EXECUTIVE SUMMARY
OF
RAPID ENVIRONMENT IMPACT ASSESSMENT
DRAFT REPORT FOR PUBLIC HEARING
FOR
PROPOSED PROJECT FOR MANUFACTURING
OF
SPECIAL GRADES ALUMINA
ALUMINA TRIHYDRATE, ACTIVATED ALUMINA,
CALCINED ALUMINA & SODIUM ALUMINATE

AT
Survey No: 94/1&2 of Kukma and
Survey No: 100/1, 101/1, 105/4, 106,107, & 110/2 of
Reladi Moti, Bhuj, Dist. Kutch, Gujarat.

Prepared By:

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VAPI-396 195., GUJARAT, INDIA.
NABET application no.92
1.1 ABOUT PROPOSED PROJECT
The Alumina Refinery Limited has proposed a well equipped alumina manufacturing production unit. The proponent has decided to setup the proposed project with modernised plant having innovative process approaches through latest & modern technologies for Bayer’s Process - the conventional & most accepted process for Alumina production. The project product range is variety of Specialty (Non Metallurgical) grade Alumina with a capacity of 25,000 MTPA. This Project will has an advantage of consuming less natural resources (i.e. Bauxite & Fuel) because of its higher operational efficiencies and limited scale of operation. The basic raw material-Bauxite is copiously available in Kutch region. The plant is proposed to setup at Survey No’s – 94/1&2 of Kukma and Survey No’s 100/1, 101/1, 105/4, 106,107, & 110/2 of Reladi Moti, Bhuj, Dist. Kutch, Gujarat.

The company being a mineral beneficiation industry, especially for beneficiation of bauxite, will have its production operations for various kind of refined alumina. The main product line of the proposed project comprising four types of alumina is shown below.

<table>
<thead>
<tr>
<th>Product</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alumina Trihydrate</td>
<td>13500 MT</td>
</tr>
<tr>
<td>Activated Alumina</td>
<td>7500 MT</td>
</tr>
<tr>
<td>Calcined Alumina</td>
<td>500 MT</td>
</tr>
<tr>
<td>Sodium Aluminate</td>
<td>3500 MT</td>
</tr>
<tr>
<td><strong>Total Specialty Grade of Alumina</strong></td>
<td><strong>25000 MT</strong></td>
</tr>
</tbody>
</table>

Capital

Land, Building, Plant & Machinery, Pipeline & Fittings, Electrical Installation, Safety systems, etc. are the major heads considered in the Capital Cost Projection for the proposed project. Environment Protection is also been considered in planning the Cost Projection, which will include APCs, Green belt development, environment monitoring measures etc. The project cost for proposed project is 28.55 Crores. The cost of environmental management has been allocated which is about 50 Lacs as capital and 23 Lacs as recurring cost.
Land

The total plot area of the unit is 160358.00 m², out of which Green belt area comprises of 33.6% (Approx) of the total area. The total land to be used for construction is about 22337 m².

Construction Materials

Construction of building will be carried out for plant, utilities and office purposes. Majority of the construction materials for the proposed project will be procured from local traders.

Water

The process of alumina extraction from Bauxite requires of water at different stages. The total industrial & utility requirement of water is estimated to be 58 KLD. About 40 KLD water will be required for irrigation of garden & greenbelt area. The domestic activities will require about 2 KLD freshwater. Hence, the total fresh water requirement of the proposed project is estimated to be 100 KLD. The water for proposed project would be sourced from M/s. Gujarat Water Infrastructure Ltd. from the pipe line laid down by Sardar Sarovar Narmada Nigam Ltd. Alternatively rain water harvesting and water supplied by local tankers (only for emergency supply).

Power & Fuel

Initially it is proposed to utilize the power from PGVCL. The total requirement of power is estimated to be 1.9 Mega Watt. The primary fuel for the calcinations process heating will be LSHS @ 8KLD. To switch to cleaner fuel options company has planned to install dual fired utilities wherever possible, so that up on availability of cleaner fuel like LNG/NG can be used to operate the utilities. Lignite @ 80 TPD is proposed as fuel for hot air generator for digestion and Boiler for steam generation. HSD @ 60 Lit/Hr is proposed for DG set to run during the failure of power supply from local grid/electricity department (PGVCL).

Human Resource

It is proposed that approximately approx. 91 persons will be employed in the proposed plant ranging from Skilled to, un/semi Skilled, technical, Semi Skilled labour etc. The man power
required for the project will be employed locally. Apart from the above given details, there would be 1 whole time director or the CEO and 2 non-executive directors on the board.

**Raw Material**

The Plant as discussed earlier is a mineral extraction plant hence it is dependent on the ore, fuel, additives and other chemicals required in the process. Raw material is going to be the most relevant advantage of this plan, as 95% of the Raw Material is to be sourced from the same state and from within a distance of 100 Kms. The details of raw materials are given in below.

A. Bauxite  6500 Ton / Month  
B. Sodium Hydroxide  160 Ton / Month  
C. Lime  100 Ton / Month  
D. Flocculent  1.5 Ton/Month  

**PROCESS DESCRIPTION**

Manufacturing process is very simple and widely accepted process of alumina production by purification of Bauxite. The process is very well known as Bayer’s Process. In the process, initially raw material- Bauxite and caustic soda are added in the digestion tank. Steam is applied to the reactor for keeping temperature & pressure at desired level considering the quality of Bauxite. After the digestion process, the digested mother liquor is sent to de-silication/clarifier unit.

In the mother liquor entered in to the de-silication/clarifier unit, lime stone & flocculent are added in where they are mixed properly then goes to Filter Press for the filtration process. The residue from filter press as solid mud is generated. This solid mud is known as Red-mud, which is collected, stored and then sold out to Cement Companies for their further use in manufacturing of Cement.

From the Filter Press, mother liquor goes to precipitation tank. At this point liquid filtered out from the filter press is **Sodium Aluminate** and same is recovered as a Product. The excess Sodium Aluminate recovered after recovery of product (Sodium Aluminate) is then sent to Primary & Secondary Precipitation tank for Precipitation where Sodium Aluminate is precipitated to Alumina Trihydrate and resultant liquid is Sodium complex liquid, this
combination is filtered in the filter press resulting Alumina Trihydrate as a product is recovered and surplus liquid is recycled.

This Alumina Trihydrate extracted as above is further calcined at 1100° C and the resultant product is Calcined Alumina or Aluminium Oxide. If Calcination is done at 500° C we get intermediate transition Alumina which is called Activated Alumina which is then pelletized and the product is called as Activated Alumina Balls.

The whole process involves the following major reaction chemistry.

\[
\begin{align*}
\text{Al}_2\text{O}_3 \text{(Solid)} + 2\text{NaOH} \text{(aqueous)} + \text{H}_2\text{O} \text{(liquid)} & \rightarrow 2\text{Na}[\text{Al(OH)}_4] \text{(aqueous)} \\
\text{Na}[\text{Al(OH)}_4] \text{(aqueous)} & \rightarrow \text{Al(OH)}_3 \text{(Solid)} + \text{NaOH} \text{(aqueous)} \\
2\text{Al(OH)}_3 & \rightarrow \text{Al}_2\text{O}_3 \text{(Solid)} + 3\text{H}_2\text{O} \text{(Vapour)}
\end{align*}
\]

Pollution Potential & Control Measures

Process wastewater will not be generated as total circulating process water will be recycled back in process continuously. Sewage from domestic activities will be generated @1.5 KLD which will be disposed off through septic & soak pit.

Fugitive emissions @ 38kg/day (approx.) from bauxite & lignite storage is anticipated but will be minimal and very local as adequate storage area has been planned with utmost care to prevent dusting outside the project site. Stationary emissions from Boiler, HAG & Calciner will occur which will be managed by provision of stacks of adequate height. For prevention/minimisation of air pollution APCDs like high efficiency ceramic candle filters will be provided as particulates will be the only major pollutant from boiler & HAG.

As revealed from the mass balance data of process and other allied activities of the proposed project, solid/hazardous wastes are expected mainly from the manufacturing process at stage of first filter press after digestion & de-silication process. The waste is identified as very well know terms Iron Oxide Residues, which is the main waste from the proposed project with expected generation rate of 150 TPD(37500 TPA max). Ash generation is also expected from boiler & HAG/Boiler @ 15TPD. Beside of the Iron Oxide Residues, other hazardous wastes are expected in form of used oil @2KL/M & empty drums/containers @10 Nos/Month. The used oil & empty drums will empty drums will be recycled through/by sell to authorised
1.2 BASELINE ENVIRONMENT STATUS

The proposed project is a Greenfield project to be established in Reldi Moti & Kukma villages of Kutch district of Gujarat. Considering the activities & operations described in earlier chapter, it is noted that the impacts of the proposed project would occur on the environmental regimes of project area mainly starting from land to socioeconomic. Further, the provisions of New EIA Notification- SO 1533 are applicable as the proposed project is categorized under Category- 2(b): “B”, which requires the EIA study.

As a primary objective of the present EIA study, the baseline environmental status has been established by conducting a field survey & secondary data collection to ascertain the prevailing environmental quality & related issues which are important to study the impacts of proposed project and to cite necessary mitigation to avoid destruction of prevailing environmental status. The Terms of References approved by SEAC, Gandhinagar, Gujarat for EIA study has been considered for the study to establish baseline environmental status. In addition to the approved TOR, guidelines published by MoEF in EIA manual are also followed. The study was conducted for 5 km radius. The details of the study conducted for establishment of Baseline Environmental Status are described in subsequent section of this chapter under respective heading/title. The details of applicability of SO 1533 and other acts / rules are already discussed in EIA report, which are considered for the baseline study.

The baseline environmental study was done by following the guidelines of MoEF & TORs awarded by SEAC, Gandhinagar, Gujarat. The details of the schedule of the baseline study has been planned considering the awarded TORs. The period of study determined was October 2010 to December 2010 (Winter Season). The required studies as per approved ToRs issued by SEAC, Gandhinagar, Gujarat were covered in the study completed in this
period. The frequency of various environmental sampling & analysis was determined following the guidelines provided by MoEF in EIA Manual.

During the baseline study the samples were collected from the selected location in-line with the planned schedule for environmental sampling & monitoring following methodologies & guidelines suggested by MoEF & CPCB for sampling & analysis. The samples were collected from the selected locations and preserved, stored & analyzed as described in the selected methods for sampling & analysis.

The study area for the baseline study has been fixed within 5 km radial distance from the project site. Five locations for Ambient Air & Noise Monitoring and Ground Water & Soil sampling have been selected. The surface water samples have been collected from two locations.

The details of the selected sampling & monitoring locations are presented below.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particular of Location</th>
<th>Details Environmental Sampling &amp; Monitoring</th>
<th>Approx. Aerial Distance from Site Km.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Project Site</td>
<td>Ambient Air Quality Monitoring</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Groundwater Sampling (Dug Well)</td>
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<tr>
<td></td>
<td></td>
<td>Surface Soil Sampling</td>
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<tr>
<td></td>
<td></td>
<td>Noise Level Monitoring</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Reldi Nani</td>
<td>Ambient Air Quality Monitoring</td>
<td>1.87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Groundwater Sampling (Bore Well)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surface Soil Sampling</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Noise Level Monitoring</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Surface Water Sampling</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Kukma</td>
<td>Ambient Air Quality Monitoring</td>
<td>3.15</td>
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<tr>
<td></td>
<td></td>
<td>Groundwater Sampling (Bore Well)</td>
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<tr>
<td></td>
<td></td>
<td>Surface Soil Sampling</td>
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<tr>
<td></td>
<td></td>
<td>Noise Level Monitoring</td>
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<tr>
<td></td>
<td></td>
<td>Surface Water Sampling</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Kukma -2</td>
<td>Ambient Air Quality Monitoring</td>
<td>2.77</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Groundwater Sampling (Bore Well)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Surface Soil Sampling</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Noise Level Monitoring</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Reldi Moti / Vavdi</td>
<td>Ambient Air Quality Monitoring</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Groundwater Sampling (Bore Well)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surface Soil Sampling</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Noise Level Monitoring</td>
<td></td>
</tr>
</tbody>
</table>
During study it has been noticed that the ambient air quality of the study area remain well within the prescribed limits for residential & sensitive area. No issue of air pollution is observed at any location. Similarly indication of contamination of water and land has not been observed at any location.

The soil of study area is noticed to be heavy clay as per the soil texture classification. This indicates that the hydraulic capacity of soil is low and will result in high runoff during monsoon. The heavy clay indicates low organic content in soil and lower porosity, which may have problem in root growth as well as crop yield. Beside, such soil also requires high irrigation water considering the hydraulic properties of heavy clay. Hence, for agriculture activity & management of soil fertility, systematic approach for organic mulching by adding cow dung or manure or similar organic materials is required. Nutrient availability do not have any issue in heavy clay and if proper organic addition is done with adequately planned irrigation schedule, such soil can be helpful in good yield. As the heavy clay soil is having poor hydraulic properties like infiltration rate and hydraulic conductivity, soil of study area has considerably influenced on groundwater availability with lesser leaching of soluble salt in the soil.

The surface water quality of the region is noticed to be good with respect to the IS 10500: 1991& CPCB classification for surface water. The surface water of Reldi Nani is noticed to be acceptable for drinking purpose and so being suitable for all purpose water resource, whereas the quality of Kukma pond is found to be suitable for non-potable purpose as the TDS, alkalinity, chloride and hardness of the water is found somewhat higher. However, in absence of the other potable resource the pond water of Kukma can be used for potable purpose. No indication of contamination or presence of toxic material is noticed in both cases.

Similarly, the groundwater quality of the study area is noticed to be acceptable for non-potable purpose as higher TDS is noticed in all cases, which indicates issues related with any of the hardness, salinity & alkalinity. Further the fluoride is also noticed in village Kukma, Reldi Moti and project site. However, it has been noticed that compare to other monitored location water quality of Reldi Nani is acceptable for all purpose resource except alkalinity.
which is found slightly higher. No indication of toxic contamination is noticed in all locations and hence in absence of other potable resource, the ground water can be used as drinking water after necessary treatment for hardness & chloride or conventional treatment.

During study period the wind was found to be blowing from NW with average wind speed of 4.35 m/s. The the minimum Daily Temperature is found to be 21.5°C where as the daily maximum temperature is found to be 37.4°C. The average daily temperature is found to be 30.09°C. The relative humidity is found to be 20% as minimum & 96% as maximum. The average humidity during the study period is noticed to be 72.58%. There was four rainy days during study period and the total rainfall during study period was noticed to be 44mm. The average annual rain fall of the area is observed to be 373.7mm as per IMD data for Kutch district.

Ecological layout is noticed to be good with presence of some wild animals. No issue of problem with ecological layout in the area has been noticed. Socioeconomic layout indicated some issues like deprived sex ratio and education level. Besides, the demographic & economic condition is found reasonably well in all villages. The area is provided with all basic public facilities and amenities. All villages are provided with drinking water & power for all purpose.

1.3 ANTICIPATED IMPACTS & MITIGATION MEASURES

During the present study anticipated impacts of the proposed alumina refinery have been identified and described for its significance along with the necessary mitigation measures. Detailed study with various approaches for prediction & evaluation of impacts has been done. The summary of the study of impacts identification, assessment & mitigation are shown below:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Activity</th>
<th>Probable Impacts</th>
<th>Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction Phase</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1      | Site Preparation | Air quality degradation due to exhaust & airborne dust, change in land cover, change in drainage pattern | • Minimal leveling & excavations,  
• Water sprinkling on loose soil,  
• Proper stock piling of excavated materials,  
• No tree felling or clearance of permanent vegetations, |
## Executive Summary

### Sr. No | Activity | Probable Impacts | Mitigation Measures
--- | --- | --- | ---
2 | Material Transportation, Storage & Handling | Air quality degradation due to exhaust & airborne particulate materials like cement, contamination of soil & subsoil water, effects on occupational health & Safety | - adequately planned internal drainage system  
- Property designed & lined covered storage area,  
- EHS manual / procedures for safe work practices,  
- Provision of necessary PPEs for employees  
- Safety officer be appointed to inspect & regulate the activities during construction phase on regular basis.

3 | Constructions of buildings & facilities and civil works | Permanent landuse change, Air quality degradation due to exhaust & airborne particulate materials like cement & soil, provision of temporary bund around site to prevent runoff, preferred use of RMC etc. lined material preparation area, contamination of soil & subsoil water, effects on occupational health & Safety | - Properly managed & barricaded construction area,  
- use of construction waste for road & PCC works,  
- EHS manual / procedures for safe work practices,  
- Provision of necessary PPEs for employees,  
- No clearance of permanent vegetation and development of additional green cover/greenbelt in total 33.5% land of site area.  
- Safety officer be appointed to inspect & regulate the activities during construction phase on regular basis.

4 | Mechanical Works | minor & local air contamination, occupation health & safety issues, waste generation, effects of noise on fauna & human health | - provision of PPEs for employees,  
- EHS manual/procedures for safe work practices,  
- mechanical activities in shaded or enclosed area where & when possible to prevent noise propagation outside the site.  
- Safety officer be appointed to inspect & regulate the activities during construction phase on regular basis.

5 | Operation of vehicles, Machinery/Equipment etc. | temporary & local impacts on air quality, effects of noise on fauna & human health | - proper maintenance to reduce noise & exhaust,  
- properly scheduled use of equipment/machinery  
- turning off unwanted idle vehicles/equipment/machineries,  
- proper maintenance to reduce noise & exhaust,  
- provision for compulsory PUC for vehicles,  
- restriction of load horn,  
- restriction on heavy transportation in night time for route passing through ecological or residential area.

6 | Landscaping | Long term beneficial impacts on local ecological layout, potential reduction in air pollution & noise pollution, improved aesthetic values of site, slightly positive effects on occupational health | - avoidance of clearance of permanent vegetation in site & greenbelt development in 33.5% area of total land including the existing permanent vegetation area in site with dense plantation in and around site.

7 | Electrical & misc. Works | Fire & shock hazards may have adverse effects on structures & occupational health, temporary | - provision of Electrical safety measures & manual/guidelines/procedure for prevention of electrical hazards,
## Executive Summary

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Activity</th>
<th>Probable Impacts</th>
<th>Mitigation Measures</th>
</tr>
</thead>
</table>
| 1      | Transport, storage & handling of Bauxite & lignite | Air contamination due to fugitive dust, increased traffic on roads, soil & groundwater contamination due to seepage from storage area, air pollution & risk due to fire in lignite storage area, impacts on ecological factors due to fugitive dust & fire, | - Designated storage area designed as enclosed & proper control (like fire fighting & water sprinkling) for prevention of dust & other associated hazards.  
- Proper distance of the storage area from other buildings & facilities to prevent spreading of probable hazards  
- Risk assessment shall be conducted after commissioning of plan & necessary safety |
| 2      |          |                  |                     |
| 3      |          |                  |                     |
| 4      |          |                  |                     |
| 5      |          |                  |                     |
| 6      |          |                  |                     |
| 7      |          |                  |                     |
| 8      | Recruitment, Outsourcing & Contracting | Beneficial impacts on local socioeconomic layout due to direct & indirect employment, improved economical prospects of local area due to probable allied business & industries | - provision preference to local people in recruitment /contracting & outsourcing |
| 9      | Administrative & Domestic Activities | Negligible impacts due to water consumption, negligible impacts on impact of sewage generation, slight impacts of sewage/solid waste on air & soil quality up on unmanaged dumping/disposal of domestic wastes. | - Provision of proper sanitation facilities with septic tank & soak pit for management of sewage,  
- adequate domestic water supply system to reduce waste through leak & spill of freshwater,  
- solid waste to be stored in designated area and disposed off through municipal disposal site,  
- Biodegradable wastes like food residues to be composted in greenbelt area and to be used for fertilization of greenbelt. |
| 10     | Installation of Plant & Commissioning | temporary high emission due to utility commissioning, short term high solid waste generation in initial commissioning & stabilization phase, temporary uncontrolled water usage in process | - Water consumption will be minimized after first intake by 100% recycling of process water,  
- stacks & APC will be provided well before commissioning to prevent/minimize impacts on air,  
- solid waste storage & utilization facilities as well as selling operation (to cement industry) will be initiated well with the commissioning activities  
- Environment & Safety officer be appointed to inspect & regulate the activities during commissioning phase on regular basis to prevent/minimize chances of hazards & environmental pollution |
| 11     | Operation Phase | Transport, storage & handling of Bauxite & lignite | Air contamination due to fugitive dust, increased traffic on roads, soil & groundwater contamination due to seepage from storage area, air pollution & risk due to fire in lignite storage area, impacts on ecological factors due to fugitive dust & fire, |
# Executive Summary

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Activity</th>
<th>Probable Impacts</th>
<th>Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>sl. increased load on public transport network</td>
<td>measures shall be implemented as suggested in RA report, • Safety manual &amp; procedures shall be prepared, implemented &amp; made available to all concern employees, • regular safety audit and necessary improvement as suggested by auditor</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Transport, storage &amp; handling of liquid &amp; gaseous fuel</td>
<td>soil &amp; groundwater contamination due to spill &amp; leak from storage area, air pollution due to leak of gaseous fuel, risk due to fire/explosion hazards in storage areas, impacts on ecological factors due to fire &amp; explosion</td>
<td>• Designated/Isolated storage area designed with closed MS tank/Drums &amp; proper control for prevention of fire &amp; other associated hazards, • Proper distance of the storage area from other buildings &amp; facilities to prevent spreading of probable hazards, • Comprehensive risk assessment shall be conducted after commissioning of plan &amp; necessary safety measures shall be implemented as suggested in RA report, • Safety manual &amp; procedures shall be prepared, implemented &amp; made available to all concern employees, • regular safety audit and necessary improvement as suggested by auditor</td>
</tr>
<tr>
<td>3</td>
<td>Transport, storage &amp; handling of chemicals (RM &amp; Products)</td>
<td>Air contamination due to fugitive dust, soil &amp; groundwater contamination due to spill &amp; leak of chemicals from storage area, minor load on public transport network</td>
<td>• Properly lined enclosed storage area, • storage of chemicals in containers/drums / bags in storage area to prevent/minimize chances of spill &amp; leak as well to reduce potential size &amp; impacts of spill/leak if occurred, • provision of necessary PPEs,</td>
</tr>
<tr>
<td>4</td>
<td>Plant operation &amp; Production process</td>
<td>Soil &amp; water contamination due solid waste &amp; effluent, occupational health due to operational hazards, effects on fauna &amp; human health due to noise, beneficial impacts of direct &amp; indirect employment of personnel for operations</td>
<td>• Use of modern technology and modified manufacturing process to reduce waste generation, • minimize resource requirement (Raw Material, fuel, power &amp; water), • novel approach with potential of various optimization scheme of process improvement for maximum product quality &amp; recovery, • latest &amp; efficient technologies for reduction of emissions &amp; solid waste generation, • recovery &amp; recycling of process water to reduce freshwater consumption &amp; to eliminate effluent generation &amp; disposal, filter press for filtering of mother liquor to minimize quantity of wet process wastes by preventing loss of water &amp; soluble raw materials with process waste, • use of flocculent to increase compaction of solids in</td>
</tr>
<tr>
<td>Sr. No</td>
<td>Activity</td>
<td>Probable Impacts</td>
<td>Mitigation Measures</td>
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<tr>
<td></td>
<td></td>
<td>mother liquor before filtering to reduce quantity of wet process waste by reducing of water &amp; soluble raw materials, all safety measures in process area and provision of PPE and safety officer &amp; medical facilities</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Risk assessment shall be conducted after commissioning of plan &amp; necessary safety measures shall be implemented as suggested in RA report, Safety manual &amp; procedures shall be prepared, implemented &amp; made available to all concern employees, regular safety audit and necessary improvement as suggested by auditor</td>
<td></td>
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<tr>
<td></td>
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<td>• APCs are provided considering the probable pollutants from specific utility, stack of adequate height &amp; internal diameter at top with sampling port as per CPCB guidelines, Ceramic Filters with &gt;95% efficiency for HAG, Boiler and calcinator to prevent PM in emission, Provision of dual fired utility to enable switching to cleaner fuel-NG/LNG when available at site</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Operation of Utilities</td>
<td>air contamination due to emissions from utility and fugitive dust from ash removal operation in Boiler, HAG and Calcinator, Ceramic Candle Filters</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Administrative &amp; Domestic activities</td>
<td>Negligible impacts due to water consumption, negligible impacts impact of sewage generation, slight impacts of sewage/solid waste on air &amp; soil quality up on unmanaged dumping /disposal of domestic wastes.</td>
<td>• Provision of proper sanitation facilities with septic tank &amp; soak pit for management of sewage, adequate domestic water supply system to reduce waste through leak &amp; spill of freshwater, solid waste to be stored in designated area and disposed off through municipal disposal site, Biodegradable wastes like food residues to be composted in greenbelt area and to be used for fertilization of greenbelt.</td>
</tr>
<tr>
<td>7</td>
<td>Waste generation, management &amp; disposal</td>
<td>contamination of environment due to improper handling, storage &amp; dumping of wastes, fugitive dust from ash handling &amp; storage, contamination of soil &amp; subsoil water due to spill/leak of wastes as well as seepage of water from waste storage area</td>
<td>• Designated storage area for all waste as per regulatory guideline and suitability of waste utilization, in house use of ash &amp; process waste in brick manufacturing, alternative arrangement for sell of process waste &amp; ash to cement manufacturing unit, disposal of hazardous waste as per regulatory provision by sell of used to authorized recycler or in-house use for suitable lubrication requirements sell of empty drums/container &amp; to authorized scrap dealers use of biodegradable domestic wastes in</td>
</tr>
</tbody>
</table>
## Executive Summary

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Activity</th>
<th>Probable Impacts</th>
<th>Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Natural &amp; manmade disaster &amp; emergency</td>
<td>Catastrophic destructions in premises, casualty &amp; loss of property, ecological destruction &amp; impacts on social layout of area due to catastrophic destruction and similar hazards, eventual impacts on all environmental attributes due to disaster/major accident</td>
<td>• Emergency action plan including on-site &amp; off-site emergency management plan, emergency facilities including fire fighting equipments, medical facilities, evacuation facilities etc.&lt;br&gt;• Comprehensive risk assessment shall be conducted after commissioning of plant, necessary safety measures shall be implemented as suggested in RA report,&lt;br&gt;• Safety manual &amp; procedures shall be prepared, implemented &amp; made available to all concern employees,&lt;br&gt;• regular safety audit and necessary improvement as suggested by auditor</td>
</tr>
<tr>
<td>9</td>
<td>Outsourcing &amp; Contracting</td>
<td>Positive impacts on socioeconomic layout of region</td>
<td>• preference to local people in contracting &amp; outsourcing&lt;br&gt;• labour recruitment shall be done from local area,&lt;br&gt;• local skilled &amp; semiskilled talents suitable for proposed activities shall be appointed with priority to increase local employment potential</td>
</tr>
<tr>
<td>10</td>
<td>Environmental management activities &amp; CSR</td>
<td>Positive impacts on socioeconomic layout of region due to CSR, beneficial impacts of EMS due to minimization of pollution and greenbelt development, economic &amp; environmental benefits due to use of process waste &amp; ash in Brick manufacturing as CSR programs</td>
<td>• regular Environmental Monitoring as per environmental monitoring plan&lt;br&gt;• regular inspection of pollution control devises/technologies and immediate maintenance whenever required,&lt;br&gt;• maximum possible use of ash &amp; solid process waste in Brick manufacturing as CSR program,&lt;br&gt;• preferential availability of produced brick to local people for house &amp; other construction work,&lt;br&gt;• regular budgetary provision for EMS &amp; CSR with necessary revisions&lt;br&gt;• CSR activities for education, health &amp; water conservation including rainwater harvesting,&lt;br&gt;• CSR for wildlife protection &amp; forest conservation,&lt;br&gt;• CSR for social forestry, CSR for awareness about Natural disaster especially for earth quake,&lt;br&gt;• Special relief CSR activities in case of natural disaster and free distribution of brick manufactured from waste for restoration of housing sector after natural disaster,&lt;br&gt;• CSR for agricultural practices with special focus on salinity &amp; aridity in region</td>
</tr>
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1.4 ENVIRONMENT MONITORING & MANAGEMENT PLAN

The approach adopted for environmental management of the proposed Alumina Refinery project focuses on technical, social, economic, cultural, public health and institutional components as described in the following sections.

Techno-scientific Approach

Techno-scientific methods will be used to prevent, control and reduce adverse impacts from the proposed project and associated activities in accordance with best available technology and working practices. Efforts will be made to enhance beneficial impacts and the environmental conditions/health.

Technical approaches will include the following:

- **Cutting & filling and Landscaping** – During site preparation, topsoil will be removed and temporarily stored for cut-fill activities. Temporary topsoil storage periods will be minimized to control erosion and run-off and to maintain topsoil quality. The site will be aligned to avoid runoff from site by keeping elevations possibly along natural topography contours to minimize soil piling and placement during the construction stage. Proper drainage will be provided for storm water. The permanent vegetation will not be cleared and additional plantation will be done to create adequate greenbelt. Minimum possible land will be used for perennial constructions.

- **Air quality management** – During Construction, excavation equipment and construction vehicles will be maintained to ensure emissions are kept to a minimum, particularly during the sourcing of raw material, land clearance and earthworks performed near settlement areas. During planning & operation, manufacturing process and required machineries/equipment of manufacturing will be selected with special focus on reducing the sources of emission by modifying the conventional process of alumina production. The stage of process will be provided with best available technology to reduce the heat, fuel & power requirement as well as cleaner fuel will be used wherever possible. Adequate air pollution control technologies will be installed.

- **Water management** – During construction, reducing adverse impacts on water quality by controlling run-off and soil erosion caused by activities during the pre-construction stage up to the operation stage. Proper storage area and handling facilities will be provided for
construction materials to prevent potentials impacts due to spill/leak. During planning & operation, manufacturing process and required machineries/equipment of manufacturing will be selected with special focus on recycling of water & elimination of effluent disposal by modifying the conventional process of alumina production. The stage of conventional process will be modify to reduce fresh water consumption and to prevent loss or wastage of water in evaporation as well as in products/ solid waste as moisture. Partial heat requirement will be provided by hot air instead of steam to reduce water requirement. Rainwater harvesting program will be designed and implemented to ensure maximum possible harvesting of rainwater and harvested rainwater will be used to meet the partial water requirement of project.

✓ **Waste management** – Managing sanitary and solid/hazardous wastes generated by from proposed project activities such as process utilities, maintenance areas and employee conveyance area & canteen in order to avoid pollution to soil, groundwater and surface water. Solid wastes from process along with ash from utility will be utilized for brick manufacturing (proposed CSR program) or will be sold to cement manufacturing industry. Used oil will be reused as lubricant for proposed project or recycled through authorized recycler/scrap dealers. Empty drums will be recycled through authorized scrap dealers. No material will be disposed off as valueless materials from proposed project by ensuring recycling or reuse of all possible material/wastes.

✓ **Safety & Emergency Response Plan** – Safety & Emergency Response Plan will be prepared through risk assessment study and necessary arrangement for implementation of safety & emergency response plan will be made for any potential emergency and situation such as the fire, explosion, earthquake, etc.

**Socio-Economic, Socio-Cultural And Public Health Approach**

Social, economic, cultural and public health approaches will be implemented to minimize adverse impacts and enhance benefits for the villagers in the vicinity of the project area as a result of the project activities. Particular approaches to be used are as follows:

✓ Respect for local myths, norms, traditions, values and human rights.

✓ Promoting public involvement and participation through transparent project disclosure and capacity building within project-affected family & persons through pre-project public participation/hearing.
Local recruitment and contract policy that favours employment of local people wherever the requisite skills and experience are available within local villages.

- Human resources training and job proficiency skill development.

- Cooperation with qualified local businesses and enterprises along the project location to supply goods and services needed to support the proposed operations and associated project activities.

- Sharing brick manufacturing unit of proposed project with local communities as CSR programs to utilize the solid process waste & ash.

- Implementation of social welfare & upliftment programs including health & education programs as CSR activities to contribute to the well-being and sustainability of the local communities.

- Conduct various social assistance activities for natural disaster management especially earthquake and restoration after natural disaster.

Organizational Approach

The organizational approach plays essential role for an effective environmental management system to help insure integrated control/minimization/prevention of identified & predicted impacts. The project proponent plans to use the following organizational approaches:

- Regularly updating information to improve the intention and understanding of regulations and laws so that project activities conform to laws and regulations as amended timely.

- Development & updating of environmental, health and safety management system adequately to ensure efficient implementation of updated pollution control & safety measures planned & implemented timely.

- Regular budgetary planning & revision thereof for environmental, health and safety management system operations as well as CSR programs.

- Transparency in reporting environmental performance & activities including CRS activities.

- Coordination and cooperation with appropriate regional authority, panchayats, local governments, local communities and other agencies & firms to indemnify sound environmental management of project activities.

Greenbelt development & Resource Conservation

(i) Greenbelt Development

The existing tree plantation in the acquired land / project site is the readily available adequate greenbelt within site. Additional Greenbelt will be created in open land to develop greenbelt
in around 33.5% are of total land of proposed project. It has suggested to plant trees with density of about 1500 trees per hectare around the place available. The management shall ensure that plantation of trees shall include mixture of lower, higher and middle canopy structure, which shall be mixed appropriately / proportionately / uniformly.

(ii) Rainwater Harvesting
The proposed project would have about 50,000 m² area as constructed & paved area which can have potential of rainwater harvesting with runoff co-efficient of 0.7-0.8. The long term average rainfall of the area is noticed to be around 400 mm which can have great potential rainwater harvesting resulting in 20-25 Million litter harvested water quantity considering the available area for RWH as mentioned above. Sufficient land is available in site for creation of harvested rainwater storage facility like pond or lagoon. Proper planning & efficient implementation of RWH programs within the project premises will result in reduction in fresh water intake and conservation of water resources. Further, the earthen pond/lagoon created for storage of harvested rainwater will be significantly helpful in recharging of groundwater due to seepage & hydraulic conductivity.

(iii) Waste Recycling/Reuse and Utilization
- Process water recovery as mother liquid and recycling in production unit
- Process waste from production & fly ash from HAG/Boiler for manufacturing of Bricks & Cement
- Waste heat Recovery & utilization to conserve fuel & reduce emission

Process Water / Mother Liquor Recovery & Recycling
The recovery & lowest loss of process water inform of mother liquor shall be ensured by efficient most filtering techniques like high efficiency filter press. The recovered mother liquor shall be stored in storage tank and then through makeup tank shall be recycled in to the process as process water along with additional freshwater as required. The filter press units installed shall be maintained properly to retain its high efficiency ensuring lowest loss of process water/ mother liquor in filtered waste residues or products. Lowest possible moisture in the filtered waste residues or products shall be ensured to prevent unusual loss of water & soluble raw material. A storage tank for recovered process water / mother liquor shall be
provided and the capacity of the tanks shall be efficient to take care of storage of one day quantity of recovered process water in form of mother liquor.

**Solid waste Utilization**

The wet cake of process waste from filter press shall be collected in plant manually and then transferred to RCC storage Pit in designated storage area. The ash from HAG/Boiler shall be collected at HAG/Boiler area & Candle filters attached with HAG/Boiler with adequate equipment/facilities and then shall be mixed with wet cake of process waste. The waste-ash mixture then shall be transferred to RCC storage Pit in designated storage area. The waste-ash mixture as well as the separate process waste stored in the storage area then shall be sent to brick manufacturing plant or shall be sold to cement industry as found feasible timely to avoid bulk in storage area. Possible use in brick manufacturing shall be increased with time by creating more market & demand in local area as well as nearby city/town.

**Waste heat recovery & utilization**

The waste heat from the process & utilities shall be recovered by installing suitable heat exchanger with suitable heat exchange media. The recovered heat shall be utilized for partial heat requirement for preheating and temperature regulation/control in process. The net fuel consumption shall be reduced in accordance with the recovered waste heat. These actions shall be implemented at suitable stages and for suitable utilities.

**1.5 RISK ASSESSMENT**

As mentioned earlier, three hazardous substances as per MSIHC will be required for proposed project. Considering this company has undergone pre-project Risk assessment study along with the EIA study. Necessary control, preventive, precautionary measures for occupation health & safety will be implemented as suggested in Risk assessment study. The company will strive to be model of management of Health Safety and Environment manager in the region. Some of the general occupational health & safety measures are already planned and are mentioned below.

- All machineries, equipments and allied requisites will be selected & purchased according to IS and other safety recommendations to ensure safety as well as safe work condition in the proposed project premises.
All necessary safeguards/safety measures will be provided as per suggestion of technologies, machinery, equipment suppliers.

Safe work procedures for equipments, machinery and requisites will be acquired from supplier and after necessary changes, such safe work procedures will be made available to all concern employees.

HSE Policy will be formulated with Vision, Commitment and Objectives, for HSE.

HSE Policy will be displayed at various spots of the industrial premises of proposed project and a copy of same in regional languages will also be given to all employees.

HSE objectives & targets will be reviewed from time to time and necessary change for continuous improvement in HSE operations will be made.

Safety plan & safety procedures will be prepared based on the result of ongoing Risk Assessment and Safety Audits to be conducted annually after commissioning of proposed project.

Trained & experienced safety auditors will be appointed to carry out annual safety audit and safety inspection.

Training need assessment will be done during the audit & inspection activities and necessary proactive & reactive safety training programs will be conducted for all level of employees by expert trainers in the field of EHS.

Information & details for HSE by various ways like safety meeting, daily rack up meeting, e-mail, safety leaflets, notice boards, posters etc will be communicated to all employees.

Safe Work Permit system for all non-routine jobs based on risk assessment will be developed & implemented.

Fire fighting system with necessary equipments & facilities will be implemented and maintained.

Inspection/investigations for accidents, incidents, near misses for designing & implementation of corrective and preventive measures will be done on regular basis.

EHS department with health Centre will be provided and will be kept always in function for 24 hours.

Regular health check-up of all employees will be carried out & record of employee health checkup will be kept on regular basis.

Pre-employment and post-employment periodical medical checkup of all employees including contractor’s employees will be carried out.

Necessary workplace monitoring will be done to ensure safe work environment in all plant area as well as other buildings/areas to ensure highest level of occupational health & safety.
1.6 ENVIRONMENT, HEALTH & SAFETY (EHS) MANAGEMENT CELL

The company proposes a cell for Environment, Health & Safety to implement and observe the measures related to the same. We propose to form a cell in order to keep a close watch on the performance of the pollution control equipment, emissions from the sources and the quality of surrounding environment in accordance with the monitoring program. The proposed cell will be also including the safety cell for observing, inspecting & regulating the safety measures inside the plant campus. The cell will be also responsible for maintaining the records of all data, documents and information in line within the legislative requirement and will regularly furnish the same to the relevant authorities.

1.7 CONCLUSION

As it has been observed at different stage of EIA study and described in various chapters of EIA report, the proposed project would not have any major issue of critical or considerable impacts on environment except in case of emission. The proponent has planned many efficient technological measures which will help the unit in its efforts for minimal use of natural resources (bauxite, fossil fuel & water) as well for minimisation or prevention of adverse impacts on environment. The only issue of emission and its impacts on air quality of surrounding area has been identified in earlier stage. As revealed from the mathematical modelling for evaluation of impacts of emission on air quality in terms of incremental GLC, the impacts on air quality will not occur beyond 500-600 mtrs from the project site. Further, the mitigation measures planned (adequate stack & Ceramic Candle Filters) are found efficient to control the pollution. It has been observed that the ambient air quality parameters after the proposed project would remain far below the prescribed norms – NAAQS. Beside, the solid waste utilisation for brick as CSR as well as employment opportunity and potential development of allied businesses will significantly beneficial for the socioeconomic layout of the project area. Thus it is suggested that the proponent shall take care to implement the all planned mitigation measures, EMP to prevent the anticipated impacts.

Considering all the above description it has been concluded that the anticipated adverse impacts from the proposed project would not significant and predicted to be almost neutral with some considerable benefits to socioeconomic layout of the local area, state and nation.