PREFEASIBILITY REPORT

OF

ALAMPARA IRON ORE MINE
& MINERAL BENEFICIATION PLANT

Location: Village : Chakkittapara, Taluka : Quilandy, Dist : Kozhikode, Kerala

(Mining Lease Area 406.45 Ha)
(Production Capacity Mine @ 5 MTPA iron ore; Beneficiation Plant : 1.8 MTPA)

PROJECT PROPOSPENT
M/S. MSPL LIMITED
Baldota Enclave, Abheraj Baldota Road,
Hospet – 583 203
Dist – Bellary, State – Karnataka

OCTOBER -2014
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1. EXECUTIVE SUMMARY

- M/s. MSPL Limited is a leading mining company in Bellary - Hospet Region in private sector and is engaged in mining iron ore for last five decades. They have introduced State of the Art advanced technology based mining machinery, in some of their mechanised iron ore mines, so that iron ore deposits are systematically and scientifically developed to produce iron ore. Recently, the company has set up a 1.2 million tonne Pellet plant at Koppal, near Hospet, by utilising iron ore fines and proposed to start 1.0 Mt per annum capacity Alloy and special Integrated Steel Plant in Bellary Hospet Region of Karnataka.

- State Govt. of Kerala has recommended for 406.45 Ha. of area for mining of iron ore.

- The applied M.L. area over 406.45 hectares is covered within the Survey of India toposheet No. 49 M/14 on a scale of 1:50,000.

- The entire Mining lease area is categorised as Forest Land. This is a part of Perruvannamuzhi Reserved forest, which was allotted to the Plantation Corporation of Kerala Limited during 1971-72 for rubber plantation. However, in the proposed ML area, only limited rubber plantation was done.

- M/s. MSPL Limited has initiated all the necessary steps for implementation of iron ore mining project in Kozikode District, Kerala. The proposed iron ore mine (406.45 hectares) will be developed as Fully Mechanized Mine for the production of iron ore @ 5 MTPA iron ore. It is proposed to set up mineral beneficiation plant within this mining lease having a rated capacity of 1.8 MTPA.

- The lease area is approachable from Peruvannamuzhi town by a tar road surrounding the Kuttiyadi dam and rising in the hill range over a distance of six km. Peruvannamuzhi is connected to the district city of Kozhikode, via Balluseri, by a tar surfaced road over a distance of 60 kms

- Alampara block is an elongated ridge, running over a distance of 2 km., in NNW-SSE direction. At its northern end, the Alampara ridge, rising to a height of 328 m above MSL in the form of a huge cliff, constitutes a prominent landmark in the region, locally named as ‘Peningonikota’. The ridge slopes down at an average angle of 26° for a length of about 250 m in a SSE direction where it bifurcates into two linear sub parallel ridges, which could be due to fault. Both the limbs (ranges) have a number of saddles.
• The proposed iron ore mine will be developed as Fully Mechanized Mine for the production of iron ore @ 5 MTPA. Commercially exploitable iron deposits occur in this proposed mining lease. The total 35.73 Mt of mineable Magnetite Ore Reserves are proved, including 0.27 Mt of float ore. In addition there are 17.27 Mt of inferred resources. After full exploitation reserves may increase. These reserves will be further reviewed and revised, after detailed exploration in Northern cliff area and Western Limb deposit is completed during the first five years of this Mining Plan.

• The magnetite ore processing will involve crushing, screening, grinding and separation of iron ore concentrate of +65% Fe for Pelletisation. From this concentrate iron ore pellets will be produced in the Pelletisation plant.

• The probable magnetite iron ore reserves estimated as per UNFC are 35.73 Mt. Therefore, at the rate of 5 Mt ore production per annum from 5th year, the anticipated life of this mine works out will be about 9 years. When areas of Northern and Western limb of this lease is fully explored by core drilling, additional magnetite reserves are likely to be proved. Therefore, life of this mine may get further extended upto 25 years or so.

• Method of Mining is opencast mechanised with shovel dumper combination and 10 m high benches. Drilling will be done by 150 mm dia m. blast holes. The blasted material will be loaded by shovels into 50/85 t dumpers to the dump in case of over burden and to the stack in the crushing - screening plant in the area.

• Although, cutoff grade is (+) 28% Fe, the average grade ROM ore with (+) 30% Fe, will be crushed, ground and beneficiated in the Beneficiation Plant to form iron ore concentrate analysing 63-65% Fe and it will be of 75 micron size. Because, chemical analysis of most of the drilled borehole samples indicate (+) 35% Fe, the average grade of ROM ore fed to primary crusher will be (+) 30% Fe. This concentrate will be used to make iron ore pellets in the proposed Pelletisation Plant within the mining lease. In the first two years concentrate produced will be sold to various consumers till pelletisation plant is commissioned.

• The total industrial water required for their mine and Beneficiation is worked out to be 2000 – 3500 cu. m. per hour. The total requirement of water for drinking and other civilian use is estimated to be 45 kl per day. The drinking water after treatment in the water treatment plant will also be drawn, by constructing a water reservoir, if possible, at suitable location.
• The manpower likely to be employed in the First Phase in Alampara Iron Ore Mine for mining, in Beneficiation Plant and related site services will be 700.

• The mine pit/ pits will remain active during the lease period. Therefore, at present there is no proposal to backfill the pit. However, after first 10 years and wherever possible biological reclamation of inactive benches and development of leveled land forms for plantation may be considered.

• The mining will be carried out as per the approved mining plan. During Mining Plan period, the mining operation will be done by development of mechanized opencast method. The plantation program will be taken up in the areas in future in a systematic manner and plantation will be carried out, starting with soil binding grasses and shrubs followed by larger trees species. Local varieties of plants should be given predominance along with introduction of some exotic species. Broad casting of seeds of local shrubs will be extremely useful in providing an immediate green cover.

• Uncontaminated topsoil, will be meticulously removed and transported to the non mineralized zone for future plantation.

• Estimated project cost is approximately Rs. 66900 lakhs The capital budget for environmental protection measure is estimated to be 1000 Lakhs, while recurring cost is estimated to be 16883 lakhs.

• No historical monument or public building exists near the area and within 10 kms radius. However, few small temples of locally worshipped deities are located at close proximity of the villages.

• There is no National Park, Wildlife sanctuary, defense installation or sensitive area located within 15 km radius of the proposed mine.

• The mining operations shall be carried out after obtaining all statutory permissions and shall be carried out as per approved mining plan.

• Baseline Environmental data consisting of micrometeorology, Air quality, Water quality, Soil and Noise has been collected during January to March 2014, as it was required during compilation of mining plan.
2. INTRODUCTION OF THE PROJECT / BACKGROUND INFORMATION.

i) Identification of Project and Project Proponent

The applicant is a Public Limited Company. Communicational details of the company are as under;

**Corporate Office:**
M/s. MSPL Limited  
Baldota Enclave, Abheraj Baldota Road,  
Hospet – 583 203  
Dist – Bellary, State – Karnataka  
Telephone – (08394) 232003/04, Fax (08394) 232333  
Email – email@mspllimited.com

**Registered Office:**
Baldota Bhavan,  
117, Maharshi Karve Road,  
Mumbai – 440 020  
State – Maharashtra  
Telephone – (022) 22030989, Fax (022) 22019762  
Email – mspl.mum@mspllimited.com

ii) Brief description of nature of the project

The proposed iron ore mine (406.45 hectares) will be developed as Fully Mechanized Mine for the production of Iron Ore @ 5 MTPA iron ore. Commercially exploitable iron ore deposits occur in this proposed mining lease. The total 35.73 Mt of mineable Magnetite Ore Reserves are proved, including 0.27 Mt of float ore. These reserves will be further reviewed and revised, after detailed exploration in Northern cliff area and Western Limb deposit is completed during the first five years of this Mining Plan. It is proposed to set up mineral beneficiation plant within this mining lease having a rated capacity of 1.8 MTPA.

**Project appraisal:**

- The Geological Survey of India carried out detailed prospecting by large Scale mapping and exploratory drilling during 1970-73 in Alampara hills in Kozhikode District. The borehole lithologs and other relevant data is covered in Chapter 3 – Geology & Exploration. M/s MSPL Ltd. have purchased the GSI Reports.
- In the interest of scientific development of Alampara iron ore deposit, the Govt. of Kerala has processed the M.L. application and decided to grant the mining lease to MSPL Ltd. (Refer Annexure 1)
• M/s. MSPL Limited have submitted Mining Plan of Alampara Iron Ore Mine, to Indian Bureau of Mines, Nagpur under Rule-22 of Mineral Concession, Rules, 1960, and Progressive Mine Closure Plan under Rule 23 (b) of Mineral Conservation & Development Rules, 1988 for grant of Mining Lease. This Mining Plan has been approved by IBM on 19/22 September 2014.

• Although, the Plantation Corporation of Kerala Limited is the occupier of the land, the Forest Department of Government of Kerala State is the Owner of the said land. Therefore, the forest department of the state has given “No Objection Certificate”, to MSPL Limited to carry out DGPS Survey of the proposed ML area for preparation of Mining Plan for approval by IBM.

• Application for diversion of forest land has been submitted to the Forest Department. The legal factors involved in this area are related to the land acquisition being a forest land and being part of “perambra Estate”, developed by the Plantation Corporation of Kerala Ltd., a Govt. of Kerala Undertaking. Before commencing mining operations, all issues related to land acquisition will be settled with the Govt. of Kerala & Plantation Corporation of Kerala Ltd.. The mine will not acquire any agriculture, private or tribal lands. As such impact of the project on Socio economics will be positive due to direct and indirect employment. The company will conduct socio economic impact studies and expects significant increase in economic activity in the buffer zone area through direct and indirect employment.

iii) Need for the project and its important to the country and or region.

Iron ore is one of the major mineral deposits occurring in the Indian sub-continent. It has played a great role in development of civilization and industrialization. The occurrence of Iron ore in the proposed area is proved by the way of exploration. The applied M.L. area over 406.45 hectares is covered within the Survey of India toposheet No. 49 M/14. The capacity of the proposed mine is 5 MTPA. The development of mining in the area is directly and indirectly going to contribute in increasing employment, infrastructure, communication, and socioeconomic infrastructure.

iv) Demand Supply Gap.

The national steel policy had set a target of 60 MTPA of steel production by 2010 and to increase it to a level of 110 MTPA by 2020. The major steel producers in India are planning to expand their capacities in tune with National Steel Policy (NSP) formulation.
Accordingly, the steel segment is accelerating their production to meet the national and international target. Although iron in cast form has many specific uses (e.g. pipes, fittings, engine blocks) its main use is to make steel. Steel is the most useful metal known being used 20 times more than all other metals put together. Pure iron is quite soft, but adding a small amount of carbon makes it significantly harder and stronger. The demand for raw iron in industrial area of across the country is ever-increasing.

v) **Imports vs. Indigenous production.**

The relationship between the supply of iron ore and steel consumption in India has been the dominant theme in the bulk commodity space for the past five years, as India’s population has begun the process of urbanisation. Significant investment has been made in infrastructure and housing, which has driven the considerable growth in demand for steel and, as a result, for iron ore. The Indian Iron ore market contains big suppliers and small regional companies. Iron ore suppliers work in collaboration with designers to create a strong demand for iron in India. Backed by significant investments in commercial, infrastructure and residential projects, the Indian steel industry has recording significant growth for more than a decade. Raw iron ore is a key raw material in production of steel industry is also expected to record growth.

vi) **Export Possibility.**

The policies of Government on economic development have given various subsidies like slashing the import duties and provisions for the Indian industry to grow indigenously. Hence, there is a good possibility of export of iron ore pellets.

vii) **Domestic / export Markets.**

Domestic market for iron ore and pellets is well also established.
viii) Employment Generation (Direct and Indirect) due to the project.

The manpower likely to be employed in the First Phase in Alampara Iron Ore Mine for mining, in Beneficiation Plant and related site services will be 700. There will be employment generation of double this number in secondary and tertiary sectors. It is proposed to employ the local population wherever possible in the proposed project activities.
3 PROJECT DESCRIPTION

i) Type of project including interlinked and Interdependent project, if any.

The proposed project is Mining by opencast fully mechanized mine with mineral beneficiation plant. The beneficiated mineral in the form of pellets will be sold in the market.

ii) Location : Figure 1 gives the location of proposed Alampara Iron Ore Mine. The location on toposheet 49M/14 showing mining lease boundary is shown on Figure 2.

The proposed lease area is spread over 2.5 km maximum in NS direction and 2.5 km of maximum width in EW direction. DGPS Survey of proposed ML area, has been carried out by “Kerala Land Information Mission”, an Undertaking of Government of Kerala State. A map prepared after the survey duly certified by Director of Mining & Geology, Dept. of Mining & Geology, Govt. of Kerala, is placed at Figure 3.
iii) Details of alternate sites considered and the basis of selecting the proposed site, particularly the environmental consideration gone into should be highlighted.

Mining is a site specific and has to be undertaken at the place of the occurrence of the mineral and hence no alternative sites explored.

iv) Size or magnitude of operation.

The proposed mining Lease Area is 406.45 Ha with Production capacity of 5 MTPA iron ore. During the course of mining it is proposed to undertake exploration in the granted lease area. The reserves may substantially increase in the Lease to be granted. It is also proposed to upgrade the quality of ore in mineral beneficiation plant proposed within the mining lease having rated capacity of 1.8 MTPA.

v) Project description with process details (a schematic diagram/flow chart showing the project layout, components of the project etc. should be given).
- **Geological formations:**
  Regionally the area forms part of the Pre Cambrian metamorphic complex of the Western ghat range. The mineralised area is in the form of an elongated hill ridge running over a distance of about two km in NNW-SSE direction and connecting two E-W trending chain of hills in the Western Ghats. At its northern end, the ridge rises to a height of 328 m above MSL and it slopes down at 26º for a length of about 250m in SSE direction.

  Magnetite bearing rocks (Magnetite – Quartz – Grunerite gneiss, (MQG), of Alampara area, being relatively more resistant to weathering, form prominent cliffs and steep rocky slopes, which are conspicuous geomorphological feature of the area. The rock is essentially made up of Quartz, magnetite and grunerite ore. The following litho succession, of the area, may be deciphered from surface exposures and borehole data.

<table>
<thead>
<tr>
<th>Quartz, pegmatite &amp; aplite veins.</th>
<th>Shear zone formation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quartz – sericite – chlorite schist</td>
<td>Hanging wall country rock</td>
</tr>
<tr>
<td>Biotite gneiss &amp; granulite</td>
<td>Hanging wall rock (poor ore)</td>
</tr>
<tr>
<td>Grunerite gneiss &amp; granulite</td>
<td>Iron – ore formation</td>
</tr>
<tr>
<td>Magnetite – quartz – grunerite</td>
<td>Foot – wall country rock,</td>
</tr>
<tr>
<td>gneiss</td>
<td>Generally</td>
</tr>
</tbody>
</table>

- **Details of Exploration:** The GSI carried out exploration in the area from November, 1970 to May 1973. The exploration included Geological Mapping of 0.9 sq.km. area on Scale 1:2000, surface sampling and exploratory drilling. A total number of 65 Chip Samples were collected from exposure of iron ore formations. The analysis results of 65 Chip samples confirm presence of magnetite ore in that area. The drilling was taken up to conform the geological structure and to ascertain the altitude, nature, and thickness of the iron ore formation on both the limbs of the isoclinal syncline. In all 26 boreholes with a total meterage of 3768.51 m, were drilled by Geological Survey of India, southern Region. It is proposed to conduct further exploration in the lease, as the substantial areas are not fully explored.

- **Reserves:** A summarized table of reserve & quality are as under:

  (Fig. in Mt.)

<table>
<thead>
<tr>
<th></th>
<th>Oxidised</th>
<th>Unoxidised</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proved Reserves</strong></td>
<td>1.20</td>
<td>18.27</td>
<td>19.47</td>
</tr>
<tr>
<td><strong>Probable Reserves</strong></td>
<td>2.13</td>
<td>14.13</td>
<td>16.26</td>
</tr>
<tr>
<td><strong>Inferred Resources upto Floor of Fold</strong></td>
<td>-</td>
<td>-</td>
<td>17.27</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3.33</td>
<td>32.40</td>
<td>53.0</td>
</tr>
</tbody>
</table>
The proved and probable magnetite iron ore reserves estimated as per UNFC guidelines are 35.73 Mt. Therefore, at the rate of 5 Mt ore production per annum from 5th year, the anticipated life of this mine works out will be about 9 years. The pillar/fort like structure on the north where the NOSE of syncline is located, in the cliff area, the reserves will be estimated by end of first year and are likely to add about 10 Mt. to the proved reserves, adding to the life of the Mine. However, substantial part of this lease, particularly the Western limb deposit is unexplored. When areas of Western limb of this lease is fully explored by core drilling, additional magnetite reserves are likely to be proved. Therefore, life of this mine may get further extended up to 25 years or so.

- **Description of proposed mining method**: During the first year, it is proposed to construct approach road as near to the top of pillar/fort like structure at northern end by developing 8 m to 10 m high benches with minimum width of 10 m, by using high capacity ripper dozers and small capacity excavator -10 t / 20 t tippers combination. It is expected that this pre-production development will be completed within three months. The material will be broken and pushed on to road on lower benches where it will be loaded by FE loaders / small shovels in dumpers and taken to stockpile area at crushing, screening and beneficiation plant. Samples from this material will be drawn and analysed for Fe content.

  a) **Float Ore Mining Method (Development & Production)**: The float ore pits will be developed by forming benches of 2.7m to 4.0m heights and 10.0m width, in the float ore layer using bulldozers, FEL and tipper trucks of 10t capacity. The materials from the benches will be excavated by FEL and loaded into tipper trucks, which will unload the same in the hopper of mobile, self-powered feeder breaker placed on pit floor, for screening and separating ore and lateritic soil. The separated lateritic soil and screened float ore will be made in rectangular stacks. As the float ore benches move forward, the feeder breaker is also moved at suitable location, for screening float ore and lateritic soil.

  b) **Hard Ore and Overburden Mining Method**

     (i) The mine is being planned for ultimate annual production capacity of five Mt. The production of 5 Mtpa will be achieved during 5th year. During the first five years the total ore removed will be 14.33 Mt. and overburden removed will be about 13.46 Mt. In additions, 1.28 Mt. inferred resources from the northern part
of the ore body will also be removed. The method of Mining will be opencast Mechanised, using conventional shovel dumper combination with large 150 mm dia hole blasting.

(ii) The pre-production development is proposed by developing 8 to 10 m high benches in the area of pillar / fort like rock on the north side. The benches will be connected by ramps which may have to be at gradient steeper than 1 in16, for which DGMS permission will be obtained.

(iii) This pre-production development will be carried out by ripper-dozer and if not possible by shovel dumper Combination, with drilling and blasting. The benches will be 10 m wide. It is expected that this development will be completed in three months. The quantity of rock excavated will be about 1.3 lakh cu. meter. The actual mining of proved ore will be started from 2nd year onward. For this mining of hard ore and overburden 150 mm dia blastholes will be drilled and blasted. The blasted material will be loaded by using 3.2 m$^3$ bucket hydraulic shovels and 50/85 tonnes rear dumpers. For mining of ore, the inferred ore on north side of section 1-1' will have to be excavated to maintain bench geometry / slope.

(iv) The loaded material will be sent to stock piles near the area of crushing, screening and beneficiation plant. If it proves to be iron ore after analysis, it will be 3.27 lakh tonnes of ore.

The Proposed Production Programme:

- During the first year, pre production development will be done in the cliff area by forming approach road from the available road at 228 mRL on the eastern side with gradient of 1 in 16 to climb the cliff area (pillar like outcrop) in the North by forming / developing 8-10 m high and 10 m wide benches from 240 mRL to 310 mRL. The benches will be connected by ramps which may have steeper gradient of 1 in 10. Also float ore on the bottom floor level of cliff area will also be mined by self powered feeder breaker. The ore produced from pre production development together will be 0.327 Mt. This work will be completed in 3-4 months period. Then from 4th or 5th months onward 0.81 Mt ore will be produced by drilling and blasting and top slicing method by mining top slices of the cliff. Simultaneously, overburden will also be removed from the central position of the fold of the top most slice of the cliff area.
Thus, procedure will be continued during the first five years going downwards by slicing method. The company has drawn the production schedule, together with overburden and side burden removal. The same is given below in the table together with yearwise stripping ratios:

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
<th>Overburden mining</th>
<th>Stripping ratio t:t</th>
<th>Total handling of material (Mt)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Proved Ore (Mt)</td>
<td>Inferred ore *(Mt)</td>
<td>Total (Mt)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>0.327</td>
<td>0.81</td>
<td>1.137</td>
<td>1.001</td>
<td>1:0.880</td>
</tr>
<tr>
<td>II</td>
<td>2.30</td>
<td>0.216</td>
<td>2.516</td>
<td>1.893</td>
<td>1:0.752</td>
</tr>
<tr>
<td>III</td>
<td>2.726</td>
<td>0.270</td>
<td>2.996</td>
<td>2.446</td>
<td>1:0.816</td>
</tr>
<tr>
<td>IV</td>
<td>4.021</td>
<td>Nil</td>
<td>4.021</td>
<td>3.540</td>
<td>1:0.880</td>
</tr>
<tr>
<td>V</td>
<td>5.00</td>
<td>Nil</td>
<td>5.00</td>
<td>5.767</td>
<td>1:1.153</td>
</tr>
<tr>
<td>Total</td>
<td>14.374</td>
<td>1.296</td>
<td>15.67</td>
<td>14.647</td>
<td>1:0.935</td>
</tr>
</tbody>
</table>

This production is from inferred resources of cliff area and will be proved during first year itself by drilling five coring type boreholes.

The above table indicates that during first five years 14.37 Mt of magnetite ore is proposed to be mined from proved ore zones i.e. from South of section 1-1’ by removing total 14.65 Mt of overburden and 1.296 Mt of inferred resource from area at North of section 1-1’ by mining cliff portion. This inferred resource will be converted to proved reserve by drilling five core boreholes each of 210 - 230 m depth and by sampling and analysing cores at 5 m interval in the first year itself.

The ore will be stacked at stack pile area near beneficiation plant at a distance of 2.5-3.0 km to the south. Overburden will be taken to overburden dump located at a distance of 2.0 to 2.5 km to the South.

**Extent of Mechanisation**: The mine will be fully mechanised using Heavy Earth Moving Machinery such as 150 mm dia blast hole drills, hydraulic shovels of 3.2 cu.m to 3.5 cu.m. bucket capacity and 30 t to 35 t dumpers some of them are articulated depending upon the quantity of blasted material to be handled per shift. After proving the more reserves, it is possible to increase production to 5 Mt per annum. Choice of the additional machinery will depend on experience of first three years. Although, proposed mine benches are 10.0 m high and minimum 10.0 m wide.

**Conceptual Mine Plan**: Since the entire area of Alampara Mining lease has been subjected to tectonic movement followed by dynamic metamorphism, different rock
types including magnetite iron ore deposit have experienced severe and complex folding and cross folding resulting in formation of isoclinal syncline and anticline. Therefore, of magnetite deposit in separate limbs of the fold is not uniform and it varies at different sections. The thickness of the deposit at trough increases. The drilling done by GSI indicates, that deposit continues below 0.0 m MRL beyond (-) 80 mRL. The present western limb is not fully explored and perhaps, it may be a part of eastern limb shifted down by faulting towards west and forming present western limb. A borehole AP-12, intersected eastern limb at a shallower depth, before intersecting western limb at a depth on the western side. The perspective planning is accordingly done keeping the above aspects in view and based on the presently available geological data, the following programmes for (i) proposed exploration, (ii) development and disposal of waste, (iii) Mining and Production strategy , as well as environmental protection measures at five yearly intervals, have been planned for the Conceptual Mining Plan.

**Beneficiation Plant:** Details of the Beneficiation Plant are given at Annexure 4.

**vi) Raw material along with estimated quantity, likely source marketing area of final products, mode of transport of raw material and Finished product.**

There is no requirement of Raw Material in this project. Mode of transport of extracted mineral from the mine to beneficiation plant and to the end user is surface transport by road.

**vii) Resource optimization / recycling and reuse envisaged in the project, if any, should be briefly outlined.**

Although, cutoff grade is (+) 28% Fe, the average grade ROM ore with (+) 30% Fe, will be crushed, ground and beneficiated in the Beneficiation Plant to form iron ore concentrate analysing 63-65% Fe and it will be of 75 micron size. Because, chemical analysis of most of the drilled borehole samples indicate (+) 35% Fe, the average grade of ROM ore fed to primary crusher will be (+) 30% Fe. This concentrate will be used to make iron ore pellets in the proposed Pelletisation Plant within the mining lease. In the first two years concentrate produced will be sold to various consumers till pelletisation plant is commissioned.

**viii) Availability of water its source, Energy / power requirement and source should be given.**
a) **Industrial Water**: The requirement of industrial water for Beneficiation Plant will be supplied by installing a Pump House at a suitable location at Tailing Dam and make up water to this plant will be supplied from a nearly perennial nalla constructing a small dam. Also industrial water required for sprinkling on mine roads and service centre for washing dumpers and vehicles will be supplied from one of the two perennial nallas flowing over Western limb of the ore deposit with the help of pumps and water tankers. The total industrial water required for their mine and Beneficiation is worked out to be 2000 – 3500 cu. m. per hour.

b) **Drinking water**: The drinking water after treatment in the water treatment plant will also be drawn, by constructing a water reservoir, if possible, at suitable location. The drinking water to the mine colony and other site services will be supplied by laying a network of pipe lines. Drinking water at the open pits, mine office and in rest shelters will be supplied by hired water tankers and stored in sintex tanks placed at selected site services for use by employees working in the mine. The total requirement of water for drinking and other civilian use is estimated to be 45 kl per day.

c) **Power**: The main electric substation for receiving and distributing electric power for Alampara Iron Ore Mine will be established near Beneficiation Plant, in consultation with Kerala State Electricity Board, which will be supplying the electric power for this project. At present, there is no electricity in the Mining Lease Area. Since all HEMM will be diesel operated, the requirement of power is estimated at 3 to 4 Megawatts, mainly for crushing and beneficiation plant. From the main sub-station receiving electric power supply from KSEB it will be step down to the useable voltage and provided to various substations proposed to be established in the mine and plant area.

ix) **Quantity of waste to be generated (liquid and solid) and scheme for their Management/disposal.**

During the first year, float ore on the slope of eastern limb and that on the northern slope of Ridge will be worked. The other area to be worked in first year is pillar/fort like structure on northern end, which has very little soil. Float ore is proposed to be worked by hired FEL and 10-t tipper trucks combination and Feeder Breaker. The top soil layer
available over ore deposit and within pit limits will be scrapped and heaped using bulldozers for use in avenue plantation on road sides and near site services area.

**Selection of Land for Top Soil and Hard Overburden / Sideburden / Waste** : The lateritic soil is expected to be generated while mining float ore on the eastern slopes of the Pit will be screened using self-powered mobile feeder breaker. This will be stacked on flat locations on the eastern side in these float ore pits temporarily. This lateritic soil separated from float ore will be analysed and if it cannot be beneficiated to produce iron ore concentrate, it will be used to give 0.3 m to 0.5 m thick top layer over the reclaimed area so that the same can be used for suitable plantation. The total lateritic soil in Alampara Mine is estimated to be 1.96 Mm$^3$.

**Method of Top Soil and Hard Overburden / Sideburden Removal and Their Transportation**

**Top Soil** : Lateritic soil removal is also described above (a) by forming float ore benches of 2.7m to 4.0m height and 10m width. The average ore recovery percentage in float ore is 8% to 10%. The balance is lateritic soil. This will be separated by screening in Mobile Feeder Breaker and stored in rectangular stacks of 1.5 m height temporarily, to be used for plantation.

**Hard overburden / Side burden Waste Removal** : The hard overburden / side burden in the pit will be removed by forming 10 m high benches and by top slicing resorting to drilling and blasting. The blasted overburden / side burden will be loaded by shovels in dumpers and transported for dumping on pre-determined locations on the south eastern side of eastern limb ore, on flat ground having no ore and at a distance of 2.0 to 2.5 km. The same may also be used for backfilling the excavated area of later years, if necessary, so that the same can be used for suitable plantation / biological reclamation by giving 0.3m to 0.5m thick layer of lateritic soil. Also a part of the waste will be used in the formation and repairs of haul roads of dumpers. During the first five years about 13.5 Mt of overburden / sideburden will be removed.

**Reclamation of worked out Area** : The mine pit/ pits will remain active during the lease period. Therefore, at present there is no proposal to backfill the pit. However, after first 10 years and wherever possible biological reclamation of inactive benches and development of leveled land forms for plantation may be considered. The incline and consolidated dump terraces are also proposed to be biologically reclaimed choosing
local tree species in consultation with the forest department. About 5000 – 7500 tree saplings are proposed to be planted per annum from 3rd year onwards, if approved by State Forest Department.

At suitable location, laterite walls of 1.5 m x 2 m size will be built around the proposed waste dump at its toe to arrest rain wash offs from the dump. About 5.00 m below the stone wall, a garland drain of 2.5 m x 1.5 m size will also be dug and built to arrest runoff released from the stone walls, so that only clear water goes out to join the existing streams. On the downward side of the hill slopes check dams across the flow of seasonal streams will also be constructed.

The ultimate pit slope is planned at 45° at present. However, it will depend on the structural conditions of wall rocks from stability points of view. Before deepening the working pit by developing benches slope stability study may be undertaken through an appropriate scientific organisation of repute.

x) **Schematic representation of the feasibility drawing which give information of EIA purpose.**

The EIA will include an assessment of the potential impacts envisaged as an effect of the project, during the operation of the mine. The assessment will be based on a consideration of the individual components of the project.
4. SITE ANALYSIS

i) Connectivity.

The Alampara mining lease area is situated at a distance of about 30 km, as the crow flies, NNE of Kozhikode town of Kerala State. The lease area is approachable from Peruvannamuzhi town by a tar road surrounding the Kuttiyadi dam and rising the hill range over a distance of six km. Peruvannamuzhi is connected to the district city of Kozhikode, via Balluseri, by a tar surfaced road over a distance of 60 kms. is the nearest railway station situated on the Chennai – Mangalore broad gauge railway line of the southern railway at a distance 30 kms from the lease area. The nearest commercial Airport is Calicut (Kozhikode) which is 25 km away from Kozhikode city. It is connected to Mumbai, Thiruananthapuram, Bangalore, Goa, Delhi etc and some international cities by direct flights.

ii) Land use and Land ownership.

The proposed 406.45 ha lease area is entirely in the Reserved forest. However, the area is part of Perambra Rubber Estate, developed by the Plantation Corporation of Kerala, a Govt. of Kerala undertaking. Since the lease deed is not executed, there are no broken or used land areas in the proposed lease area. Thus, premining use of land is Reserved Forest.

iii) Topography (along with map).

Alampara block is an elongated ridge, running over a distance of 2 km., in NNW-SSE direction. It is a part of Western ghats. At its northern end, the Alampara ridge, rising to a height of 328 m above MSL in the form of a huge cliff, constitutes a prominent landmark in the region, locally named as ‘Peningonikota’. The ridge slopes down at an average angle of 26° for a length of about 250 m in a SSE direction where it bifurcates into two linear sub parallel ridges, which could be due to fault. Both the limbs (ranges) have a number of saddles. The Surface plan of the lease area is enclosed as Plate 2.

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 forest, 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 should be given.

Although, the proposed 406.5 ha. M.L. area is entirely in reserved forest, except the cliff area and area on the NE slope, it has medium thick South Indian Moist Deciduous and Dry Deciduous Forest. Remaining area is a degraded forest with thin vegetation. The lease area is a part of the “Plantation Corporation of Kerala” a Kerala Government undertaking which was created for rubber plantation. However, there is hardly any rubber plantation in the lease area.

v) Existing Infrastructure.

Water supply in most of the villages is available. Latrine facility, Waste Water disposal, garbage disposal were absent. Inter-village transport facility is available only for the selected villages. While educational facilities & health facilities are not encouraging in most of the villages. There is well established road connection.

vi) Soil classification.

The area does not have much soil due to steep slopes and heavy rainfall. Whatever soil is there, is lateritic soil, mainly with the float ore.

vii) Climatic data from secondary sources.

The climate of the area is warm and humid throughout the year. The nearest meteorological station is at Kozhikode, the district place, about 27/28 km on West side as the crow flies. Kozhikode is located on the sea coast.

The long term climatological data has been extracted from the publication, climatological tables published by the India Meteorological department (IMD). The station was established on 1st August 1880. Salient features of data are summarised below:

i) The daily maximum temperatures are fairly uniform through out the year and varies between narrow range of 32.2°C to 37.2°C. The mean daily maximum temperatures vary between 24.6°C to 31.1°C.

ii) The mean daily minimum temperatures vary between 22.0°C to 25.9°C. The lowest temperature recorded during 30 year period was 13.8°C on 24 January, 1969. The lowest temperatures recorded during all months was above 16°C.
iii) The relative humidity at Kozhikode was always more than 60% with maximum reaching 93%, which is not surprising for a coastal town.

iv) The 30 year average rainfall for the period was 3284.6 mm with average number of rainy days being 115.6. Almost 90% rainfall occurred during six months from May to September each year. There was meagre rainfall during months of January and February each year and very low rainfall in December and March.

v) The mean wind velocity was higher than eight km per hour for major part of years. For eighty percent of time, wind velocity was between 1 to 19 kmph. Calm periods were very low, less than 20%.

vi) An analysis of wind direction showed that wind for 50% time wind was from NE & E at 8.30 am while it was 82% of time from W and NW at 5.30 pm, typical of sea shores.

viii) Weather phenomena like Hail, Fog dust storms and squalls were nearly absent. Only thunderstorms occurred, particularly during months of April / May and October / November.

ix) The monthwise windrose diagram were available for period 1980-1996. The diagrams show that wind velocities were higher than 6 kmph for major part of the time. Calm periods were usually quite low mostly less than 2 %. As seen from long term data, wind velocity is from ESE –SSE at 08.30 am during months from January to March and October to December. It almost reverses to WNW NNW at 05.30 pm.

x) During remaining six months i.e. April to September wind is from all sixteen directions. But predominant wind direction E, NE at 08.30 am and W, NW and NNW at 05.30 pm.

viii) Social Infrastructure available.

- **Education**: Education is a basic requirement for every human being. The governments should utilize its entire recourses irrational manner to encourage people to become literate to some extent since educated persons are assets ho help in proper development of the country. In the Kozikode district there are number of primary, middle and Higher secondary school and colleges.
- **Hospital**: There are number of Hospital, dispensaries, primary health centre and Sub primary health centre available in Kozikode district.

- **Transport**: The transport facilities in the Kozikode district are well developed and wide spread. State or national highway link most of the urban areas.

- **Communication**: Communication facilities go a long way in information collection and its dissemination in an effective and speedy manner. In the modern society, the roll of the facilities in the socioeconomic development of the society is very well recognized. Communication facility help in the flow of information from one place to another in shortest time, thus helping administration and corporate managers to take crucial decisions relating to daily functioning of administration and business dealings in shortest possible time. The importance of developed communication network for the common men judged from the fact that in rural areas. All communication facility like as phone, fax, printer, scanner, computer etc are available in Kozikode district.
5. PLANNING BRIEF

i) Planning Concept (type of Industries, facilities, transportation etc) Town and country planning/ Development authority Classification.

The mining will be carried out as per the approved mining plan. During Mining Plan period, the mining operation will be done by development of mechanized opencast method. The statutory provisions for the development of mine shall be followed to ensure safe mining practices and conservation of mineral. During the course of mining protection and conservation of natural resources and protection of environment will be ensured. The Environment Management Plan in brief is described at Annexure II.

ii) Population Projection.

- There are no villages in proposed lease area. However, there is a small colony of Perambra Rubber Estate, developed by Kerala Plantation Corporation. There is another colony, of the same entity within 500 m of southern lease boundary. After lease execution PCK will handover the colony to MSPL.

- There are only 10 census villages in 10 km radius buffer zone. All of these are Quilandy Taluka of Kozhikode District.

- As per 2001 Census, population of these villages is 1,25,267 comprising of 61,976 males and 63,291 females. Eight of these villages have population of more than 10,000 one has population of 9,100. The smallest, one village has population of 5,718.

- The total area of 10 villages is 31791 ha. As per 2001 Census, population density comes to 394 per sq. km against population density of 1228 per sq. km for Kozhikode district and 819 per sq. km for State of Kerala.

- There are 1021 females per thousand males, a unique feature of the State of Kerala. The state has 1058 females per 1000 males. The same figure for Kozhikode district is 1057.

- The Scheduled caste population constitutes 11.86% of buffer zone population while scheduled Tribe population only 0.29%. These are compared with similar figures for Kozhikode District, State of Kerala and all India for rural areas.

<table>
<thead>
<tr>
<th>% of Total Population</th>
<th>Buffer Zone villages</th>
<th>Kozhikode District</th>
<th>State of Kerala (Rural)</th>
<th>All India (Rural)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule cast</td>
<td>11.86</td>
<td>7.96</td>
<td>10.83</td>
<td>17.91</td>
</tr>
<tr>
<td>Scheduled Tribes</td>
<td>0.29</td>
<td>0.31</td>
<td>1.48</td>
<td>10.42</td>
</tr>
</tbody>
</table>
The percentage of Scheduled Caste population in buffer zone villages is about one percent higher than State of Kerala, but more than 30% lower than figures for rural areas of the Country. The percentage of Scheduled Tribes population in buffer zone villages is similar to Kozhikode district, but lower than State of Kerala and almost negligible to rural area percentages of all India.

iii) Land use planning (breakup along with green belt etc.).

- **Post mining land use pattern**: The post mining land use shall be as under:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Head</th>
<th>At the end of 5th year</th>
<th>As per Conceptual Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Area to be excavated</td>
<td>17.71</td>
<td>111.58</td>
</tr>
<tr>
<td>2</td>
<td>Storage of top soil</td>
<td>01.77</td>
<td>1.77</td>
</tr>
<tr>
<td>3</td>
<td>Overburden/ dump</td>
<td>12.86</td>
<td>12.86</td>
</tr>
<tr>
<td>4</td>
<td>Mineral storage</td>
<td>07.0</td>
<td>07.0</td>
</tr>
<tr>
<td>5</td>
<td>Infrastructure (Workshop, site services)</td>
<td>03.01</td>
<td>03.01</td>
</tr>
<tr>
<td>6</td>
<td>Roads / Power lines</td>
<td>05.46</td>
<td>05.46</td>
</tr>
<tr>
<td>7</td>
<td>Railways</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>8</td>
<td>Green Belt*</td>
<td>09.735</td>
<td>15.085</td>
</tr>
<tr>
<td>9</td>
<td>Tailing pond</td>
<td>61.92</td>
<td>61.92</td>
</tr>
<tr>
<td>10</td>
<td>Effluent Treatment Plant</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>11</td>
<td>Mineral Beneficiation Plant/ Crushing Plant / Pelletisation plant</td>
<td>65.17</td>
<td>65.17</td>
</tr>
<tr>
<td>12</td>
<td>Township / Colony</td>
<td>02.00</td>
<td>02.00</td>
</tr>
<tr>
<td>13</td>
<td>Others to specify - Garland drain, check bund retaining walls</td>
<td>03.36</td>
<td>03.36</td>
</tr>
<tr>
<td>13 a</td>
<td>Area for exploration (*included in the unused area)</td>
<td>(117.235)*</td>
<td>117.235</td>
</tr>
<tr>
<td>14</td>
<td>Unused Area</td>
<td>216.455</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>406.45</strong></td>
<td><strong>406.45</strong></td>
</tr>
</tbody>
</table>

iv) **Assessment of Infrastructure Demand (physical & social).**

The proposed mining will require roads for the transport of the mineral besides it will require manpower to operate the proposed mine.

v) **Amenities/Facilities.**

**Major Site Services proposed to be provided** : Since Beneficiation Plant and Tailing Dam are proposed to be established in the Mining Lease area at the south end and to the east of proposed Western Pit, the company is proposing to establish its main site offices for this mine on the western side near the Beneficiation Plant to co-ordinate various activities in Alampara Mining lease area. The company also proposes to set up required essential site services in this mechanised mine at suitable locations in the lease area so that mining and ore beneficiation activities continue without any hindrances. These include
(i) Main site office / Mine Managers office
(ii) Workshop
(iii) Warehouse / stores
(iv) Electric sub-station
(v) Industrial and Drinking water supply
(vi) Canteen
(vii) Township / Colony for mine and plant officers and essential staff
(viii) HSD outlet etc.
(ix) Magazine
(x) Weighbridge

In addition, a Mine site office, First Aid stations, Rest shelters and other statutory facilities required under Mines Act and Regulations will be provided at suitable locations.

**Statutory Facilities** : The mine will have a centrally located Vocational Training Centre at a suitable place. This vocational Training Centre may also cater to the needs of the company's other mines in this area, likely to be opened in due course. First Aid Stations, Rest shelters and other statutory facilities will also be located in working pit areas at suitable locations.

**Dispensary Facilities** : A small dispensary will be established in the colony area to provide medical facilities to the mine workers as well as to mine and plant officials staying in the colony. Ambulance vans will be stationed at the dispensary, mine and at plant for emergency use.

**H. S. D. Outlet** : For meeting the requirements of HSD supply to various machinery that could be working in this mine, a HSD pump shall be installed at suitable location near workshop area. It will have a storage capacity of 75 to 100 KL, to meet the requirement for about 10 days.
6. PROPOSED INFRASTRUCTURE

i) Industrial area (processing area).

Mineral Beneficiation Plant will be located within the mining lease. Details are provided in Annexure 4.

ii) Residential Area (Non processing Area).

A self-contained colony, with required number of residential units may be constructed on the eastern side within lease, about ½ km away from the Beneficiation Plant. This colony will be connected to the mine and other site services by motorable roads. The salient amenities proposed to be provided are listed below:

i) The main Security office
ii) Colony Maintenance Department
iii) Dispensary facilities
iv) Postal and Telephone facilities with Telephone towers

The existing colony of the Plantation Corporation of Kerala Limited shown on the surface plan will be improved and used.

iii) Green Belt.

The area is Reserved Forest and already has reasonably good tree cover. So whatever plantation is planned, will mainly fill the gaps. During the first five years infilling plantation will be carried out, in addition to plantation along 7.5 m lease boundary. In addition infilling plantation will also be carried out around mineral stock piles, tailing area, crushing, screening and beneficiation plant and offices and site services. The total plantation during first five years is expected to 30,000 Nos.

Stabilisation and vegetation of dumps

a) The overburden dump is planned in area having relatively mild slope. Such area is available only in SE part of the lease. Rest of the non mineral bearing areas are having steep slopes.

b) The overburden removed during first three years is expected to be 4.43 Mt or 1.64 Mm³. Hence, it is not expected that one terrace can be completed before end of third year, to start plantation / Geo Matting.
c) As soon as one terrace is completed, preparation for plantation will start on slope of the terrace. The saplings will be planted in 0.8 m x 0.8 m pits which will be 0.5 to 0.6 m deep filled with mixture of soil, organic manure and chemical fertilizers.

iv) Social Infrastructure.

A. Employment

i) Although the mine is fully mechanised, it will create more than 700 jobs, revise and consider plant staff, out of these about 550 will be skilled jobs and remaining 150 unskilled and semi skilled ones.

ii) Against the skilled jobs, preference will be given to local people and those from State of Kerala. A large number of skilled workers from the State are working in other parts of the country and many other abroad.

iii) For semiskilled and unskilled workers, the preference will be given to local people after due training.

iv) In addition some jobs revise will be created in ancillary services like security, sanitation, civil constructions and maintenance. Here again local people will be given preference.

B. CSR Activities

i) The company intends to spend about 15 crore rupees during first five years for activities under CSR. In this connection Notifications / guidelines issued by the MoEF will be kept in view.

ii) A programme will be drawn up in consultation with local administration and local bodies like Gram Panchayats. The amounts spent will satisfy the amended Mines and Minerals (Development & Regulation) Act, 2011. The act is under consideration of the parliament.

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

Well established

vi) Drinking Water management (Source & Supply of water)

Drinking water for the workers will be met from the borewell within the mining lease. Drinking water arrangement for the nearby villages under Corporate Social Responsibility (CSR) will be also made.
vii) Sewerage System.
   None proposed

viii) Industrial Waste Management.
    Not required

ix) Solid Waste Management.
    None

   Through K SEB grid

7. REHABILITATION AND RESETTLEMENT (R & R) PLAN

i) Policy to be adopted (central/state) in respect of the project affected person including home oustees, land oustees and landless laborers (a brief outline to be given.)
   Not Applicable

8. PROJECT SCHEDULE & COST ESTIMATES

   The budget for environmental protection measure is estimated to be 941 lakhs.

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

   The mining operations shall be carried out after obtaining all statutory permissions and shall be carried out as per approved mining plan.

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

   Rs. 66900 lakhs The cost analysis in terms of economic viability of the project is presented at Table below.
## Budget for Proposed Mining

<table>
<thead>
<tr>
<th>Activities</th>
<th>Areas of investment</th>
<th>Method of Calculation</th>
<th>Basics</th>
<th>Expenses (In Lakh Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Investment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I Land</td>
<td>Land cost expenditure</td>
<td>Rs 10.43 Lakh / Ha. For forest land</td>
<td>Area: 406.450 Ha. Forest land</td>
<td>4239</td>
</tr>
<tr>
<td>a</td>
<td>Land cost expenditure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>Cost on relief and rehabilitation</td>
<td></td>
<td>Rehabilitation not required</td>
<td>0</td>
</tr>
<tr>
<td>c</td>
<td>compensation to the land outstees</td>
<td></td>
<td>No land outstees</td>
<td>0</td>
</tr>
<tr>
<td>d</td>
<td>Cost of acquiring surface Rights</td>
<td></td>
<td>Not required as it is Forest land</td>
<td>0</td>
</tr>
<tr>
<td>II. Mining</td>
<td>Mechanized mining</td>
<td></td>
<td></td>
<td>4538</td>
</tr>
<tr>
<td>III. Beneficiation plant &amp; Pellet Plant</td>
<td></td>
<td></td>
<td></td>
<td>55000</td>
</tr>
<tr>
<td>IV. Environmental protection</td>
<td>941</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Pollution Control (check dam, gully plug, settling tanks, water tanker, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Infrastructure (Edu, Medical, etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Educational facilities</td>
<td>Free Scholarship for higher education in the buffer zone</td>
<td></td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>ii. Medical facilities</td>
<td>Health check up of villagers villages in buffer zone &amp; workers</td>
<td></td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>iii. Others</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Income Generation Activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI. Occupational Health &amp; Safety</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>a. Infrastructure &amp; PPEs</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>R &amp; R Plan</td>
<td></td>
<td></td>
<td></td>
<td>2000</td>
</tr>
<tr>
<td>Total Capital Investment</td>
<td></td>
<td></td>
<td></td>
<td>66900</td>
</tr>
</tbody>
</table>
### ALAMPARA IRON ORE MINE

**Operating Cost per Tonne of Ore Beneficiation and Pelletisation**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Areas of investment</th>
<th>Method of Calculation</th>
<th>Basics</th>
<th>Mines (ROM)</th>
<th>Beneficiation &amp; Concentration</th>
<th>Pelletization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurring Expenditure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mining</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>Expenditure for infrastructure and equipment maintenance</td>
<td>15% of direct investment for infrastructure &amp; maintenance</td>
<td>681</td>
<td>23.99</td>
<td>1,250</td>
<td>97.92</td>
</tr>
<tr>
<td>b.</td>
<td>Material Cost</td>
<td></td>
<td></td>
<td>16,708.40</td>
<td>588.97</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>Mining of ore and waste / Operational Cost</td>
<td>Rs. Per ton</td>
<td>450</td>
<td>12,766</td>
<td>450.00</td>
<td>638.298</td>
</tr>
<tr>
<td>d.</td>
<td>Salaries &amp; Wages of 700 staffs</td>
<td>No of workers X Wages</td>
<td>Rs. 1,40,777/- per Annum</td>
<td>282</td>
<td>9.92</td>
<td>282</td>
</tr>
<tr>
<td>e.</td>
<td>Royalty on mineral &amp; miscellaneous</td>
<td>Rs. Per ton</td>
<td>300</td>
<td>0</td>
<td>0.00</td>
<td>3,830</td>
</tr>
<tr>
<td>f.</td>
<td>Depreciation</td>
<td>% on Capital Investments of Machinery</td>
<td>15.33%</td>
<td>696</td>
<td>24.52</td>
<td>3,833</td>
</tr>
<tr>
<td>g.</td>
<td>Mining Lease Charges</td>
<td>(Amortized for 20 Years)</td>
<td></td>
<td>212</td>
<td>7.47</td>
<td>4,599</td>
</tr>
<tr>
<td>h.</td>
<td>Insurance</td>
<td>0.5% of direct investment for infrastructure &amp; maintenance</td>
<td></td>
<td>23</td>
<td>0.80</td>
<td>125</td>
</tr>
<tr>
<td>i.</td>
<td>Interest on Working Capital</td>
<td>on Debtor (DC Period 1.5 month)</td>
<td></td>
<td>184</td>
<td>6.48</td>
<td>524</td>
</tr>
<tr>
<td>j.</td>
<td>Interest on Capital</td>
<td>% on Infra &amp; Equip Invest Cost</td>
<td></td>
<td>1,317</td>
<td>46.41</td>
<td>2,766</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contd...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activities</td>
<td>Areas of investment</td>
<td>Method of Calculation</td>
<td>Basics</td>
<td>Expenses (In Lakh Rs.)</td>
<td>Cost per tonne in Rs.</td>
<td>Expenses (In Lakh Rs.)</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>---------------------</td>
<td>-----------------------</td>
<td>------------------------------------------------------------------------</td>
<td>------------------------</td>
<td>----------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>ii.</td>
<td>Corporate Social Responsibility</td>
<td></td>
<td></td>
<td>192</td>
<td>6.78</td>
<td>548</td>
</tr>
<tr>
<td>a.</td>
<td>Crop Damage Compensation</td>
<td></td>
<td></td>
<td>0.00</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>Corporate Social Responsibility</td>
<td></td>
<td></td>
<td>0.00</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>Income Generation Activities</td>
<td></td>
<td></td>
<td>0.00</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>Community Health checkup</td>
<td></td>
<td></td>
<td>0.00</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>iii.</td>
<td>Occupational Health &amp; Safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>For routine checkup</td>
<td>700 persons X per annum</td>
<td>Budget Rs.3000/- per annum per employee</td>
<td>6</td>
<td>0.21</td>
<td>6</td>
</tr>
<tr>
<td>b.</td>
<td>Medical aid</td>
<td>Rs.2544/- per annum per employee</td>
<td></td>
<td>5</td>
<td>0.18</td>
<td>5</td>
</tr>
<tr>
<td>c.</td>
<td>Budget for training</td>
<td>per year</td>
<td></td>
<td>20</td>
<td>0.70</td>
<td>20</td>
</tr>
<tr>
<td>d.</td>
<td>Compensation for accident and injuries</td>
<td>Rs. 100,000 X Anticipated rate of injuries (No of workers)</td>
<td>Anticipated rate of Injury : 1%</td>
<td>14</td>
<td>0.49</td>
<td>-</td>
</tr>
<tr>
<td>iv.</td>
<td>Environment Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>Maintenance of Pollution control Facilities</td>
<td></td>
<td></td>
<td>282</td>
<td>9.94</td>
<td>10</td>
</tr>
<tr>
<td>b.</td>
<td>Dust Suppression &amp; Pollution Control</td>
<td></td>
<td></td>
<td>10</td>
<td>0.35</td>
<td>10</td>
</tr>
<tr>
<td>c.</td>
<td>Environmental Monitoring</td>
<td></td>
<td></td>
<td>10</td>
<td>0.35</td>
<td>-</td>
</tr>
<tr>
<td>d.</td>
<td>Environmental division</td>
<td></td>
<td></td>
<td>10</td>
<td>0.35</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Recurring Expenditure</strong></td>
<td></td>
<td></td>
<td></td>
<td>16,708</td>
<td><strong>588.97</strong></td>
<td>30,554</td>
</tr>
</tbody>
</table>
9. 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.**

The liberalization of the Indian economy has catapulted the Indian industry into new realms of development through global thinking and related progress. The policies of Government on economic development have given various subsidies like slashing import duties and provisions for the Indian industry to grow indigenously, also there are clearly spelled guidelines for environmental management. The project under consideration aims to contribute in the national objective of economy and ecology developing hand in hand. The region, where the project is situated is mostly dependant on agriculture forest and mineral resources where Iron ore has a major share. The development of mining in the area is directly and indirectly going to contribute in increasing employment, infrastructure, communication, and socioeconomic infrastructure. It is proposed to employ the local population wherever possible in the proposed project activities directly or indirectly. The proposed Iron ore mine would naturally have implications on the neighborhood with reference to socio-economic aspects of society, environmental attributes such as land, water, air, aesthetics, flora and fauna. In assessing the environmental impact, collection, collation and interpretation of baseline data is of prime importance. Environmental impact analysis and assessment, which is required for every industrial project, should preferably be carried out at the planning stage itself.

In compliance with the environmental procedure the environmental clearance application is made. Necessary scientific studies will be undertaken as per the guidelines set by the Ministry of Environment and Forests (MoEF) and prescribed Terms of Reference. The suggestions/recommendations of all the experts, competent authorities, and government officials are being sought for the impacts of the proposed project. Views and guidance of the local residents, community based organizations, social organizations are extremely important in order to devise a full proof Environment Management Plan for the proposed mining project and also mitigate the damages caused due to the project. Allocation of necessary funds, manpower and machinery will be made to for the protection and conservation of all the components of environment. It is ensured that all mandatory clearances will be sought from respective competent authorities before operating the proposed Alampara Iron Ore Mine (406.45 Ha).
GOVERNMENT OF KERALA

INDUSTRIES (A) DEPARTMENT

No.29675/ A3/09/ID

Thiruvananthapuram,

From

Additional Chief Secretary to Government

To

The Executive Director,
M/s MSPL Ltd, Baldota Enclave,
Abheraj Baldota Road, Hospet - 583203,
Karnataka.

Sir,

Sub: Industries Department – Mining and Geology- Grant of Mining Lease for iron ore over an area of - 406.45 Ha in Sy.No.801 to 804,917 to 923 part, 924,929 part in Chakkittapara, Quilandy Taluk, Kozhikode in favour of M/s MSPL Ltd - Reg.


In pursuance of Sec.5 read with Sec.8 of the Mines and Minerals (D&R) Act 1957, and after obtaining the approval of Government of India, New Delhi vide their letter No. 5/46/09-MIV dated 9/10/09 Government of Kerala hereby accord in principal approval for grant of Mining Lease for a period of 30 years in favour of M/s MSPL Ltd for Iron ore over an area of 406.4500 Ha in Sy. No. 801 to 804, 917 to 923 part, 924,929 part in village Chakkittapara, Quilandy Taluk, Kozhikode subject to compliance of the provisions of Mines and Minerals (D&R) Act 1957 and MCR 1960 as amended from time to time and Rules made thereunder. Formal sanction of mining lease will be issued by Government after obtaining all the necessary statutory clearance as per rules like Forest clearance under Forest (conservation) Act, 1980, Environment Clearance under
Environment Protection Act, 1986 from the Ministry of Environment & Forest, Government of India, New Delhi, Mining plan approval form Indian Bureau of Mines etc and the final execution of the lease deed in favour of M/s MSPL Ltd on the basis of the terms and condition fixed by State Government.

Yours faithfully,

PUSHPAKUMARI.G.
Joint Secretary,
for Additional Chief Secretary to Govt

Approved for issue

Section Officer
Annexure II

Letter of Grant of Mining Lease of Ministry of Mine from Govt. India

To

The Principal Secretary,
Government of Kerala,
Department of Industries and Commerce and BPE,
Government Secretariat,
Thiruvananthapuram, Kerala.

Sub: (i) Grant of ML to M/s MSPL, Karnataka for iron ore over an area of 53.9303 hectare in village Mavoor, Kozhikkode Taluk, Kozhikode in Distt.

(ii) Grant of ML for iron ore over an area of 694.96 (281.22 hectare) acres in Sy. No. 1 to 16, 16/1, 17, 17/1, 18, 18/1, 19 to 25, 54, 56 to 66, 70 to 73 in Naduvallur Desam and 1, 2, 15, 16 in (Ramallur Desam) Kokkur village, Kozhikkode Taluk & Distt.

(iii) Grant of ML for iron ore over an area of 406.4500 hectare in Sy. No. 801 to 804, 917 to 923 part, 924, 929 part in village Chakkittapara, Quillandy Taluk, Kozhikode in Distt.

Sir,

I am directed to refer to your letter Nos. 30630/A3/09/ID, 29676/A3/09/ID and 2975/A3/09/ID all are dated 22.12.2009 on subject mentioned above and to say that the State Government can execute the lease deeds in favour of the grantee only after obtaining all the statutory clearances like Forest Clearance, Environmental Clearance, Mining Plan approval from Indian Bureau of Mines (IBM), etc. You are requested to issue a Letter of Intent (LoI) to M/s MSPL, Karnataka to facilitate them to obtain the requisite clearances.

2. In this regard the State Government is advised to also refer to the relevant provisions of the Mineral Concession Rules (MCR),1960. For any further clarification in this regard, Controller of Mines, IBM, Southern Region, Bangalore may be contacted.

Yours faithfully,

(C.K. Rawat)

Under Secretary to the Government of India

Copy to:

M/s MSPL Ltd.,
Baldota Enclave, Ashray Beicota Road,
Hospet – 583203, Karnataka
ENVIRONMENT MANAGEMENT PLAN

The project proponent has been engaged in Mining of iron ore over last sixty years and today operates five mechanised iron ore mines in Bellary Hospet region. Over the years the company has introduced latest HEMM in their mines. So they have good knowledge of environmental issues they are likely face at Alampara. Some of these are summarised below:

a) Proper removal, storage and utilization of top soil as whole of the lease area is Reserved Forest.

b) Suppression of dust generated during Mining as well as crushing, screening and beneficiation.

c) Management of rain water runoff particularly because average rainfall in this area is over 3000 mm.

d) Proper storage of overburden so that water with heavy quantum suspended solids does not percolates to the Kuttiyadi reservoir outside the lease.

The EIA/EMP document for obtaining environmental clearance from MoEF, is in the process of preparation. For this purpose, 24 hourly baseline data for various environmental parameters such as air, water, noise levels etc. for 13 continuous weeks is collected from Nilawar Laboratories (MoEF Recognised Laboratory). The company proposes to obtain Environmental Clearance from MoEF for 5.0 MTPA iron ore production and Mineral Beneficiation Plant @ 1.8 MTPA.

1.1 For Water Environment

- In the process of mining the flow of direct rain water runoff and percolating rain water through the weathered zone, will be prevented from reaching on mine benches. For this purpose, the benches will be suitably graded and the rain run off is properly coursed to flow out of the Mine Pit to the extent possible. The remaining part of the rain run off, when the pit becomes deep, will be collected in a sump to be created at one end of the pit. This water will be used for dust suppression in dry season with the help of pump installed and water tankers.

- On the benches, from where ore and sideburden will be extracted, the bench floors will be sloped at 2% towards high walls. Longitudinally, along the toe of the high walls also, the benches will be sloped at 1% along their whole lengths upto the nearest culvert outlets.
• The dumper roads in the mine pit are also sloped at 1 in 20 or 1 in 16 longitudinally so that rain run off from the road can be diverted towards the nearby culvert and into two garland drains surrounding the mine pit, one on the eastern side and another on the western side. The rain runoffs from these garland drains will be collected in two separate silt settling ponds viz SSP-1 and SSP-2. Silt of rain runoff gets settled at the bottom of these ponds and only clear water from these ponds will be released to join the natural streams.

• The silt settled in these ponds is removed at intervals and at the end of rainy season, so that, silt of rain runoff of the next rainy season is again collected in these silt settling ponds.

1.2 For Air Environment
The proposed mining operations are mechanized and shall be done through deployment of mining machineries. The dust from the haul roads and drilling is expected to pollute the air to some extent. However, considering the production and nature of proposed mining operations SPM level will not be more than the permissible limit. However, on the haulage road water will be sprinkled to minimize the raising of dust in the area. Further, for minimizing dust generation during drilling & blasting and loading following measures are proposed:

• Wet drilling of blast holes
• Muckpile will be wetted before loading.
• The drillers will be given protective appliances to be used during drilling operations.

1.3 For Noise Environment:
Noise Level is likely to increase due to movement of machineries, drilling, etc. The measures will be taken to maintain the noise levels within limits. Periodical maintenance of equipment will be carried out. Moreover, the building of green belt that would be continued along lease boundary, dumping yards, haulage roads will help in restricting noise level. Noise due to blasting is controlled by using NONEL.

1.4 For reducing ground vibrations:
Ground vibrations caused by blasting will be monitored in order to know their degree and to build safe guards. The ground vibrations would be mainly at the point of blasting and further away the vibrations will decrease and becomes imperceptible.
To reduce the ground vibrations multi-row blasting will be adopted and charge per delay to be kept within limit. Blasting shall be carried out by using NONEL detonators, which controls air last and ground vibration effectively.

Blasting will be done preferably in the afternoon. This will minimize vibration due to blasting and check noise pollution. Ground Vibration monitoring will be done regularly.

1.5 **Stabilization of Overburden Dumps**:

The stabilizations of dumps will be undertaken by means of terracing of dumps wherever necessary.

The dumps will be pitched from the slope side to a suitable height. Further, suitable vegetation / grass shall be planted on the dumps for making it biologically stable.

1.7 **For Socio -Economic Environment**

The proposed mining activity is expected to have a positive impact on the socio-demographic profile of the area. The local people shall get opportunities of employment in the unskilled semi-skilled category. The overall standard of living in the area is expected to improve due to coming Iron ore Mining Project.
DETAILS OF THE BENEFICIATION PLANT

1.1 Beneficiation Investigations

1.1 The company is proposing to set up a Beneficiation Plant including Tailing Dam on the south side of the proposed ML area, as shown on the Conceptual Plan Plate VIA based on the planned tentative Ore Processing Flow sheet for beneficiation of magnetite ore from Alampara Iron Ore Mine and the same is given in Figure 2A and its tentative Material Balance at each stage is shown on Figure 2B. The plant concentrate production from 2.7 Mt ore will be 1.2 Mt per annum. Later, it will be expanded to produce concentrate at the rate of 1.8 Mt per annum. The actual Beneficiation flow sheet with material balance, based on laboratory scale and pilot plant investigations will be developed after grant of mining lease. The various beneficiation investigations on magnetite ore samples carried out are described below:

1.2 Mineralogy

Mineralogical investigations: Investigation on handpicked iron ore samples were carried out in the MSPL’s own Laboratory. The ore essentially contains magnetite in Banded Magnetite Quartzite (BMQ). Magnetite is percentage of magnetite and quartzite and Martitized magnetite. The percentage of magnetite and quartz are 60-70% and 30-35% respectively. It also contains 1-2% martitized magnetite and 2-3% Goathite / Limonite. Magnetite gets liberated when it is ground to (-) 75 micron size.

1.3 Screen Analysis, Chemical Analysis and Size Distribution

The handpicked magnetite samples were subjected to screen analysis after grinding to (-) 75 micron size to find out sizewise weight percentage distribution of magnetite, which were later subjected to chemical analysis to know percentage of Fe, SiO$_2$ and Al$_2$O$_3$. The sizewise screen analysis, chemical analysis and sizewise distribution Percentage results are given below in the table:

<table>
<thead>
<tr>
<th>Size in micron</th>
<th>Weight %</th>
<th>Chemical Analysis</th>
<th>Distribution %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Fe %</td>
<td>SiO$_2$ %</td>
</tr>
<tr>
<td>710</td>
<td>08.0</td>
<td>35.50</td>
<td>47.42</td>
</tr>
<tr>
<td>500</td>
<td>30.0</td>
<td>35.12</td>
<td>42.61</td>
</tr>
<tr>
<td>250</td>
<td>13.8</td>
<td>34.60</td>
<td>36.76</td>
</tr>
<tr>
<td>150</td>
<td>08.1</td>
<td>40.24</td>
<td>34.12</td>
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<tr>
<td>75</td>
<td>09.0</td>
<td>45.52</td>
<td>33.57</td>
</tr>
<tr>
<td>45</td>
<td>11.6</td>
<td>35.90</td>
<td>47.71</td>
</tr>
<tr>
<td>(-) 45</td>
<td>19.5</td>
<td>31.13</td>
<td>54.45</td>
</tr>
<tr>
<td>100</td>
<td>35.74</td>
<td>43.59</td>
<td>1.38</td>
</tr>
</tbody>
</table>
ALAM PARA IRON ORE MINE
TENTATIVE FLOW SHEET FOR BENEFICIATION

ROM 0-1000 MM

HOPPER

FEEDER 600 TPH

JAW CRUSHER
1100 x 800 SIZE

SCALPING SCREEN 828 TPH

+200 MM

-200 MM

PRIMARY CONE CRUSHER 228 TPH

SCREEN 900 TPH

-25 MM

+25-100 MM

+100 MM

SCREEN 960 TPH

+10 MM

-10 + 5 MM

-5 MM

CONC CRUSHER 360 TPH

BALL MILL

HYDROCYCLONE

OVERFLOW 600 TPH

UNDERFLOW 780 TPH

DRUM MAGNETIC SEPARATOR

MAG CONCENTRATE

NON MAG TAILS

WHIMS

THICKNER

UNDERFLOW

FILTER

CAKE

OVERFLOW

FOR RECIRCULATION

CONCENTRATE

TAILS

THICKNER

OVERFLOW

UNDERFLOW

FIGURE 2A
1.4 Description of Proposed Beneficiation Process

1.4.1 As shown in the flow sheet, the ROM Ore containing average (+) 35.58% Fe is transported to the hopper of a Jaw crusher having 600 TPH crushing capacity. The maximum ore is crushed to 200 mm size. The crushed product of 200 mm size from Jaw crusher is delivered by belt conveyor to scalping screen of 828 TPH capacity with 200 mm size screen. Here two products of (+) 200 mm and (-) 200 mm size get separated. The (+) 200 mm size product is fed to the primary cone crusher of 228 TPH capacity for crushing. The crushed product is then again fed to the scalping screen of 200 mm size.

1.4.2 The (-) 200 mm size fraction of the scalping screen is fed to another screen of 900 TPN capacity fitted with two screens of 100 mm and 25 mm sizes. Here three separate products of (+) 100 mm (+) 25 to (-) 100 mm and (-) 25 mm sizes get separated. The (+) 100 mm size and (+) 25 to (-) 100 mm size fractions are fed to secondary cone crusher of 300 TPH capacity for secondary crushing and this crushed products is again fed to 900 TPH capacity screen for further screening.

1.4.3 The third (-) 25 mm size fraction separated from the first 900 TPH capacity screen is fed to second 960 TPH capacity screen three fractions of (+) 10 mm and 5 mm sizes from where three fractions of (+) 10 mm , (-) 10 mm to (+) 5 mm size fraction are alternatively fed to the Tertiary crusher of 360 TPH capacity for further crushing. This crushed product will be taken to second screen of 960 TPH capacity for secondary crushing and this crushed products is again fed to 900 TPH capacity screen for further screening.

1.4.4 The crushed ore of -5 mm size from the storage bin is fed to the Ball Mills at the rate of 1380 TPH for grinding in water medium. The Ball Mills are expected to have 40 mm and 25 mm steel balls, occupying about 30% to 45% volume of the Ball Mill. The water is added in the ball mills at the rate of 2543 TPH and ore gets grounded in the revolving ball mills by steel balls. The grounded ore in the ball mill in slurry form is fed to a series of Hydrocyclones. The under flow slurry of the Hydrocyclones containing 50% solids is again fed to the Ball mills at the rate of 780 TPH for regrinding. Additional quantity of water is again added in the Ball Mills at the rate 780 TPH so that total water load becomes 1380 TPH. The successive grinding of the underflow of Hydrocyclones in the revolving ball mills, grinds the ore to (-)75 micron size.

1.4.5 The overflow from the Hydrocyclones containing (-75) micron size ground ore with 25% solids is then fed at the rate of 600 TPH to Drum Magnetic Separator having magnetic intensity of 900 gause. In the Drum Magnetic separator, wet magnetic concentrate No. 1 containing 65.51% Fe is recovered at the rate of 120 TPH and nonmagnetic tailing in the form slurry containing 28.09 % Fe also get separated with 21% solids at the rate of 480 TPH.

1.4.6 Additional water at the rate of 1640 TPH is added into the separated tailings slurry. This diluted slurry with 17% solids is fed to the Wet High Intensity Magnetic Separators (i.e.
WHIMS). In the WHIMS, wet magnetic concentrate No. 2 containing 65% Fe at the rate of 150 TPH is recovered and tailings in the form of slurry containing 11.26% Fe at the rate of 330 TPH get separated as underflow with 64% solids.

1.4.7 These tailings from WHIMs in slurry form with 18.6% solids will be sent to the thickner for recovering water in the form of over flow at the rate of 1474 TPH for recirculation in the Beneficiation Process. The under flow of Tailings thickener in the slurry form with 64% solids is discharged through pipe lines to the tailing pond of 14.87 m.cu.m. at the rate of 330 TPH.

1.4.8 The concentrate No. 1 recovered from Drum Magnetic Separator and concentrate No. 2 recovered in the WHIMS together will be sent to the concentrate thickener, where extra water is recovered at the rate of 446 TPH and it also joins the water recovered from the Tailing Dam for recirculation in the circuit of Beneficiation Plant.

The underflow of the thickener containing 65.28% Fe in the form of slurry is sent to the Filter Plant at the rate of 270 TPH. It is fed to the filter to recover water and iron ore concentrate in the form of cake containing 9% moisture and 65.28% Fe gets separated.

1.4.9 The Quantum of mill tailings which are likely to be generated will be 55% of the ROM treated in the Beneficiation Plant. These will be discharged in the proposed Tailings pond Plate No VI B. The capacity of the said Tailings Pond has been estimated to be 14.87 Million Cu.M.

1.4.10 The various operations described above including crushing, ore beneficiation and filtration to produce filter cake will be computerized.

1.4.11 It may be observed that 270 tonnes of ore concentrate in the form of filter cake with 65.28% Fe and 10% water is recovered from 600t of ROM ore beneficiated. Thus concentrate / cake recovery works out to be 45%.

1.5 Water Requirement for Beneficiation

1.5.1 The total water required for the beneficiation process as indicated in the flow sheet is at the rate of 2543 m³ per hour. Out of this 2084 m³ per hour or about 82% of the total water is recovered from the tailing pond for recirculation in the circuit of the Beneficiation Process. Thus, 459 m³ per hour of fresh water will be required to make up the shortfall.

1.6 Pelletisation

1.6.1 The Management proposes to set up a common pelletisation plant also in Alampara ML area. In this process of pelletisation, the concentrate cake of iron ore fines with 10% moisture, having -75micron size. The concentrate of iron ore required to prepare pellets and which is fed to the pelletisation plant should have the following size specification with weight percentage and chemical specifications:
<table>
<thead>
<tr>
<th>Size</th>
<th>Wt %</th>
<th>Chemical Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ 100 mesh</td>
<td>Nil</td>
<td>Fe</td>
</tr>
<tr>
<td>+ 200 mesh</td>
<td>23.5</td>
<td>SiO2 &lt;4 %</td>
</tr>
<tr>
<td>- 325 mash</td>
<td>51.5</td>
<td>Al2O3 &lt;4</td>
</tr>
</tbody>
</table>

Our blended concentrate meets these specifications for Pellet preparation. Besides, other chemicals required are also added. This mixture is then fed to the cylindrical revolving balling drum. In this balling drum, the moist iron ore fines form cake, and binders like Bentonite or Iron ore are rolled in the process of revolving and form round shaped balls called “Green Pellets”. The size of these pellets varies from 8-15 mm.

These green pellets are then screened in the screening chambers to separate fines which are sent back to the cylindrical mixing chamber. The screened and separated green pellets have to be dried and fired for hardening, to the Pellets grate via distributer. The dried green pellet spillage and preheated fine dust at the travelling Grate is pneumatically conveyed to the balling drum, via proportioning chamber as shown in the flow sheet of pellet preparation at Figure 3.

10.6.2 The green pellets travel on the travelling grate. These green pellets must be strong enough to withstand repeated drops that are involved in conveying them to the Rotary Kiln. These green pellets on the travelling grate are fired and heated by fuel oil. The air is supplied for combustion of fuel oil.

10.6.3 In this process, called Grate Rotary Kiln, preheating of the green pellets takes place on the travelling grate and indurating of the preheated pellets takes place in the Rotary kiln together with the calcination of bentonite or Iron ore at a very high temperature of 1250 º - 1350 º C and results in uniform heating of pellets. Rolling and burning in the Rotary Kiln result in better strength of the pellets.

10.6.4 There are separate machines for effecting drying, preheating and indurating in different phases.

10.6.5 The fully indured pellets get discharged from another end of the Rotary Kiln into the annular cooler for cooling and for onward discharge to the pellet stockpile / stockyard for supply to the consumers.
FIGURE - 3