ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR DEVELOPMENT OF INTERNATIONAL CONTAINER TRANSHIPMENT TERMINAL

AT VIZHINJAM, THIRUVANANTHAPURAM DISTRICT, KERALA

Prepared For

VIZHINJAM INTERNATIONAL SEAPORT LIMITED (VISL)

Form I & ToR

April 2011

Prepared By

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C1101302
RP001, Rev.B

L&T-RAMBØLL CONSULTING ENGINEERS LIMITED

Client: **Vizhinjam International Seaport Limited**
[Government of Kerala]

Project: Development of Vizhinjam International Container Transhipment Terminal at Vizhinjam

Project No.: C1101302

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Revision Details:

Rev.	Date	Details	Prepared Init.	Prepared Sign.	Checked Init.	Checked Sign.	Approved Init.	Approved Sign.
B	01.04.2011	Second Submission	KRN		CVS		CVS	
A	01.10.2010	Second Submission	KRN		BRT		CVS	
0	20.08.2010	First Submission	NVR KRN VCF		SAP		CVS	

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Form 1

1 Basic Information

S. No	Item	Details
1.	Name of the Project	Development of Vizhinjam International Container Transhipment Terminal at Vizhinjam
2	S.No. in the schedule	Activity 7(E)
3	Proposed capacity/area/length/tonnage to be handled / command area/lease area/number of wells to be drilled	International Container Transhipment Terminal at Vizhinjam is proposed to develop in Three (3) phases. Proposed Capacity: Container Terminal • Phase I (2019): 700,000 TEU • Phase I (2029)I:1,600,000 TEU • Phase III (2044): 2,850,000 TEU Multi- purpose Terminal • Phase I:107,000 tons • Phase II:359,000 tons • Phase III: 777,000 tons Proposed Area: • Phase I: 26 ha • Phase II: 24 ha • Phase III: 30 ha
4	New/ Expansion/Modernisation	New Project
5	Existing Capacity/Area etc	Not Applicable
6	Category of Project i.e., 'A 'or 'B'	'A'
7	Does it attract the general condition? If yes, please specify	Not Applicable
8	Does it attract the specific condition? If yes, please specify	Not Applicable
9	Location	Project Site located between Latitude $8^0$22' 20" N and Longitude 77^0E Location map is given as **Figure FD0101**
	Plot/Survey/Khasra No.	Reclaimed land
	Village	Vizhinjam
	Tehsil	Neyyattinkara
	District	Thiruvananthapuram
	State	Kerala
10	Name of the applicant	**Vizhinjam International Seaport Limited (VISL)**

S. No	Item	Details
11	Registered Address	3rd Floor, Trans Towers, Vazhuthacaud, Thiruvananthapuram – 695 014 Kerala
12	Address for correspondence:	3rd Floor, Trans Towers, Vazhuthacaud, Thiruvananthapuram – 695 014 Kerala
	Name	Mr. Manoj Joshi, I.A.S
	Designation(Owner/Partner/CEO)	Managing Director & Chief Executive Officer
	Address	3rd Floor, Trans Towers, Vazhuthacaud, Thiruvananthapuram – 695 014 Kerala
	Pin code	695014
	E-mail	secyports.ker@nic.in ceo@vizhinjamport.in
	Telephone No	0471-6542484, 09496001600
	Fax No	+91 471 2328616
13	Details of Alternative Sites examined, if any. Location of these sites should be shown on a Toposheet.	Following three potential sites were considered for port development. • Site A: Located south of Vizhinjam fishing harbour to the promontory of coastal hillocks 2.5 km further south-east. • Site B: Located near Karichal River towards Southeast of fishing harbour. • Site C: Located near backwaters around the mouth of River Neyyar, from Poovar towards Southeast Based on site selection study, Site A was found most favourable. Location of Alternative Sites on Survey of India (SoI) Toposheet is given as **Figure FD0102**.
14	Interlined Projects	Proposed road-rail connectivity to Vizhinjam port
15	Whether separate application of interlined project has been submitted.	No
16	If yes, date of submission	-
17	If no, reason	Details regarding proposed road-rail connectivity will be covered in the EIA study of proposed International Container Transhipment Terminal
18	Whether the proposal involves approval/ clearance under: The Forest (Conservation) Act, 1980 The Wildlife (Protection) Act,1972	The proposed project/development attracts The CRZ Notification, 1991 (as amended).

S. No	Item	Details
	The CRZ Notofication,1991	Physical demarcation of HTL, LTL and delineation of CRZ boundaries for the project site were carried out by Centre for Earth Science Studies, Thiruvananthapuram Map showing HTL/LTL, CRZ set back lines is given as **Appendix A** The proposed project will not invlove any forest land or wildlife sanctuary.
19	Forest land involved (hectare)	Nil
20	Whether there is any litigation pending against the project and/or land in which the project is proposed to be set up Name of the court Case no Orders/ directions of the court, if any and its relevance with the proposed project.	No

2 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 thereof (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	There will be a permanent change in land use, land cover and topography due rail and road connectivity to proposed development of International Container Transhipment Terminal. Area to be developed in the sea (reclaimed land) : • Phase I: 26 ha • Phase II: 24 ha • Phase III: 30 ha
1.2	Clearance of existing land, vegetation and buildings?	Yes	Since the port is coming in the reclaimed land there won't be clearance of vegetation and buildings etc Whereas, for rail/road connectivity, few structures like individual houses and buildings fields of banana, coconut and tapioca etc to be cleared off. The details will be given in the EIA report.
1.3	Creation of new land uses?	Yes	As per the requirement of proposed development
1.4	Pre-construction investigations e.g. bore houses, soil testing?	Yes	Geotechnical investigations were carried out.
1.5	Construction works?	Yes	• Berths • Dredging • Reclamation • Breakwaters • Internal Road/ Rail network • External Road/Rail network • Cargo storage and handling facilities • Utilities, amenities and services
1.6	Demolition works?	Yes	Few individual structures need to be demolished as discussed in section 1.2
1.7	Temporary sites used for construction works or housing of construction workers?	Yes	Construction worker camps with all amenities such as power, supply, water supply, fuel, sanitation etc., will be provided to make it self

S. No.	Information / Checklist Confirmation	Yes / No	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
			sufficient. The workers camps will be located away from coast and habitations to avoid any conflict.
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations	Yes	The common infrastructure facilities like maintenance buildings, customs and security buildings, traffic offices, amenity buildings, ware houses, Transit sheds shall be developed as part of the port requirements
1.9	Underground works including mining or tunneling?	No	-
1.10	Reclamation works?	Yes	Reclamation shall be carried out in the backup area for providing landside facilities. Material required for reclamation is as follows: • Phase I: 3.3 MCM[1] • Phase II & III: 3.3 MCM
1.11	Dredging?	Yes	Dredging will be carried out at berthing area, turning circle, approach channel and material required for reclamation. The estimated dredging quantities are as follows: • Phase I: 2.4 MCM • Phase II&III: 3.9 MCM
1.12	Offshore structures?	Yes	• Breakwaters • Container & Multi-purpose Cargo Terminal
1.13	Production and manufacturing processes?	No	-
1.14	Facilities for storage of goods or materials?	Yes	Terminal yards for storage of cargo/ containers
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?	Yes	Treatment facilities such as Effluent Treatment Plant (ETP), Sewage Treatment Plant (STP) will be provided.
1.16	Facilities for long term housing of operational workers?	Yes	SPC/Operator to provide the township area

[1] Million Cubic Metre

S. No.	Information / Checklist Confirmation	Yes / No	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
1.17	New road, rail or sea traffic during construction or operation?	Yes	• Construction phase Movement of quarry material, construction material, equipment general traffic • Operational phase Inland cargo movement, general traffic
1.18	New road, rail, air waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	Yes	A new road alignment of 1.9 km connecting Vizhinjam port to NH-47 bypass is proposed A new rail corridor of ~10 km length connecting Vizhinjam port to Southern Railway main line at Balarampuram junction is proposed. The road/rail connectivity will be developed by Government of Kerala and VISL.
1.19	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	No	-
1.20	New or diverted transmission lines or pipelines?	Yes	Power will be supplied by Kerala State Electricity Board for the proposed port; accordingly new transmission lines will be laid. New internal transmission lines and pipelines will also be laid as per the requirement.
1.21	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	Yes	Culverts shall be constructed as per the project requirement
1.22	Stream crossings?	No	-
1.23	Abstraction or transfers of water from ground or surface waters?	Yes	The proposed water source for the port project is Vellayani lake. Water will be supplied by VISL through a dedicated water supply project.
1.24	Changes in water bodies or the land surface affecting drainage or run-off?	No	Reclamation activities at the port site will be planned in such a way that natural drainage or runoff will not be affected.
1.25	Transport of personnel or materials for construction, operation or decommissioning?	Yes	During construction and operational phase by road/rail.
1.26	Long-term dismantling or decommissioning or restoration works?	No	-

S. No.	Information / Checklist Confirmation	Yes / No	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
1.27	Ongoing activity during decommissioning which could have an impact on the environment?	No	-
1.28	Influx of people to an area in either temporarily or permanently?	Yes	• Temporary Influx of people during construction phase • Significant population influx is expected during operational phase as world class port is bound to attract investors to Vizhinjam
1.29	Introduction of alien species?	No	-
1.30	Loss of native species or genetic diversity?	No	-
1.31	Any other actions?	No	-

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

S. No.	Information /Checklist Confirmation	Yes / No	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
2.1	Land especially undeveloped or agricultural land (ha)	No	Reclaimed land (Port is developed at sea)
2.2	Water (expected source & competing users) unit: KLD	Yes	• .Construction phase: o Requirement: 10 KLD o Source: VISL, through a dedicated water supply scheme. • Operational phase: o Requirement – 30 KLD o Source: VISL, through a dedicated water supply scheme. Government of Kerala allotted 3000 KLD of water from Vellayani fresh lake which is located at about 7.0 km from Port Site.
2.3	Minerals (MT)	No	
2.4	Construction material – stone, aggregates, sand / soil (expected source – MT)	Yes	Construction material will be sourced from an approved quarry site Quarry volume is equal to: o Phase I: – 6.5 Million MT o Phase II: – 1 Million MT

S. No.	Information /Checklist Confirmation	Yes / No	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
			○ Phase III: – 4 Million MT
2.5	Forests and timber (source –MT)	No	-
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)	Yes	• Construction Phase: ○ Power requirement – 5 MVA ○ Source: Kerala State Electricity Board • Operational Phase: ○ Power requirement ○ Phase I: – 11 MVA ○ Phase III: – 35 MW (cumulative) ○ Source: Kerala State Electricity Board
2.7	Any other natural resources (use appropriate standard units)	No	-

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)	Yes	Storage and handling of Fertiliser & Fertiliser raw material (FRM), timber etc will be handled with requisite spill control, fire fighting and safety measures.
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)	No	-
3.3	Affect the welfare of people e.g. by changing living conditions?	No	-
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.,	No	-

S. No.	Information / Checklist Confirmation	Yes / No	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
3.5	Any other causes	No	-

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	No	-
4.2	Municipal waste (domestic and or commercial wastes)	Yes	Details regarding quantifications, collection, handling and disposal / management shall be covered in the EIA study.
4.3	Hazardous wastes (as per Hazardous Waste Management Rules)	Yes	Used oil and other waste will be stored in closed drums and be transferred to authorized pre-processors.
4.4	Other industrial process wastes	No	-
4.5	Surplus product	No	-
4.6	Sewage sludge or other sludge from effluent treatment	Yes	Sludge generated from STP will be used as manure for greenbelt development; Sludge generated from ETP shall be disposed off as per KSPCB/CPCB guidelines or norms.
4.7	Construction or demolition wastes		Construction waste to the extent possible will be utilised in the port premises for site grading etc., and remaining waste will be disposed off suitably as per KSPCB guidelines.
4.8	Redundant machinery or equipment	No	-
4.9	Contaminated soils or other materials	No	-
4.10	Agricultural wastes	No	-
4.11	Other solid wastes	No	-

5. Release of pollutants or any hazardous, toxic or noxious substances to air

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	• Emissions from construction machinery, dredgers and vehicular movements during construction and operational phases. • All such vehicles and DG sets will have Pollution Under Control (PUC) Certificate as applicable
5.2	Emissions from production processes	No	-
5.3	Emissions from materials handling including storage or transport	Yes	Fugitive dust emissions are anticipated from unloading/loading/transfer points. The impacts due to emissions shall be covered in EIA study.
5.4	Emissions from construction activities including plant and equipment	Yes	• Construction equipment and vehicles • Fugitive dust emissions during transport of construction material
5.5	Dust or odours from handling of materials including construction materials, sewage and waste	Yes	• Dust due to handling of construction material during construction phase • Dust due to cargo handling • Odour from Sewage Treatment Plant (STP) Dust suppression measures will be proposed and the details will be provided in the EIA report.
5.6	Emissions from incineration of waste	No	-
5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)	No	-
5.8	Emissions from any other sources	No	-

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 generating sources during construction phase • Dredging • Reclamation • Breakwater construction • Diesel engines of dredgers, work boats, barges • DG sets Noise generating source during operational phase • Container Handling Equipment (RTGs/Cranes/Reach Stackers) • Containers • Back up DG sets • Road trucks However, equipment will be deployed with noise mitigating devices and conforming to applicable standards.
6.2	From industrial or similar processes	No	-
6.3	From construction or demolition	Yes	• Excavators • Dumpers • Compressors • Trucks etc. Personnel Protection Equipment will be provided during construction activities.
6.4	From blasting or piling	Yes	There will be piling activity. However Personal Protection Equipment (PPE) will be provided to workers.
6.5	From construction or operational traffic	Yes	From vehicular and inland cargo movement, and rock transport
6.6	From lighting or cooling systems	No	-

S. No.	Information / Checklist Confirmation	Yes / No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
6.7	From any other sources	No	-

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	Yes	Spills do not occur during normal operations, as the cargo will be handled using Mechanised cargo handling systems. In the event of accidental spills of cargo during transfer from / to the ships, the marine water quality and sediment quality in the harbour basin can be changed. Measures shall be taken to recover the spills in order to minimise the impacts on marine water quality. The hazardous material will be stored and handled as per the provisions of the Manufacture, Storage and import of Hazardous Chemical Rules, Hazardous Wastes (Management and Handling) Rules and Amendments thereof. There will be no chances of contamination of land or water bodies.
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)	No	Treated wastewater will be reused for greenbelt development

S. No.	Information/Checklist confirmation	Yes / No	Details thereof (with approximate quantities / rates, wherever possible) with source of information data
7.3	By deposition of pollutants emitted to air, onto the land or into water	Yes	• Fugitive emissions due to cargo handling can build up the air pollutant concentrations. Oil spills, ship wastes can impact the marine waters if not controlled. • Emission control norms and spill contingency shall be adhered to in all the cases. • The EIA study will address the impacts and mitigation measures.
7.4	From any other sources	No	-
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	No	-

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	During Construction phase there will be requirement to store hazardous material like weld gases, paints, lubricants etc. During operational phase, there will be storage and handling of hazardous materials like LNG/LPG and Crude Oil. The hazardous materials will be stored and handled as per the provisions of the Manufacture, Storage and import of Hazardous Chemical Rules, Hazardous Wastes (Management and Handling) Rules and Amendments thereof to avoid accidents during construction or operational phase. As per Disaster Management Plan (DMP), the necessary measures will be followed to meet any eventuality and to combat hazards or disasters during port construction and operational phase.
8.2	From any other causes	No	-
8.3	Could the project be affected by natural disasters causing environmental damage (e.g. floods, earthquakes, landslides, cloudburst, etc.)?	Yes	Proposed port at Vizhinjam can be affected due to natural disasters like cyclone and floods. A broad Disaster Management Plan that includes both onsite and offsite emergency plan will be proposed and the details will be provided in the EIA report.

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	Lead to development of supporting utilities, ancillary development or development stimulated by the project which could have impact on the environment e.g.: 1. Supporting infrastructure (roads, power supply, waste or wastewater treatment, etc.) 2. Housing development 3. Extractive industries 4. Supply industries 5. Other	Yes	Development of Vizhinjam port would lead to overall socio-economic development of region. Necessary supportive utilities, infrastructure etc. to cater the requirements of the port. Tourism may also increase due to proximity to luxury cruise destinations like the Lakshadweep islands & Maldives
9.2	Lead to after-use of the site, which could have an impact on the environment	No	Development of port would be a permanent feature
9.3	Set a precedent for later developments	No	-
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects	No	-

3 Environmental Sensitivity

S. No.	Areas	Name / Identity	Aerial distance (within 15 km.)
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	Nil	-
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	• Killi River • Karamana River • Vellayani Lake • Neyyar River	• 8 km, NW • 10 km , NW • 4.2 km, N • 10 km, SE
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	Nil	-
4	Inland, coastal, marine or underground waters	Arabian Sea	Adjoining on West
5	State, National boundaries	Tamil Nadu Boundary	13.5 km, SE
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	• NH-47 • Proposed NH-47 Bypass • Southern Railway Mainline	• 8 km, NE • 1.8 km, NE • 9 km, NE
7	Defense installations	Nil	
8	Densely populated or built-up area	Thiruvananthapuram	13 km, NW
9	Areas occupied by sensitive man-made land uses *(hospitals, schools, places of worship, community facilities)*	Places of worship • Bhagavathi temple at Kottukal • Church • Church • 2 Mosques • Mosque	• 3.3 km, SE • 0.5 km, NE • 0.3 km, E • 1.0 km, N • 2.5 km, E

S. No.	Areas	Name / Identity	Aerial distance (within 15 km.)
10	Areas containing important, high quality or scarce resources, *(ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)*	Fishing Villages in the vicinity of the port: • Vizhinjam • Adilamulathurai • Chowara • Pulivilla • Karumkulam • Poovar Tourist Destinations • Kovalam (internationally renowned tourist destination) • Puvar South	• 1.0 km, NWW • 3.0 km, SE • 2.5 km, SE • 5.2 km, SE • 7.8 km, SE • 10 km, SE • 4 km, NW • 10 km, SE
11	Areas already subjected to pollution or environmental damage. *(those where existing legal environmental standards are exceeded)*	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*)	The proposed project falls under Seismic Zone III (Very low Seismic disturbance up to 0-0.2) as per IS 1893 (Part I) of Indian Seismic Map. It is a cyclone prone area	

"I hereby given undertaking that the data and information given on the application and closures are true to the best of my knowledge and belief and I am aware that if any part of the data and information submitted is found to be false or misleading at any stage, the project will be rejected and clearance give, if any to the project will be revoked at our risk and cost.

Date:

Place:

Mr. Manoj Joshi, I.A.S
Managing Director & Chief Executive Officer
3rd Floor, Trans Towers, Vazhuthacaud,
Thiruvananthapuram – 695 014
Kerala

4 Proposed Terms of Reference for EIA Study

Proposed Terms of Reference (ToR) for EIA study are drawn keeping in view of EIA Notification dated September 14, 2006 (as amended) and also based on Environmental Impact Assessment Guidance Manual for Ports and Harbours (published in February 2010) by Ministry of Environment and Forests (MoEF).

4.1 Introduction to Project

The onset of liberalisation and globalisation of Indian economy has resulted in attracting private sector investments in general. In line with the Government of India (GoI) policies, Government of Kerala (GoK) also adopted a pro-active approach to these changes and developed a policy for development of port infrastructure and maritime sector. The policy redefines the role of the principal agencies mandated with maritime issues such as Fisheries and Ports Department (FPD), Director of Ports (DoP) and Kerala Maritime Development Corporation (KMDC) in the 'Business of Ports' and outlined the privatisation guidelines.

The State of Kerala, located along the West Coast of India, is endowed with a coastline of 580 km. Along this coast, there are 14 minor ports, 3 intermediate ports and one major port i.e. Cochin. The minor ports and the intermediate ports come under the jurisdiction of Department of Ports, Government of Kerala and Cochin Port is under the jurisdiction of Ministry of Shipping, Government of India. Out of the minor / intermediate ports, Vizhinjam Port is one which has been accorded Minor Port status in 1977. Since then, a fishing harbour and a custom port has been developed with limited facilities like a wharf and transit shed.

Other than Cochin Port, none of the other ports including Vizhinjam along the Kerala coast handle significant amount of cargo. Further, rapid strides in shipping trade and technology necessitate specialised handling systems, which are not available at the state ports. With this background, Government of Kerala is poised to attract investments and has embarked on development of a Port at Vizhinjam with Private Sector Participation (PSP).

The Government of Kerala (GoK) has appointed the Vizhinjam International Seaport Limited (VISL) as the Nodal Agency to develop a Greenfield port at Vizhinjam in Thiruvananthapuram (Trivandrum) district, Kerala, India. As such VISL is seeking to appoint a private operator to develop the port on Build, Operate and Transfer (BOT) basis. GoK engaged the International Finance Corporation (IFC) as their lead transaction adviser for the project. IFC is assisting GoK in structuring and implementing the project and seeking private sector partner(s) to implement the port project in collaboration with the Department of Ports, GoK.

4.2 Project Details

On offshore outer harbour is proposed to be constructed at Vizhinjam based on existing site conditions. A port layout is proposed with South-East opening. Planned port facilities are as discussed below.

- Berth length
  Phase 1: 650m (resulting in 52% occupancy)
  Phase 2: 1,250m (resulting in 54% occupancy)
  Phase 3: 2,000m (resulting in 56% occupancy)
- Approach Channel :
  - Length of approach channel: 1,850 m
  - Inner Channel
    - ✓ Width: 200 m

- ✓ Depth: (-) 17.5 CD
- Outer Channel
  - ✓ Width: 300 m
  - ✓ Depth: (-) 20.2 CD
- Turning Circle:
  - Diameter: 700 m
  - Depth: (-) 17.5 m CD

4.3 Methodology

Methodology to carry out EIA study involves following stages:

- Reconnaissance survey and site visit
- Review of available literature
- Compliance to statutory requirements
- Baseline environmental monitoring (terrestrial and marine environment)
- Identification and Prediction of Impacts
- Risk Assessment and Disaster Management Plan
- Environmental Management Plan

4.3.1 Review of Available Literature

- IFC-Vizhinjam Port PPP Preliminary Project plan by M/s. Royal Haskoning, Netherlands in 2010
- Techno-economic Feasibility Report prepared by L&T-RAMBØLL Consulting Engineers Limited in 2004
- Rapid Environmental Social Impact Assessment Report prepared by L&T-RAMBØLL Consulting Engineers Limited in 2004
- Kerala Port PPP- Market Study prepared by Drewry Consultancy,November,2010
- Strategic Option Study (SOS), September 2010

4.3.2 Baseline Environmental Monitoring

The baseline environmental studies will be carried out for terrestrial and marine environments. The study will be a combination of primary (field surveys) and secondary data collection.

Study Period: The study period shall be for one full season (covering 12 weeks or 3 months) during Post monsoon season of 2010.

Study Area: Study area would be of 10 km radius with the port as centre. A map showing the study area is enclosed as **Figure FD0103**.

4.3.2.1 Land Environment

Land:

Availability of land for earmarking for the port without causing hardship to local habitat will be justified.

Topography:

Baseline data describing terrain features, habitations, cropping pattern, forest cover, environmentally sensitive areas will be discussed.

Geology:

Baseline data describing geological setting, seismicity and associated hazards, availability of quarry sites will be discussed.

Soil:

Baseline data including soil type and characteristics based on soil investigations will be provided. A map showing soil sampling locations is enclosed as **Figure FD0104**.

4.3.2.2 Water Environment

Groundwater & Surface Water:

Water quality will be analysed for both surface and groundwater sources. Water samples will be collected and analysed, once in season, for physico-chemical, bacteriological and biological characteristics. Water Quality will be monitored adopting procedures as per IS: 3026, APHA, AWWA, WPCF and relevant guidelines of MoEF/ CPCB. A map showing water quality monitoring locations is enclosed as **Figure FD0105.**

Sampling parameters: pH, Salinity, temperature, TSS, turbidity, Oil & grease, DO, BOD, Heavy metals.

4.3.2.3 Marine Environment

Marine environment in the region will be assessed through field studies and compilation of secondary data and literature surveys.

Marine environmental studies will be undertaken covering water quality, sediment quality, biological aspects (planktons and benthos), mangroves, nesting grounds of sensitive marine fauna, fishing and breeding grounds and fishery resources. A reputed marine environmental monitoring agency will be appointed for carrying out marine monitoring studies. A map showing marine sampling locations is enclosed as **Figure FD0106**.

Marine Water Quality:

Surface and bottom samples will be collected using NISKIN Sampler. Some of the physical parameters such as Temperature, pH, Salinity and Transparency will be observed on-site. Samples will be preserved for assessing other physico-chemical and bacteriological parameters later. Methodologies used for collecting, preserving and analysing water samples will be as per standard protocols and procedures defined in standard manuals and reference material viz. UNESCO, 1978; Parsons et al, 1984; APHA Methods, 1989, 1998; Grasshoff et al, 1999. Parameters that will be assessed are listed below:

- Physico-chemical parameters: pH, temperature, salinity, turbidity, conductivity, suspended solids, total dissolved solids, DO, BOD, COD, chloride, sulphate, sodium, potassium, silicate, hydrocarbons, oil and grease
- Nutrients: nitrite, nitrate, ammonia, total nitrogen, total phosphates, sulphide
- Heavy Metals
- Bacteriological parameters: Total Coliforms, Faecal Coliforms.

Sediment Quality:

Sediment samples will be collected at the proposed project and the neighbourhood areas using a suitable grab (Naturalist's Grab / Van Veen Grab). After collection, samples will be

sieved and subjected to physico-chemical analysis. Parameters that will be assessed will include composition, texture, organic matter and heavy metals.

4.3.2.4 Biological Environment

Marine Biological Aspects:

Biological parameters viz., phytoplankton, zooplankton, chlorophyll-a and primary productivity will be assessed.

Plankton content in coastal waters will be assessed through collection of water samples using Plankton net of suitable mesh size. All net hauls will be fixed in buffered 5% Formaldehyde and stored for analysis in Laboratory. In addition, samples collected with NISKIN sampler will be fixed in Lugol's iodine for quantitative enumeration. Quantitative enumeration will be done using a Sedgewick Rafter counting chamber following a standard protocol (UNESCO, 1978). A research microscope will be used for taxonomic identification. Primary Productivity will be measured following light and dark bottle method (Gaarder and Gran, 1927, re-described Subba Rao, 2002).

Benthic Communities:

Sediment samples collected for assessing physico-chemical characteristics will also be used for enumerating benthic communities. Sediment samples intended for benthic communities assessment will be preserved with Rose Bengal and Formalin Solutions. Analysis of benthic communities will include meio and macro benthos in the region.

Terrestrial Ecology:

Vegetation pattern will be identified based on literature survey and field investigation. A list of flora and fauna of terrestrial ecosystem will be prepared. Endangered and dominant plant species area will be identified. Flora and fauna in project area will be assessed through field observations and also information collected from secondary sources.

Flora and Fauna: Flora and fauna in study area will be assessed by primary surveys and collecting secondary information from sources like Forest Department and other agencies involved in similar studies.

Floral Diversity and Species Inventory

Sampling of vegetation will be done using selected samples of 100 m x 10 m belt transects for tree species, 10 m x 10 m quadrants for shrub species and 1 m x 1 m quadrants for herb species.

Faunal Diversity and Species Inventory (Vertebrates)

Inventory of animal species will be prepared based on following methodology:

- Direct observation during field visits
- Interviewing local villagers and forest officials
- Secondary sources such as published literature on fauna.

Bio-diversity index and relative abundance index of different types of flora will be established. Cover of trees in different areas will be established. Canopy cover of trees in different areas will also be established. Terrestrial flora and fauna survey will be carried out as per standard practice.

4.3.2.5 Air Environment

Meteorology:

Meteorological parameters such as temperature, relative humidity, wind speed and direction, etc. will be recorded by establishing a meteorological station (automatic weather monitoring station) in study area during study period.

Ambient Air Quality:

Ambient air quality monitoring will be carried out as per CPCB guidelines. Parameters to be monitored include PM_{10}, $PM_{2.5}$, SO_2, NO_X, CO and HC. Frequency of sampling is twice a week at each location. One sample of 24 hours duration each will be taken for PM_{10}, $PM_{2.5}$, SO_2 and NO_X. For CO and HC monitoring, eight hourly average samples will be taken on each monitoring day. A map showing air quality monitoring locations is enclosed as **Figure FD0107.**

4.3.2.6 Noise

Intensity of noise levels in the project area and the neighbourhood up to 1 km or nearest residential area will be measured. Peak noise and Equivalent noise levels will be measured at hourly intervals during study period. Monitoring locations will cover important land use such as residential, commercial, sensitive and industrial area. A map showing noise level monitoring locations is enclosed as **Figure FD0108.**

4.3.2.7 Socio-Economic and Occupational Health Environment

Baseline demography and socio-economics will be covered within the study area. Data on socio-economic profile of area including population, literacy, occupational pattern, educational and medical facilities will be collected.

4.3.3 Establishment of Baseline Environmental Conditions

Baseline conditions (environment and social) will be established by compiling data generated from field surveys and secondary data. Further, baseline environmental conditions will also be graphically presented and critical locations in project area, if any, in environmental and social context will be identified.

4.3.4 Anticipated Environmental Impacts and their Mitigation Measures

Environmental attributes likely to be affected by project activities will be identified and impacts will be assessed. Project activities can be broadly classified into construction and operational phase activities.

Construction phase activities will include capital dredging, reclamation, cargo berths, cargo storage areas, port colony and installation of cargo handling equipment, development of internal infrastructure.

Operational phase activities will include maintenance dredging, cargo handling, movement of ships calling at port, movement of tugs and port crafts, cargo storage and inland cargo movement.

Most appropriate and accepted methods will be used to quantify impacts likely to arise due to development of port. The mitigation measures proposed to minimise/avoid each of the likely impacts that occur during construction and operational phases will be discussed in detail.

4.3.4.1 Land Environment

Impacts on land environment during construction and operational phase will largely result from soil erosion, soil permeability and change in land use patterns. Impacts on land environment will be predicted considering activities involved in construction and operational phases.

4.3.4.2 Water Environment

Discharge of wastewater, run off from cargo storage area containing contaminated water during construction and operational phases of project can impact surface as well as ground water environment. Impacts will be addressed and subsequent mitigation measures will be accordingly included in the study.

4.3.4.3 Marine Environment

Impacts on marine ecology will be studied both for construction and operational phases of port development. Based on development plan of port, impacts will be identified and predicted both for construction and operational phases. Impact on environment will be studied with respect to following project activities:

- Construction Phase
  - Dredging and disposal of dredged material
  - Marine water quality
  - Impact on fishing communities
  - Reclamation of back-up area
  - Construction of cargo berths

- Operational Phase (Maintenance Dredging and Disposal; Ship Movement; Cargo Handling)
  - Marine water quality
  - Marine ecology
  - Fishing communities.

4.3.4.4 Biological Environment

Impact on the marine/ coastal ecology on account of port construction and operational will be assessed and subsequent mitigation measures will be accordingly included in the study.

4.3.4.5 Air Environment

Construction phase will involve movement of construction material to project area, site clearing, vehicular emissions, emissions from construction machinery, etc. which in turn could influence ambient air quality in the region through build-up of dust levels and gaseous emission levels.

Impacts on air environment during operational phase are envisaged in terms of fugitive emissions during cargo handling and emissions from ships. These might result in increased levels of PM, CO, NO_X and SO_2. Build-up of pollutant levels due to these emissions will be arrived through modelling studies using suitable air quality models. Mitigation measures will be accordingly suggested.

4.3.4.6 Noise Pollution

Generally, activities impacting air environment also impact noise levels. Impacts on noise levels during construction phase could be from vehicular traffic, construction machinery, DG sets and transportation of raw material to site. During operational phase, noise might be generated due to activities involved in cargo handling and transportation and same will be felt upon work personnel operating in respective areas. Impacts will be predicted taking into consideration noise generating sources together with environmental conditions and receptors in project influence area.

4.3.4.7 Solid Waste Management

Wastes generated during construction and operational phases of the port will be assessed based on activities proposed and suitable collection, treatment, reuse/recycle and disposal options will be suggested.

4.3.4.8 Socio-cultural Impact

Impacts due to relocation of local communities and navigational problems to fishing communities due to proposed developmental activity, socio-economic status of affected families and population influx due to increased activities will be accessed and mitigation measures including satisfactory R&R methods will be worked out.

4.3.5 Environmental Monitoring Programme

Environmental Monitoring Programme covering the technical aspects (including methodology, parameters, frequency, location, etc., and detailed budget) of monitoring to check the effectiveness of mitigation measures during construction and operational phases will be prepared.

4.3.6 Additional Studies

4.3.6.1 Risk Analysis and Disaster Management Plan

Risk analysis shall be carried out for liquid terminals and storage tanks proposed. Maximum inventory of storage at site shall be taken into account. Potential hazards shall be identified through Consequence Analysis and Fire & Explosion hazards. In order to manage potential hazards and disasters effectively and minimise damage, an on-site management plan approach will be adopted and details will be provided.

4.3.6.2 Rehabilitation and Resettlement Action Plan

Details of land acquisition from either public or private sources will be evolved and availability of required land for acquisition will be ascertained from local authorities and revenue records etc. Accordingly detailed Rehabilitation and Resettlement Plan with data on existing socio-economic status of population and broad plan for resettlement of the displaced population, site for the resettlement colony, alternative livelihood concerns/employment and rehabilitation of the displaced people, civil and housing amenities being offered, etc and the schedule of the implementation of the project specific R&R Plan will be covered in study.

4.3.6.3 Corporate Social Responsibility

Corporate social responsibility measures will be takenup by VISL for community development will be covered in EIA study.

4.3.7 Project Benefits

The project benefits in terms of improvements in the physical infrastructures and social infrastructure, employment potential and other tangible benefits will be discussed in detail.

4.3.8 Environmental Management Plan

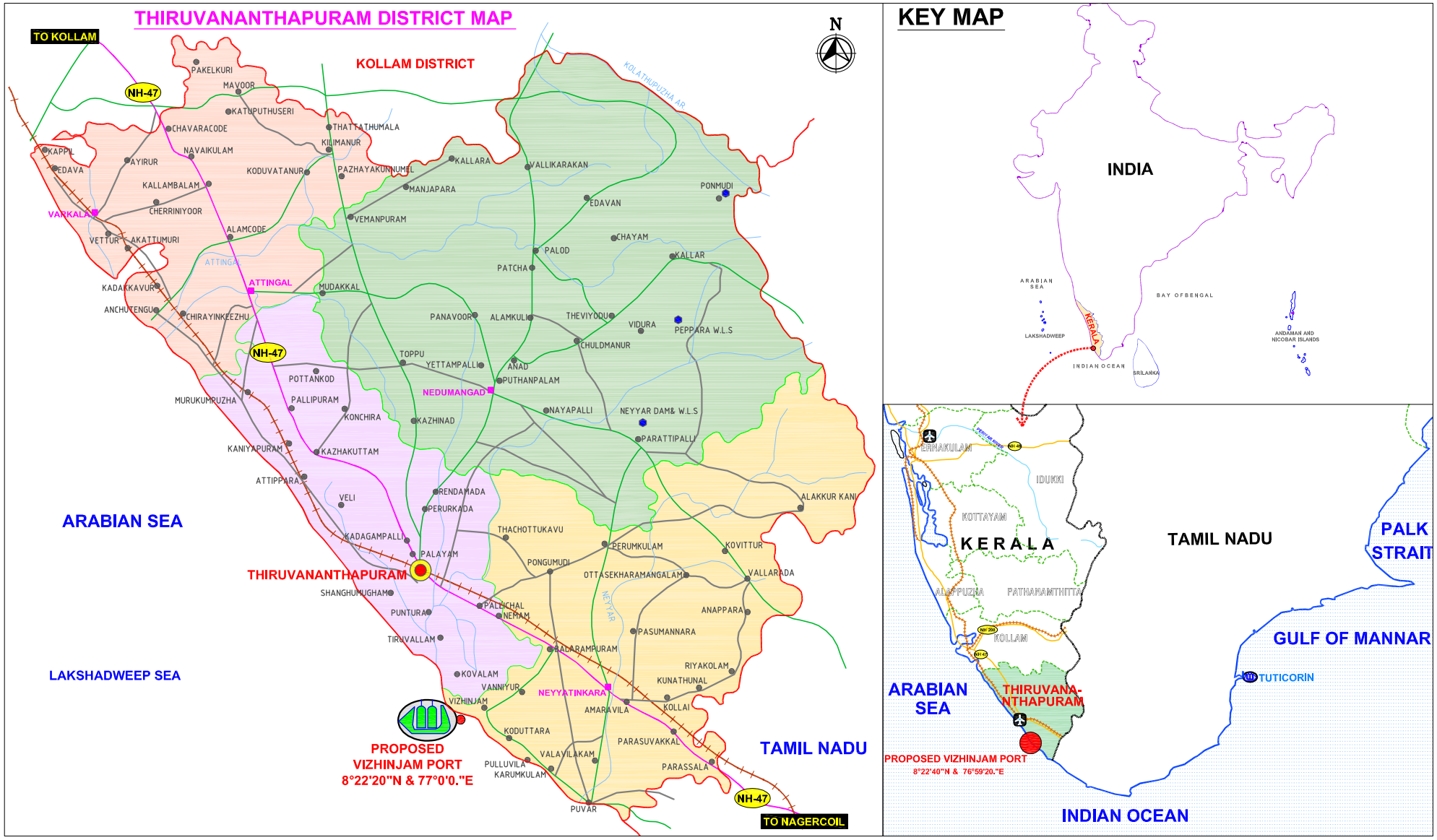
An Environmental Management Plan (EMP) will be formulated for proposed project. EMP will address mitigation measures for marine and terrestrial environmental attributes separately, covering all relevant aspects as per recommendations and requirement of MoEF. Based on identified impacts associated with project, an EMP will be framed for the construction and operations phases of project.

4.4 Structure of EIA Report

Based on above tasks, EIA report will be compiled and submitted to MoEF for seeking Environmental Clearance. Structure of EIA report is given below.

Chapter 1 : Introduction
Chapter 2 : Project Description
Chapter 3 : Analysis of Alternatives
Chapter 4 : Description of the Environment
Chapter 5 : Anticipated Environmental Impacts & Mitigation Measures
Chapter 6 : Environmental Monitoring Programme
Chapter 7 : Additional studies
Chapter 8 : Project Benefits
Chapter 9 : Environmental Management Plan
Chapter 10 : Summary and Conclusions
Chapter 11 : Disclosure of Consultants Engaged

Figure FD0101
LOCATION MAP



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PROJECT: TECHNICAL ASSISTANCE TO GET ENVIRONMENTAL /CRZ CLEARANCE FOR INTERNATIONAL CONTAINER TRANSHIPMENT TERMINAL AT VIZHINJAM

PROJECT NO: C1101302

TITLE: LOCATION MAP

DATE: 200810

MADE: ASN

L&T-RAMBØLL CONSULTING ENGINEERS LIMITED

FIGURE NO: FD0101

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AUTO PATH: L:\PORTS\2010\C1101302 - EIA FOR VIZHINJAM PORT\DRAWINGS\REPORT DWGS\01-FORM I & TOR\FD0101-R1-LOCATION MAP.DWG

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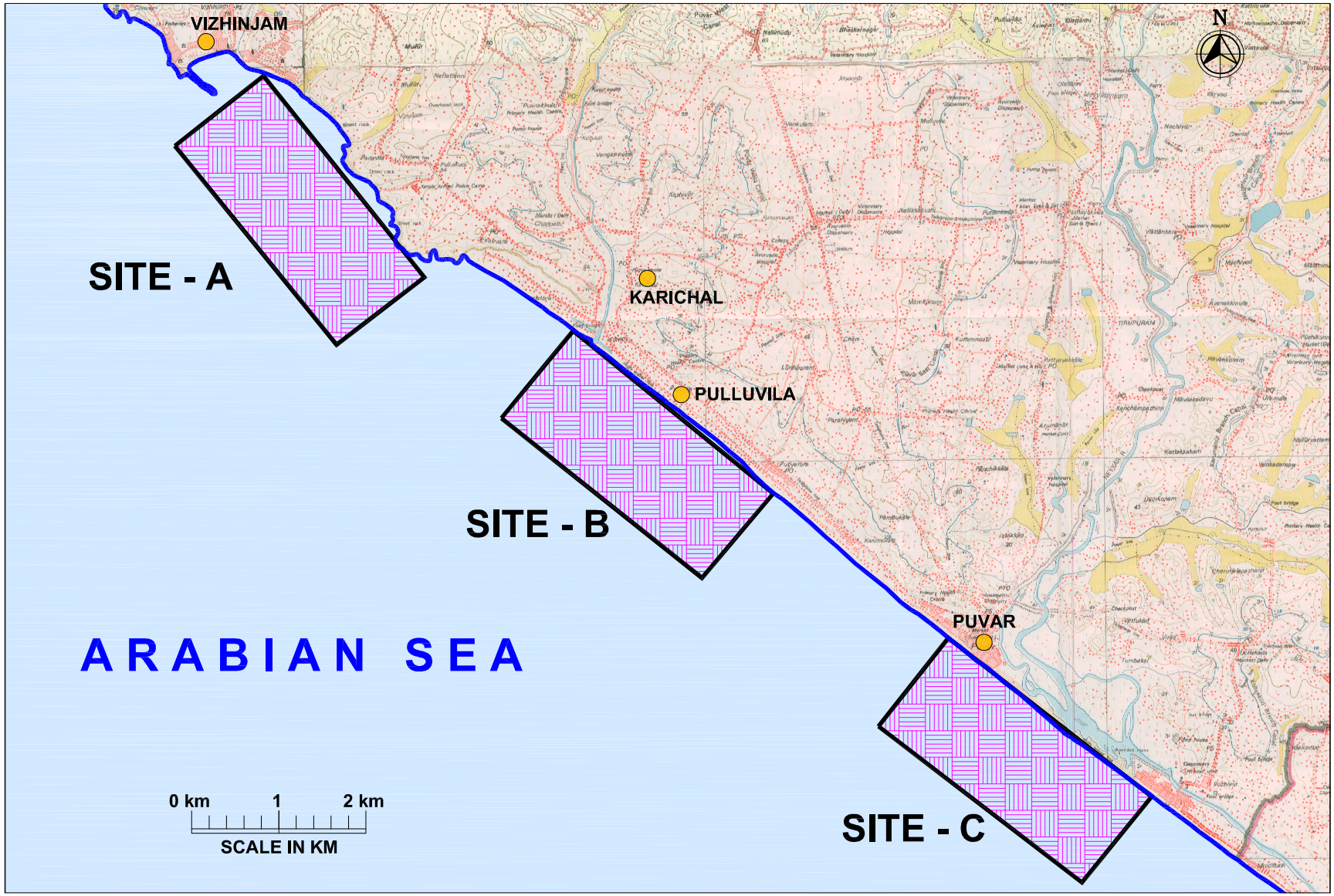
Figure FD0102
LOCATION OF ALTERNATIVE SITES



NOTE:BASE MAP PREPARED FROM 1:25000 SURVEY OF INDIA TOPOSHEETS, SURVEYED IN 1989-90

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PROJECT: TECHNICAL ASSISTANCE TO GET ENVIRONMENTAL /CRZ CLEARANCE FOR INTERNATIONAL CONTAINER TRANSHIPMENT TERMINAL AT VIZHINJAM

PROJECT NO: C1101302

TITLE: ALTERNATIVE SITE OPTIONS

DATE: 200810

MADE: ASN

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FIGURE NO: FD0102

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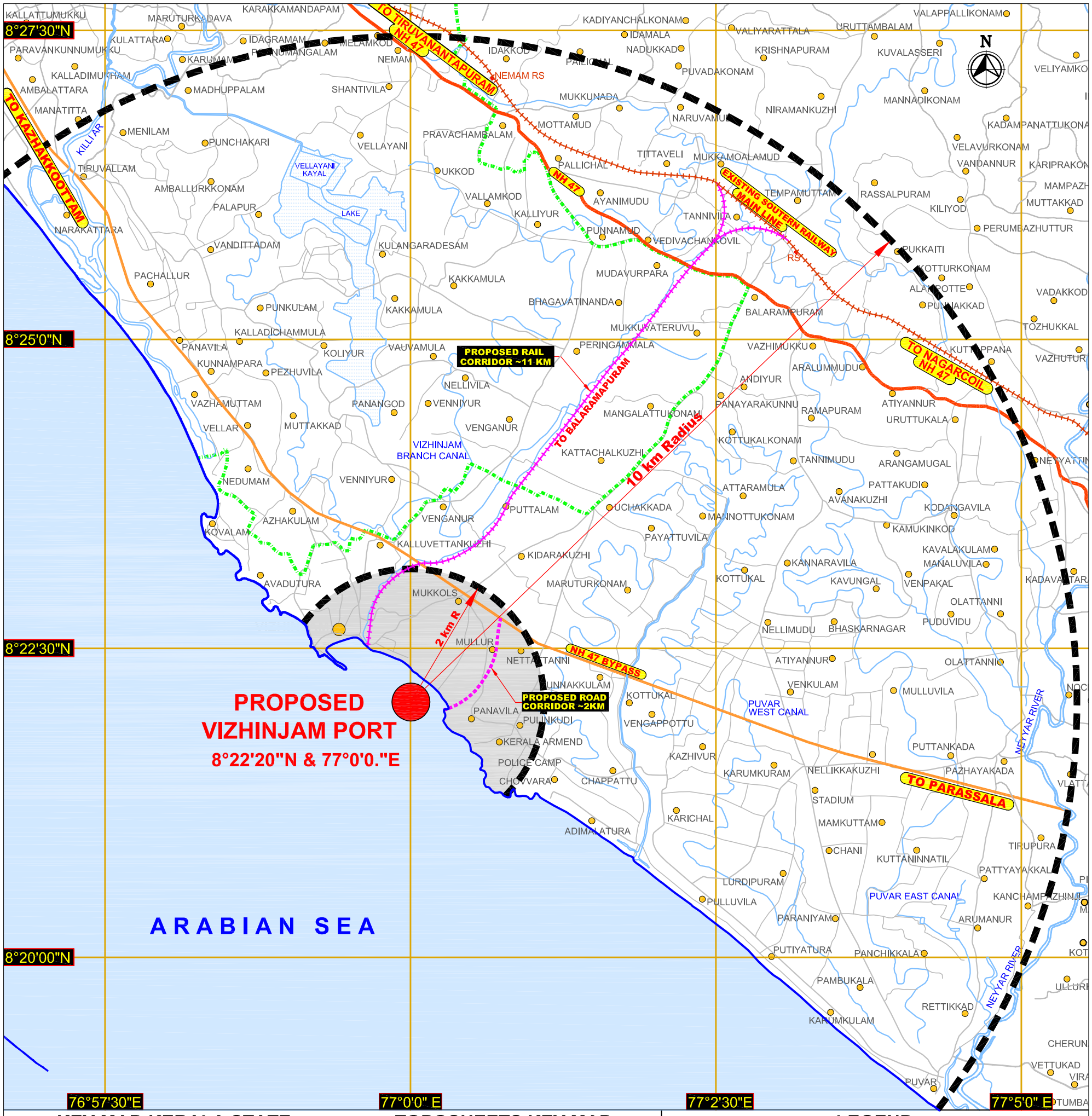
Figure FD0103
STUDY AREA MAP



KEY MAP-KERALA STATE

TOPOSHEETS KEY MAP

LEGEND

NOTE:BASE MAP PREPARED FROM 1:25000 SURVEY OF INDIA TOPOSHEETS, SURVEYED IN 1989-90

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PROJECT: TECHNICAL ASSISTANCE TO GET ENVIRONMENTAL /CRZ CLEARANCE FOR INTERNATIONAL CONTAINER TRANSHIPMENT TERMINAL AT VIZHINJAM

PROJECT NO: C1101302

TITLE: STUDY AREA MAP

DATE: 200810

MADE: ASN

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FIGURE NO: FD0103

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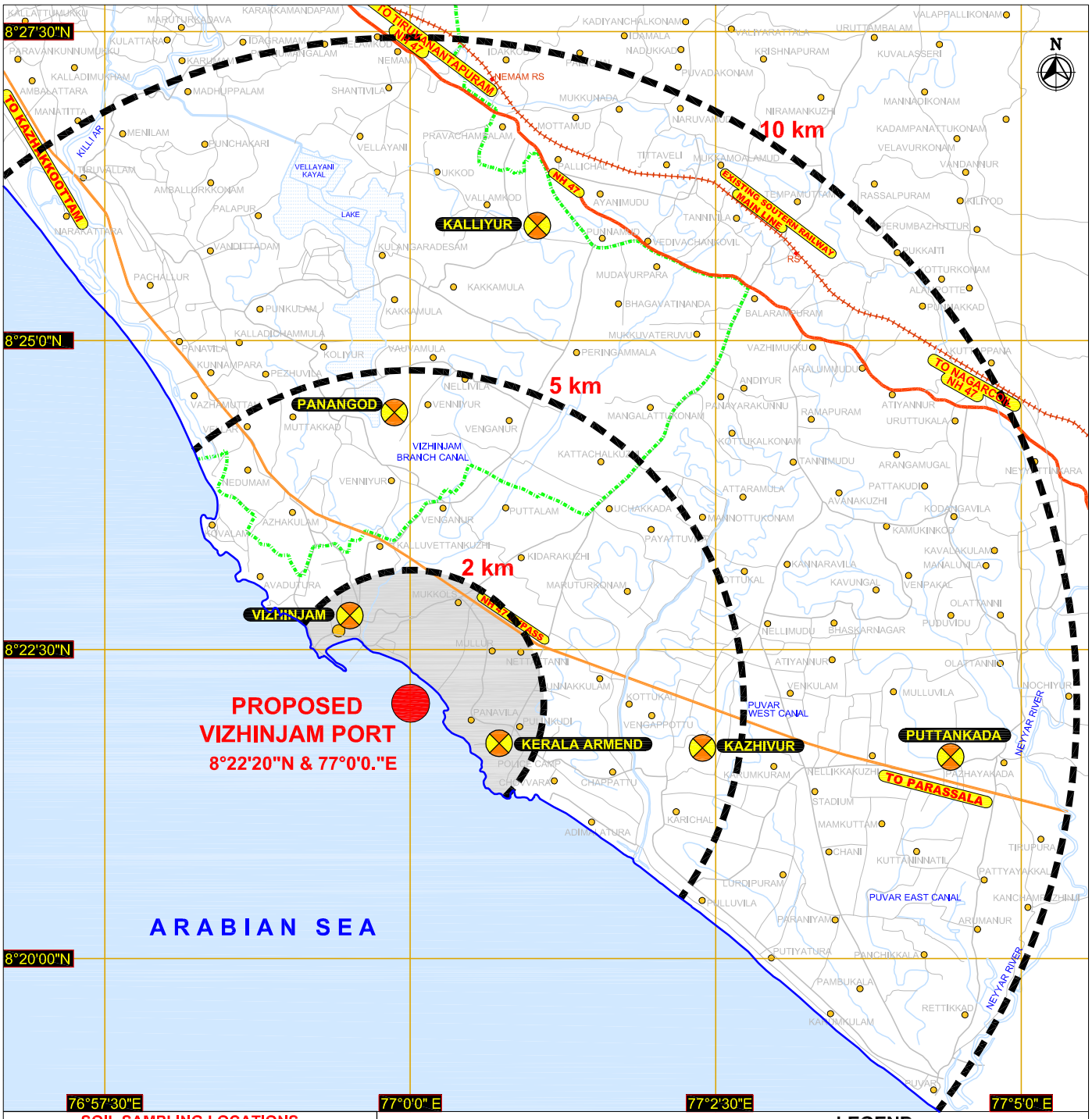
Figure FD0104
SOIL SAMPLING LOCATIONS MAP

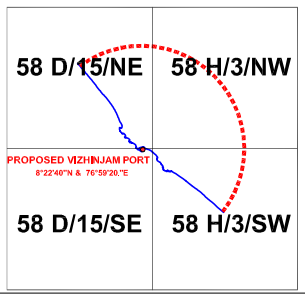


SOIL SAMPLING LOCATIONS

S.NO	LOCATION	DISTANCE IN KM	DIRECTION
S1	KERALA ARMEND	1.5	ESE
S2	VIZHINJAM	1.7	NNW
S3	KAZHIVUR	4.4	E
S4	PANANGOD	4.4	N
S5	KALLIYUR	7.4	NNE
S6	PUTTANKADA	8.1	E

Scale : 0 km 1 2 km

TOPOSHEETS KEY MAP



LEGEND

- SOIL SAMPLING LOCATION
- TAHASIL / TALUK BOUNDARY
- NATIONAL HIGHWAY 47
- PROPOSED NH 47 BYPASS
- MAJOR ROADS
- OTHER ROADS
- RAILWAY LINE (SR-TRIVENDRUM-NAGARCOIL-KANYAKUMARI SECTION)
- WATER BODY/RIVER/STREAM/CANAL

NOTE: BASE MAP PREPARED FROM 1:25000 SURVEY OF INDIA TOPOSHEETS, SURVEYED IN 1989-90

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PROJECT: TECHNICAL ASSISTANCE TO GET ENVIRONMENTAL /CRZ CLEARANCE FOR INTERNATIONAL CONTAINER TRANSHIPMENT TERMINAL AT VIZHINJAM

PROJECT NO: C1101302

TITLE: SOIL SAMPLING LOCATIONS

DATE: 200810

MADE: ASN

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FIGURE NO: FD0104

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AUTO PATH: L:\PORTS\2010\C1101302 - EIA FOR VIZHINJAM PORT\DRAWINGS\REPORT DWGS\01-FORM I & TOR\FD0104-107-MONITORING LOCATIONS MAP.DWG

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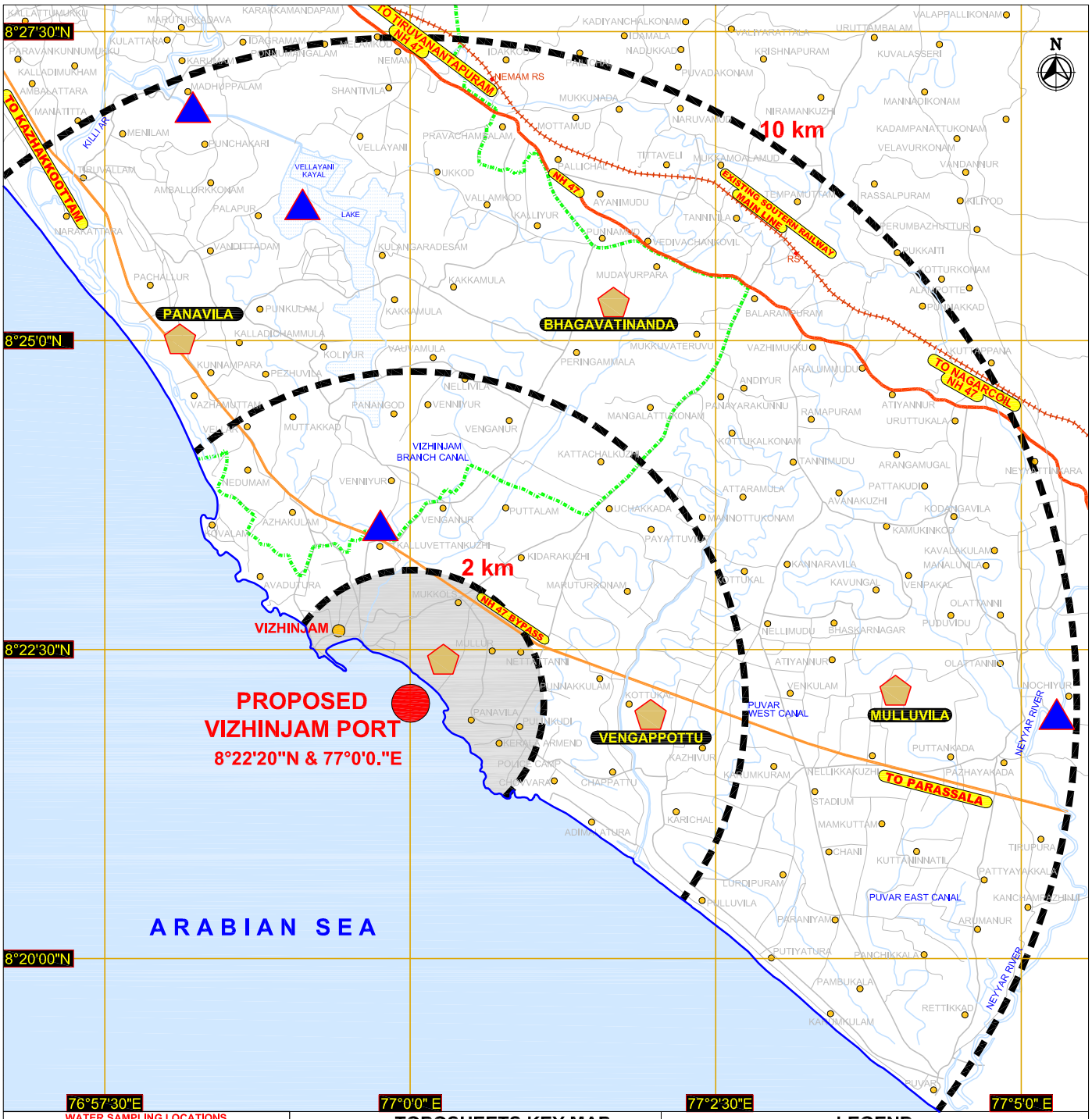
Figure FD0105
INLAND WATER SAMPLING LOCATIONS MAP

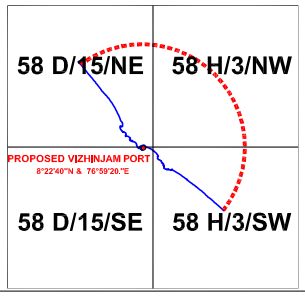


WATER SAMPLING LOCATIONS

GROUND WATER SAMPLING LOCATIONS

S.NO	LOCATION	DISTANCE IN KM	DIRECTION
GW1	PORT SITE	0.7	NE
GW2	VENGAPPOTTU	3.6	E
GW3	PANAVILA	6.5	NNW
GW4	BHAGAVATINANDA	6.7	NNE
GW5	MULLUVILA	7.3	E
SURFACE WATER SAMPLING LOCATIONS			
SW1	VIZHINJAM BRANCH CANAL	2.5	N
SW2	VELLAYANI KAYAL LAKE	7.6	NNW
SW3	KILLI AR NEAR MADHUPPALAM	9.5	NNW
SW4	NEYYAR RIVER AT NOCHIYUR	9.8	E

TOPOSHEETS KEY MAP



LEGEND

- TAHASIL / TALUK BOUNDARY
- NATIONAL HIGHWAY 47
- PROPOSED NH 47 BYPASS
- MAJOR ROADS
- OTHER ROADS
- RAILWAY LINE (SR-TRIVENDRUM-NAGARCOIL-KANYAKUMARI SECTION)
- WATER BODY/RIVER/STREAM/CANAL
- GROUND WATER SAMPLING LOCATION
- SURFACE WATER SAMPLING LOCATION

0 km 1 2 km

NOTE: BASE MAP PREPARED FROM 1:25000 SURVEY OF INDIA TOPOSHEETS, SURVEYED IN 1989-90

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PROJECT: TECHNICAL ASSISTANCE TO GET ENVIRONMENTAL /CRZ CLEARANCE FOR INTERNATIONAL CONTAINER TRANSHIPMENT TERMINAL AT VIZHINJAM

PROJECT NO: C1101302

TITLE: WATER SAMPLING LOCATIONS

DATE: 200810

MADE: ASN

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FIGURE NO: FD0105

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Figure FD0106
MARINE WATER SAMPLING LOCATIONS MAP

SOURCE : GOOGLE IMAGE

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PROJECT: TECHNICAL ASSISTANCE TO GET ENVIRONMENTAL /CRZ CLEARANCE FOR INTERNATIONAL CONTAINER TRANSHIPMENT TERMINAL AT VIZHINJAM

PROJECT NO: C1101302

TITLE: MARINE SAMPLING LOCATIONS

DATE: 190810

MADE: ASN

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FIGURE NO: FD0106

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AUTO PATH: L:\PORTS\2010\C1101302 - EIA FOR VIZHINJAM PORT\DRAWINGS\REPORT DWGS\01-FORM I & TOR\MARINE SAMPLING LOCATIONS.DWG

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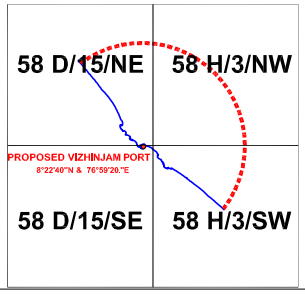
Figure FD0107
AMBIENT AIR MONITORING LOCATIONS MAP

AIR MONITORING LOCATIONS

S.No	LOCATION	DISTANCE IN KM	DIRECTION
A1	PORT SITE	0.7	NE
A2	VIZHINJAM	1.7	NNW
A3	PULINKUDI	1.7	ESE
A4	CHAPPATTU	3.2	ESE
A5	AZHAKULAM	3.4	NNW
A6	ATTARAMULA	5.9	NE
A7	KAKKAMULA	6.3	N
A8	CHANI	6.8	ESE
A9	VANDITTADAM	7.3	NNW
A10	MUDAVURPARA	7.6	NNE
A11	PUDUVIDU	8.2	ESE
A12	VELLAYANI	8.6	N

TOPOSHEETS KEY MAP



LEGEND

- AIR MONITORING LOCATION
- TAHASIL / TALUK BOUNDARY
- NATIONAL HIGHWAY 47
- PROPOSED NH 47 BYPASS
- MAJOR ROADS
- OTHER ROADS
- RAILWAY LINE (SR-TRIVENDRUM-NAGARCOIL-KANYAKUMARI SECTION)
- WATER BODY/RIVER/STREAM/CANAL

Scale : 0 km 1 2 km

NOTE: BASE MAP PREPARED FROM 1:25000 SURVEY OF INDIA TOPOSHEETS, SURVEYED IN 1989-90

PATH: J:\XXXXXXXX\XXXXXX.DWG

PROJECT: TECHNICAL ASSISTANCE TO GET ENVIRONMENTAL /CRZ CLEARANCE FOR INTERNATIONAL CONTAINER TRANSHIPMENT TERMINAL AT VIZHINJAM

PROJECT NO: C1101302

TITLE: AMBIENT AIR MONITORING LOCATIONS

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FIGURE NO: FD0107

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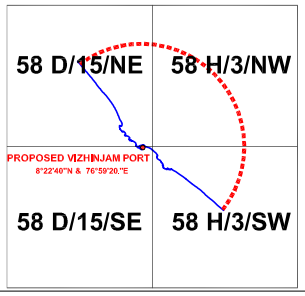
Figure FD0108
NOISE MONITORING LOCATIONS MAP

NOISE MONITORING LOCATIONS

S.NO	LOCATION	DISTANCE IN KM	DIRECTION
N1	PPORT SITE	0.7	NE
N2	VIZHINJAM	1.7	NNW
N3	PULINKUDI	1.7	ESE
N4	CHAPPATTU	3.2	ESE
N5	AZHAKULAM	3.4	NNW
N6	ATTARAMULA	5.9	NE
N7	CHANI	6.8	ESE
N8	VANDITTADAM	7.3	NNW
N9	MUDAVURPARA	7.6	NNE
N10	PUDUVIDU	8.2	ESE

TOPOSHEETS KEY MAP



LEGEND

- NOISE MONITORING LOCATION
- TAHASIL / TALUK BOUNDARY
- NATIONAL HIGHWAY 47
- PROPOSED NH 47 BYPASS
- MAJOR ROADS
- OTHER ROADS
- RAILWAY LINE (SR-TRIVENDRUM-NAGARCOIL-KANYAKUMARI SECTION)
- WATER BODY/RIVER/STREAM/CANAL

Scale : 0 km 1 2 km

NOTE: BASE MAP PREPARED FROM 1:25000 SURVEY OF INDIA TOPOSHEETS, SURVEYED IN 1989-90

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PROJECT: TECHNICAL ASSISTANCE TO GET ENVIRONMENTAL /CRZ CLEARANCE FOR INTERNATIONAL CONTAINER TRANSHIPMENT TERMINAL AT VIZHINJAM

PROJECT NO: C1101302

TITLE: NOISE MONITORING LOCATIONS

DATE: 200810

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FIGURE NO: FD0108

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