

APPENDIX I

(See Paragraph-6)

FORM 1

Note : If space provided against any parameter is inadequate, Kindly upload supporting document under 'Additional Attachments if any' at the last part of the Form1. Please note that all such Annexures must be part of single pdf document.

(I) Basic Informations

S.No.	Item	Details	
1.	Name of the Project	Mining of heavy mineral sand in Chavara, Thekkumbhagom villages in Karunagapally Taluk, Kollam district for an area of 67 Ha, in NK Block II EE	
2.	Project Sector	Non-Coal Mining	
3.	Location of the project	Chavara and Neendakara villages, Karunagapally Taluk, Kollam District, Kerala	
4.	Shape of the project land Uploaded GPS file Uploaded copy of survey of India Toposheet	Block (Polygon) Annexure-GPS file Annexure-Survey of india toposheet	
5.	Brief summary of project	Annexure-Brief summary of project	
6.	State of the project	Kerala	
Details of State of the project			
S.no	State Name	District Name	Tehsil Name
(1.)	Kerala	Kollam	Karunagappally
7.	Town / Village	Karunagapally	
8.	Plot/Survey/Khasra No.	Sy.No 141,143 to 146,151 to 157,167 to 178,193 to 196,201 to 205,211 to 216,222 to 225,235,236,243 to 246,252,253,255,634,681,689 to 1054,1060 to 1082,1087 to 1108,1115 to 1134,1146 to 1168,1171,1172,1183 to 1186,1212 to 1236, part of Sy.No 1230,1242,1237,1210,1211,1195,1194,1185,1171,1167,1169,1145,1135,1136,1114,1110,1109,1086,1081,1080,1090,1079,1063,1062,1066,1059,1058,1057,1056 to 1060 in Chavara & 1 to 13,655 to 667, part of Sy.No 683,685,676,730,743 & 847 in Neendakara.	

9.	S. No. in the schedule	1(a) Mining of minerals
10.	Proposed capacity/area/length/tonnage to be handled/command area/lease area/number or wells to be drilled	4 lakh tpa ha.
11.	New/Expansion/Modernization	New
12.	Category of project i.e. 'A' or 'B'	A
13.	Does it attract the general condition? If yes, please specify	No
15.	Does it attract the specific condition?	No
16.	Is there any litigation pending against the project?	No
17.	Nearest railway station along with distance in kms.	kollam, 15 km
18.	Nearest airport along with distance in kms	Thiruvananthapuram, 85 km
19.	Nearest Town/City/District Headquarters along with distance in kms	Kollam , 15 km
20.	Details of alternative sites examined shown on a toposheet	No
21.	Whether part of interlinked projects?	No
22.	Whether the proposal involves approval/clearance under the Forest (Conservation)Act,1980?	No
23.	Whether the proposal involves approval/clearance under the wildlife (Protection)Act,1972?	No
24.	Whether the proposal involves approval/clearance under the C.R.Z notification,2011?	Yes
25.	Whether there is any Government Order/Policy relevent/relating to the site? Uploaded Order/Policy	Yes Annexure-Uploaded order/policy
26.	Whether there is any litigation pending against the project and/or land in which the project is proposed to be set up?	No

27. Project Cost(in lacs)

1000

Activity

1 Construction, operation or decommissioning of the Project involving actions, which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.)

S.No	Information/Checklist confirmation	Yes/No	Details there of (with approximate quantities/rates, wherever possible) with source of information data
1.1	Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)	Yes	Temporary changes occur in the topography during mining activity. The mined out area will be refilled instantly
1.2	Clearance of existing land, vegetation and buildings?	Yes	The land has to be acquired and the buildings will be demolished. The vegetation cleared for the mining operation. After completing the mining, the land will be systematically refilled as per the EMP,
1.3	Creation of new land uses?	Yes	The mined out land will be refilled back with non-radioactive free sand pumped out from the dredger
1.4	Pre-construction investigations e.g. bore houses, soil testing?	No	Exploratory bore holes for reserve estimation has already been completed. Pre-construction investigation for buildings etc. is not required as the mined out sand will be transported to the Mineral Separation Plant at Chavara within a distance of 1 km.
1.5	Construction works?	No	No construction work involved. Only clearing the area is needed before dredging of mineral sand.
1.6	Demolition works?	Yes	Demolition of houses within the lease area will be done after paying compensation
1.7	Temporary sites used for construction works or housing of construction workers?	No	A temporary/portable office will be constructed at site which will be cleared after the dredging & back filling is completed.(No construction of houses will be taken up)

1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations and fill or excavations	Yes	Dredging and refilling will be done. Construction of houses will not be done
1.9	Underground works including mining or tunneling?	No	No underground mining or tunneling involved
1.10	Reclamation works?	Yes	After mining the area, the same will be back filled with the tailings generated
1.11	Dredging?	Yes	The proposed area will be dredged out for the collection of heavy minerals and the tailings generated is used for back filling the area
1.12	Offshore structures?	No	No offshore Mining
1.13	Production and manufacturing processes?	Yes	The sand containing heavy minerals like ilmenite, rutile, zircon, monazite, sillimanite etc., will be processed in the Mineral Separation Plant where a part of it is located within the mining lease area.
1.14	Facilities for storage of goods or materials?	Yes	The dredge output is transported to the Mineral Separation Plant. The products from the Mineral Separation Plant is stored in godowns constructed for the purpose in the area
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?	Yes	Tailing of DWUP, HUP and MSP consisting mostly of silica sand will be used for back filling the mined out area. No effluents are generated.
1.16	Facilities for long term housing of operational workers?	No	Housing for operational workers are not provided within the project area.
1.17	New road, rail or sea traffic during construction or operation?	No	Existing roads will be utilized
1.18	New road, rail, air water borne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	No	Not required
1.19	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	No	Not required
1.20	New or diverted transmission lines or pipelines?	Yes	The transmission lines and pipelines has to be diverted during the time of dredging and new lines will be provided after mining
1.21	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	No	No change will occur to the hydrology of the watercourses and aquifers

1.22	Stream crossings?	No	Not required
1.23	Abstraction or transfers of water from ground or surface waters?	No	The excavation will be up to a depth of 8 metres from surface and the water table will be intercepted at a depth of about 2 metres. The dredge will be working in a pond of water and the water used for slurry pumping will be recycled. However, no ground water or surface water will be consumed during the mining operations
1.24	Changes in water bodies or the land surface affecting drainage or run-off?	No	Insignificant changes in hydrology because of dredge mining
1.25	Transport of personnel or materials for construction, operation or decommissioning?	Yes	The area proposed for mining is nearby the Mineral Separation Plant. Transport of personnel or materials can be done by road transport. Water transport from the mining area to the plant may also be explored
1.26	Long-term dismantling or decommissioning or restoration works?	No	The back filled area will be leveled immediately
1.27	Ongoing activity during decommissioning which could have an impact on the environment?	No	No ongoing activity
1.28	Influx of people to an area in either temporarily or permanently?	Yes	People of mine lease area will be given temporary employment during the time of raw sand collection and mining operation
1.29	Introduction of alien species?	No	Coconut, Arecanut, Cashew nut are the available species
1.30	Loss of native species or genetic diversity?	No	The proposed area after mining operation will be refilled to regain its original landscape . Plants and trees will be cultivated in this area and this will enable the area to regain its original genetic diversity
1.31	Any other actions?	No	Nil

2 Use of Natural resources for construction or operation of the Project (such as land, water, materials or energy, especially any resources which are non-renewable or in short supply):

S.No			Details thereof (with approximate
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	Information/Checklist confirmation	Yes/No	quantities/rates, wherever possible) with source of information data
2.1	Land especially undeveloped or agricultural land (ha)	Yes	It is a low lying agriculture land mainly with coconut trees and on the eastern boundary side there are marshy agricultural lands.
2.2	Water (expected source & competing users) unit: KLD	Yes	The dredge will be working in a pond of water and no effluents are generated during its operations. Water used for slurry operations is recycled
2.3	Minerals (MT)	No	Not required
2.4	Construction material – stone, aggregates, sand / soil (expected source – MT)	No	Not required
2.5	Forests and timber (source – MT)	No	Not required
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT),energy (MW)	Yes	Power supply is available from Kerala State Electricity Board (KSEB) 11 KV line. Necessary distribution arrangements will be made in the mining area. No other fuels are used for energy
2.7	Any other natural resources (use appropriate standard units)	No	Not required

3 Use, storage, transport, handling or production of substances or materials, which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health

S.No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
3.1	Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)	No	No substances or materials which are hazardous as per MSIHC rule are used. Monazite, a radio active mineral is mined out making the area radiation free.
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)	No	Not Applicable
3.3	Affect the welfare of people e.g. by changing living conditions?	No	Welfare of the people will be taken care by providing health centre at the mining site and also by arranging medical camps regularly

3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.	No	Not Applicable
3.5	Any other causes	No	Not Applicable

4 Production of solid wastes during construction or operation or decommissioning (MT/month)

S.No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
4.1	Spoil, overburden or mine wastes	Yes	The debris due to demolition of building as well as tailings generated after separation of minerals will be used for back filling of the mined out area. There is no overburden in the deposit
4.2	Municipal waste (domestic and or commercial wastes)	No	No Municipal waste (domestic and or commercial) is generated
4.3	Hazardous wastes (as per Hazardous Waste Management Rules)	No	No hazardous wastes (as per hazardous waste management rules)
4.4	Other industrial process wastes	No	No other industrial process waste is generated at the proposed site
4.5	Surplus product	No	No surplus product is generated
4.6	Sewage sludge or other sludge from effluent treatment	No	No sewage sludge or other sludge from effluent treatment is generated at proposed site
4.7	Construction or demolition wastes	No	The debris due to demolition of buildings will be used for back filling of the mined out area
4.8	Redundant machinery or equipment	No	The machinery deployed for excavation shall be removed after completion of excavation and back filling
4.9	Contaminated soils or other materials	No	Contamination of soils or other materials is unlikely
			The main plantation of the area is coconut, areca nut etc. The waste generated by cutting

4.10	Agricultural wastes	Yes	down the trees will be used for the construction purpose.
4.11	Other solid wastes	No	The debris due to demolition of building as well as tailings generated after separation of minerals will be used for back filling of the mined out area

5 Release of pollutants or any hazardous, toxic or noxious substances to air(Kg/hr)

S.No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources	Yes	The emissions from excavators and tippers will be within permissible limit. Wt % Ash will be < 0.01 and Wt % of Sulphur is 0.7
5.2	Emissions from production processes	No	No emission
5.3	Emissions from materials handling including storage or transport	Yes	The sand transported contains moisture and hence is free of dust. Truck routes will be sprayed with water to prevent dust generation
5.4	Emissions from construction activities including plant and equipment	Yes	Earth moving machineries will be used for excavation, loading and transportation. The emission is negligible
5.5	Dust or odours from handling of materials including construction materials, sewage and waste	No	Since the excavation will be to a depth below the water table, the sand will contain moisture and no dust will be generated.
5.6	Emissions from incineration of waste	No	Nil
5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)	No	Nil
5.8	Emissions from any other sources	No	Nil

6 Generation of Noise and Vibration, and Emissions of Light and Heat:

S.No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
6.1	From operation of equipment e.g. engines, ventilation plant, crushers	Yes	Noise is likely to be generated from earth moving machinery & dredge. The noise level due to operation of excavators and tippers will be between 46 to 62 dBA.
6.2	From industrial or similar processes	No	Not Applicable
6.3	From construction or demolition	No	Not Applicable
6.4	From blasting or piling	No	Not Applicable
6.5	From construction or operational traffic	Yes	Noise is likely to be generated from earth moving machinery & tippers. It will be between 46 to 62 dBA
6.6	From lighting or cooling systems	No	Nil
6.7	From any other sources	No	Nil

7 Risks of contamination of land or water from releases of pollutants into the ground or into sewers, surface waters, groundwater, coastal waters or the sea:

S.No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
7.1	From handling, storage, use or spillage of hazardous materials	No	No Hazardous wastes (as per Hazardous Waste Management Rules) .
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)	No	Not Applicable
7.3	By deposition of pollutants emitted to air into the land or into water	No	Not Applicable
7.4	From any other sources	No	Not Applicable
7.5	Is there a risk of long term build up of pollutants in the environment from these	No	Not Applicable

sources?

8 Risk of accidents during construction or operation of the Project, which could affect human health or the environment

S.No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances	Yes	Since IREL Chavara is an ISO certified organization, all the safety measures as per ISO 14001 and OHSAS 18001 and DGMS will be taken care with respect to spillages, fires etc from storage, handling, use or production of hazardous substances
8.2	From any other causes	No	Nil
8.3	Could the project be affected by natural disasters causing environmental damage (e.g. floods, earthquakes, landslides, cloudburst etc)?	No	No possibility of high risk accidents like landslides, flood, fire, seismic etc. Existing emergency preparedness plans will be followed

9 Factors which should be considered (such as consequential development) which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality

S.No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
9.1	<p>Lead to development of supporting facilities, ancillary development or development stimulated by the project which could have impact on the environment e.g.:</p> <ul style="list-style-type: none"> o Supporting infrastructure (roads, power supply, waste or waste water treatment, etc.) o housing development o extractive industries o supply industries o Other 	Yes	The proposed project is for the mining of heavy minerals. The mining and collection of heavy mineral sands from the area and refilling the area with the waste materials from the mineral separation plant .

9.2	Lead to after-use of the site, which could have an impact on the environment	Yes	Positive impact. The mining and collection of heavy mineral sands from the area and refilling the area with the waste materials generated for the rehabilitation will lead to restore the topography of the area
9.3	Set a precedent for later developments	Yes	The area refilled after the mining activities in the Karithura and Kovilthottam were rehabilitated by the locals
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects	No	Nil

(III) Environmental Sensitivity

S.No	Areas	Name/Identity	Aerial distance (within 15km.) Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	No	Not in the protected area
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	Yes	The detailed information will be available in the CRZ status report prepared by NCESS, Thiruvananthapuram. The important water bodies are 1. T.S. Canal 0.050 km 2. Vatta kayal 6.000 km 3. Arabian Sea 0.050km
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	No	Nil
4	Inland, coastal, marine or underground waters	Yes	1.T.S. Canal 0.050 km 2.Arabian Sea 0.050 km 3.Sasthamkotta kayal 13 km 4Vattakayal 6 km
5	State, National boundaries	No	Nil
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	Yes	NH 47-2 km
7	Defence installations	No	Nil
8	Densely populated or built-up area	Yes	Chavara and Neendakara Villages-0.050 km

9	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	Yes	The detailed information is available in the EIA report.
10	Areas containing important, high quality or scarce resources.(ground water resources,surface resources,forestry,agriculture,fisheries,tourism,minerals)	No	Nil
11	Areas already subjected to pollution or environmental damage.(those where existing legal environmental standards are exceeded)	No	Nil
12	Areas susceptible to natural hazard which could cause the project to present environmental problems (earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions) similar effects	No	Nil

(IV) PROPOSED TERMS OF REFERENCE FOR EIA STUDIES

1	Uploaded Proposed TOR File	Annexure-TOR file
2	Uploaded scanned copy of covering letter	Annexure-scanned copy of covering letter
3	Uploaded Pre-Feasibility report(PFR)	Annexure-PFR
4	Uploaded additional attachments(only single pdf file)	Annexure-Additional attachments

	Uploaded Approval of mining Plan	Annexure-Uploaded Approval of mining plan
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(V) Undertaking

The aforesaid application and documents furnished here with are true to my knowledge

V.(i)	Name of Applicant Designation Name of Company(Applicant Name should not be given here) Address	A.J.Janarthanan HEAD INDIAN RARE EARTHS LIMITED Plot No 1206 Veer Savarkar Marg Near Sidhivinayak Temple,Prabhadevi,Mumbai-28
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PRE-FEASIBILITY REPORT

Indian Rare Earths Limited (IREL) is a Government of India Undertaking under the Administrative Control of Department of Atomic Energy. Indian Rare Earths (IREL) has been engaged in the mining and beneficiation of the heavy minerals from the Chavara deposit in Kollam district of Kerala state since 1965. Besides Chavara, IREL has plants at Manavalakurichi in Kanyakumari district (Tamil Nadu) and at Chatrapur in Ganjam District (Odisha).

Mining of heavy mineral sand for an area of 67 Ha.is granted to Indian Rare Earths Limited, Chavara (G.O (Ms) No. 147/98/ID Dated 21/10/1998 by the Government of Kerala.The lease is valid up to 2019.

IREL has appointed NIIST – (CSIR) – Thiruvananthapuram, to evaluate the environmental aspects and their possible associated impacts that would arise due to the proposed heavy mineral sand mining operations and to work out environmental management plans and environmental monitoring programme to prevent, control, minimize or eliminate the adverse environmental impacts envisaged from the mining activity.

The field studies shall be carried out for the study area (buffer zone) within 10 km radius with the IRE-ML area (core area) at the centre. No major industries exist in the core area except M/s Kerala Minerals & Metals Limited (KMML) which is about 2.5 km from the IREL Mineral Separation Plant. The mining lease about 2 km from the IREL processing plant at Chavara.

EIA study is a well recognized, effective planning tool which ensures environmentally sound activity. In this report the impacts on relevant discipline of environment due to the operation of the proposed project have been identified and assessed quantitatively as far as possible. Environmental management programme for mitigation of impacts are delineated. An environmental monitoring programme has been suggested for post operational phase of the project. The monitoring programme of specifies the locations, parameters and frequency of monitoring of significant aspects. Capacity building in terms of staff, technical expertise and monitoring facilities are also suggested.

Improved roads and communication, electrical facilities already exists. The report shall lay stress on the probable occupational health hazards involved and the remedial measures.

The present ML area does not come under 'forest land' and hence no compensatory afforestation is required.

Data regarding the existing socioeconomic conditions shall be collected and Social Impact Assessment (SIA) will be prepared and the R & R scheme will be formulated.

2 Introduction of the Project/Back Ground Information

In the year 1965, Indian Rare Earths Limited, succeeded in taking over the assets of two companies viz M/s Travancore Mineral Concern and M/s Hopkins & Williams Ltd, and rationalized and reorganized the production of economic mineral outputs from the Chavara sand deposits. Initially, their activities were confined to the utilization of beach washings containing the rich heavy minerals deposited over the beach by the wave action between high and low watermarks. The Atomic Minerals Directorate for Exploration and Research under the Department of Atomic Energy carried out geological exploration of the area and the company is engaged in inland dredge mining operation since 1990.

The deposit of heavy minerals is commonly known as “Chavara deposits”. It occurs in a 22.5 km long barrier beach with an average width of 200 m between the two tidal channels at Neendakara in the south and Kayamkulam in the north. The western part of the deposit is bounded by the Arabian Sea. The deposit is seen to extend beyond Kayamkulam estuary (or Pozhi) up to Thottapalli but the area to the North of the Pozhi has not been mined so far. The area south of Kayamkulam Pozhi has been under intensive mining since 1932. During this period, it was the main center for export of Ilmenite. This has been the only deposit so far on the Indian coast, to have a heavy mineral content running as high as 60 to 76 %. Also the Chavara Ilmenite known as Quilon grade or ‘Q’ grade ilmenite has high TiO_2 content of 59 to 60%.

2.1 Brief description of the nature of the Project

Sand mining is carried out by dredging. The raw material collected from the different mining lease areas is the feed material for the mineral separation plant (MSP).

The process employed at MSP is based on the physical properties of the minerals such as magnetic susceptibility, electrical conductivity, size, specific gravity etc and no chemical process is involved. Low intensity magnetic separators separate the highly magnetic Ilmenite and high intensity separators separate weakly magnetic Monazite. The electrical conductivity of the mineral is utilized to separate the conductive Ilmenite & Rutile and ‘non-conductive’ Zircon and Sillimanite.

The mineral sand from different mining areas as well as dredged sand from DWUP site is fed to HUP, where it is passed through a set of spirals and is separated into heavies and tailings (lighter) fractions. The heavies are passed through Wet High Intensity Magnetic Separator (WHIMS) to get magnetic and non- magnetic fractions.

The dewatered Magnetic Fraction of WHIMS from HUP is dried in Fluidized Bed Drier (FBD) and is fed to the High Tension Separators (HTS) to get conducting fraction which is the Ilmenite product and non-conducting fraction, which is enriched in Monazite, is sent to monazite plant for further processing.

The dewatered Non-magnetic Fraction of WHIMS from HUP is dried in another FBD and fed to HTS to get conducting fraction and non-conducting fractions.

The conducting fraction is fed to Magnetic separators to get three fractions viz;

- Magnetics (Ilmenite product)
- Non-magnetic (Rutile product) and
- Middling fraction (Leucoxene product)

The non-conducting fraction from the HTS in Rutile plant is fed to another set of Magnetic separators, the Magnetic fraction of which is fed to Monazite circuit. The heavies fraction from these spirals is further upgraded through Wet Tables, Magnetic Separators, HTS etc to produce Zircon product. The tailings from the spirals are treated in Kelsey Jig and wet tables to recover Zircon. The tailings fraction from Kelsey Jig is treated in Spirals, Flotation cells etc to produce sillimanite product.

2.2 Need of the Project and its importance to the country and or region

Beach sand of this region consists of several important minerals of industrial importance. The major minerals present are Ilmenite, Rutile, Zircon, Sillimanite and Monazite. Monazite is a source of Rare-Earths and Thorium. Mining of these valuable minerals are required to meet the demands of several user industries in the state as well in the country.

Ilmenite (FeO TiO_2) is the main raw material for the Titanium Dioxide Pigment and Titanium Metal industry. The Ilmenite is sold to the nearby industries Kerala Minerals and Metals limited (KMML) and Travancore Titanium Products (TTP) for production of Titanium pigment, Cochin Minerals and Rutilites Limited (CMRL) for manufacturing synthetic rutile.

Rutile (TiO_2) is used for the manufacture of TiO_2 pigment, welding electrodes and titanium metal & its alloys. Titanium is very light corrosion resistant and erosion resistant and is used in highly corrosive environment as alloys. Titanium metal is also extensively used in aircraft industry.

Zircon ($\text{ZrO}_2 \text{ SiO}_2$) is used in the production of foundry moulds, refractory bricks and crucibles, and in the ceramic industry as opacifier. Zirconium alloys are used for nuclear power reactors and as jet engine parts in Aircraft industry. Zirconium Alloys are also extensively used in the manufacture of surgical instruments.

Sillimanite ($\text{Al}_2\text{O}_3 \text{ SiO}_2$) finds the largest application in the manufacture of refractory products for lining furnaces and it is also used in ceramic industry.

Monazite ($\text{Ce, Y, La, Th (PO}_4$) is a phosphate of rare earths with variable amounts of thorium usually combined with silicate or phosphate. Thorium is largely used as a breeder in the Nuclear Reactors. Mixtures of rare earths are used in glass polishing, arc

carbons and flint for lighters. They are used in optical lenses, prisms, television tubes, faceplates etc. Monazite contains 0.3% of Uranium and 8-9% of thorium which are of strategic importance.

2.3 Demand – Supply Gap

The demand for Ilmenite in the state is approximately 2 lakh tons. IREL is currently able to supply less than 50% of the quantity of Ilmenite due to shortage of Raw sand.

There is also a huge demand for minerals like Rutile, Zircon and Sillimanite for use in the state and across the country. Due to shortage of the above minerals the users have to resort to imports. IREL Chavara unit is currently able to meet only above 25% of the demand of Zircon and Sillimanite

2.4 Imports Vs Indigenous production

The end uses of the minerals supplied by IREL are mostly substitutes.

2.5 Export Possibility

There is huge export potential for Ilmenite and Sillimanite in the overseas market.

2.6 Domestic and Export Market

The user industries of our minerals are spread across the country. IREL caters the requirements of a wide range of industries viz pigment, ceramics (traditional and advance), foundry, refractory, abrasive, electronics, automobiles, chemicals, metals & alloys, sports, air-craft, satellite launch vehicle, health care and medical, optics, nuclear power etc.

The major export market includes US and Japan etc.

2.7 Employment Generation (Direct and Indirect) due to the Project

The mining and plant operation in this area is being carried out for the last 40 years and the various personnel for running the plant and the mines shall be maintained. IREL manpower will be utilized. However, indirect employment to the locals (~50 temporary workers) is envisaged.

3.0 Project Description

The mining lease is located in the Neendakara-Kayamkulam (NK) belt of beach sand deposit (Survey of India Toposheet no. 58 D/9). The coastal strip from Neendakara to Kayamkulam was divided into 8 blocks for sanctioning mining lease by Kerala Government. The mining lease areas even four blocks have been allotted to IREL, whereas the odd four blocks have been allotted to Kerala Minerals and Metals limited (KMML). The coastal deposits are placer deposits formed between the two tidal

channels and are deposited along the coast by the tidal action. The raw sand mined from the beach is used as feed to the mineral separation plant for the separation of mineral like Ilmenite, Sillimanite, Zircon, Rutile, Leucosene and Monazite.

4.0 Site Analysis

The area applied for the lease has been extensively explored by AMDER in the year 1971 and the reserve with a heavy mineral content of 12%, which is as estimated was 67,50,000 tonnes. AMDER will be doing the detailed exploration work in this area to ascertain the reserves/resources of the area as per UNFC codification.

4.1 Connectivity

The mining area is well connected by both all weather roads and National Waterways (NW -3). Mineral Separation plant is within the lease area which is about 14 km from Kollam town and the nearest railway station is Kollam. Export of minerals is through Cochin port, which is about 130 km from the plant site.

4.2 Land Form, Land Use and Land Ownership

The land is flat. There is no forest area in the mining lease area. There is no stream in the area. the area is mostly inhabited with fisherman community people. Most of the land is under possession of IREL.

4.3 Topography

The area of the mining lease is marked on the Survey of India Topo-sheet No. 58 D/9

Latitude: $8^{\circ} 58'07''$ to $8^{\circ} 59' 00''$

Longitude: $76^{\circ} 31' 35''$ to $76^{\circ} 31' 56''$

4.4 Existing Land use pattern

Mostly the area is now lying agricultural land with coconut trees. There is no Natural Park, wild life sanctuary and national monuments existing in the present lease hold area. The detail land use area will be given in the EIA report.

4.5 Existing Infrastructure

The proposed lease area contain Mineral Separation plant building and other infrastructure.

4.6 Soil Classification

Soil analysis will be carried out as a part of the EIA study.

4.7 Climate data from secondary source.

Kollam district has a tropical humid climate, with an oppressive summer. The hot

season from March to May is followed by the southwest monsoon season from June to September. October – November may be termed the post monsoon or the retreating monsoon season. December to February is the northeast monsoon season.

Temperature

There are three observatories in the adjacent districts, two at Thiruvananthapuram and one at Kovalam. Of the two observatories at Thiruvananthapuram, one is in the city and other is at the aerodrome. The description that follows is based on the Thiruvananthapuram observatory (city) data. The temperature and other meteorological conditions are fairly uniform throughout the district except on the Ghats, and hence the data of Thiruvananthapuram is taken as representative of the district. The temperature variations through the seasons are not large. March, April and May are the hottest months, the mean daily maximum temperature being of the order of 30.5⁰C. On some days the maximum temperature may reach 36⁰C. In April and May, the oppressive heat is relieved somewhat by thundershowers. With the onset of the monsoon by the end of May, the weather becomes cooler. After September, the day temperature increases gradually till they reach maximum in the hot season. The average daily minimum temperature during December to February is 22.6⁰ C.

Humidity

The air is highly humid almost all the year around, the relative humidity being over 75%. The relative humidity during the months in December to May is slightly less than that during the rest of the year.

Cloudness

Skies are heavily clouded or overcast on most of the days in the monsoon months and to a lesser extent in the post monsoon months. In the summer and post monsoon months cloudiness generally increases in the afternoons. During the rest of the year skies are highly clouded or clear.

Winds

Winds are moderate to strong during the months of May to September. In other months they are light to moderate. Wind speeds are generally more in the afternoons in the non-monsoon months. During the period of December to February winds are northeasterly or easterly in the mornings and westerly or south-westerly in the afternoons. In the summer months they are mainly northwesterly or northerly in the mornings backing to a more westerly direction in the afternoons. In the monsoon months winds blow from directions between west and north, afternoon winds being more westerly than in the mornings and westerly to northwesterly in the afternoons. In November winds are light and variable and in the afternoons they blow from directions between south west and northwest. Wind rose diagram plotted season wise from data of Alappuzha meteorological station is given as Annexure

4.8 Social Infrastructure available

IREL is spending around Rs 1.0 to 1.50 crores every year for Corporate Social Responsibilities (CSR) activities. A hospital with two Doctors and required number of staff for assistance is maintained in the plant. Canteen is maintained in the plant area for the convenience of workers.

5.0 Planning Brief

The existing mining lease area is under possession and operation of IREL since 1970. The mining is carried out both by manual and mechanized method.

Mining is carried out by mechanized method using a cutter suction dredger. The mineral sand will be mined out up to the depth of its occurrence and concentrating the dredge output using the gravity concentrators. The waste sand from the Dredge and Wet Up-gradation Plant (DWUP) will be pumped back to the dredge pond for backfilling. The whole equipment for these is mounted on a set of pontoons and will be floating in the dredge pond. This unit is called DWUP. The concentrate from the DWUP is pumped to the land for discharge as a heap. This concentrate is transported to the Heavy Up-gradation Plant (HUP_) for further treatment to produce marketable minerals products.

The Mining operation goes hand in hand with reclamation. About 50% of the raw sand will be deposited back to the mining area and will be used to reclaim the mined area. The effect of operation will be restricted to the dredging pond. At all stages efforts will be taken to ensure that environmental impact of the operation is minimum. Since it is a wet process, no dust is generated. The concentration in DWUP is purely physical process and no chemicals are used. No effluent is also generated.

6.0 Proposed Infrastructure

An office cum store is separately maintained. A first Aid room is also maintained with suitable staff in the area for the benefit of the workers. A small site workshop is used, as no major machinery is used for the working. Drinking water is supplied by Kerala Water Authority.

7.0 Rehabilitation and Resettlement (R & R) Plan

IREL is having a Rehabilitation and Resettlement package formulated in co-ordination with District Administration, local people and IREL. The same will be followed.

8.0 Project Schedule and Cost Estimates

This is the existing mining lease area under possession and operation of IREL since 1970. The cost estimated is 10 crores

9.0 Analysis of Proposal

- Mining and mineral processing involve transportation activity for day to day operation. Substantial amount of revenue is expected to be generated by transportation activities along with employment e.g. labour, helper, etc. Project authorities shall engage (on contract) the local people for transportation or at least can arrange for loading and unloading heavies/tailings by local people.
- In case of direct manpower required for mining and mineral processing operations, local people are employed as much as possible especially in the categories of unskilled and semi skilled labours subject to rules and procedures in vogue for Public Sector undertakings.
- A section of local youth are trained in phases so that they can take up some jobs (mining contractor ship, building contractor ship, supply of mining/MSP materials and also small scale rural business developments) of their own (self employment) or in mines (on contract basis) or elsewhere.
- IRE is providing training from time to time for improved agro-techniques, first aid and safety, adult literacy programme to the villagers.
- IRE is providing regular grant to neighbouring schools and constant encouragement for cultural activities in local villages.