37 mm.	9	1
Compressor	365 cfm	0	2
Placer Dumper	3.00 Cu.m	0	2
Dozer	180 HP	1	3
Water Sprinkler	8000 litres	1	2
Water Sprinkler	15000 litres	1	3
Explosive Van	10 tonnes	1	2
Jeeps		3	5
Flat Body Truck		1	2
Ambulance		1	2
Crane	3 tonnes	1	2
Rock Breaker	-	0	2
Screen (75 Tph)		0	1
Feeding Shovel (PC 200)	0.9 Cum	0	1

(i) Mineral Processing –

Present method of manual processing of Manganese Ore :-

The ROM excavated from quarry is shifted to sorting yard for mechanized screening by dumpers. Dressing, sorting and sizing of ROM is carried out at sorting yard by manual means under the supervision of mining supervisors. After dressing and sorting, different grades of ore are kept separately at sorting yard to prevent contamination. Different grades are

assessed by visualizing the streak colour by experienced field workers and samplers from our Geological Dept. Mineral rejects generated during dressing and sorting are transported to separate places for its storage for future use. Mineral fines generated during dressing and sorting are kept at sorting yard and dispatched to different parties when there is a market demand.

Lump ore is then shifted manually to stack yard from sorting yard by dumpers. If any mixed up ore found, the spurious materials are segregated before shifting it to stack yard. During shifting of ore, the supervisors ascertain the grade by virtue of their experience and eye estimation and then allow for it's shifting to the specific stack yard as per grade. Stacking of Lump ore is done as per the grade in different area. Ore Stack is kept within (100 -500) tonnes, depending upon the availability of that grade ore and space at stack yard. The face workers are deployed for making the stack in a geometrical shape. Then samples are drawn to prepare the pulps for subsequent analysis at our own laboratory to ascertain the grades of each mineral stack.

The face workers deployed at sorting yard are provided with all safety appliances (i.e. helmet, safety shoe, goggles, knee guard, hand gloves etc) and the supervisors are responsible for implementation of all safety procedures at work place.

Mechanized processing of Manganese Ore :-

These ores are mined by semi-mechanised mining and manual ore sorting and sizing methods are employed to segregate different grade ores. Objective of sizing and sorting to segregate unwanted gangues and convert the materials into 10-75 mm sizes used in submerged arc furnaces at ferromanganese and silicomanganese producers. The ore found in Joda region shown significant difference in hardness and friability. Manual sizing and sorting is very effective process for sizing of these ores, but require a lot of space, manpower and time thus increasing the input cost of operation. The company shall explore the feasibility of enriching the fines/low grade ores by using dry-magnetic separators.

Recovery of Manganese Ore –

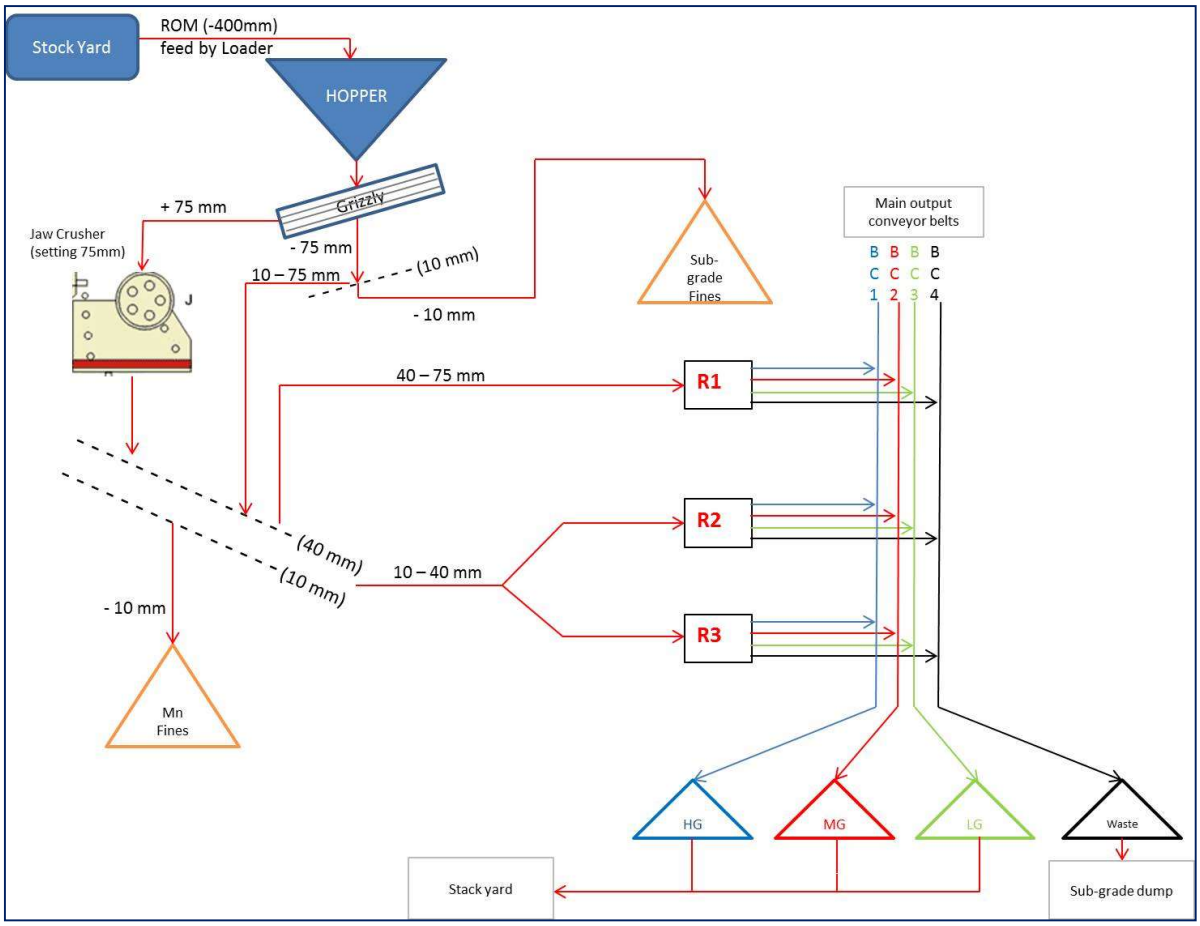
This is pertinent to mention that, the entire ROM (> 10% Mn. content) is being considered for consumption since 2018-19, hence the recovery of the grade wise product at present is 100%. The mineral fines do not have a regular demand throughout the year and being occasionally consumed by Ferro alloys making plants. Hence, the unblended fines will be stored for usage as when required.

Further Scope of mechanized processing of Manganese Ore -

The Manganese ore in the area exhibits complex mineralogy and agglomeration behavior. The most critical gangue materials are hematite and goethite which have very narrow density difference with manganese minerals. The narrow density difference between these minerals limits the applicability of conventional gravity separation methods like jigging, dense media separation etc. So, magnetic separation based methods have been explored. However, these technologies are yet to be established for successful commercial deployment.

Tata Steel Ltd. is presently trying to establish process for upgrading >25% Mn containing material for to a product which can be used in the Steel Making process.

The Schematic Process flow for proposed mechanised processing (Crushing, Screening & Sorting) of Manganese Ore has been indicated in Figure – 5



(Figure – 5)

With the completion of feasibility study, it is proposed to use the low-grade ore from the mines and beneficiate centrally ores from all the manganese leases of Tata Steel.

Iron Ore –

Present method of processing of Iron Ore :- Presently, the Iron ore is stacked separately in the mine lease area.

Future proposal for mechanized processing of Iron Ore :-

It is proposed that Iron ore will be processed through mobile dry processing units only for crushing for sizing and screening. Dry processing unit having 2 X 300 TPH of crushing and

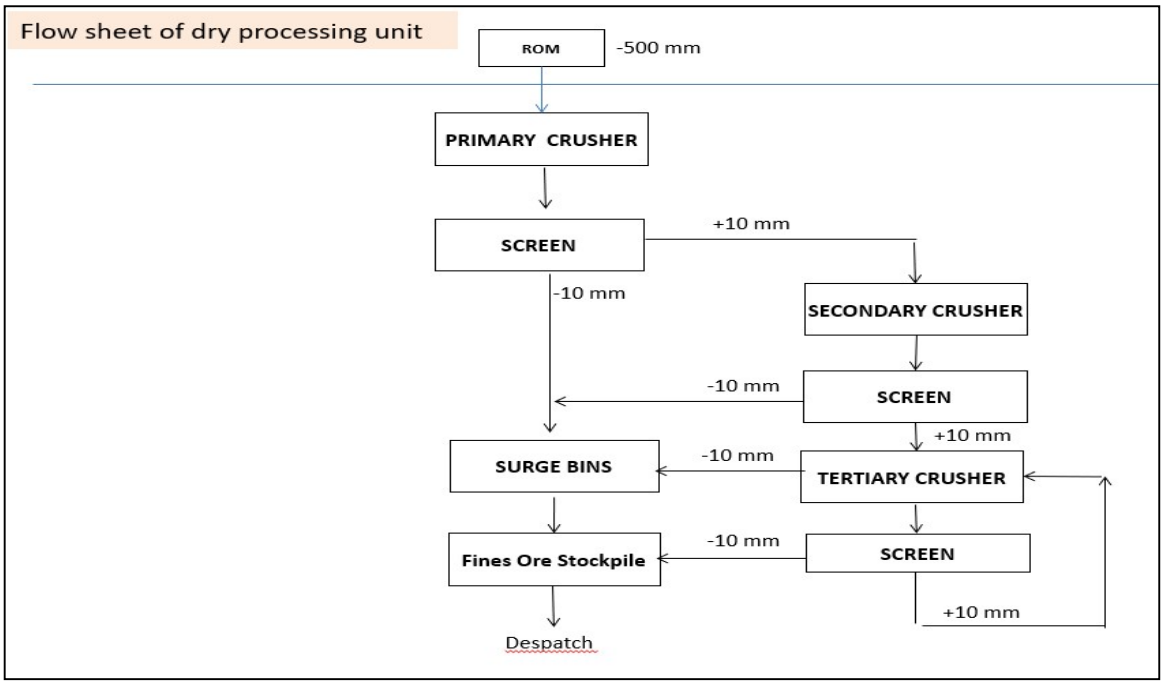
double deck vibrating screening arrangement will be used for processing higher Fe grade ores based on the Iron ore specification from captive steel plants.

Dry processing system:

Dry processing unit of around 1 MTPA capacity is proposed to process higher Fe grade ROM ore to make suitable lump and fines ore. Mobile Dry crushing unit having 2 X 300 TPH of crushing and double deck vibrating screening arrangement comprises of primary crusher / sizers, screens, bins and conveyors. The ROM Ore shall be transported by 35 Ton dumpers from the mines and dumped into the primary crusher. Primary crushed oversize product then shall be conveyed to secondary cone crusher operating in open circuit with feed and product conveyors. Oversize product from the secondary crusher will be conveyed to a tertiary crusher which is in closed circuit operation with a vibrating screen and conveyor system. Finally, fines ore (-10 mm) will be recovered after screening at every stage. Since the mining operation will be at different locations, it is proposed that the production will be met through mobile dry processing units. The flow sheet and layout for these dry processing units is given in **Figure - 6**. The size and quality details of feed & product of dry process are given below in Table No. 15. The detailed product recovery study will be carried out after commissioning of the processing unit.

Table No. 15

	Feed Quality		Product Quality			Recovery
Dry	Fe %	Al2O3%	Product	Fe %	Al2O3%	
Process	>58	<3.5	Lump	>58	<3.5	85%
	>58	<3.5	Fines	>58	<3.5	15%



(Figure – 6)

(j) Use of Mineral –

The Manganese ore is mostly being mined out to cater to the requirements of our Ferro Alloys Plant at Joda and Steel Plants at Jamshedpur & Kalinga Nagar. With the proposed acquisition of some other steel plants and upcoming silico-manganese plant, the captive requirement of manganese ore will be increased in near future.

Similar requirement of other captive plants will call for production of manganese ore of different physical and chemical composition. In the course of producing higher grade manganese ore, additional quantity of medium and low-grade manganese ore shall also be produced.

Physical and chemical composition of ore required for captive consumption:

There is no change in the specifications of the manganese ore to be produced from the mine.

The specifications of ore required for Ferro manganese alloy production is as follows:

Mn.	Fe.	SiO2	Al2O3	P	Mn/Fe
44 -48%	10-12%	4.5-5%(Min.)	4%(Max.)	0.15%(Max.)	3.8– 4.8

The specifications of ore required for Silico manganese alloy production is as follows:

Mn.	Fe.	SiO2	Al2O3	P	Mn/Fe
35-42%	18-22%	10-15%(Min.)	2%(Max.)	0.15%(Max.)	1.6–2.4

The different grades of ore from all the quarries/mines of the Company are ultimately blended in the plant to meet the desired specification as mentioned above for production of Ferro manganese / other alloys. The typical chemical analysis of the above ore types analysed at Company's Geological Laboratory is given in Table No. 15.

Table No. 15
(Typical Chemical analysis of Manganese Ore)

Grade	Chemical Analysis					Ratio	O/s%	U/s%
	Mn%	Fe%	SiO_2%	Al_2O_3%	Phos%	Mn:Fe		
High	47.63	9.52	1.64	4.09	0.11	5.00	2.05	4.91
Medium	37.46	18.18	3.06	5.02	0.08	2.06	1.95	4.97
Low	31.50	22.27	6.14	4.74	0.09	1.41	1.85	4.76
Mineral Reject	18.65	32.41	10.48	5.05	0.04	0.58	-	-

The specification of the Ferromanganese and Silicomanganese alloys as required by the end use industry is mentioned below in Table No. 16.

Table No. 16

Products	Chemical composition					Size
	Mn%	Si%	C%	P%	S%	
50/12 SiMn	50	12.5	2.5	0.3	0.03	+10 -60
60/15 SiMn	60	15	2	0.3	0.05	+10 -60
Low Carbon SiMn	55	20	0.5	0.25	0.02	+10 -60
Medium Carbon FeMn	70	1.5	6	0.3	0.05	+10 -60
High Carbon FeMn	70	1.5	6	0.3	0.05	+10 -60

Physical and Chemical specification stipulated by buyers.

There is no change in the specifications of the manganese ore to be produced from the mine.

Mn.	Fe.	SiO2	Al2O3	P	Mn/Fe
44 -48%	10-12%	4.5-5%(Min.)	4%(Max.)	0.15%(Max.)	3.8– 4.8

The specifications of ore required for Silico manganese alloy production is as follows:

Mn.	Fe.	SiO2	Al2O3	P	Mn/Fe
35-42%	18-22%	10-15%(Min.)	2%(Max.)	0.15%(Max.)	1.6–2.4

The specifications of Iron ore required for Steel production is as follows:

Product	Product Physical Quality		Chemical Quality	
	Under Size	Over Size	Fe%	Alumina &/ Silica %
Lump Ore (+5-18mm)	7%	5 %	64.0-66.0	Al2O3+SiO2 : 5.0-6.0
Lump Ore (+10-40mm)	7%	5 %	64.5-65.5	Al2O3: 1.3-1.6
Fines Ore (-5mm, -8mm)	5%	5%	63.5-65.5	Al2O3: 1.5-3.5

Use of Iron Ore:

It is proposed that the finished product i.e. sized ore and ore fines produced from Bamebari Iron & Manganese Mine shall be transported to Company's Steel Plants at Jamshedpur, Kalinganagar etc. and other sister concerns like Tata Metaliks Ltd., Tata Sponge Iron Ltd. & Tayo by road or by rail through Joda East siding, Juruli siding, Nayagarh siding, Deojhar siding, Banspani siding and other private/public sidings. It is proposed that Iron ore will be processed through dry processing units for crushing and screening.
The size and quality details of feed & product of dry process are given below:

Dry Process	Feed Quality		Product Quality		
	Fe %	Al2O3%	Product	Fe %	Al2O3%
	>62	>2	Lump	>62	>2
	>62	>2	Fines	>62	>2

(vi) Raw material required along with estimated quantity, likely source, marketing area of final product/s, Mode of transport of raw Material and Finished Product.

Mining unlike manufacturing industries is an extracting unit where no such raw materials as such is required to manufacture any product. However during the mining operation to facilitate various steps to get desired grades of Ore, a number of natural resources shall be consumed for operation of HEMMs and blasting operations.

Explosives & detonator are used for blasting rock for production of ore. Blasting is done by using mostly cartridge formed explosives / SME (Site Mixed Emulsion Explosives). The Nonel (non-electric initiation is used for controlled blasting. At present the scale of explosive consumption at the Bamebari Iron & Mn Mine is around 115-120 T/Annum.

HSD Oil and lubricants are also used for operation of machineries deployed for mine development as well as allied activities. At present the scale of HSD consumption at the Bamebari Iron & Mn Mine is around 431Kl/yr. With proposed expansion of the mine Gross HSD consumption shall be around 600KL/yr.

There is also a plan that the mine has to supply product to M/s Tata Long Products Ltd., M/s Tata Metaliks Ltd., & Tata Steel Jamshedpur & Tata Steel Kalinganagar & Tata Steel Meramandli. The proposed new mine and transport system is required to cater to the requirement of Iron Ore of the company's steel plants at Odisha and Jamshedpur.

During the detailed EIA/EMP assessment the feasibility of the all possile alternatives for the longterm transportation of ore shall be assessed and accordingly the favourale options shall be adopted in line with the suggested Transport Model as per NEERI's carrying capacity assessment.

(vii) Resource Optimization/Recycling and Reuse envisaged in the Project, if any, should be briefly outlined

Presently, all the subgrade (mineral rejects) i.e Mn Ore with % of Mn is less than 25) generated during the mining & mineral processing are being stacked separately for its use for blending and further enrichment purpose by recovering favourable portion of out of the subgrade ore with the technology of Dry Magnetic separation. All sorts of screening and crushing options shall be explored to make utilization of these low grade ore.

Apart from the mineral resource, the company has implemented the fixed type sprinkling system along the haul roads in the place of Mobile water Tanker for dust suppression purpose which will result in reduction of around 20-30% from the present volume of water being used for dust suppression purpose.

(viii) Availability of Water its Source, Energy/ Power Requirement and Source should be given

Water Demand & Its source:

During the mining of the mineral none of the processes are water intense in nature starting from Drilling till production of Mn Ore. Presently, manganese ore processing is manual in nature and thus no water is required in the beneficiation process.

Water usage at Bamebari Iron & Mn Mine is attributed to following three purposes:

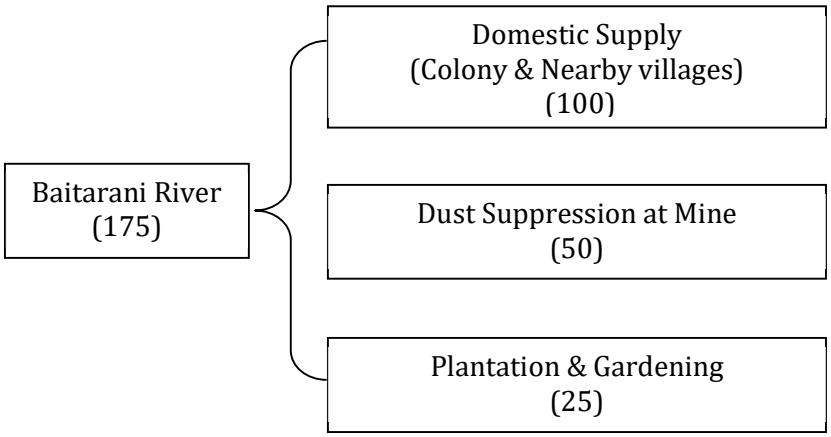
Dust Suppression: Dust Suppression measures such as Haul Road Dust suppression, Mist Canons, Fixed Sprinkling system, etc. to the tune of around 50-60KLD except during the Monsoon Season during which the water demand is around 5-10 KLD.

Greenbelt Development: For maintaining and sustaining existing greenbelt areas and also to create new greenbelt areas water is used to the tune of around 20-25KLD.

Domestic Consumption: for drinking and all other domestic requirement water is used to the tune of around 90-100KLD.

Schematic representation of present level of water demand for the Bamebari Mine is illustrated as follows:

Fig.12-Water Demand of Bamebari Iron & Mn Mine.



Presently, water used at the mine is being drawn from three bore wells for which the company has obtained No Objection Certificate from the Central Ground Water Authority.

With the proposed expansion, it is envisaged that water demand for the project would increase. Maximum Water Demand (Non-Monsoon Season) is illustrated in fig.13 as below.

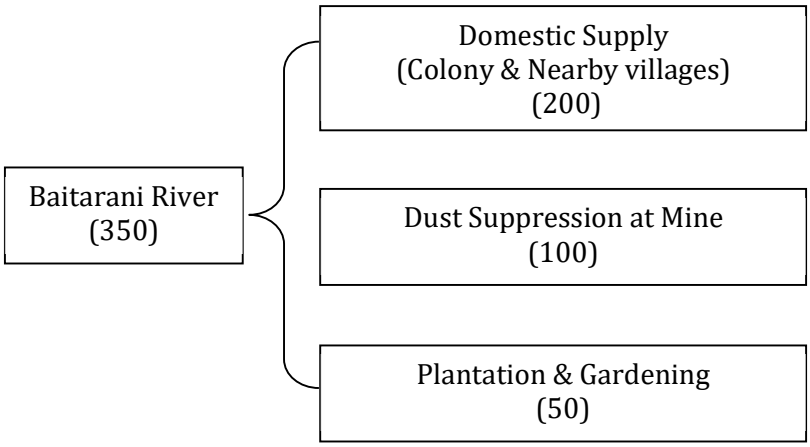


Fig.13 Water demand during non-monsson season.

During the lean season where water demand is on higher side, the company relies on Baitarani River at Tindharia village for drawing surface water. For this purpose the company has been allotted permission from the Principal Secretary Water Resource Department, GoO for drawing 0.4cusec of water.

The company has planned for adopting dry beneficiation technology for the mineral beneficiation with the proposed expansion to eliminate the possibility of increasing water demand.

The company's dependence upon the ground water (from the borewells) and surface water from the Baitarani river during the proposed expansion since one of the operational pit i.e Joribar block has started intercepting the ground water table on account of which significant volume of water is expected to seep into the working pit. A detailed Hydrogeological investiogation is being carried out in this regard by engaging reputed consultants accredited by Central Ground Water Authority.

Power Demand & Its source:

Based on the actual consumption from the last two years, the average present level of energy demand (electrical energy) is around 416746.5 Kw-H (432748 Kw-H in FY 2019-20 and 400745 Kw-H in FY 2020-21) which is sourced from the local substation of NESCO by a power supply agreement. Out of which around 75927 Kw-H and 657Kw-H was generated from the DG Sets in FY 2019-20 & 2020-21 respectively. This is expected to rise by another 30-40% to cater to the night shift requirement such as operations, maintenance facilities, township related functions and mine related enhanced illumination.

(ix) Quantity of Wastes to be generated (liquid and solid) and scheme for their Management/Disposal –

Solid Waste - The waste from mining is overburden generated during extraction of ore, which shall be stacked separately and rehabilitated by adequate plantations in the area as

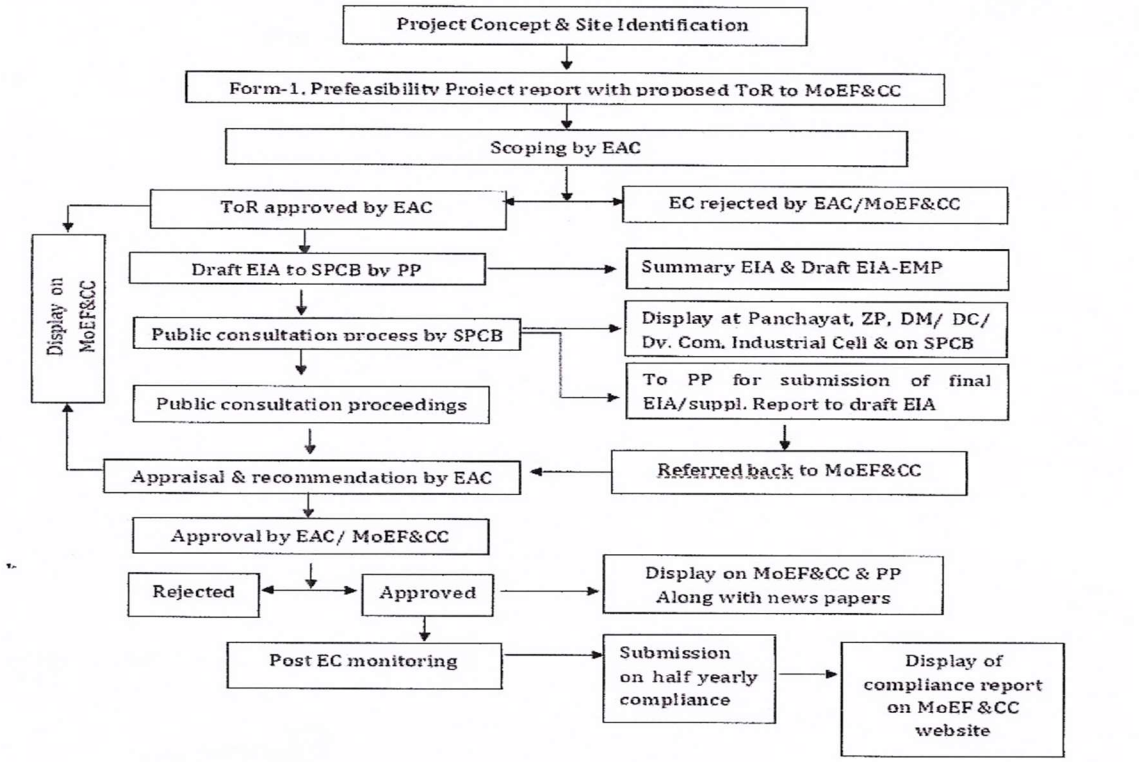
per progressive reclamation activities. The peak generation of overburden to be generated from the mine shall be 44.18 LTPA.

Precautions and Protective Measures for Dumps -The dumps will be provided with all necessary protective features such as toe wall and garland drains to arrest any surface run offs. To improve the stability terracing is proposed with an interval of 10 m height in the dump while maintaining the terrace angle less than 37.5°. The ultimate slope angle of the dump is planned to be less than 27^0. Afforestation on the dump slopes will be done for stabilizing the dump slopes, once a part of the dump slope become inactive.

The terraces are designed so that rain water is drained out of the dump and there is no accumulation of rain water. The rain water gets channelized to the toe wall and garland drain provided at the base of the dump.

Liquid Waste – As the mineral processing will be involved with dry processing system, there will be no generation of liquid waste from the mine. However Hazardous waste such as used oil shall be generated out of the maintenance of HEMMs. The same shall be recycled by authorised recyclers as per the provision of hW Rule of 2016.

(x) Schematic representations of the feasibility drawing which give information of EIA purpose: Detailed schematic representations of the feasibility covering for the purpose of EIA will be given in the Environmental Impact Assessment report.



4.0 SITE ANALYSIS

(i) Connectivity –

The site is well connected with NH-215. Nearest town is Barbil (~ 14km, NW) and nearest city is Keonjhar at a distance of 89 km (SSE). Nearest airport is Bhubaneshwar at a distance of 300 kms.

The site is well connected with communication facilities like telephone, wireless etc. and as such, no constraints are envisaged in this aspect as the tehsil and district headquarter is near to the site. The details of connectivity in respect of Bamebari Iron & Mn Mine is as follows:

a) SE Railway(2km-E from Boneikela), 0.5kmE from Joribar Block, 0.5km from Bamebari Block)
b) NH 215(NH 215 passes through Boneikela block), 12 km NNW from Joribar block, 14 km NNW from Bamebari block)
c) Expressway(Expressway passes within the lease)
d) Barbil Railway Siding(7.5 Km N from Boneikela)
e) Banspani Railway Siding (6 km S from Boneikela, 6.1 km N from Joribar, 10 km from Bamebari)
f) Joruri Railway Siding (10 Km S from Boneikela,2Km N from Joribar,5 km from Bamebari)

(ii) Land Form, Land Use and Land Ownership –

The project area of 464.0ha consists of448.395ha of forest land and 15.605ha of non-forest land. Out of which the company has alredy diverted an area of 145.329ha of forest land vide Stage-II Forest clearance granted by the earstwhile Ministry of Environment & Forest, Govt. of India vide letter no. 8-72/2004-FC, Dt.25.01.2007. The company has obtained physical possession of the entire ML area of 464.0ha vide acquired surface rights.

Present land use is already under industrial mining & allied purposes. Land utilization during the expansion will be as per the approved Mining plan. The table 16 below illustrates the present Land Use pattern over ML area of 464.0 ha as well as the proposed land use pattern as per the Mine Plan approved by IBM at the end of the plan period i.e 31st March 2025.

Table-16.Land Use Pattern (Bamebari Mine Area 464.0 Ha)

Sl. No	Type of Use	As at Present as on 01.04.2020 (ha.)				As at end of lease period (as on 31.03.2030 (ha.)			
		Bamebari	Joribar	Bonaikela	Total	Bamebari	Joribar	Bonaikela	Total
1	Area Excavated	25.747	16.173	45.920	87.840	39.65	36.760	58.680	135.090
2	Storage of Top Soil	0	0	0	0	0	0	0	0
3	Waste Dump	21.712	12.812	11.010	45.534	30.812	27.200	26.120	84.132
4	Mineral Storage	1.823	2.193	4.000	8.016	3.14	8.330	4.500	15.970
5	Infrastructure (Workshop, Magazine etc)	2.000	1.256	0.830	4.086	1.25	4.475	0.830	6.555
6	Roads	3.100	3.58	3.740	10.420	6.78	3.580	8.500	18.860
7	Railways	0	0	0	0	0	0	0	0

8	Tailing Pond	0	0	0	0	0	0	0	0
9	Effluent Treatment Plant	0	0	0	0	0	0	0	0
10	Mineral Separation Plant	0	0	0	0	0	0	0	0
11	Township Area	17.346	7.004	0	24.350	18.682	6.540	0	25.222
12	Others - Green Belt	11.450	9.594	0	21.044	4.11	4.115	5.470	13.695
	Area remaim Un touched	56.822	38.388	167.500	262.710	35.576	0.000	128.90	164.476
Total		140.000	91.000	233.000	464.000	140.000	91.000	233.000	464.000

(iii) Topography (along with map) –

a) Topography, Drainage Pattern, Vegetation, Climate & Rainfall:

The Bamebari Manganese Mines consisting of three detached blocks (Bamebari, Joribar and Boneikela), covering a total area of 464 Ha in Champua Sub-division of Keonjhar district in the state of Orissa. A topographical plan (Drawing no DWG 01), showing position of all the blocks is enclosed. Block wise details is as follows:

Block – Bamebari - 140 ha :

Topography

The Bamebari block consists mainly of two hills along the same ridge, one towards north and the other towards south. The highest & lowest heights attained in the region are 624 m in north-east & south-east and 546 m in north-west, respectively. The topographic expressions have been controlled by truncation of rocks of varying resistances.

Drainage Pattern

The area is intersected by several small nallahs mostly flowing towards east. These nallahs remain dry for most part of the year. The Kashi nallah, a perennial water source is situated towards the south-eastern part of the lease area and flows towards south-east and meets Baitarani river at a distance of 2.5 kms from the eastern boundary of the lease.

Flora and Fauna

The block is covered by moderate Sal forest on the higher slopes and shrubs/bushes on the lower level. Prominent botanical species like Shorea Robusta (Sal), Terminalia Tomentosa (Asan), Bassia Latifolia (Mahua), Butea Monosperma (Kosi), Magnifier Indicia (Mango) etc are in abundance. The animals consisting of elephants, bears, squirrels, jackals, mongoose, while among the avians are white chlorospsis, woodpecker, crows, bulbul.

Climate & Rainfall

The climate is tropical with maximum temperature going up to 44-46°C in summer months and a minimum temperature going down to 5-6°C in winter months. The mean annual rainfall is around 1400mm. (During 2018-19, rainfall received was about 1409.56 mm).

Block – Joribar – 170 ha (79 ha intended for relinquishment and 91 ha intended to retain):

Topography

The Joribar Block has an undulating terrain consisting of small hillocks towards the western and northern part with a gentle slope towards east. The highest & lowest heights attained in the region are 646 m in west & 512 m in east.

Drainage Pattern

The area is intersected by several small nallahs mostly flowing towards east and meets the Baitarani River towards east beyond the lease area.

Flora and Fauna

The block is covered by moderate Sal forest on the higher slopes and shrubs/bushes on the lower level. The plain grounds are cultivated lands. The lease area is covered by dense forests with an appreciable part covered by the open mixed jungle. Prominent botanical species like Shorea Robusta (Sal), Terminalia Tomentosa (Asan), Bassia Latifolia (Mahua), Butea Monosperma (Kosi), Magnifier Indicia (Mango) etc are in abundance. The animals consisting of elephants, bears, squirrels, jackals, mongoose, while among the avians are white chlorospsis, woodpecker, crows, bulbul.

Climate & Rainfall

The climate is tropical with maximum temperature going up to 44-46°C in summer months and a minimum temperature going down to 5-6°C in winter months. The mean annual rainfall is around 1400mm. During 2018-19, Rainfall was about 1409.56 mm.

Block – Boneikela –233 ha :

Topography

The area is mainly hilly terrain with prominent hills in the North-Western and North-Eastern part and steeply sloping towards south. The highest & lowest heights are 717 m & 501 m in the North-eastern and southern part of the block.

Drainage Pattern

The area is intersected by several small nallahs flowing towards south and meets the Suna River which flows south of the lease area.

Flora and Fauna

The block is covered by moderate Sal forest on the higher slopes and shrubs/bushes on the lower level. The plain grounds are cultivated lands. The lease area is covered by dense forests with an appreciable part covered by the Siddhamath Reserve Forest. Prominent botanical species like Shorea Robusta (Sal), Terminalia Tomentosa (Asan), Bassia Latifolia (Mahua), Butea Monosperma (Kosi), Mangifera indica (Mango) etc are in abundance. The animals consisting of elephants, bears, squirrels, jackals, mongoose, while among the avians are white chlorospsis, woodpecker, crows, bulbul.

Climate & Rainfall

The climate is tropical with maximum temperature going up to 44-46°C in humid summer months and a minimum temperature going down to 5-6°C in winter months. The average annual rainfall is about 2018-19 is about 1409.56 mm.

(iv) Existing land use pattern (agriculture, non-agriculture, forest, water bodies (including area under CRZ), shortest distances from the periphery of the project to periphery of the forests, national park, wild life sanctuary, eco sensitive areas, water bodies (distance from the HFL of the river), CRZ. In case of notified industrial area, a copy of the Gazette notification of notified industrial area, a copy of the Gazette notification should be given –

There are no historical monuments, national parks, biosphere reserve, sanctuary, habitat for migratory birds, archaeological site, defence installation, airports within 10 km of the periphery of mine lease. The lease area also does not fall within the Coastal Regulatory Zone.

The Kundra Nala (Suna River) is flowing S-N adjoining to the western and northern lease boundary at Boneikala block. The HFL of the said nala was 521.384 mRL as on 01.08.2008.

The nearest Wildlife protected area i.e Karakarompada Elephant Corridor is at 19.5Km from Boneikala block. (Table)

(v) Existing Infrastructure –

Canteen: There is a main canteen at Bamebari Iron and Mn Mine serving snacks and meals in all the working shifts as well as one canteen at the Joribar block near to the pit office.

Rest Shelters: There are three well-ventilated, neat & clean rest shelters within the mine.

Crèche: One well-ventilated, neat & clean crèches has been provided in Bamebari Iron and Mn Mine as per the requirements of the Mines Crèche Rules 1966.

First Aid Station: First-Aid Stations manned by qualified First-Aiders during all working hours are being maintained. The First Aid Stations are provided with all necessary equipment as per the requirement of the Mines Rules, 1955. The company's main Hospital at Joda, with all modern medical aids serves the employees of the mine as well as the people in vicinity of the Joda region.

Sanitation: All other facilities, which include provision of drinking water, urinals and latrines as per the provisions of The Mines Rules, 1955 have been provided in the mines.

Water Treatment Plant: One water treatment plant with capacity of 400 KLD has been installed within the lease area of Bamebari Block having automated chemical dosing facility to supply of drinking water to township area as well as nearby villages.

Sewage Treatment Plant: One sewage treatment plant with capacity of 100 KLD has been installed within the lease for treatment of domestic effluents for alternate use in plantation and gardening activities.

Ancillary facilities:

Equipment Garage / Workshop : The Equipment Garage takes care of repair and maintenance of all working equipment such as dumpers, excavators, dozers, drills etc. The garage has provision of various repairing and handling facilities and maintenance of HEMM. In addition to this, a mobile service van has been provided which takes care of routine servicing and minor repairs of the equipment in the field.

Magazine: One centralized magazine has been established at the Joda West mining lease of the company from where the explosives are carried to the site of blasting through licenced explosive vans. The Magazine is having capacity of 15,000 kg of Nitrate Mixture, 40,000 Nos of detonator, Safety fuse 50,000 meter and 40,000 nos. electric fuse and ignitors.

Roads: Well-developed roads within the lease hold area already exist.

(vi) Soil Classification –

The distribution of different soil types of the area depends much on its physiographic and lithologic variations. The soil of the project defined as a mixture of rock and mineral material with the organic matter.

The Top Soil is the outermost layer of the earth's crust. Soil is made of mineral matter, organic matter, water, and air. Living organisms are also present in soil. Mineral matter began as rock, and soil generally has mineral particles of different sizes. Organic matter is partially decomposed plant and animal matter. Pore spaces are the gaps between solid soil particles. They are occupied by water and air. Earthworms, insects, bacteria, fungi, and other organisms inhabit soil. Most land plants depend on soil to provide four basic needs; anchorage, water, air, and nutrients.

The Overburden (Waste) mostly consists of laterite and shale. Laterite mostly occurs at the top benches and its composition varies at different places. Shale found in the quarry is mostly lateritized. Banded shale mostly occurs at the quarry bottom. Latertized shale grades from a few centimetres to several metres. Very often, lumps and nodules of manganese and iron ore are found to be irregularly distributed in the lateritic morrum. Laterite mostly occurs at the top benches and its composition varies at different places. Shale found in the quarry is mostly lateritized. Latertized shale grades from a few centimetres to several metres. Chert is mostly exposed in the eastern benches of the quarry. It is usually bouldery, sometime massive and weathered in places. It is unbanded and no definite dip is observed. Stringers and veins of quartz, iron and manganese are at times seen to traverse the rock.

The different lithologies encountered in the area are: -

a) Soil / Alluvium with floats of iron and manganese ores
b) Laterite, manganiferous in places

c) Iron ore
d) Manganese Ore
e) Shale
f) Cherty and Jaspery quartzite

(vii) Climatic Data from Secondary Sources –

The area experiences tropical climate with hot and humid summer. Geographically, the area is located near the Tropic of Cancer. Summers (from April to June) are very hot with temperature generally hovering around 45^0C. whereas winters (during November-January) are severe, particularly at night when the minimum temperature goes below 5^0C. The first shower of the rain starts in the month of June, which continues up to the month of October; however, August-September remains the months with highest rainfall in the region. The annual rainfall varies between 1170mm to 1500 mm.

(viii) Social Infrastructure available –

Within ML Area: The statutory buildings such as rest shed, first-aid centre has been constructed and maintained properly. Rest shed is provided which serves the purpose to rest and take food and water during lunch time. Safety equipment and blasting sheds has been provided to the workers as per need. A centralized canteen has been serving to bothe the mines i.e Bamebari Iron & Mn Mine & Tiringpahar iron & Mn Mine (another mining lease of the company that is in vicinity to the Bamebari mine). Apart from this a separate canteen has also been provided at the Joribar Pit office of the Bamebari Mine. Dispensary is provided at Bamebari block. There is a township of 24.35 ha in the project area with playgrounds and parks.

Outside the ML area: Full-fledged market facilities are available at Joda, Barbil and Keonjhar, the District Head Quarter. Medical facilities are also available from the Dispensary at Bamebari and Govt. hospital at Joda NAC area. Education up to 7th class is available at Guruda UGME School, and High school level at Bamebari and college level, at Joda. Postal and telephonic facilities are available at Bamebari, Joruri, Banspani & Joda. Moreover, a state of the art hospital, "Tata Medical Hospital" has been provided by the lessee in Joda west to cater to the needs of the local community.

5.0 PLANNING BRIEF –

(i) Planning concept (type of industries, facilities, transportation etc.), Town and Country Planning/Development authority Classification

The present Proposal is for the regularisation of the existing EC that was granted vide EIA Notification 1994 along with enhancement of the production potential in respect of Manganese Ore & Iron ore mining with crushing & screening plant.

Planning concept: Mining is carried out as per the scheme of mining approved by Indian Bureau of Mines. The present Mining Plan is approved for the period 2020-2025. The validity

of the present mining plan is till 31st March 2025. The proposed enhancement of production shall be realised from the existing mining lease area of 464.0Ha. No change to theprevailing approved mine plan has been envisaged.

Town and Country Planning/Development authority Classification:

a) **SIC CODE**: As per the Standard Industry Classification the project falls under SIC Group-10-14 (Mining) SIC Code for Iron Ore Mining is 101 and SIC Code for Mn Ore Mining is 106.
b) **NIC CODE**: As per the National Industry Classification notified by Ministry of Statistics and Programme implementation, GoI, New Delhi in 2008 Mining falls under Division 07 Mining of metal ores.

Group 071-Mining of iron ores (NIC CODE: 07100)
Group 072- Mining of Mn Ore (NIC CODE: 07293)

c) As per the EIA Notification, 2006, the project is categorised as "**Category A**" Project based on it's leasehold area (exceeding 50Ha)

(ii) Population Projection

Presently the local population constitutes a significant fraction of the direct employment. Over the years such people have been trained in various vocations and they form a part of the semi-skilled and skilled employees. After the mine closure, such population is likely to engage themselves either in other neighbouring mines or may take up entrepreneurship in their own profession, such as motor garage, workshops, general & electrical repairs etc.

Presently around 312 persons are employed directly by the company at Bamebari Iron & Manganese Mine. Subsequent to enhancement of production of Manganese Ore, total 362 persons (additional 50 persons) are likely to be directly employed in the mine. Apart from the direct employment the proposed enhancement is expected to generate opportunities for around 150-200 persons on contractual basis round the year in various other support service related funtions.

(iii) Land use Planning (break up along with greenbelt etc.)

Proposed enhancement in the production shall be realised from the existing Ml Area of 464.0ha. The land use pattern for the ML area of 464.o ha shall be as per the approved Mine Plan. The table below illustrates the existing land use pattern as well as the proposed land use pattern as approved by IBM.

Sl.No	Type of Use	As on 01.04.2020 (ha)	As on 31.03.2025 (ha)	As on 31.03.2030 (ha)
1	Area Excavated	87.840	101.138	135.090
2	Storage of Top Soil	0	0.450	0

Sl.No	Type of Use	As on 01.04.2020 (ha)	As on 31.03.2025 (ha)	As on 31.03.2030 (ha)
3	Waste Dump	45.534	58.386	84.132
4	Mineral Storage	8.016	13.488	15.970
5	Infrastructure (Workshop, Magazine etc)	4.086	5.451	6.555
6	Roads	10.420	11.420	18.860
7	Railways	0	0.000	0
8	Tailing Pond	0	0.000	0
9	Effluent Treatment Plant	0	0.000	0
10	Mineral Separation Plant	0	0.000	0
11	Township Area	24.350	24.350	25.222
12	Others - Green Belt	21.044	17.150	13.695
13	Area remaim Un touched	262.710	232.167	164.476
Total		464	464	464

(iv) Assessment of Infrastructure Demand (Physical and Social)

Tata Steel Ltd. (TSL) has assessed the demand of infrastructure (Physical & Social) in nearby area of the mine site and development activities have been doing under corporate social responsibility programs by the TSRDS wing of the company. .

(v) Amenities/ Facilities

Rest shelters, toilets, drinking water facilities, first aid facilities, and regular medical checkup facilities have been provided for laborers and their families. Other site facilities include a substation, water reservoir for storing water for drinking as well as water sprinkling. The mine is well communicated to the head quarter of Ferro Alloys & Minerals Division, Kolkata through P&T telephones, Tata Net and internal telephone system. Adequate lighting facilities as per the standard laid down by DGMS is provided in the mine. Power required for the mine is supplied by GRIDCO of Odisha.

6.0 PROPOSED INFRASTRUCTURE –

(i) Industrial Area (Processing Area)

This is an already operating mine having operational histry since 1930 and over the years, all the requisite infrastructure facilities have been provided with almost all the necessary infrastructure and service facilities.

Details of proposed infrastructure includes installation of new dry plant, mobile crushing & screening facility, upgradation of existing screening unit to receive more ore feed, new HEMM & its maintenance area, new auxiliary infrastructure such as new thickeners, enhanced dispatch & loading system, etc.

(ii) Residential Area (Non-Processing Area)

There are no residential area within core-zone. There is no proposal for extension of existing township area. There is no likelyhood of effect of outside people or influx on the existing local population. The lessee is spending substantial amount through Tata Steel Rural Development Society for peripheral developments such as education, health, sports, afforestation etc. Hence the benefits to the community and its economy because of this project are quite appreciable.

(iii) Greenbelt

Greenbelt development activities are carried out as per the Biodiversity Management Plan with special focus on restoring the natural and native ecosystem by planting only native varieties of forestry species such as species like Arjun, Cashew-Nut, Karanj, Gamhar, Teak Neem, Mahaneem etc. A centralised nursery at Joda West lease have been constructed to cater to the requirement of saplings and other afforestation measures.
Site of plantation is maintained with plant density of about 2500 saplings/ hectare or more depending on the method of plantation such as High Density plantation or Miyawaki Method etc. Proposal for reclamation and rehabilitation of mined out area as proposed in ensuing approved Modification of Review of Mining Plan is furnished below in Table No. 18.

Table No. 18-YEAR WISE PLANTATION PROGRAMME FOR 20-21 to 24-25

Year	Bamebari Block			Joribar Block			Bonaikela Block			Total	
	No. of Sapling	Area (in ha.)	Location	No. of Sapling	Area (in ha.)	Location	No. of Sapling	Area (in ha.)	Location	No. of Sapling	Area (in ha.)
2020-21	2500	1.00	2832N-2930N & 3043E-3170E	0	0.00	-	0	0.00	-	2500	1
2021-22	2500	1.00	2150N-2355N & 3046E-3291E	0	0.00	-	2500	1.00	4430N - 4601N & 4888E - 5159E	5000	2
2022-23	2500	1.00	2145N – 2355N & 3082E-3337E	0	0.00	-	2000	0.80	4478N - 4593N & 4905E & 5178E	4500	1.8
2023-24	5875	2.35	2154N-2345N & 3106E-3430E	2500	1.00	12422N - 12498N & 12529E	0	0.00	-	8375	3.35

Year	Bamebari Block			Joribar Block			Bonaikela Block			Total	
	No. of Sapling	Area (in ha.)	Location	No. of Sapling	Area (in ha.)	Location	No. of Sapling	Area (in ha.)	Location	No. of Sapling	Area (in ha.)
						- 13631E					
2024-25	3500	1.40	2213N -2385N & 3162E-3426E	2500	1.00	12360 N - 12512 N & 13474E - 13590E	0	0.00	-	6000	2.4
Total	16875	6.75		5000	2.00	0	4500	1.80	0	26375	10.55

(iv) Social Infrastructure

Employment, medical facilities, educational facilities, transportation etc. will be further strengthened by Tata Steel Ltd.

(v) Connectivity (Traffic and Transportation Road/Rail/Metro/Water ways etc.)

The site is well connected by all-weather road. The Banspani railway station is located about 8 km from the lease. The public road (State Express Highway) is passing thru' the lease area at Boneikala block and connected to NH-215 at a distance 2km.

(vi) Drinking Water Management (Source & Supply of Water)

Presently, Drinking water is being drawn from three borewells as per the permission obtained from Central Ground Water Authority. During the expansion and the company proposes to draw water from Baitarani river at Tindharia village for which surface water agreement has been executed.

(vii) Sewerage System

There is one township (at Bamebari) within the lease belonging to lessee. Domestic discharges are channelized to Sewage Treatment Plant of 100KLD capacity for its treatment for further usage in plantation and gardening purposes.

(viii) Industrial Waste Management

Industrial waste such as overburden will be generated in course of mine development and shall be managed adequately as per proposals of approved Mining Plan.

(ix) Solid Waste Management

The waste from mining is overburden generated during extraction of ore, which shall be stacked separately and rehabilitated by adequate plantations in the area as per progressive reclamation activities. The total quantity of wastes likely to be generated and handled in the plan period (2020- 2021 to 2024-25) is 4.05 Million Cubic meter.

(x) Power Requirement & Supply/Source

Based on the actual consumption from the last two years, the average present level of energy demand (electrical energy) is around 416746.5 Kw-H (432748 Kw-H in FY 2019-20 and 400745 Kw-H in FY 2020-21) which is sourced from the local substation of NESCO by a power supply agreement. Out of which around 75927 Kw-H and 657Kw-H was generated from the DG Sets in FY 2019-20 & 2020-21 respectively. This is expected to rise by another 30-40% to cater to the night shift requirement such as operations, maintenance facilities, township related functions and mine related enhanced illumination.

7.0 REHABILITATION AND RESETTLEMENT (R & R) PLAN –

No R&R plan is required as no displacement of people is proposed for the expansion of mining project.

8.0 PROJECT SCHEDULE & COST ESTIMATES –

(i) Likely date of start of construction and likely date of completion (Time schedule for the project to be given)

It is an already operating mine. The enhancement of the production shall be initiated after getting all the regulatory approvals. Presently, Ministry's approval in favour of this proposal would help the project proponent to apply for Consent To Establish and Consent To Operate subsequent to which the activities can be initiated.

(ii) Estimated project cost along with analysis in terms of economic viability of the project

Net Asset Value as on 31.03.2020 = Rs. 22 Crores

Upcoming Capital Investment by 31.03.2025 = Rs. 479 Crores

Internal Rate of Return (IRR) = 211.70 % (In case of Captive Consumption).
However, the IRR may be more subsequent to implementation of amendment made in MMDR Act, 2015 during Mar'2021 wherein allowance of 50% (max) sale of ore has been mandated.

However, as per Corporate Environment Responsibility (CER) guideline dated 1st May 2018 of MOEF & CC no 22-65/2017-IA.III, the total environment cost for the project is estimated around Rs 135Lakhs rupees.

Economic Viability of the Project –

While working out the economic evaluation with opencast mining method till 31.03.2030 (expiry of lease), the following aspects were considered to arrive the Internal Rate of Return (IRR) and furnished in Table No. 19.

- Capital cost
- Cash flow forecast
- Investment cost
- Inflation forecasts
- Operating cost
- Closure cost – Not envisaged during this plan period till 31.03.2023.
- Rehabilitation cost – Not envisaged during this plan period till 31.03.2023.
- Exploration Cost has been considered as Rs.5000/mtr

Assumptions:

- Production = 90% of the Quantity as mentioned in Table No. 13
- IBM Price = Average of the year 2019-20 [Net Realisation (NR)for future periods has been assumed to remain same]
- Depreciation = Assuming Mine Life till 31.03.2030 (i.e. expiry of the lease)
- Interest Cost (Debtor and Inventory) = 2-month inventory of production value @15% WACC
- The subject IRR is exclusive of consideration of selling of low grade ore due to uncertainty in favourable market scenario and thus may change accordingly.
- The Iron Ore (Mineral Reject) to be generated while development of Manganese Ore Pits has not been considered during 2020-21 & 2021-22 has not been considered in economic evaluation, This will be stacked at designated place within the lease for future usage.

Table No. 28

Particulars			START	FY21	FY22	FY23	FY24	FY25
PROD(TONNES)	CG			5,824	14,000	17,500	17,500	17,500
	HG			27,456	66,000	82,500	82,500	82,500
	MG			21,632	52,000	65,000	65,000	65,000
	LG			16,640	40,000	50,000	50,000	50,000
	Mineral Reject			24,848	1,03,680	2,19,800	2,55,000	3,60,600
	Total Production			**86,760**	**2,48,112**	**3,91,320**	**4,23,000**	**5,18,040**
REVENUE/MT	CG			32,157	32,157	32,157	32,157	32,157
	HG			26,037	26,037	26,037	26,037	26,037

Particulars			START	FY21	FY22	FY23	FY24	FY25
	MG			18,239	18,239	18,239	18,239	18,239
	LG			8,758	8,758	8,758	8,758	8,758
	Mineral Reject			4,370	4,370	4,370	4,370	4,370
TOTAL REVENUE(₹ Cr)		(A)		155	392	529	545	591
Net Asset Value as on 31.03.2019			22					
CAPEX (₹ Cr)	ABANDONEMENT COST							
	PLANTS & EQUIPMENTS				75	75	75	75
	EXPLORATION			11	23			
	FOREST(FDP)SCHEMES			35	25	25	25	20
	CONTINGENCY			4	3	3	3	2
		(B)		49	125	103	103	97
DEPRECIATION (₹ Cr)				3	3	2	2	2
ADDITIONAL DEP (₹ Cr)				3	6	8	10	11
DEPRECIATION (₹ Cr)		(C)		6	8	10	12	13
Cost/MT before Depreciation & Royalty				5,725	3,652	4,676	5,582	13,608
Royalty, DMF & NMET Cost/MT				1,311	1,311	1,311	1,311	1,311
Cost/MT before				7,036	4,963	5,987	6,893	14,919

Particulars			START	FY21	FY22	FY23	FY24	FY25
Depreciation								
Operating Cost before depreciation (₹ Cr)		(D)		50	85	129	148	321
Selling, distribution and Finance Cost (₹ Cr)				15	17	18	20	22
Interest Cost (Debtor and Inventory)				4	10	13	14	15
Total Selling, distribution and Finance Cost (₹ Cr)		(E)		19	26	31	34	37
Terminal employee benefits (₹ Cr)								0
PROFIT BEFORE TAX		(F) = A-C-D-E		80	272	359	351	221
TAX@	25.17%			20	68	90	88	56
PROFIT AFTER TAX		(G)		60	204	269	263	165
CASH FLOW		(H) = G+C-B	-22	16	87	176	172	81

Particulars			START	FY21	FY22	FY23	FY24	FY25
NPV (₹ Crores) (WACC @)	15%		₹ 351.41					
IRR			211.70 %					

9.0 ANALYSIS OF PROPOSAL (FINAL RECOMMENDATIONS)

(i) Financial and social benefits with special emphasis on the benefit to the local people including tribal population, if any, in the area

Large number of population of study area are employed in existing operations including tribal people either directly or indirectly earning their livelihood. Upcoming proposed expansion shall further add to their social and economic up-liftment in terms of indirect income generation opportunities. CSR activities being run by Tata Steel will continue further.

With the increase of mining the following socio-economic changes are expected to take place especially within 104 – 5 km from the project area.

a) The project will improve the overall quality of life of the community and society at large in terms of provision of safe drinking water, solar lights, borewells and other basic infrastrutucres.
b) The proposed expansion of the project would help restoring the livelihood programmes in the nearby vilages by strengthening the existing training facilities to the villagers on Crop protection, Crop Rotation, Agriculture and other associated activities. Moreever this proposed expansion activities is neither going to affect any existing agricultural land.
c) The company's TSRDS wing will upgrade their supply chain mechanism for connecting farmers with technology and innovations so as to improve the prevailing yielding capacity by promoting a number of self-help groups.
d) The project is going to have positive employment and income effects, on account of indirect employment associated with allied activities.
e) The project is going to have positive impact on consumption behavior by way of raising average consumption and income through multiplier effect.
f) The project is likely to accelerate the need and importance of education among the local people and increase the literacy rate.
g) The project is going to push up the demand for water for drinking and other purposes in the region.

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