

# CONSULTANCY SERVICES FOR PREPARATION OF INTEGRATED MASTER PLAN FOR VIZHINJAM PORT



# Integrated Port Master Plan Report - Addendum

Prepared for

Vizhinjam International Seaport Limited

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May 2013

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## Quality Information

Client: Vizhinjam International Seaport Limited	Contract No. (if any): VISL/AECOM/2011/665
Project Title: Consultancy Services for Preparation of EPC Tenders, Selection of Contractors and Preparation of Integrated Master Plan for Development of Vizhinjam Port	Project No.: DELD11137
Document No:  SharePoint Ref:	Controlled Copy No:
Document Title: Integrated Port Master Plan Report - Addendum	
Covering Letter/ Transmittal Ref. No:	Date of Issue: May 2013

### Revision, Review and Approval Records

02	Integrated Port Master Plan Report - Addendum	ASM/MA May 2013	VA May 2013	VA May 2013
01	Integrated Port Master Plan Report - Addendum	ASM/MA May 2013	VA May 2013	VA May 2013
Revision	Description	Prepared by/ date	Reviewed by/ date	Approved by/ date

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# 1 Introduction

## 1.1 Project

The Government of Kerala (GoK) through its special purpose government company (SPV – Special Purpose Vehicle) Vizhinjam International Seaport Ltd (VISL) is developing a deep water Multipurpose Greenfield Port at Vizhinjam.

The proposed project is based on a Landlord Port Model, where all the civil work facilities viz., construction of basic infrastructure like breakwater, quay wall, dredging, reclamation, rail and road access to the Port will be developed by VISL. Port Operation will be through the PPP model for an agreed concession time period. Terminal operator(s) will be required to develop the container yard, terminal buildings, and purchase & operate the cargo handling equipments.

In this regard, VISL have engaged AECOM to develop an integrated port master plan and preparation of EPC tender documents for the civil works.

## 1.2 Present Milestone

As part of the assignment, AECOM submitted the Integrated Port Master Plan Report to VISL in Nov. 2012. To meet the requirements for environmental clearance, VISL approached AECOM to review all the previous studies and prepare the Detailed Project Report for environmental compliance. During the course of this study, the Phase 1 and port master plan had to undergo changes based on

- the additional mathematical model study results;
- addition of new facilities to accommodate within the port;
- facilities within port limits as part of CSR;
- and other entities showing interest in the port development given the fact of the strategic location of the port.

This milestone is an Addendum to the 'Final Integrated Master Plan Report' incorporating the additions/modifications and optimization in the proposed port facilities as mentioned above.

This Master Plan Addendum captures the overview of changes since the Master Plan Report was finalized in Nov. 2012. For more details on these elements, please refer the Detailed Project Report (DPR) May 2013.

## 1.3 Salient Features of Proposed Port Facilities

As per the master plan, the changes and the additional facilities proposed are summarized as below. The port will be developed in three phases. Once fully developed, the port is envisioned to have:

- Breakwaters of total length 4,100m (north breakwater 3,040m, with 140m spur breakwater for fish landing harbour, extension of northern breakwater by 200m in Phase 2, and extension by another 720m for Phase 3).
- Total container berth length of 2,000m which would be developed in three phases (800m in Phase 1, additional 400m in Phase 2 and another 800m in Phase 3).
- Container yard commensurate with the quay development in three phases.
- Cruise berths of 500m which would be developed in two phases (300m in Phase 1 and another 200m in Phase 3). In Phase 1 the berth would serve both the cruise as well as multipurpose cargo.
- Port craft berth of 100m and Coast Guard berth of 120m length in Phase 1.
- Berthing, Storage and operational facilities for Indian Navy with berth length 500m in Phase 1.
- Fish landing center with a total berth length of 500m in Phase 1 development.



The port is designed to primarily cater to the container transshipment business. Fish Landing berths and Cruise berth (part of Phase 2 development proposed in Master Plan Report, Nov. 2012 and now brought to Phase 1) are being developed as part of CSR activities as an outcome of the ESIA study to improve the fisheries and tourism sector in the project vicinity.

The Navy and Coast guard berths are as per the requirements of the security of the country as desired by the Ministry of Defense, Government of India, considering the strategic location of Vizhinjam Port in the Indian Peninsula for combined operations of the Army & Air force stations located in Thiruvananthapuram, Kerala.

The Master plan has been developed based on inputs received from VISL and other project stakeholders at the time of preparation of the report and various development requirements conveyed to AECOM. The master plan is a dynamic document and may evolve with changes in user requirements and market scenario while maintaining the core development infrastructure outlined in the report.



## 2 Functional Requirements

### 2.1 General

The functional requirements mentioned in the master plan report still holds good with no much change in the requirements apart from the additional facilities being proposed and further layout optimization as part of the port development. The additional requirements are described in the sections below.

### 2.2 Design Ship Sizes

#### 2.2.1 Range of Ship Sizes

Based on the outcome of ship size analysis for major commodities carried out in the master plan report and detailed project report, the design ship sizes considered for Phase 1 and Master Plan development of Vizhinjam port is presented in Table 2.1.

Table 2.1 Summary of Design Vessels over Master Plan Horizon

S. No	Commodity	Average Parcel Size	Design Ship Size		Overall Length	Beam	Loaded Draft
		TEU (DWT)	TEU/DWT		(m)	(m)	(m)
1.	Transshipment Containers	2,500 (23,000)	Min	9,000 (82,500)	350	46.0	14.5
			Max	18,000 (165,000)	400	59.0	16.0
2.	Import/Export Containers	1200 (11,000)	Min	1,000 (9200)	175	27.0	10.0
			Max	6,000 (55,000)	300	43.0	13.5
3.	Multipurpose Cargo vessels	(30,000)	Min	25,000	178	26.4	10.7
			Max	40,000	190	28.0	11.3
4.	Cruise	3000 pax (55,000)	Min	40,000	212	32	8.0
			Max	70,000	268	32	8.0

#### 2.2.2 Governing Parameters of Design Ships

Parameters of design ship considered for estimating the navigational requirements (dredged depths, channel widths, safe stopping distance etc) of the channel and harbour basin for Phase 1 and Master Plan layout development of Vizhinjam port, are presented in Table 2.2.

Table 2.2 Governing Parameters of Design Ship

Development Stage	Vessel Size	Overall Length	Beam	Loaded Draft
	TEU/ DWT	(m)	(m)	(m)
Phase 1	18,000 (165,000)	400	59.0	16.0

## 2.3 Berth Requirements

### 2.3.1 General

The berth length needs to be sufficient to accommodate the length of the vessel plus an allowance at either end for mooring and clearances between vessels. The amount of clearance required at either end of the vessel depends upon the vessel size. Minimum single berth length for the design vessels are shown in Table 2.3.

Table 2.3 Minimum Berth Lengths

S. No	Berth Type	Average Design Ship Size	Phase 1	Phase 3 (Master Plan)
			m	m
1.	Container Berths	12,500 TEU	360 – 400	360 – 400
2.	Cruise/ Multipurpose Berth	70,000 DWT	300	300

### 2.3.2 Other Cargo Requirements

#### 2.3.2.1 Cruise cum Multipurpose Cargo Berth

For the Phase 1 development, cruise berths is programmed to be constructed in order to optimize the container cargo handling berths and provide flexibility for phasing the cruise berths on a need basis without interrupting the cargo operations. The cruise demand based on Drewry report is estimated that the size of the cruise vessel varied from 1200 passengers in Phase 1 to up to 3000 passengers in the Master Plan i.e., in Phase 1 the number of cruise ships calling to the port is 30 increasing to 120 over the master plan horizon.

The long term demand for general/ breakbulk cargo was provided by Drewry to be in the range of 0.1 MTPA in the Phase 1 to 0.8 MTPA over the master plan horizon.

The forecast of these cargoes is not significant that would require a dedicated berth and equipments in Phase 1. These commodities can be handled at the proposed cruise berth using the ship's gears until more dedicated need for bulk cargo is identified.

It is proposed to provide 1 berth of 300m to carry out the cruise and multipurpose cargo handling operations.

#### 2.3.2.2 Coast Guard

The need for effective coastal security in the present security scenario was highlighted by Coast Guards during the February 2012 workshop held in Thiruvananthapuram. The same was communicated to VISL with reference to the letter dated on December, 2011, where Coast Guard had put requirement for development of a station at Vizhinjam.

The Coast Guard requested a dedicated berthing space at Port of Vizhinjam to enable operation of its ships. The present docking facility available within the existing Vizhinjam harbour is insufficient to cater to the increased needs in the region. The Coast Guard is planning to have station at Port of Vizhinjam for effective coastal security and monitoring of Sea Lanes of Communication which is located at 10 nautical miles off the south west coast of Thiruvananthapuram. It will also help to provide enhanced training to Marine Police.

The Coast Guard at Vizhinjam requested for a dedicated berth having a minimum berthing space of 120m, alongside depth of 8m with 5 acres of area behind the berth for operations. A land parcel of 5 acre for construction of accommodation for staff of Coast Guard was also requested outside the CRZ near the Port of Vizhinjam. VISL and the State Government agreed to the above requirement on a cost sharing basis, considering the coastal security needs of the region.

### 2.3.2.3 Navy Berth

Taking the advantage of the strategic location of the port, The Indian Navy (IN) has shown the interest in the port proposing the requirement of a navy berth and the associated storage facility.

The requirement is basically to provide a mounting base for loading of amphibious vessels, troops and transports. This would require a contiguous berth of 500m with a loading ramp of width 20m to enable loading of vehicles through the bow ramps of Indian Naval Ships. The IN plans to utilize the berth mainly for loading of amphibious troops, transports and armored vehicles for joint operation with the Indian Army base at Thiruvananthapuram (where the only amphibian infantry brigade in the Country is stationed) and the Indian Air Force Base at Thiruvananthapuram. The above berth requirement and the requirement of 25 acres of land (10 acres behind the berth and 15 acres outside for colony requirements) was agreed to by VISL and the State Government on cost sharing basis, considering the larger interests of the security of the Country.

Table 2.4 Characteristics of Navy Crafts

S. No.	Ships	LOA	Beam	Draft
		(m)	(m)	(m)
1.	Navy Ship	175.0	32.0	8.0

### 2.3.2.4 Port Crafts Berth

The Ship Navigation study has recommended a minimum requirement of four tugs i.e. 3 Tugs with 70T bollard pull capacity and 1 Tug with 40T bollard pull capacity to assist the navigation of ships visiting the port, 3 Mooring launches and 1 Pilot launch. It is recommended that a back-up tug be procured for the port.

The characteristics of these support crafts are given hereunder in Table 2.5.

Table 2.5 Characteristics of Port Crafts

S. No.	Type of Craft	LOA	Beam	Draft	Freeboard
		(m)	(m)	(m)	(m)
1.	Tugs	30.0	9.0	2.5	1.5
2.	Pilot Launch	19.5	4.8	1.8	1.1
3.	Mooring Launch	10.3	3.2	1.2	0.8

A total of 100m of berth length is provided at the port for the port crafts mentioned above.

### 2.3.3 Berth Length for various Port Facilities

The table below provides the summary of the support facilities required for Phase 1 Development of Vizhinjam port.

Table 2.6 Summary of Berth Length for Support Facilities

S. No	Type	Berth Length
		(m)
1.	Container Berths	800
2.	Cruise cum Multipurpose Cargo Berth	300
3.	Port Craft Berth	100
4.	Coast Guard Berth	120
5.	Navy Berth	500

## 2.4 Fishery Landing Centre

The existing Vizhinjam fishing harbour has the berthing facility of 500m and is being utilized to its peak causing the congestion in the utilization of the harbour. Apart from this, the harbour requires upgradation in terms of ancillary facilities.

In order to ease the congestion in the existing fishing harbour and provide additional facilities for the local population, VISL has proposed to provide fishery berths along the sea side of north breakwater of the proposed Vizhinjam port as part of Corporate Social Responsibility.

The facilities to be provided are broadly divided into two categories viz.

- a) Waterside facilities
  - o Proper access to the landing area from the sea
  - o Landing, Outfitting Quay and berthing quay/ jetty
  - o Navigational Aids etc
- b) Landside facilities
  - o Auction hall
  - o Administrative building
  - o Vehicle parking area
  - o Access roads
  - o Electric & Water Supply etc.

It is proposed to provide 500m Landing, Outfitting Quay and berthing quay/ jetty for the fishing trawlers and country boats.

## 3 Master Plan Facility Requirements

### 3.1 General

The Integrated Master Plan for the proposed port at Vizhinjam was submitted by AECOM in November 2012. Considering the needs of the Indian Navy and considering the outcome of the ESIA and modeling studies, the master plan layout has been further optimized in May, 2013. This section provides a summary of the master plan. Please refer to the master plan report available through VISL for additional details.

The final Master Plan (also referred to as Phase 3 of development) results from identifying the infrastructure needed to achieve the projected market demand over the 30-year planning horizon for the Vizhinjam Port's two core commodities: containerized cargo and cruise. This is based on the traffic projections in the IFC/Drewry 2010 report, and considering the limited / utilizable shore length of 2.5 Km at Vizhinjam. This infrastructure will include:

- Ability to berth fully laden two 12,500 twenty foot equivalent container units (TEU) vessels in Phase 1 itself with capability to handle up to 18,000 TEU vessels.
- Ability to handle 3,000 passenger capacity cruise ships.
- Additional fish landing berths on the sea side sheltered section of breakwater.
- Liquid bunker fuel berth in Master Plan.
- Container Yard on reclaimed land.
- Rail line to port and the railway yard.
- Berthing facilities for Coast Guard and Indian Navy.
- Other support and ancillary facilities.

The AECOM team applied the site-specific physical constraints, based on the infrastructure assessment, to identify the master plan while keeping VISL objectives in mind. These constraints include proximity to an existing fishing harbor and fishermen settlements in the north; a temple in the middle; a fishing village with long beach (Adimalathura) in the south (Phase 3 end) and steep topography of the backup area.

### 3.2 Master Plan Requirements

#### 3.2.1 Harbour and Breakwater Alignment

The harbour and breakwater alignment was maintained from the RH report as it was arrived at after due consideration and studies. However, some alterations were made such as maintaining the distance between the existing fishing harbor and the proposed port to 300m (RH report had it 220m), considering the improved tranquility conditions of the fishing harbor as observed from the mathematical modeling studies.

The shape/ layout of the northern breakwater have been designed in such a way that bunkering vessels can also be berthed in future. The port design was made futuristic by considering 18,000 TEU vessels as the design vessel in Phase 1 itself with a turning circle of 700m diameter, to cater to tug assisted rotation of even futuristic vessels of 400+ m length. Considering that about 18m draft is naturally available at Vizhinjam (which will be deepened to about 21m), currently the biggest 18,000 TEU vessels (like MAERSK EEE class) will also be able to berth.

After modeling studies, it became evident that south breakwater was not needed from maintaining tranquility within the harbour and has been subsequently removed. The navigation studies have been used to further optimize and verify the navigational channel of the harbour. The harbour has been further optimized to accommodate Indian Navy and Coast Guard facilities.

The harbour and breakwater alignment for Phase 2 will be maintained as per the Phase 1 layout. LTR modeling studies have shown that a 200m extension of the breakwater will be required to achieve permissible level of tranquility for Phase 2 berths. For the Master Plan development a further breakwater extension of around 720m will be needed.

### 3.2.2 Container Berths

The master plan provides for a total of five, 400m each container berths. Phase 1 development will have a total of 800m berth length to accommodate two 12,500 TEU container vessels. Phase 2 development will add another 400m berth to have a total of 1200m berth length to accommodate up to three 12,500+ TEU container vessels. Phase 3 will add two additional 400m berths to have a total of 2000m berth length to accommodate up to five 12,500+ TEU container vessels. The berths have been planned so as to meet the traffic forecast. These berths will be designed to be able to berth 18,000 TEU vessels as well.

Each berth will be equipped with four quay container cranes. The Quay apron area has been planned to accommodate the crane rail (upto 35m rail gauge), circulation lanes as well as hatch cover laydown area. The apron area has been planned for a width of 70m.

### 3.2.3 Fishery Berths

The Phase 1 development plan provides for additional fishery berths for the local fishing community. A total berth length of 500m is provided for along the sheltered sea-ward side of the proposed north breakwater. The Master Plan Report submitted in Nov. 2012, suggested that fish landing berths could also be situated on the sea side of the existing Vizhinjam harbour south breakwater. However, the modeling reports have shown that only 500m along the proposed port breakwater are feasible.

### 3.2.4 Cruise cum Multipurpose Berths

For the port master development, cruise berths is programmed to be constructed on the leeside along the northern breakwater, in order to optimize the container cargo handling berths and provide flexibility for phasing the cruise berths on a need basis without interrupting the cargo operations.

The master plan provides for two dedicated berths for Cruise vessels (300m length in Phase 1 with 200m length additional in Phase 3) along the northern breakwater. The depth required for maneuvering and berthing of cruise ships is naturally available at the proposed location and will not involve any capital dredging. The berths are located on the lee-side of the breakwater so as to utilize the structure and provide a wide area behind the berths.

These berths also cater the handling for multipurpose cargo traffic which is not significant that would require a dedicated berth.

### 3.2.5 Coastguard and Navy Berth

A total berth length of 500m is provided for navy. The first 200m of the berth with the ramp loading facility is provided on the leeside of the north breakwater near the northern edge of container berth. A dedicated 120m coast guard berth will be provided in Phase 1 and is contiguous to the IN berth, while, the other 300m berth is provided at the west end of the port on the leeside of the north breakwater to segregate the operations as per the IN requirements. As per Indian Navy and Coast Guard requirement, an area of ten acres and four acre respectively has been earmarked for them behind the berths.

### 3.2.6 Liquid Berth

A provision has been provided in the master plan for a dedicated liquid berth. This berth will be used to import bunker fuel for the vessels calling at the Vizhinjam port. The berth will be connected to the storage tanks through pipelines passing along the north breakwater. A provision for 250m long berth has been provided in the Master Plan and will be able to berth a 60,000 DWT liquid bulk tanker. The berth will be located south of the Indian Navy berth along the lee side of the north breakwater. This location would cause minimum interference between liquid berth operations with any other port vessel operations.

### 3.2.7 Port Craft Berth

A total of 100m of berth length is provided on the leeside of the northern breakwater and is contiguous with the coastguard and Navy berth. The 100m berth will be able to accommodate port crafts for the Phase 1 requirements. Over the master plan horizon, additional port craft berths would be required for which the cruise berth could be utilized intermittently to meet the requirement. Alternatively, a pontoon berthing arrangement could also be used

intermittently. The location of these port craft berth has been carefully chosen so as to provide a sheltered location as well as at an optimum distance from all berthing areas, and having a provision for pilot office area adjacent to the berths.

### **3.2.8 Container Yard**

The master plan provides for around 100 hectares of Container Yard and support facilities. The container yard is located adjacent to the berths allowing for the efficient transfer of containers from the yard to the apron. The container yard has been planned for efficient handling operations providing for dedicated areas for full, empty and reefer containers. Dedicated circulation lanes have also been provided for quay to yard as well as within yard circulation. The mode of operation for the container yard will be Rubber Tired Gantry (RTG) Cranes in Phase 1 with provision for up gradation to Electric RTG's in later phases. Side Pick cranes are proposed for handling empty containers. Master Plan provides flexibility with adequate space provision for terminal operator to choose a different container handling operating mode such as RMG.

### **3.2.9 Railway Connectivity/Yard**

Electrified railway lines (with two live & three service lines - one service line each in Phase 1, 2 and 3) with container handling facilities using Reach Stackers in Phase 1 and Phase 2, upgradable to RTG's or Rail Mounted Gantry's (RMG's) in Phase 3 have been planned. The proposed port is essentially a transshipment container terminal with around 30% of gateway container traffic. The split of gateway traffic coming through rail is assumed to be 30%. The number of rail lines has been sized to accommodate this traffic.

In future, the proximity of the planned cruise berths to the rail yard can also be utilized to handle the multipurpose/ bulk cargo from the cruise berths using rail for landside transfer.

Provisional future expansion space east of rail yard and north of the gate complex can be also used for bunker fuel storage, which can also avail the proximity of rail yard, for bringing in the liquid petroleum products in the port by rail.

### **3.2.10 Entry/Exit Gate Complex**

The main terminal gate has been provided at the east end of the port. It will consist of a gate canopy with three entry and three exit lanes with one bypass lane and one lane for port vehicles on each side. It is planned that the gate operations in Phase 1 will consist of single shift increasing to two and three shifts in Phase 2 and Phase 3 respectively. The proposed port is essentially a transshipment container terminal with around 16% of total container traffic will be Gateway traffic handled by trucks.

The gate complex is designed for handling the master plan gateway traffic handled by trucks. Traffic forecast by IFC/Drewry has been considered for designing of gate complex. In case there will be any change in market statistics and increase in gateway traffic by gate, there will be possibility to expand gate complex further in north-east direction. In case of two or more terminal operators, gate complex will remain same and secondary check gates will be provided at terminal entry points.



## 4 Outcome of Mathematical Model Studies

### 4.1 Discussions on the Outcome of Model Studies

The outcome of the mathematical model studies conducted on the Phase 1 and Master Plan port layout is summarized in the following paragraphs:

#### 4.1.1 Wave Tranquility

RH studies were performed during 2010 and have been updated with site-specific studies by LTR. These modeling studies state that there is no need for the south breakwater. The proposed north breakwater itself provides complete protection from offshore waves. Since the extreme waves conditions are during the monsoons, the breakwater alignment effectively provides full protection from the monsoon waves. The breakwater alignment may be further optimized during the detail design stage and after physical modeling studies during EPC stages.

The proposed port layout is expected to improve tranquility for the existing fishing harbour as the proposed port breakwaters will provide additional protection to the existing fishing harbour basin. The proposed fish landing harbour will be protected by the north breakwater extension.

#### 4.1.2 Sediment Transport and Shoreline Change

The proposed port breakwater alignment is not expected to alter the sedimentation pattern around the shoreline significantly. The existing pocket beaches around Kovalam are not expected to be affected. The beaches south of the proposed port at Adimalathura are expected to see accretion due to the presence of the proposed bund structure at the south of container terminal. This accretion is estimated to equilibrate at around 20m at the end of ten years of simulation. The proposed bund structure is also expected to block any sediment from entering into the proposed harbour. Hence, maintenance dredging activities at the port are expected to be minimal. The proposed port is also expected to reduce sedimentation inside the existing fishing harbour.

Offshore dredge material dumping locations have been also identified and modeled. The sediment dispersion studies indicate that the most of the sediments dumped do not travel far from the proposed dumping ground and the concentration of sediments will be very minimal away from the dumping grounds.

#### 4.1.3 Ship Navigation Study

The fast-time ship navigation study has validated various navigational arrangements at the port in respect of dredge depths, channel widths, turning adequacy, berth arrangements etc. The recommendation of 400m outer channel width has been adopted for the Vizhinjam port.

# 5 Land Use and Proposed Port Plan

## 5.1 Land Use Plan

The land use plan was prepared in the Integrated Master Plan Report. Based on the additional facilities and further optimization of the port layout, the amended land use plan has been prepared over the master plan horizon based on the recommended port Master Plan layout after identifying the land required for the port for various purposes

The allocation of land over the master plan horizon is presented in Drawing DELD11137/MPR/ 2. It is estimated that the total existing land area required by VISL is around 140.42 hectares out of which around 48.16 is under the ownership of VISL. Table 5.1 lists out various areas considered in the Land Use plan.

Table 5.1 Land Use Plan Areas

S. No	Land Use Plan Areas	Area
		(Ha)
1.	Container Yard Phase 1	31
2.	Container Yard Phase 2	15
3.	Container Yard Phase 3	30
4.	Future Expansion Area	29
5.	Breakwater Area	3
6.	Area Reserved for VISL Port Building / Construction Staging Area	2
7.	Terminal Administrative Area	1
8.	Truck Terminal/Fuel Filling & Other Utilities	14
9.	Rail Corridor Within Port	7
10.	Port based SEZ, additional warehousing and commercial facilities	29
11.	Road Access Corridor	12
12.	Port Operators Colony area	5
13.	Area To Be Procured for Port Operator Utility for Phase 1 and 2	6
14.	Cruise Service/Resort Area	8
15.	Terminal Gate Area	10
16.	Cruise Berthing Area	5
17.	Pre-Gate Area	1
18.	Port Operator Utility Area for Phase 3/ Construction Staging area	4
19.	VISL Colony Area	9
20.	VISL 220/66KV Main Receiving Sub-station	1
21.	Coast Guard Operational Area	2
22.	Auction Hall, Net Mending Facilities for Fish landing Center	0.1
23.	Rain Water Harvesting Area	1
24.	Indian Navy Operational Area	5
25.	Indian navy/ Coast Guard Colony Area	10
26.	66/11KV Sub-station for Port	0.02
	<b>Total</b>	<b>238</b>

## 5.2 Proposed Port Plan

### 5.2.1 Port Master Plan

The proposed port Master Plan development i.e. Phase 3 is as shown in **Drawing DELD11137/MPR/ 3**.

### 5.2.2 Recommended Phase 1 Marine Layout for Implementation

The summary of the marine layout for Phase 1 development is provided in Table 5.2 below and is as shown in drawing **DELD11137/MPR/ 5**.

Table 5.2 Summary of Phase 1 Marine Layout

S. No	Description	Unit	Phase 1
1.	<b>Maximum Ship Size</b>		
	– Container Vessels	TEU	18,000
2.	<b>Breakwaters</b>		
	– Length of North Breakwater	m	3,040
	– Breakwater for fishery harbour extension	m	140
3.	<b>Number of Berths (Total length of berths in meters)</b>		
	– Container Berths	No.(m)	2 (800)
	– Cruise cum multipurpose cargo berth	No.(m)	1 (300)
	– Port Craft Berths	No.(m)	1 (100)
	– Coast Guard Berths	No.(m)	1 (120)
	– Navy Berth	m	500
	– Fishery Berths	m	500
4.	<b>Navigational Areas</b>		
	– Length of Outer Approach Channel	m	2,800
	– Width of Outer Approach Channel	m	400
	– Length of Inner Approach Channel (m)	m	1,200
	– Width of Inner Approach Channel (m)	m	300
	– Diameter of Turning Circle (m)	m	700

### 5.2.3 Phase 1 Expansion

The proposed expansion of the Phase 1 development i.e. Phase 2 is as shown in **Drawing DELD11137/MPR/ 6**.

## 6 Block Cost Estimates

### Disclaimer

The capital cost estimates prepared for the various Phase Development of the project have been arrived at based upon site information, appropriate assumptions, wherever required, and the database available with the AECOM for the similar projects. These site information and assumptions are subject to many factors that are beyond the control of the AECOM; and AECOM thus make no representations or warranties with respect to these estimates and disclaim any responsibility for the accuracy of these estimates.

### 6.1 Cost Estimates

The cost estimates have been summarized in Table 6.1 for various phase developments.

Table 6.1 Block Cost Estimates Summary

S. No.	Item	Capital Cost					
		Phase 1		Phase 2		Phase 3 (Master Plan)	
		(in Mil. USD)	(in Crore INR)	(in Mil. USD)	(in Crore INR)	(in Mil. USD)	(in Crore INR)
1.	Project Preliminaries and Site Development	2	13	1	6	1	6
2.	Dredging and Reclamation	70	379	25	133	62	334
3.	Breakwaters	142	767	15	82	43	233
4.	Berths	100	541	29	155	65	352
5.	Buildings	5	25	2	11	4	22
6.	Container Yard	22	119	10	53	23	122
7.	Equipments	117	632	58	312	116	625
8.	Utilities and Others	30	160	6	33	12	67
9.	Port Crafts and Aids to Navigation	21	114	5	25	6	32
10.	Gates Complex & Road Development	9	50	0	0	1	6
	<b>Total</b>	<b>518</b>	<b>2,800</b>	<b>150</b>	<b>810</b>	<b>333</b>	<b>1,798</b>
	Contingencies @ 20%	104	560	30	162	67	360
	Engineering and Project Management @ 10%	52	280	15	81	33	180
	<b>GRAND TOTAL</b>	<b>674</b>	<b>3,640</b>	<b>195</b>	<b>1,053</b>	<b>433</b>	<b>2,337</b>

For the “landlord” port model, Table 6.2 list out the estimated capital cost split between VISL and private terminal operator(s) based on the discussion with VISL and AECOM's experience and understanding of the market. It is assumed that VISL will provide all civil costs associated with the project including breakwaters, dredging and reclamation, berths, port crafts and navigation aids. Some buildings such as VISL Admin, security guard booth, fish landing center will be provided by VISL. Private operator will provide all container terminal and gate complex development costs as well as equipment costs. It is also assumed that VISL will provide utilities to an agreed upon

“hand-shake” point and the private terminal operator will be providing the utilities for the rest of the container terminal. An exchange rate of 1USD=54 INR is used for block cost estimates.

These cost numbers are in 2012 base year and may vary depending on actual contractual agreements between VISL and potential terminal operators.

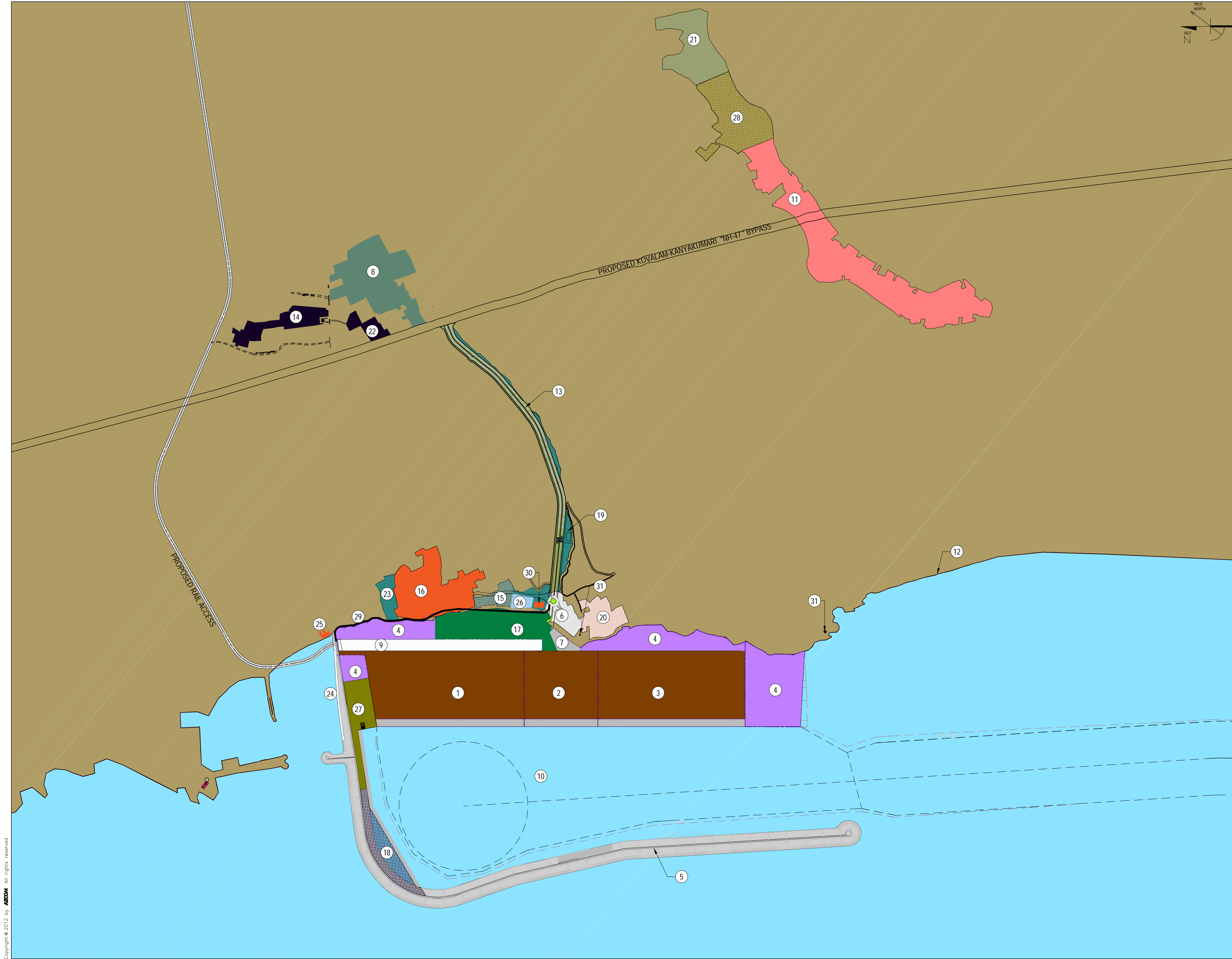
Table 6.2 Block Cost Estimates Split between VISL and Private Port Operator

S. No.	Item	Capital Cost (in Million USD)					
		Phase 1		Phase 2		Phase 3 (Master Plan)	
		VISL	Private Operator	VISL	Private Operator	VISL	Private Operator
1.	Project Preliminaries and Site Development	2	0	1	0	1	0
2.	Dredging and Reclamation	70	0	25	0	62	0
3.	Breakwaters	142	0	15	0	43	0
4.	Berths	100	0	29	0	65	0
5.	Buildings	1	4	0	2	1	3
6.	Container Yard	0	22	0	10	0	22
7.	Equipments	0	117	0	58	0	116
8.	Utilities and Others	16	14	0	6	0	12
9.	Port Crafts and Aids to Navigation	0	21	0	5	0	6
10.	Gates Complex & Road Development	0	9	0	0	0	1
	<b>Total</b>	<b>332</b>	<b>186</b>	<b>70</b>	<b>80</b>	<b>172</b>	<b>160</b>
	Contingencies @ 20%	66	37	14	16	34	32
	Engineering and Project Management @ 10%	33	19	7	8	17	16
	<b>GRAND TOTAL</b>	<b>432</b>	<b>242</b>	<b>91</b>	<b>104</b>	<b>224</b>	<b>209</b>

# Drawings







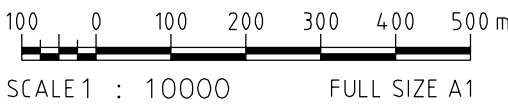
KEYNOTES

1	CONTAINER YARD PHASE 1	31.3HA
2	CONTAINER YARD PHASE 2	14.8HA
3	CONTAINER YARD PHASE 3	29.6HA
4	FUTURE EXPANSION AREA	28.6HA
5	BREAKWATER ROAD	3.3HA
6	AREA RESERVED FOR VISL PORT BUILDING & CONSTRUCTION STAGING AREA	2.1HA
7	TERMINAL ADMIN AREA	1HA
8	TRUCK TERMINAL / FUEL FILLING & OTHER UTILITIES	13.5HA
9	RAIL TERMINAL	6.8HA
10	HARBOUR AREA WITHIN BREAKWATER	167HA
11	PORT BASED SEZ, ADDITIONAL WARE HOUSING & COMMERCIAL FACILITIES	28.7HA
12	SHORE LINE	
13	ROAD ACCESS CORRIDOR	11.7HA
14	PORT OPERATOR'S COLONY AREA	4.9HA
15	AREA TO BE PROCURED FOR PORT OPERATOR UTILITY FOR PHASE 1 & 2	6.1HA
16	CRUISE SERVICE / RESORT AREA	7.5HA
17	TERMINAL GATE AREA	10HA
18	CRUISE BERTHING AREA	5.2HA
19	PREGATE AREA	1.3HA
20	PORT OPERATOR UTILITY AREA FOR PHASE 3 / CONSTRUCTION STAGING AREA	4HA
21	VISL COLONY AREA	9HA
22	VISL 220/66KV MAIN RECEIVING SUBSTATION	1.2HA
23	COAST GUARD OPERATIONAL AREA	1.8HA
24	FISHING BERTHS	0.05HA
25	AUCTION HALL, MENDING HALL, FACILITY FOR FISHING LANDING BERTHS	0.14HA
26	RAIN WATER HARVESTING AREA	0.8HA
27	INDIAN NAVY OPERATIONAL AREA	4.5HA
28	NAVY / COAST GUARD COLONY AREA	10HA
29	INDICATIVE ACCESS ROAD FOR NAVY & COAST GUARD	
30	66/11 KV SUBSTATION FOR PORT	0.02HA
31	EXISTING TEMPLE	

LEGEND

	CONTAINER YARD
	CRUISE BERTHING AREA
	BREAKWATER
	LAND AREA
	SEA AREA
	FUTURE EXPANSION AREA
	PORT BASED SEZ / COMMERCIAL FACILITIES
	ROAD ACCESS
	TRUCK TERMINAL
	PORT OPERATOR COLONY AREA
	CRUISE SERVICE AREA
	TERMINAL GATE AREA
	INDIAN NAVY AREA
	VISL COLONY AREA
	INDIAN NAVY / COAST GUARD COLONY AREA

Revision	By	Approved	Date
REV 1	VB	VA	17-05-13
REV 2	VB	VA	21-05-13
REV 3	VB	VA	23-05-13



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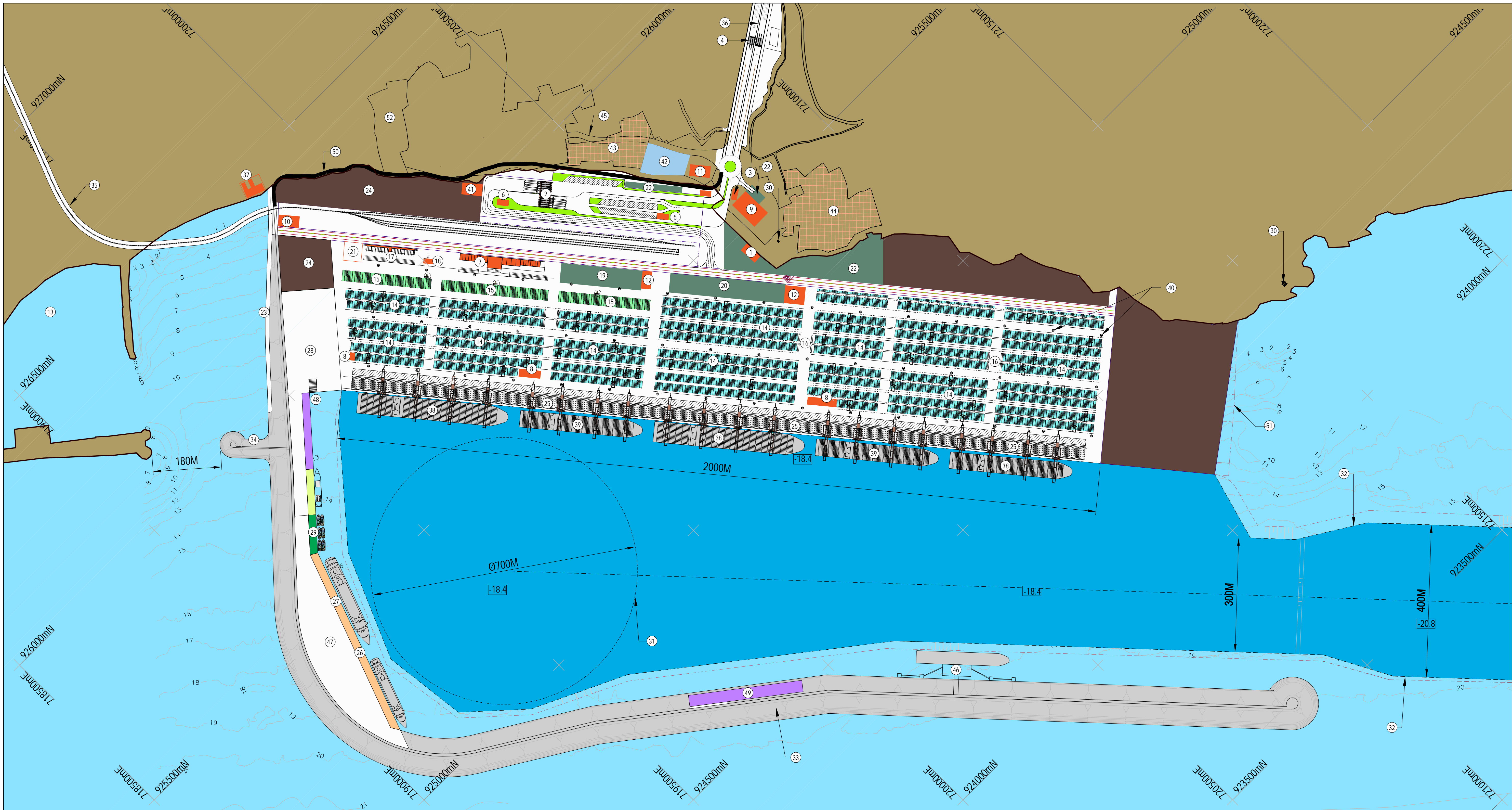
Drawn By	DK
Approved By	VA
Date	05/11/2012
Meeting	MASTER-PLAN-REPORT



VIZHINJAM PORT PROJECT  
PLANNING AND ANALYSIS

Sheet Title	LAND USE PLAN	
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REV 3		



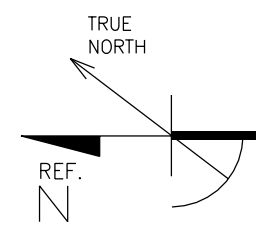


KEYNOTES

- |   |                                     |                                     |   |  |
|---|-------------------------------------|-------------------------------------|---|--|
| 1 ADMINISTRATION BUILDING                             | 11 SUB STATION & UTILITY AREA       | 21 HAZARDOUS CARGO AREA             | 32 APPROACH CHANNEL   | 42 RAIN WATER HARVESTING AREA                    |
| 2 ENTRY / EXIT GATE CANOPY                            | 12 YARD OPERATIONS BUILDING         | 22 POV PARKING / TERMINAL BUILDINGS | 33 NORTH BREAKWATER (3960M LONG)                              | 43 OPERATOR UTILITY AREA (PHASE - 1 & 2)         |
| 3 SECURITY GUARD BOOTH                                | 13 EXISTING FISHING HARBOUR         | 23 FISH LANDING BERTHS              | 34 FISHERY BERTH BREAKWATER (140M LONG)                       | 44 OPERATOR UTILITY AREA (PHASE - 3)             |
| 4 PRE - GATE  | 14 LOADED BOX STORAGE               | 24 FUTURE EXPANSION AREA            | 35 PROPOSED RAIL ACCESS CORRIDOR                              | 45 CRUISE SERVICE AREA ACCESS ROAD               |
| 5 CUSTOMS BUILDING                                    | 15 EMPTY BOX STORAGE                | 25 CONTAINER BERTHS 2000M LONG      | 36 MAIN PORT ACCESS ROAD                                      | 46 LIQUID BERTH                                  |
| 6 GATE STAFF BUILDING                                 | 16 REEFER STORAGE                   | 26 CRUISE BERTHS 500M LONG          | 37 AUCTION HALL, NET MENDING FACILITY FOR FISH LANDING BERTHS | 47 CRUISE TERMINAL AREA                          |
| 7 MAINTENANCE & REPAIR AREA AND BUILDING              | 17 REEFER WASH AREA                 | 27 COAST GUARD BERTH 120M LONG      | 38 12500 TEU CONTAINER VESSEL (TYP.)                          | 48 INDIAN NAVY BERTH WITH LOADING RAMP 200M LONG |
| 8 QUAY CRANE MAINTENANCE & MARINE OPERATIONS BUILDING | 18 REEFER SERVICE & GENSET AREA     | 28 INDIAN NAVY OPERATIONAL AREA     | 39 9000 TEU CONTAINER VESSELS (TYP.)                          | 49 INDIAN NAVY BERTH 300M                        |
| 9 VISL PORT ADMINISTRATE BUILDING                     | 19 EQUIPMENT STORAGE AREA           | 29 PORT CRAFT BERTH 100M LONG       | 40 HIGH MAST LIGHTING POLE (TYP.)                             | 50 INDICATIVE ACCESS ROAD FOR NAVY & COAST GUARD |
| 10 RAILWAY STATION MASTER BUILDING                    | 20 ITV STORAGE / TERMINAL BUILDINGS | 30 EXISTING TEMPLE                  | 41 FIRE STATION   | 51 BUND  |
|   |                                     | 31 TURNING CIRCLE 700M DIA          |   | 52 COAST GUARD OPERATIONAL AREA                  |

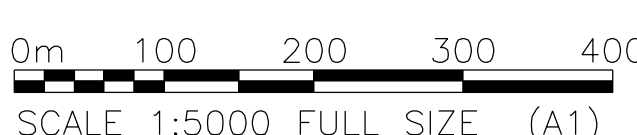
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- |  |  |
|--|--|
|  | BUILDINGS                              |
|  | POV / TERMINAL EQUIPMENTS PARKING AREA |
|  | BREAKWATER                             |
|  | LAND AREA                              |
|  | SEA AREA                               |
|  | FUTURE EXPANSION AREA                  |



PRELIMINARY

Revision	By	Approved	Date
1	VB	VA	28/11/2012
2	VB	VA	21/05/2013
3	VB	VA	23/05/2013



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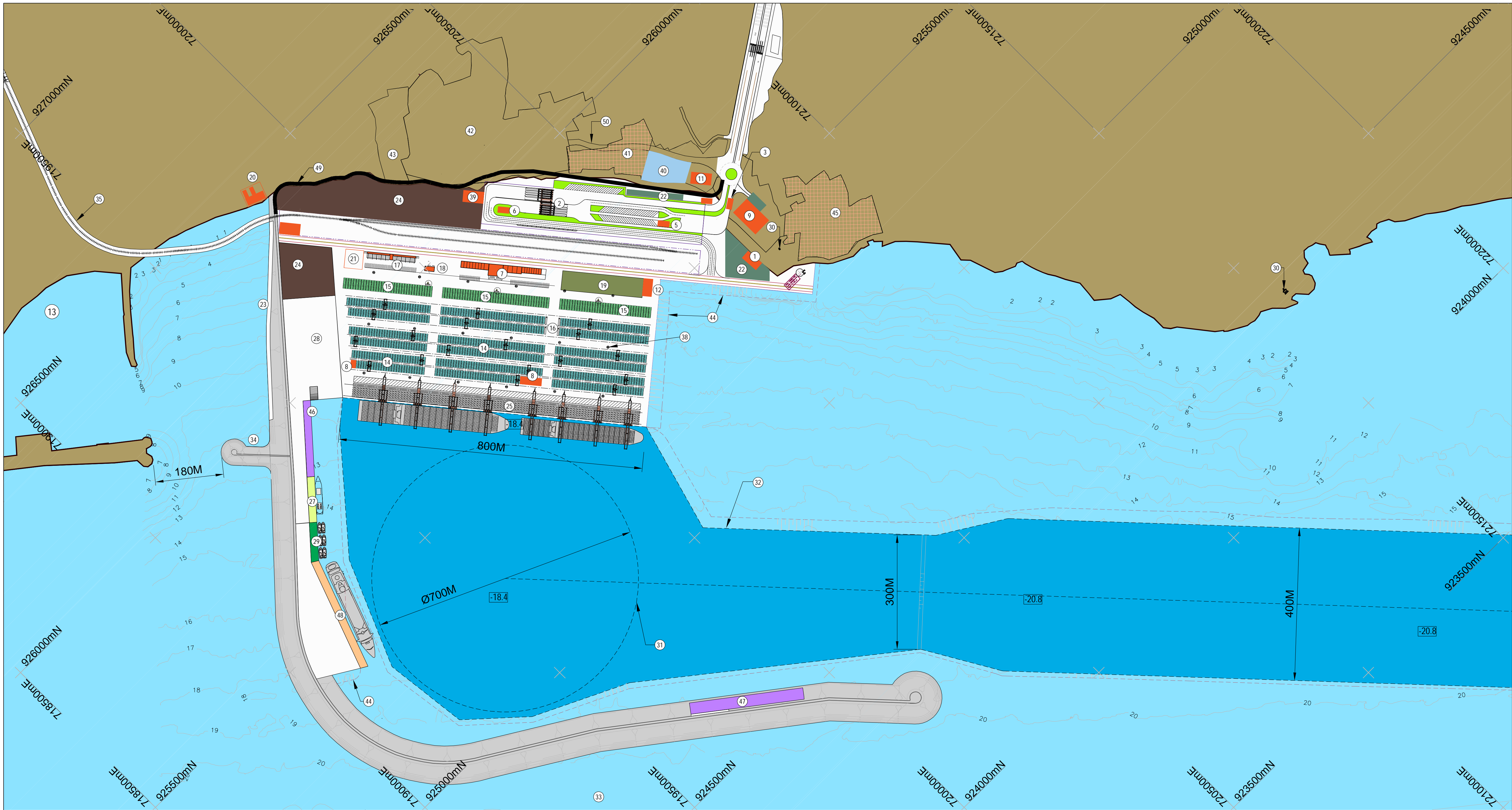
Drawn By  
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Approved By  
VA  
Date  
2/11/2012  
Meeting  
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**VIZHINJAM PORT PROJECT**  
**PLANNING AND ANALYSIS**

Sheet Title	RECOMMENDED PORT MASTER PLAN
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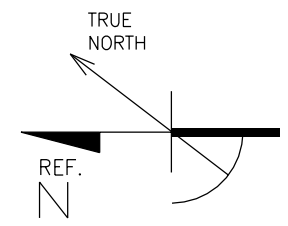


KEYNOTES

- |   |   |                                  |  |  |
|---|---|----------------------------------|--|--|
| 1 ADMINISTRATION BUILDING                             | 11 SUB STATION & UTILITY AREA                                 | 21 HAZARDOUS CARGO AREA          | 31 TURNING CIRCLE 700M DIA               | 42 CRUISE TERMINAL AREA                          |
| 2 ENTRY / EXIT GATE CANOPY                            | 12 YARD OPERATIONS BUILDING                                   | 22 POV PARKING AREA              | 32 APPROACH CHANNEL                      | 43 COAST GUARD OPERATIONAL AREA                  |
| 3 SECURITY GUARD BOOTH                                | 13 EXISTING FISHING HARBOUR                                   | 23 FISH LANDING BERTHS 500M LONG | 33 NORTH BREAKWATER (3040M LONG)         | 44 BUND  |
| 4 PRE - GATE  | 14 LOADED BOX STORAGE   | 24 FUTURE EXPANSION AREA         | 34 FISHERY BERTH BREAKWATER (140M LONG)  | 45 OPERATOR UTILITY AREA (MASTER PLAN)           |
| 5 CUSTOMS BUILDING                                    | 15 EMPTY BOX STORAGE  | 25 CONTAINER BERTHS 800M LONG    | 35 PROPOSED RAIL ACCESS CORRIDOR         | 46 INDIAN NAVY BERTH WITH LOADING RAMP 200M LONG |
| 6 GATE STAFF BUILDING                                 | 16 REEFER STORAGE   | 26 MAIN PORT ACCESS ROAD         | 36 12500 TEU CONTAINER VESSELS           | 47 INDIAN NAVY BERTH 300M                        |
| 7 MAINTENANCE & REPAIR AREA AND BUILDING              | 17 REEFER WASH AREA   | 27 COAST GUARD BERTH 120M LONG   | 37 9000 TEU CONTAINER VESSELS            | 48 CRUISE BERTH 300M                             |
| 8 QUAY CRANE MAINTENANCE & MARINE OPERATIONS BUILDING | 18 REEFER SERVICE & GENSET AREA                               | 28 INDIAN NAVY OPERATIONAL AREA  | 38 HIGH MAST LIGHTING POLE (TYP.)        | 49 INDICATIVE ACCESS ROAD FOR NAVY & COAST GUARD |
| 9 VISL PORT ADMINISTRATE BUILDING                     | 19 EQUIPMENT STORAGE AREA                                     | 29 PORT CRAFT BERTHS 100M LONG   | 39 FIRE STATION                          | 50 CRUISE SERVICE AREA ACCESS ROAD               |
| 10 RAILWAY STATION MASTER BUILDING                    | 20 AUCTION HALL, NET MENDING FACILITY FOR FISH LANDING BERTHS | 30 EXISTING TEMPLE               | 40 RAIN WATER HARVESTING AREA            |  |
|   |   |                                  | 41 OPERATOR UTILITY AREA (PHASE - 1 & 2) |  |

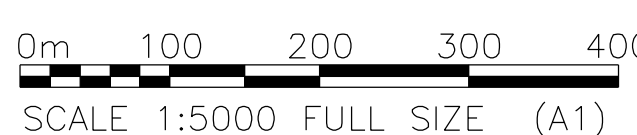
LEGEND

- |  |  |
|--|--|
|  | BUILDINGS                              |
|  | POV / TERMINAL EQUIPMENTS PARKING AREA |
|  | BREAKWATER                             |
|  | LAND AREA                              |
|  | SEA AREA                               |
|  | FUTURE EXPANSION AREA                  |



PRELIMINARY

Revision	By	Approved	Date
1	VB	VA	28/11/2012
2	VB	VA	11/12/2012
3	VB	VA	21/05/2013
4	VB	VA	23/05/2013



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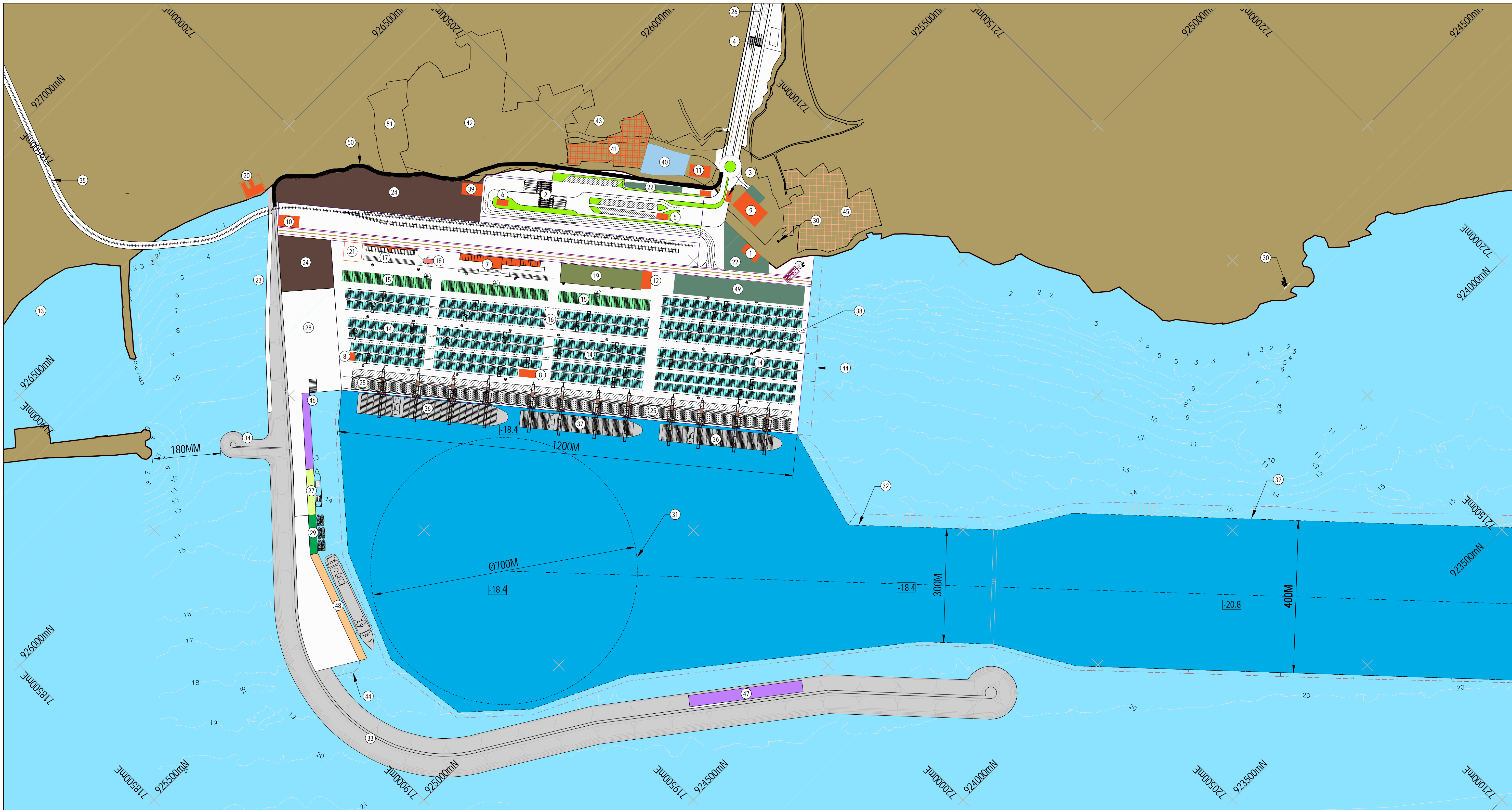
Drawn By  
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2/11/2012  
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MASTER PLAN REPORT



VIZHINJAM PORT PROJECT  
PLANNING AND ANALYSIS

Sheet Title	RECOMMENDED PORT PHASE-1 PLAN
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**KEYNOTES**

- 1 ADMINISTRATION BUILDING
- 2 ENTRY / EXIT GATE CANOPY
- 3 SECURITY GUARD BOOTH
- 4 PRE - GATE
- 5 CUSTOMS BUILDING
- 6 GATE STAFF BUILDING
- 7 MAINTENANCE & REPAIR AREA AND BUILDING
- 8 QUAY CRANE MAINTENANCE & MARINE OPERATIONS BUILDING
- 9 VISL PORT ADMINISTRATE BUILDING
- 10 RAILWAY STATION MASTER BUILDING

- 11 SUB STATION & UTILITY AREA
- 12 YARD OPERATIONS BUILDING
- 13 EXISTING FISHING HARBOUR
- 14 LOADED BOX STORAGE
- 15 EMPTY BOX STORAGE
- 16 REEFER STORAGE
- 17 REEFER WASH AREA
- 18 REEFER SERVICE & GENSET AREA
- 19 EQUIPMENT STORAGE AREA
- 20 AUCTION HALL, NET MENDING FACILITY FOR FISH LANDING BERTHS

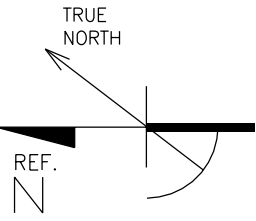
- 21 HAZARDOUS CARGO AREA
- 22 POV PARKING AREA
- 23 FISH LANDING BERTHS 500M LONG
- 24 FUTURE EXPANSION AREA
- 25 CONTAINER BERTHS 1200M LONG
- 26 MAIN PORT ACCESS ROAD
- 27 COAST GUARD BERTH 120M LONG
- 28 INDIAN NAVY OPERATIONAL AREA
- 29 PORT CRAFT BERTHS 100M LONG
- 30 EXISTING TEMPLE

- 31 TURNING CIRCLE 700M DIA
- 32 APPROACH CHANNEL
- 33 NORTH BREAKWATER (3240M LONG)
- 34 FISHERY BERTH BREAKWATER (140M LONG)
- 35 PROPOSED RAIL ACCESS CORRIDOR
- 36 12500 TEU CONTAINER VESSELS
- 37 9000 TEU CONTAINER VESSELS
- 38 HIGH MAST LIGHTING POLE (TYP.)
- 39 FIRE STATION
- 40 RAIN WATER HARVESTING AREA
- 41 OPERATOR UTILITY AREA (PHASE - 1 & 2)

- 42 CRUISE TERMINAL AREA
- 43 CRUISE SERVICE AREA ACCESS ROAD
- 44 BUND
- 45 OPERATOR UTILITY AREA (MASTER PLAN)
- 46 INDIAN NAVY BERTH WITH LOADING RAMP 200M LONG
- 47 INDIAN NAVY BERTH 300M
- 48 CRUISE BERTH 300M
- 49 ITV STORAGE / TERMINAL BUILDING
- 50 INDICATIVE ACCESS ROAD FOR NAVY & COAST GUARD
- 51 COAST GUARD OPERATIONAL AREA

**LEGEND**

- BUILDINGS
- POV / TERMINAL EQUIPMENTS PARKING AREA
- BREAKWATER
- LAND AREA
- SEA AREA
- FUTURE EXPANSION AREA



**PRELIMINARY**

Revision	By	Approved	Date
1	VB	VA	28/11/2012
2	VB	VA	21/05/2013
3	VB	VA	23/05/2013

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**VIZHINJAM PORT PROJECT  
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Sheet Title	RECOMMENDED PORT PHASE-II PLAN
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Drawing No.	DELD11137/MPR/ 6
REV	3