DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

FEASIBILITY REPORT

Consultant

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1. INTRODUCTION

1.1 Background

To augment the capacity of National Waterway-1 (from Haldia to Varanasi 1390 Kilometer stretch), the Jal Marg Vikas Project (JMVP) is being implemented with technical and financial support of the World Bank. The development objective of JMVP is to enhance the transport efficiency and reliability of NW-1. As a part of the development, the river cruise sector attracts tourists seeking history, spirituality, and natural beauty. To further expand the growth of tourism, infrastructure improvements and other utilities are essential for attracting tourists.

The river Ganga at Varanasi is being used as an Inland waterway to connect nearby cities such as Chunar and Prayagraj using ferries. The river system between Haldia (Sagar) and Prayagraj (1620 km) namely Ganga-Bhagirathi-Hooghly was declared a National Waterway-1 (NW-1) in 1986. IWAI is carrying out various developmental works on the waterway to improve its navigability and develop other infrastructure such as navigation aids and terminal facilities as laid down in the IWAI Act, 1985.

It is also pertinent to note that the Cruise vessel “Ganga Vilas” is being operated from Varanasi, Uttar Pradesh to Dibrugarh, Assam to witness the world heritage sites of various cities across the river to develop tourism. In this regard, the Inland Waterway Authority of India intends to develop a berthing cum cruise terminal to facilitate the passengers in approaching cruise services. Hence, the Inland Waterway Authority of India (IWAI) assigned IIT Madras to perform a feasibility study for developing a World class Cruise Terminal at Varanasi.

1.2 Need for the study

At present, the cruises and ferries are being operated at the existing MMT terminal located on the outskirts of Varanasi. However, it is deliberated by the department to develop a dedicated Cruise Terminal for the operation of cruise vessels.

Cruise terminals are designed to serve the requirements of cruise vessels and passengers. The same shall have to meet the requirements of transport, tourism and urban planning strategies of the proposed location. This envisaged the requirement for the development of terminal buildings. This envisaged the requirement for the development of terminal buildings. It shall also be noted that the proposed cruise terminal building serves as an international gateway for the vessels proposed to sail from neighbouring countries such as Nepal, Bhutan and Bangladesh.

1.3 Scope of the study

The scope of the feasibility study includes the following.

a) Visit site and assess the physical condition at the sites available along the river front of Varanasi.
b) Collect data from secondary sources including maps, master plans from local and central authorities, land use maps, ongoing and upcoming projects, and any other data relevant to the project development.
c) Preparation of conceptual design focuses on the tourism and heritage aspects in a sustainable manner.
d) River front development for being vessels considering the local heritage and environmental conditionals. Floating solutions are preferred.
e) At least three alternatives' locations shall be investigated and presented with merits and demerits.
f) Assessment of dredging requirements for the cruise liners arrival and departure.
g) Prepare overall Master plan
    i. Main Terminal building housing immigration, customs and passenger arrival and departures halls.
    ii. Commercial shopping space for passengers
    iii. Parking area
    iv. Road and Approach
h) Connectivity between the onshore and jetty including approach, etc
i) Block Estimate for facilities
j) Prepare Feasibility Report
k) Presentation to IWAI and Ministry.

The above study shall be used as the basis for further field investigation, market analysis and financial viability for the proposed Cruise Terminal.

1.4 Reference Documents

Following documents were used as reference documents in the preparation of this report.

Table 1.1 Reference Documents

No	Document No	Document Description	Date / revision
1.	-	Hydrographic River Map of Varanasi – Gazipur Channel	18.12.2024
2.	-	Water Level Data of 2023 and 2024	18.12.2024
3.	2316323701NW	DPR of Intermodal Terminal at Varanasi	March 2007
4.	I-525/2017/DPR-VT/R	Detailed Feasibility Study for Capacity Augmentation of National Waterway-1 and Detailed Engineering for its Ancillary Works and Processes between Ghazipur to Allahabad	

1.5 Codes and Standards

The National and International standards used for the development of this report are summarised in Table 1.2.

Table 1.2 List of National and International Standards

Code	Description
BS 6349	Code of practice for maritime structures
Part 1	General Criteria
Part 2	Design of Quay walls, jetties and dolphins
Part 4	Fendering and Mooring System
Part 5	Code of practice for dredging and land reclamation
Part 7	Guide to the design and construction of breakwaters
IS 456-2000	Code of Practice for Plain and Reinforced Concrete
IS 4651	Code of Practice for Planning and Design of Port and
Part 1	Site Investigation
Part 2	Earth Pressure
Part 3	Loading
Part 4	General design considerations
Part 5	Layout and functional requirements
IS 800	General Construction in steel – Code of Practice
PIANC MarCom WG 212	Criteria for acceptable movement of ships at berths
PIANC MarCom WG 185	Ports on greenfield sites – guidelines For site selection and
PIANC MarCom WG 235	Ship dimensions and data for Design of marine
PIANC MarCom WG 152	Guidelines for cruise terminals
PIANC MarCom WG 212	Criteria for acceptable movement of ships at berths
PIANC MarCom WG 185	Ports on greenfield sites – guidelines For site selection and

1.6 Record of submissions

The draft report was submitted on 31st January 2025 and a meeting with IWAI and cruise operators was held on 12th March 2025. The minutes of the meeting forwarded by IWAI is attached in Appendix C. The major change required by IWAI is listed below.

(a) To examine the feasibility of developing a cruise terminal considering the requirements of short journey and long journey cruises.
(b) To examine the land availability and its ownership of the identified locations.
(c) To conduct a meeting with various cruise operators plying in the Varanasi region to incorporate their comments.
(d) Feasibility of providing berthing infrastructure for RO-PAX vessels in the layout.
(e) Feasibility of extension facilities at Assi Ghat.

Accordingly, the second site visit was conducted by IITM on 02.04.2025 to examine the land availability and to obtain an opinion from various cruise operators at Varanasi regarding the development of the facility. The list of attendees representing the cruise operators in the meeting are as follows.

1. Vivek Malviya - Alaknanda Cruiseline Pvt Ltd.
2. Gagan Singh - Banaras Buxar Cruise Services
3. Vineet Arora - Heritage River Journey Pvt Ltd

The observations during the second site visit are described below.

(a) The sites at Assi Ghat and the MMT Terminal were visited by IITM representatives to assess land availability and identify practical constraints for terminal development.
(b) It was informed that the land at Assi Ghat is owned by the UP Government, whereas the land at the MMT Terminal is owned by IWAI.
(c) The coordinates of the land available at Assi Ghat and MMT Terminal were obtained during the site visit.

The extracts of the discussion held with various cruise operators are described below.

(a) Alaknanda Cruise Lines expressed their opinion of developing a cruise terminal at Assi Ghat for short journey cruises. The cruise operator also reiterated the requirement of the ramp for the berthing of ROPAX vessels and requested to incorporate the same in the layout. A further request was made by the operator to include multiple entry points in the berthing infrastructure for boarding the ferries.
(b) The Banaras Buxar cruise operator requested to propose the cruise terminal in a PPP mode and to be operated by a private firm to enhance the hospitality of terminal meet the requirement of passengers.
(c) The Heritage River journey has requested to develop a berth length of 300m to meet the future requirement. The cruise operator has further requested amenities such as Air conditioned Longue/Waiting Area, a Parking area for boarding and boarding guests, a separate Gangway and access area for supplies and deliverables, and other basic facilities such as water and fuel supply.

Accordingly, the revised report incorporating the above changes is submitted.

2. SITE APPRECIATION

2.1. Location

Varanasi (Banaras) is located on the banks of the holy river, Ganges in the state of Uttar Pradesh. Varanasi is one of the world's oldest cities and is considered the spiritual capital of India. It's a major pilgrimage destination for Hindus and Jains, and is also important in the history of Buddhism. The city is home to many temples, including Kashi Vishwanath, the "Golden Temple," which is dedicated to the Hindu god Shiva. Varanasi is a city of temples.

Varanasi, also known as Banaras or Kashi, is located in the northern part of India. It is situated in the state of Uttar Pradesh, along the banks of the holy river Ganges. Varanasi is approximately 800 kilometers southeast of the national capital, New Delhi.

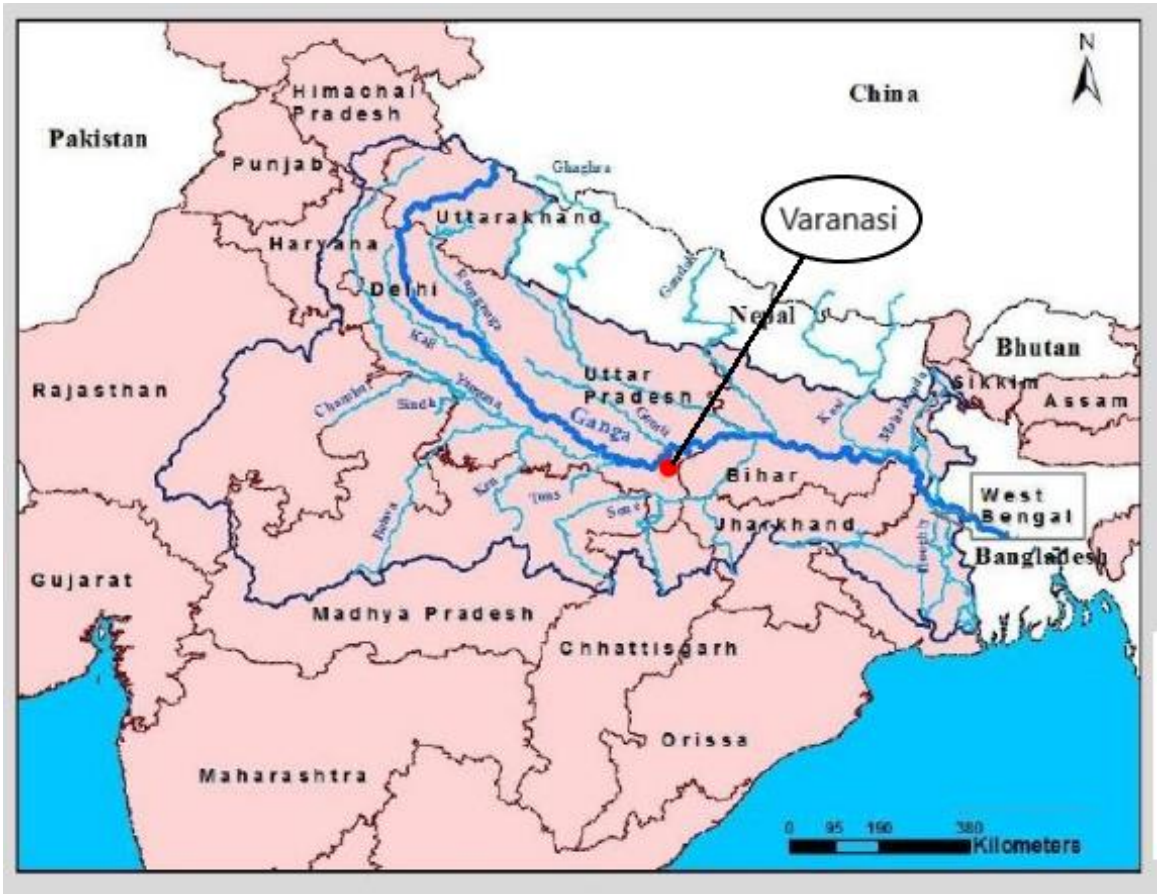


Figure 2.1 View of Location of Varanasi

2.2. Site Visit

A site visit to Varanasi was conducted on 25th November 2024 by a two-member team from IIT Madras, accompanied by officials from the Inland Waterways Authority of India (IWAI),

to assess the site conditions and evaluate its feasibility for the proposed Cruise Terminal. The list of participants involved in the site visit is provided below.

1. Utkarsh Pande, IWAI
2. Surjith Raj V., IITM
3. Nithiyanantham R., IITM

The site visit photographs are shown in figure 2.2 to 2.8.

Figure 2.2 Directions showing the views of Photographs

Figure 2.3 Location Opposite Namo Ghat (D/s of Malviya Bridge)

Figure 2.4 Upstream of Vishwasundari Bridge

Figure 2.5 Downstream of Vishwasundari Bridge

Figure 2.6 Location Adjacent to Namo Ghat Helipad

Figure 2.7 Location at Assi Ghat

Figure 2.8 Location adjacent to MMT Terminal

2.3. Environmental data

2.3.1. Climate

During summer, the weather can be as hot as 45° C and humid as Varanasi lies at the Tropic of Cancer. Torrential rains and high humidity accompany the monsoons that usually come in late June or early July for about two months. In Varanasi, the climatic conditions are most favourable for tourists between October to April.

Varanasi experiences a humid subtropical climate with large variations between summer and winter temperatures. The dry summer starts in April and lasts until June, followed by the monsoon season from July to October. The temperature ranges between 22 and 46 °C in the summer.

Winters in Varanasi see very large diurnal variations, with warm days and downright cold nights. In winter, from mid-November to late February or early March, nights are cool, and sometimes even cold. In January 1990, the temperature dropped to 1 °C, while in January 2013, it dropped to 2 °C.

In addition, from November to January, fog can form at night and in the early morning. In December 2019, there were three days with a maximum of 13 °C and one day with a maximum of 12 °C.
From mid-March to mid-June, before the monsoon, it is witnessed to be very hot with the temperature exceeding 45 °C. In May 1998 and in June 2005, the temperature reached 47 °C.

2.3.2. Seasons

Varanasi also experiences extreme summers with high and dry temperatures. During the winter, the city can experience very cold weather with minimum temperatures as low as 4°C. The Ganges can also get covered in moderate to dense fog, especially in the mornings. The seasons of Varanasi are shown in table 2.1

Table 2.1 Typical seasons

Seasons	Period	Characteristics
Winter	October-February	The temperature drops to -4 deg C
SW Monsoon	June-October	85% average annual rainfall
Summer	March-June	Hot &Dry

Varanasi experiences extreme seasonal variation in the perceived humidity. The muggier period of the year lasts for 6 months, from May to November, during which time the comfort level is muggy, oppressive, or miserable at least 26% of the time. The month with the most muggy days in Varanasi is August, with 31.0 days that are muggy or worse. The month with the fewest muggy days in Varanasi is January, with 0.7 days that are muggy or worse.

2.3.3. Wind

Varanasi's average hourly wind speed experiences significant seasonal variation over the year. The windier part of the year lasts for 7 months, from February to September, with average wind speeds of more than 11 km/hour. The windiest month of the year in Varanasi is June, with an average hourly wind speed of 13.5 km/hour. Whereas, the calmer time of year lasts for 5 months, from September to February. Varanasi's calmest month of the year is November, with an average hourly wind speed of 8 km/hour.

2.3.4. Flood Levels

The Ganga River in Varanasi is prone to annual flooding during the monsoon season. Varanasi experienced the highest flood level of 73.90 meters occurred during September 1978 and the second-highest flood with 72.94m in August 2013.

The highest flood level occurs in the month of September whereas, the lowest flood level is in June. The flood levels of the Varanasi location are summarized in Table 2.2.

Table 2.2 Water Levels of 2024

Description	Water levels with respect to CD
Danger Level	+71.262 m
Warning Level	+70.262 m
High Flood Level (HFL) (Sept.1978)	+73.901 m
Low Flood Level (June 2024)	+57.600 m
Chart Datum	+57.165 m

Source: IWAI

2.3.5. Rainfall

The annual rainfall varies between 39 cm and 200 cm, with an average of 110 cm. Eighty percent of the rainfall occurs during the monsoon months, from June to October. Because of large temporal variations in precipitation over the year, the river's flow characteristics fluctuate widely.

In Varanasi, monsoons normally begin in late June. The annual rainfall varies from 680 mm to 1,500 mm with a large proportion occurring from June to September. October receives about 5 % of rainfall, and only 8 % of the rain occurs in the remaining seven months from November to May. The rainfall data for the period 1999-2019 are depicted in table 2.3.

Table 2.3(a) Rainfall data for the period 1999-2019

S. No.	Months	Mean Total Rainfall (mm)	Mean Number of Rainy Days
1	January	16	2
2	February	19	2
3	March	9	1
4	April	6	1
5	May	10	2
6	June	137	9
7	July	305	18
8	August	254	18
9	September	173	13
10	October	40	1
11	November	6	1
12	December	7	1
	Total	**982**	**69**

Table 2.3(b) Rainfall data for the year 2022

S. No.	Months	Rainfall for the year 2022 in mm
1	January	14.1
2	February	3.0
3	March	0.0
4	April	0.0
5	May	5.6
6	June	182.1
7	July	166.7
8	August	229.7
9	September	181.2
10	October	39.8
11	November	0.0
12	December	0.0
	Total	**822.2**

Source: https://en.climate-data.org/

2.3.6. Temperature

The month of maximum warmth in a year is May. The average temperature during the period reached upto 33.4 deg C, making it the hottest time of the year. January is the coldest month of the year. The variation in annual temperature is around 17.5deg C., The average data for the period 1991-2021 is depicted in table 2.4.

Table 2.4 Temperature for the period 1991-2021

S. No.	Months	Avg Temperature (deg C)	Minimum Temperature (deg C)	Maximum Temperature (deg C)
1	January	16	9.9	22.3
2	February	19.8	13.1	26.4
3	March	25.4	17.7	32.7
4	April	31.1	23.1	38.6
5	May	33.4	26.6	39.7
6	June	32.6	28	37.3
7	July	29	26.5	32.2
8	August	28.4	26	31.5
9	September	27.8	25	31.2
10	October	25.7	21	30.7
11	November	21.9	15.8	28
12	December	17.5	11.3	23.8

2.3.7. Humidity

The month with the most relative humidity is August (82.18%). The month with the least relative humidity is April (29.65%). The wettest month is July (23.73 days), while the driest is November (0.80.). The average data for humidity between 1991-2021 is depicted in table 2.5.

Table 2.5 Humidity for the period 1991-2021

S. No.	Months	Humidity (%)
1	January	66
2	February	58
3	March	41
4	April	30
5	May	38
6	June	53
7	July	78
8	August	82
9	September	82
10	October	71
11	November	61
12	December	64

2.3.8. Earthquake

Varanasi falls under the seismic zone III with moderate damage. The history of major earthquakes in Uttar Pradesh are tabulated in table 2.6.

Table 2.6 List of Earthquake Occurrences in vicinity of Varanasi

Year	Epicenter	Magnitude	Districts Affected
6 Nov 1925	Raebareli, Sultanpur Dist.	6.0	Raebareli and Sultanpur
15 Jan 1934	India-Nepal Border Region	8.0	Eastern UP, Allahabad and Lucknow
8 Nov 1952	Nepal	6.0	Bahraich - Gonda
10 Oct 1956	Jahangirpur	6.2	Bulandshahr
27 Aug 1960	Ghagot, Haryana	6.0	Gurgaon, Faridabad, Noida
24 Dec 1961	Slakot, Nepal	6.0	Pilibhit and Lakhimpur Kheri
1 June 1965	Sant Kabir Nagar	5.7	Gorakpur and Basti
15 Sept 1966	Raunda Mustahkam	5.8	Moradabad
21 Oct 1991	Uttarkashi	6.8	Uttarkashi and UP
18 Oct 2007	Gautam Buddha Nagar	3.8	Gautam Buddha Nagar
26 Apr 2015	Barpak, Nepal	7.3	Entire UP

2.4. Geotechnical data

No geotechnical data is available.

2.5. Connectivity

2.5.1. Rail Connectivity

There are two railway stations from the proposed cruise Terminal namely Varanasi Junction and Banaras Railway Station where the train runs across the country.

2.5.2. Road Connectivity

Varanasi is well connected by road to nearby cities, including Allahabad, Kanpur, Gorakhpur, Lucknow, Patna, and Ranchi. National Highways 19 and 28 are the main connecting road to Varanasi. The road NH 19 connects Delhi and Kolkata, whereas National Highway 28 connects Lucknow, Uttar Pradesh to Barauni, Bihar.

2.5.3. Airport Connectivity

Lal Bahadur Shastri International Airport, also known as Varanasi Airport, has both domestic and limited international flights. It connects Varanasi with major Indian cities like Delhi, Mumbai, and Kolkata, etc as well as international destinations like Bangkok and Colombo.

3. RIVER CRUISE TOURISM

3.1 Inland Waterway in India

India has various navigable waterways comprising river systems, canals, backwaters, creeks, and tidal inlets. However, the Inland waterway could be functionally important in regions covered by the Brahmaputra and Ganges in the Northeast and Eastern parts of the country, Kerala, Goa and in the deltas of the rivers of Krishna and Godavari with minimum constraints. The map showing the National Waterway is shown in figure 3.1.

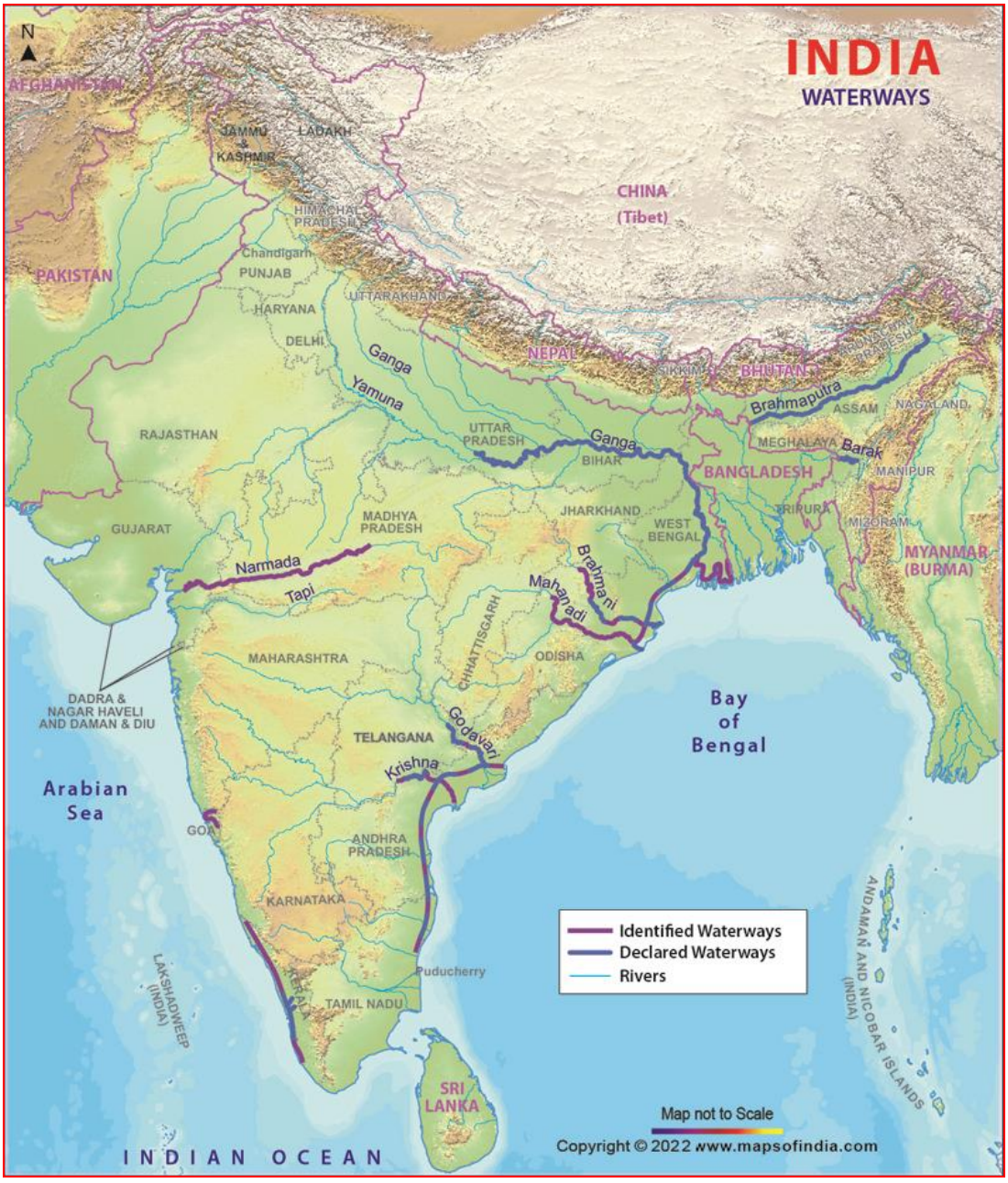


Figure 3.1 Locations of National Waterway

In light of the above, National Waterways are operational for shipping, navigation and cargo/passenger vessels. A few of the Operational Waterways are listed below.

i. NW-1 : Ganga-Bhagirathi-Hooghly river system (Allahabad-Haldia)
ii. NW-2 : River Brahmaputra
iii. NW-3 : West Coast Canal (Kottapuram-Kollam) along with Udyogmandal and Champa Canals
iv. NH-4 : Phase-1 Development of the stretch Muktiyala to Vijayawada of river Krishna
v. NH 5: East Coast Canal Integrated with Brahmani river and Mahanadi delta rivers

Among the above list, the first three waterways have been developed substantially with fairways of required depth & width, navigational aids & terminal facilities for loading/unloading of cargo & ingress/egress of the passengers and cargo & passenger vessels.

3.2 National Waterway I (Ganga-Bhagirathi-Hooghly)

The Ganga - Bhagirathi - Hooghly river system between Haldia (Sagar) and Allahabad (1620 km) was declared a National Waterway-1 (NW-1) in 1986. IWAI has carried out various developmental works on the waterway for the improvement on navigability and development of other infrastructure such as navigation aids and terminal facilities as laid down in the IWAI Act, 1985. The below map shows the route of NW I are shown in figure 3.2.

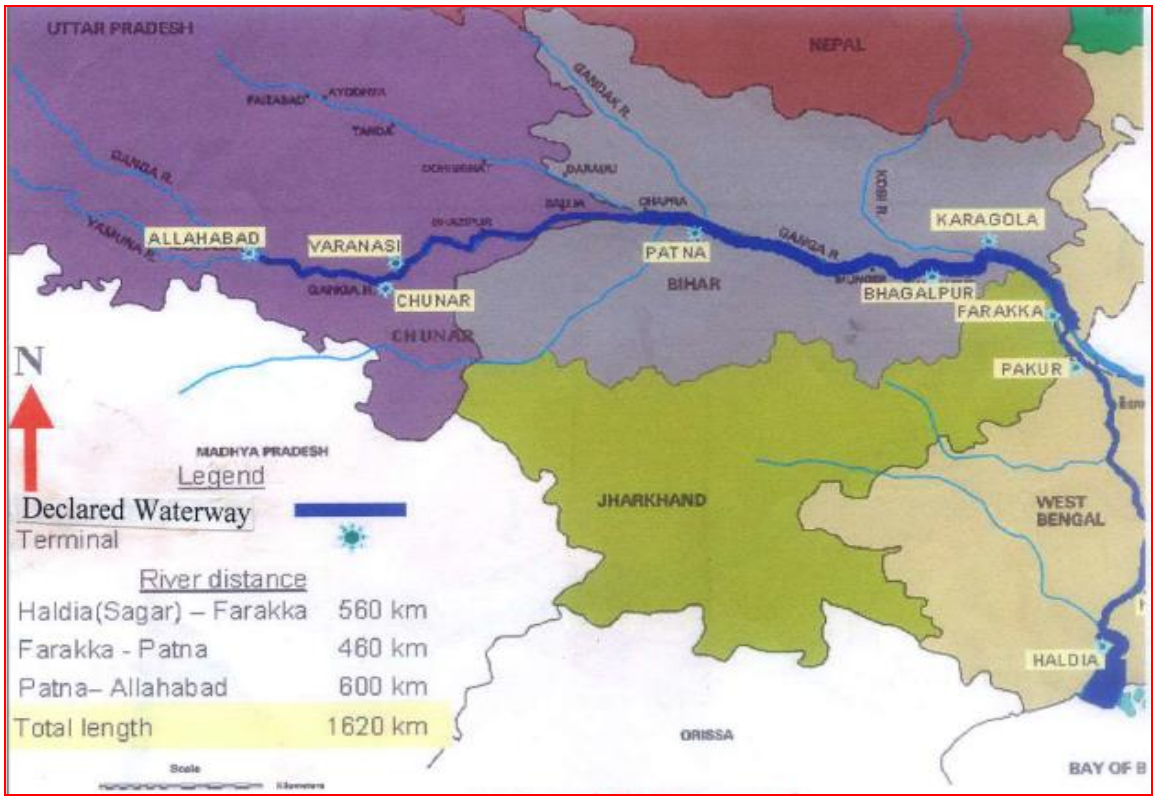


Figure 3.2 Map of National Waterway I

Under the scheme of Jal Marg Vikas Project (JMVP), IWAI is in the process of developing the infrastructure of National Waterway I in India. The project aims to develop the 1,393 km stretch of the NW-1 from Varanasi to Haldia.

The water depth in India's National Waterway I (Ganga-Bhagirathi-Hooghly River System) varies depending on the location but generally ranges from around 2.5 meters to 4 meters in the navigable sections, with the shallowest points being near bends and during low water periods.

Even though, the National Waterway -1 (river Ganga) is being used for navigation since time immemorial, there are cross structures like bridges, power line etc. have been constructed across and they generally have adequate horizontal and vertical clearances and the details of the cross structures taken from IWAI website is summarised in Table 3.1.

Table 3.1 Detail of cross structures/Bridges across NW-1 between Haldia – Allahabad

SI. No	Name of bridge & Location	Chainage on NW-1	Vertical Clearance (m)	Horizontal Clearance (m)
Haldia – Farakka Stretch the State of West Bengal				
1.	Vidya Sager Setu at Kolkata	141.50	33.84	443.54
2.	Ravindra Setu Howrah Road Bridge at Kolkata	144.00	9.00	32.62
3.	Nivedita Setu (Road Bridge)	152.70		
4.	Swami Vivekanda Setu (Rail cum Road Bridge, Bally)	152.75	8.88	100.30
5.	Jubilee Rail Bridge (Hooghly Bridge, Naihati)	184.80	11.38	159.00
6.	Ishwar Chand Gupta Road Bridge, Kalyani	191.30	10.00	110.00
7.	Gourange setu at Nabadwip	277.80	13.00	100.25
8.	Bhagirathi Road Bridge at Berhampur	422.00	10.67	70.95
9.	Bhagirathi Rail Bridge at Nasirpur	436.80	10.00	10.00
10.	Bhagirathi Road Bridge at Jangipur	498.00	10.71	73.00
11.	Road cum Rail Bridge (over Feeder Canal, 112-07, U/s Jangipur)	509.50	11.30	76.22
12.	Pakur Road Bridge (over Feeder Canal)	524.70	12.15	49.07
13.	Shankapur Road Bridge (over Feeder Canal)	534.50	15.24	7.23
14.	Incomplete Bridge (over Feeder Canal Near Alinagar)	538.00		
15.	Rail-cum Road Bridge over Feeder Canal Road 8-57, Near NTPC	541.00	11.30	76.20
Farakka - Allahabad Stretch in the State of Bihar & Uttar Pradesh				
1.	Vikramshila Setu (Road Bridge) at Bhagalpur	712.00	10.67	100.00
2.	Rajendera Setu (Road cum Rail Bridge) at Mokamah, (Bihar)	853.00	10.00	40.00
3.	Mahatama Gandhi Setu (Road Bridge) at Patna	955.00	12.00	114.00
4.	Digha - Pahleja Road cum Rail Bridge at	968.00	12.00	126.00

SI. No	Name of bridge & Location	Chainage on NW-1	Vertical Clearance (m)	Horizontal Clearance (m)
	Patna			
5.	Road Bridge at Doriganj, Chhapra (Bihar)	1000.00	10.00	117.60
6.	Road Bridge at Srirampur Ghat, Ballia (U.P.)	1085.00	10.00	80.00
7.	Road Bridge at Buxar (Bihar)	1120.00	9.45	92.70
8.	Road Bridge at Ghazipur (U.P.)	1178.00	10.68	85.10
9.	Road Bridge at Zamania (U.P.)	1205.00	15.87	76.50
10.	Road Bridge at Saidpur (U.P.)	1254.00	15.80	76.50
11.	Road Bridge at Baluaghat (U.P.)	1281.00	9.90	98.65
12.	Road cum Rail Bridge at Varanasi (U.P.)	1308.00	6.56	101.50
13.	Road Bridge at Saamneghat at Varanasi (U.P.)	1318.00	10.00	90.00
14.	Vishwasundari Road Bridge at Ramnagar (U.P.)	1318.00	13.00	120.00
15.	Road Bridge at Chunar (U.P.)	1342.00	10.60	76.50
16.	Road Bridge at Bhatauli (U.P.) Under construction	1368.00	10.00	73.50
17.	Road Bridge at Mirzapur (U.P.)	1398.00	2.52	30.50

In addition to above, pontoon bridges, 04 nos. in Bihar and 14 nos. in Uttar Pradesh being installed by the State government in every year during the lean season (October - June) for public conveyance. These bridges can be opened during voyages in coordination with the State government. The detail of pontoon bridges is given in table 3.2:

Table 3.2 Detail of Pontoon Bridges

Sl No.	Location	Chainage (K.m)	Stretch	Remark
1	Gyashpur	923.00	Patna-Munger	Being maintained by State Govt. of Bihar through PWD.
2	Kachidargah	942.00	Patna-Munger	
3	Gai Ghat	955.00	Patna-Munger	
4	Danapur	972.00	Patna-Ghazipur	
5	Mauzampur	1034.00	Patna-Ghazipur	Being maintained by State Govt. of Uttar Pradesh through PWD.
6	Nauranga	1055.00	Patna-Ghazipur	
7	Nainijor	1069.00	Patna-Ghazipur	
8	Srirampur	1086.00	Patna-Ghazipur	
9	Semra	1162.00	Patna-Ghazipur	
10	Zamania	1205.00	Ghazipur-Chunar	
11	Chochakpur	1227.00	Ghazipur-Chunar	
12	Chunar	1344.00	Ghazipur-Chunar	
13	Bhatauli	1370.00	Chunar-Allahabad	
14	Rampur Ghat	1420.00	Chunar-Allahabad	
15	Manda	1469.00	Chunar-Allahabad	
16	Tela	1488.00	Chunar-Allahabad	
17	Sirsha	1505.00	Chunar-Allahabad	
18	Dumduma	1512.00	Chunar-Allahabad	

3.3 National Waterway II

The River Brahmaputra from Dhubri (Bangladesh Border) to Sadiya (891 km) was declared a National Waterway -2 (NW-2) in 1988. The map showing the route of NW II is shown in Figure 3.3.

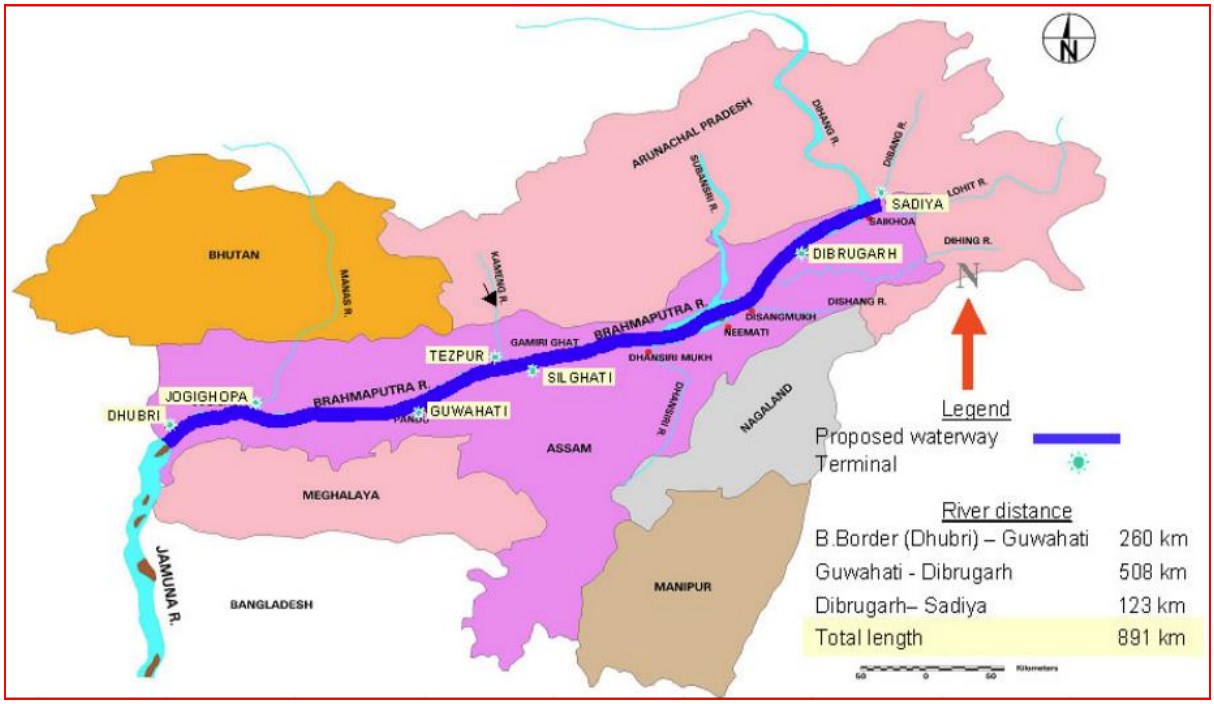


Figure 3.3 Map of National Waterway II

The waterway is being developed with a fairway of required depth and width, day and night navigation aids and terminals. A navigable fairway of 45-meter width and 2.5 meters least available depth (LAD) from Dhubri to Neamati (629km), 2.0m LAD from Neamati to Dibrugarh (139km) and 1.5meter LAD from Dibrugarh to Sadiya (123km)/Oriumghat (92km) has been provided. Annual river conservancy works like Bandalling and maintenance dredging are carried out regularly to maintain the navigable fairway.

The total cargo traffic on NW II was 4.28 lakh Tonnes during 2021-22 as against 3.07 lakh Tonnes during 2020-21.

3.4 Inland Waterways Connecting Neighbouring Countries

The development of NW 1 from Varanasi to Haldia/ Sagar under the Jal Marg Vikas Project (JMVP) has also opened up an opportunity for transportation of Nepalese cargo to/ from third countries via Kolkata Port using NW 1.

Currently, Nepalese trade to/ from third countries primarily uses Kolkata Port (K D S and H D C) and hinterland transportation takes place using road and rail mode. Considering the

availability and significance of IWT mode for hinterland transportation, India and Nepal have agreed to include Inland waterways mode in the Treaty of Trade and Transit between the two countries. The inclusion of IWT mode will allow Nepal-bound cargo (to/ from 3rd country via Kolkata port) to take the waterway route from Haldia/ Kolkata up to Sahibganj, Kalughat and Varanasi for onward movement by road. The route also gives a way to connect the other countries such as Myanmar and Bhutan.

3.5 Existing Multi-Model Terminal at Varanasi

The objective of the Multimodal Terminal is to provide infrastructure to handle both cargo and passengers in the Inland water transport network. The terminal is being used for cargo movement for heavy and bulk cargo which can be transported through the river. This terminal has been developed as a part of the Jal Marg Vikas Project (JMVP) by the Ministry of Ports, Shipping, and Waterways and operational from 2021. The terminal is located near Ramnagar on the outskirts of Varanasi. The view of the MMT terminal and existing pontoon are shown in Figure 3.4 and 3.5 respectively.

Figure 3.4 View of Multimodal Terminal, Varanasi

The volume of freight movement on National Waterways-I was 109.28 lakh Tonnes in 2021-22 against 92.06 lakh Tonnes in 2020-21 reflecting an increase of 18.70 %. Building material (constituting Fly ash, stone chips etc.) constituted 38.48% of traffic on NW-1 followed by Mix (32.25%) and miscellaneous (27.43%). These three items together accounted for about 98.16 % of the total cargo moved on NW I during 2021-22. The composition of cargo moved on National Waterway I is shown in Table 3.3.

Table 3.3 Composition of Cargo Moved on National Waterway- I (%)

Name of the Commodity	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Building Material	60.0	65.1	61.0	51.0	52.3	38.5
Fertilizers	16.1	0.0	0.0	0.0	0.0	0.0
Food Items	3.1	0.7	0.0	0.1	1.1	1.5
Miscellaneous	1.3	0.1	0.1	23.7	14.6	27.4
Mix	0.0	30.9	38.8	24.9	31.9	32.3
Ore/Minerals	0.4	0.0	0.0	0.0	0.0	0.0
POL Products	3.6	0.0	0.0	0.0	0.0	0.0
Coal	14.8	2.9	0.0	0.1	0.0	0.1
Iron Steel	0.6	0.3	0.1	0.2	0.1	0.2

Existing Passenger Ferry Pontoon adjacent to MMT Terminal

The passenger ferry pontoon has been visited to conduct a feasibility study for the development of a cruise terminal and the utilisation of the existing facility. At present, the ferry pontoon is being used as a boarding point for the long journey cruise vessels. The area available at this location is very limited. It was also noted that the backup area of the facility has been set up with a Hydrogen fuelling station for the IWAI vessels sailing at Varanasi. It was also seen that the DGPS station has been setup by the authorities. It was also informed by the local authorities that the location has been laid with various electrical wirelines running to the High mast and DGPS station.

This location may not be an ideal location for the development of a cruise terminal as it has several constraints in the utilisation of land. The identified location is at the outskirts of Varanasi. It shall also be noted that the existing facility can be utilised only by long journey cruise vessels, whereas the cruise operators operating short journey cruises require much closer to the temple.

Figure 3.5 Existing Passenger Ferry Pontoon adjacent to MMT Terminal

3.6 River Cruise Terminals in World-wide

Various river cruises around the world offer comfort cruise experiences. The list of river cruises is listed in table 3.4.

Table 3.4 List of River cruises in the World

Sl No.	Country	Name of River	Destinations
1.	Europe	Danube River	Passes through 10 countries including Germany, Austria, Hungary, Romania
2.	Europe	Rhine River	Germany, Switzerland, France, and the Netherlands.
3.	South America	Amazon River	Brazil, Peru, Colombia, and Ecuador
4.	Southeast Asia	Mekong River	Cambodia, Vietnam, Laos, Thailand, and Myanmar
5.	Egypt	Nile River	Egypt, primarily between Luxor and Aswan
6.	China	Yangtze River	Chongqing to Shanghai
7.	Russia	Volga River	From Moscow to the Caspian Sea
8.	USA	Mississippi River	From Minnesota to Louisiana
9.	Myanmar	Irrawaddy River	From Mandalay to Bagan

One among the list, India joins the river cruise by introducing the spiritual journey in river Ganga witnessing the ancient temples and cultural immersion in one of the holiest rivers in the world.

3.7 Existing River Cruise Operations

The following inland cruise operators are plying cruise/ tourist vessels on NW-1

Table 3.5 Addresses of Cruise Operators at Varanasi

Alakanand Cruise line, Varanasi (4 Vessels)	**Alakananda Cruise line** Ravidas Ghat, Ravidas Park, Nagwa, Varanasi Tel : 639202899 and 9219342434 Email : **alaknanda.cruiseline@gmail.com**
Antara Cruise line (5 cruise vessels)	**Heritage River Journeys Pvt. Ltd.** No. 7, 2nd Floor, Local Shopping Centre, Vasant Arcade, Vasant Kunj, New Delhi, 110070, India Email : sales@antaracruises.com

The movements of these tourist vessels, including foreign tourists, are plying in NW-1. At present, Government of India has launched a Motor Cruise Vessel named MV Ganga Vilas from Varanasi to Dibrugrah. From Varanasi in Uttar Pradesh, the MV Ganga Vilas will travel

around 3,200 km in 51 days to Dibrugarh in Assam via Bangladesh, passing through 27 river systems. With a capacity of 36 tourists onboard, the MV Ganga Vilas has three decks and 18 suites.

The MV Ganga Vilas cruise itinerary includes World Heritage Sites, National Parks, and River Ghats to key cities such as Patna in Bihar, Sahibganj in Jharkhand, Kolkata in West Bengal, Dhaka in Bangladesh, and Guwahati in Assam. Over fifty destinations will be visited during this 51-day itinerary.

Since the cruise's launch in 2023, it has attracted a lot of attention, especially from international tourists interested in experiencing India from a unique perspective. For example, in the first few months of operation, the cruise received significant interest from international travelers, especially from European countries.

With a focus on eco-tourism, luxury, and cultural immersion, the MV Ganga Vilas is likely to draw hundreds of passengers annually. Facilitating, its unique offering, the cruise is expected to increase passenger numbers gradually in subsequent years, potentially reaching 1,000 – 1,500 passengers per year by 2025–2026.

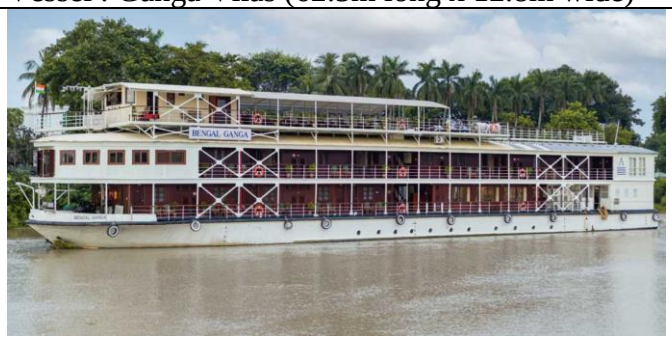
Table 3.6 Alakananda River Cruise, Varanasi

1	 Vessel : Sam Manikshaw	A triple-deck multipurpose vessel, MV Sam Manekshaw has the capacity of 200 plus. The cruise operates in river Ganga along the globally famous Ghats of Kashi. It is also suitable for day long inter-city cruise tours.
2	 Vessel : Swami Vivekanand	A triple-deck multipurpose vessel, MV Swami Vivekanand has the capacity of 200 plus. The cruise operates in river Ganga along the globally famous Ghats of Kashi. It is also suitable for day long inter-city cruise tours.

3		Bhagirathi is a double decker cruise vessel with a capacity of 80 pax.
4		Alaknanda is a double decker vessel with a capacity of 60 pax on lower deck.

Table 3.7 Antara River Cruise, Varanasi

1	 Vessel : Ganges Voyager I (56.5m longx12.5m wide)	Ganges Voyager I is designed to travel upstream from the colonial city of Kolkata to the late Mughal princely capital of Murshidabad; and downstream to the Indian Sundarbans, the largest mangrove forest in the world
2	 Vessel :Ganges Voyager II (56.5m long x 12.5m wide)	Ganges Voyager II is designed to travel upstream from the colonial city of Kolkata to the late Mughal princely capital of Murshidabad; and downstream to the Indian Sundarbans, the largest mangrove forest in the world

3	 Vessel : Ganga Vilas (62.5m long x 12.8m wide)	Antara Ganga Vilas, sails from Uttar Pradesh in the north to Assam in the eastern India.
4	 Vessel :Bengal Ganga (54.86m long x 10.36m wide)	Bengal Ganga Travels through cultural heritage sites including the magnificent Kashi Vishwanath Corridor and ancient Buddhist sites.
5	 Vessel : Antara Catamarans (17m long x 6m wide)	Antara Catamarans are premium 2-suite vessels built just for the river system in Bhitarkanika National Park.

3.8 Cruise Vessel Selection

The maximum length of the cruise vessel shall be considered for the berthing facility. The vessel MV Ganga Vessel has a maximum length of 62m. However, the vessel length of 100m with a limiting draft of 2.5m has been considered while choosing the appropriate location having a sufficient turning circle and waterfront.

It shall be noted that a few of the bridges running across the river are very narrow with reduced vertical clearance. Therefore, the possibility of calling International cruise vessels from the open sea/other countries couldn't be made possible. Hence, the proposed cruise

terminal shall be designed for low-height range vessels only. Thus, the maximum vessel size for the proposed cruise terminal may be limited to 100m. Therefore, the proposed berthing facility cum cruise terminal shall be operated for vessels with reduced depth of the ship. These vessels could be sailed in the vicinity of Varanasi and, Hooghly and Guwahati promoting river cruise tourism.

3.9 Operational Requirements

The core consideration for cruise terminal design is related to the expected technical characteristics of the cruise ships. Indicators, such as the tonnage, overall length (LOA), beam, and draft of modern cruise ships, along with the passenger capacity, and the number of crew on board, are the most considered. Due to the range of cruise vessel types, and sizes related to cruise ship scale of dimensions and capacities, the maritime infrastructure of a cruise terminal depends on several factors:

- Navigational river depth
- Water level variation
- Neighboring facilities
- Vessel dimensional characteristics
- Potential berthing patterns and the average number of cruise ships expected to be docked.

Some of the above require careful consideration both during design and operation for efficient use of the facility. The above requirements will be useful in defining the operational limits of the marine terminal such as

3.10 Planning of Cruise Terminal

The location of the terminal shall be integrated with transport and urban planning strategies. The planning shall be made as per PIANC Working Group 158 – Master Plans for the Development of Existing Ports and PIANC WG 152 – Guidelines for Cruise Terminals. The proposed cruise Terminal shall have a provision for an apron area, terminal building, city connectivity, and waterside drivers.

The size of the terminal building depends on the number and size of vessels to be served. This establishes the population of cruise passengers (PAX) to be processed through the building for both disembarkation and embarkation. Where multiple vessels are served, the terminal must simultaneously handle passengers getting off ships while others are getting on ships. This envisages the requirement of single-storey or multi-story buildings.

Therefore, the proposed cruise terminal is considered to have 500 passengers' capacity initially and expand to 1000 in future. The typical cruise terminal facility with embarkation and disembarkation from cruise vessels is shown in figure 3.6.

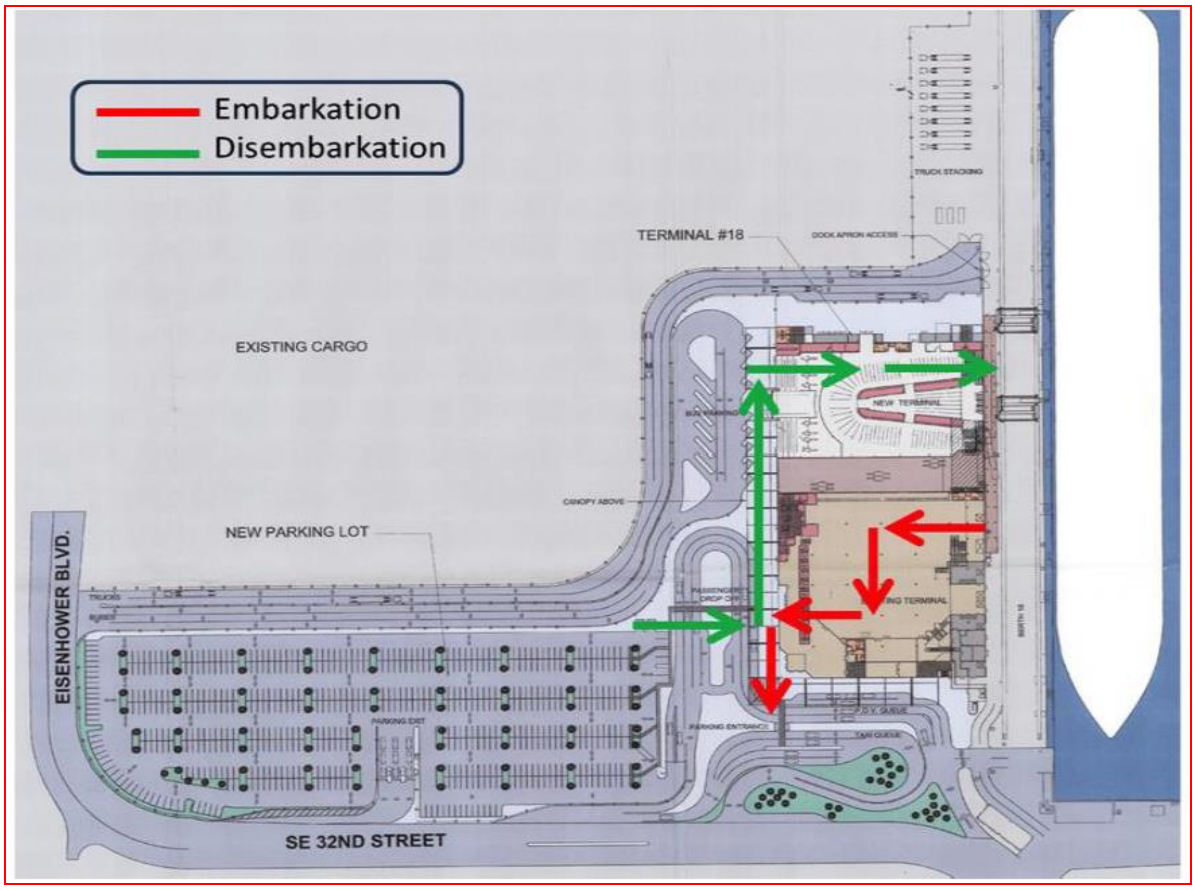


Figure 3.6 Typical Cruise Terminal layout

3.11 Passenger Terminal Building

The floor area required for a passenger terminal building is calculated using the following equations:

$$R = P \times U$$

Where, R – Floor area Requirement

P – Number of peak hour passengers (both ways)

U – Unit floor area requirement per passenger

Unit Floor area requirement per passenger varies between 3 – 15 sqm/passenger depending on the design, passenger flow patterns and amenities offered within the terminal. Hence, the Floor Area requirement is calculated as follows

Floor Area Required, R = 500 x 3.6 = 1800 sqm

The width of the terminal building has been considered as 30m. The length of the building is calculated as:

Length of the building= 1800/30 = 60m

Therefore, the dimensions of the building shall be calculated as 60m x 30m. The building shall be proposed to have 2 floors (Ground and First).

Figure 3.7 Passenger Terminal Building

The typical dimensions of passenger amenities are shown in table 3.8.

Table 3.8 Typical dimensions of Passenger amenities

Ground level					
Room name	Area (m^2)	(ft^2)	Room name	Area (m^2)	(ft^2)
Baggage screening	250	2.690	WC's	98	1.054
Data/Comm	12	129	Porters	41	441
Mechanical/Electrical	36	387	Cleaning staff	17	183
Local police	16	172	Provisions	114	1.227
Detention room	13	140	Warehouse	53	570
Post screen area	283	3.045	Bag lay down	3.045	32.764
Embarkation lobby	466	5.014	Mechanical	26	280
Port police	29	312	Generator	55	592
Medical	20	215	Main electrical	29	312
Control Room	18	194			
Security office	25	269			
Terminal operators	98	1.054			
Transition lobby	213	2.292			
Transit pax exit	62	667			
Crew	50	538			
Level 1					
Room name	Area (m^2)	(ft^2)	Room name	Area (m^2)	(ft^2)
Elec/Comm	20	215	Bar warehouse	29	312
Health sanitary	13	140	Bar	49	527
Ship agents	39	420	WC	66	710
Staff dining	13	140	Hostess fitting room	31	334
Warehouse	13	140	Check-in	569	6.122
Chiller/AHU/Mech	308	3.314	Overall lounge seating	2580	27.761
Immigration offices	32	344	Retail zone	489	5.262
A-Pass/Immigration	180	1.937	VIP	125	1.345
Immigration screening	180	1.937	Conference room	58	624
			Elec/Comm	39	420
			Terrace	250	2.690

The above dimensions are for a typical terminal building and the same shall be adjusted as per the site conditions, number of passengers to be handled per day etc.

3.12 Bunkering

Bunkering involves the process of supplying fuel to ships and is crucial for cruise terminals. The cruise scheduled for the departure often bunkers in advance or during the passenger's dismemberment. Fuel such as Marine Diesel oil (MDO) and heavy fuel oil (HFO) are made available at the terminal. Bunkers require specialized equipment, including fuel hoses, pipelines, and storage tanks, which shall be made available near the terminal or on the berth.

3.13 Sewerage and solid waste handling

Sewage from ships shall be transferred through sewage handling pipes and transferred to either municipal lines or a dedicated sewage treatment system installed on the terminal. Depending on the location, of the terminal this facility shall be developed.

3.14 Potable water

Potable water to cruise ships shall be supplied from onshore storage tanks. This water shall be supplied from municipal supply and sufficient quantity shall be stored in sumps and elevated storage tanks. Supply lines from storage tanks to shore supply points on the jetty shall be provided at suitable points.

3.15 Electricity and shore power

The electrical supply shall be made available for ship shore power connection to make the terminal efficient with less pollution due to continuous running of ships engine.

3.16 Ballast water disposal

Like many large vessels, cruise ships use large amounts of ballast water to maintain proper trim and buoyancy. Owing to heightened concerns about invasive species, discharge of ballast water is highly regulated by national and international standards. Cruise vessels generally operate under strict ballast water management programmes which include use of modern ballast water treatment systems and regulation of where ballast water can be taken on and discharged.

3.17 Communication

Communication between the ship and the terminal shall be via VHF through dedicated frequency. The system shall have adequate number of channels, and the control room shall have dedicated staff for the operation.

3.18 Ship to Shore Gangways

Ship shore connectivity for the passengers and the luggage shall be developed carefully to the convenience of the passengers. Fully air-conditioned gangways both movable and fixed depending on the difference between the ship elevation and ground.

Typical passengers handling gangways are shown in figure 3.8 and 3.9.

Figure 3.8 Passenger gangway to ship

Figure 3.9 Passenger movement from terminal to apron

3.19 Navigational Requirements

The arriving vessel for loading at the berth shall also be assisted by tugs and pilotage during the process of berthing. The berthing area shall be free from any obstacles such as debris or high points on the seabed. Sufficient width in front of the port shall be provided with adequate water depth. A turning circle of 2 to 3 times the length of the vessel is sufficient. At least 3 to

5 times the width of the vessel shall be available during tug-assisted berthing. The typical image showing the turning circle is shown in Figure 3.10.

Where turning basins are required, PIANC standards suggest a diameter of 2 x LOA plus an allowance for vessel drift appropriate for most weather conditions. Where waters are more protected, this allowance may be reduced.

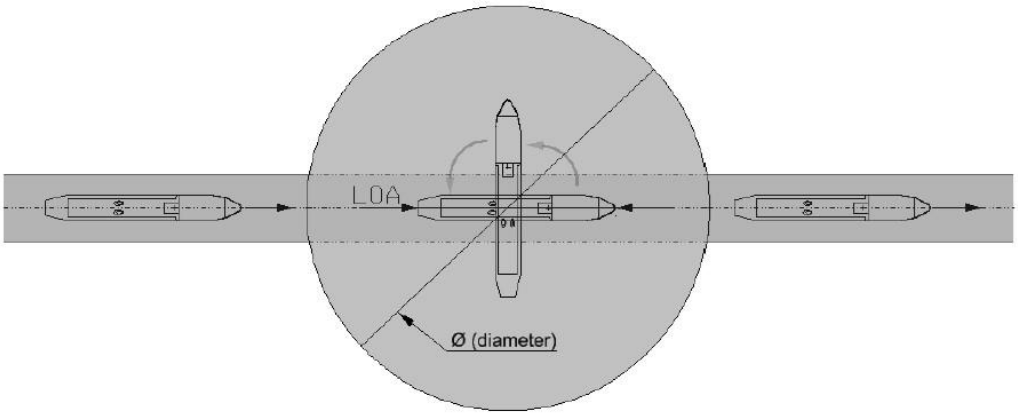


Figure 2.7: Recommended dimensions for the turning basin (PIANC WG 152, 2015)

Figure 3.10 Turning Circle

4. SITE SELECTION

4.1 Factors affecting site selection

To select a potential location, the following essential requirements were kept as a crucial factor for setting up of Cruise Terminal.

a) Shall have adequate water depth to ensure sufficient draft which substantially reduce the cost of capital dredging.
b) Location shall serve an optimized cost.
c) To have road connectivity and availability of sufficient infrastructure facilities.
d) Climatic condition shall serve reasonably in sheltered environment so as to provide continuous operation of cruises.
e) Adequate availability of Large Turning circle to handle the large vessels.
f) Sufficient availability of revenue land for the terminal development.
g) Shall also promote tourism.

4.2 Proposed Sites

Seven different locations proposed for its suitability are shown in figure 4.1.

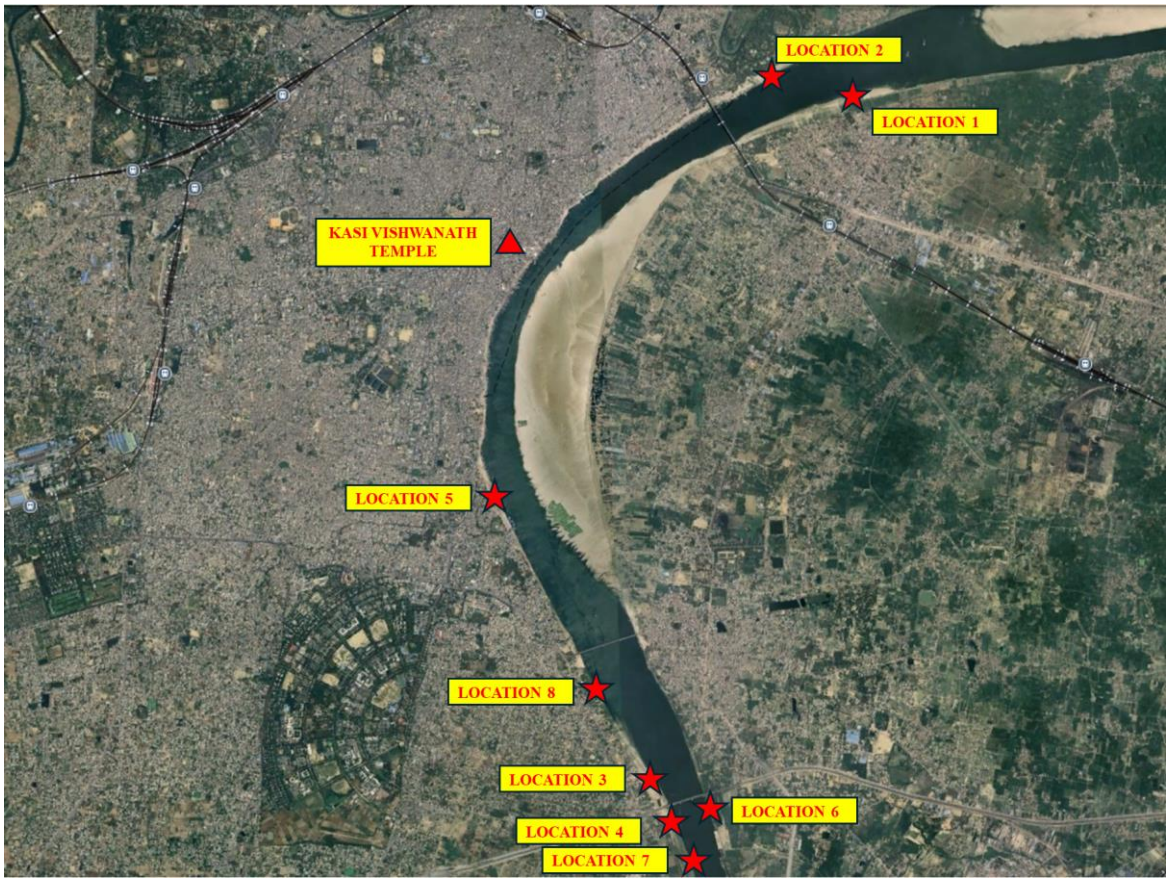


Figure 4.1 Locations proposed for the development of Cruise Terminal

The following locations were identified and examined for merits and demerits for the development of World Class Cruise Terminal at Varanasi Location.

a) Location 1 – Opposite to Namo Ghat (D/s of Malviya Bridge)
b) Location 2 – Adjacent to Namo Ghat
c) Location 3 – D/s of Vishwasundari Bridge
d) Location 4 – U/s of Vishwasundari Bridge
e) Location 5 – Assi Ghat
f) Location 6 – Adjacent to MMT Terminal
g) Location 7 – U/s of MMT Ramnagar
h) Location 8 – U/s of Ramnagar - Samneghat bridge

4.3 Assessment of Location 1 - Opposite to Namo Ghat (D/s of Malviya Bridge)

The location Opposite Namo Ghat(Downstream of Malviya Bridge) has been identified for the development of the Cruise Terminal. The following merits and demerits were evaluated for feasibility.

Merits

- ✓ This location is seen to have sufficient reclamation land naturally for the development of Terminal Building. A land area of about 4 ha shall be required for establishing internal roads along with its utilities.
- ✓ The identified location is close to National Highway 44 having a length of 950m.
- ✓ The distance between Varanasi airport and the identified location is about 31 kms, whereas the distance from the Varanasi Junction is 10 km.
- ✓ This location is also situated in proximity to the Kasi Vishwanath Temples where tourists can easily access the proposed location.

Demerits

- ✓ This location doesn't have a direct road network from the Malviya Bridge. The identified location is observed to be surrounded by residential houses along with a private mutt. Therefore, additional land may be required to connect the roadway from the National Highway/Malviya Bridge.
- ✓ It was also informed by the officials of IWAI that the identified location is found to be a low-lying area and prone to an increase in water depth of 7 to 8m during the flood season. Therefore, the proposed berthing structure shall be required to be positioned above HFL.
- ✓ The identified location is observed to have inadequate dredge depth during low flood levels for the berthing of cruise vessels. Hence, dredging may be carried out as a part of the project.

The positioning of the cruise terminal for the identified location 1 is shown in Figure 4.2.

Figure 4.2 Layout of Cruise Terminal at Location 1

The coordinates for the same are shown in Table 4.1.

Table 4.1 Coordinates of Location 1 (Opposite to Namo Ghat)

Location	Easting (m)	Northing (m)
A	705095.66 E	2801827.47 N
B	705088.99 E	2801846.84 N
C	705224.32 E	2801893.41 N
D	705186.00 E	2802105.25 N
E	705199.01 E	2802127.91 N
F	705472.10 E	2802223.91 N
G	705465.01 E	2802244.51 N
H	705668.51 E	2802323.77 N
I	705706.94 E	2802213.10 N
J	705501.25 E	2802140.88 N
K	705478.69 E	2802205.03 N
L	705205.64 E	2802109.04 N
M	705243.95 E	2801897.20 N
N	705228.52 E	2801873.85 N

It can be concluded that the location described above wouldn't be suitable, as the proposed roads would pass-through privately-owned land.

4.4 Assessment of Location 2 - Adjacent to Namo Ghat

The location adjacent to Namo Ghat has been identified for the development of the Cruise terminal. The following merits and demerits were evaluated by visual inspection for their feasibility.

Mertis

- ✓ This location is adjacent to the helipad of Namo Ghat. The identified location is situated close to the Railway station as well as Kasi Viswanath temple.
- ✓ The land required for the proposed cruise terminal is 1.2 Ha for the development of a cruise terminal.

Demerits

- ✓ This location doesn't have direct access to the identified location and shall be accessible only through Namo ghat entry. Buggy services may be required to utilise the cruise terminal.
- ✓ Since this location is very close to the temple, the identified location is flooded with pilgrims around the year which is a barrier for the passengers approaching the cruise terminal.
- ✓ It was also observed that the location adjacent to the Namo Ghat is surrounded by private property. Therefore, additional roads couldn't be developed from the identified location to connect the existing road network. The access can be provided only from the Namo Ghat premises using buggy vehicles. It has a lack of access to vehicular movement.

The coordinates for the same are shown in table 4.2.

Table 4.2 Coordinates of Location 2(Opposite adjacent Namo Ghat)

Location	Easting (m)	Northing (m)
A	705434.05 E	2802768.36 N
B	705407.49 E	2802815.85 N
C	705397.72 E	2802833.34 N
D	705554.02 E	2802908.12 N
E	705582.74 E	2802848.08 N

The positioning of the cruise terminal for the identified location 2 is shown in Figure 4.3

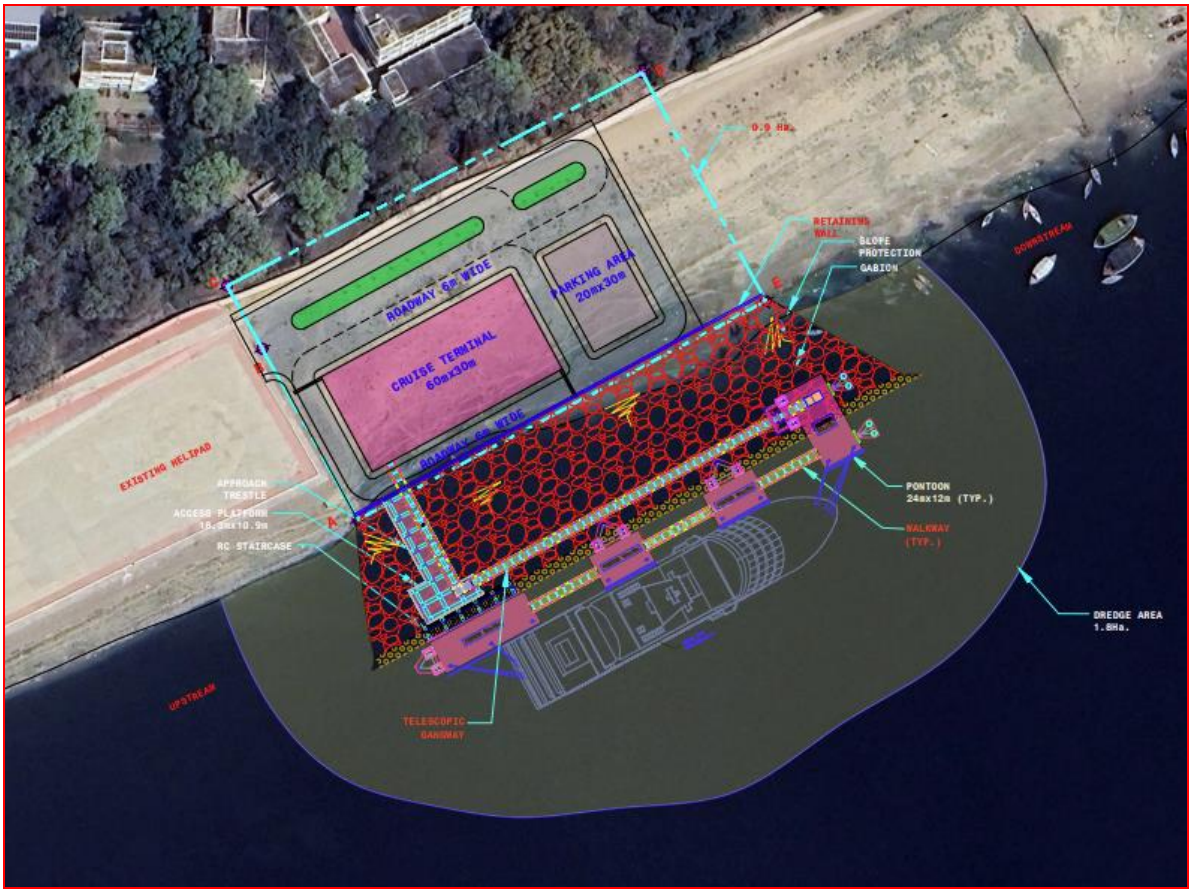


Figure 4.3 Layout of Cruise Terminal for Location Adjacent to Namo Ghat

It can be concluded that the above-described location wouldn't be feasible due to constraints on developing access to the connecting roads from the identified site.

4.5 Assessment of Location 3 – Downstream of Vishwasundari Bridge

The location downstream of Vishwasundari Bridge has been identified for the development of the Cruise terminal. The following merits and demerits were evaluated by visual inspection for its feasibility.

The positioning of the cruise terminal for the identified location 3 is shown in Figure 4.4.

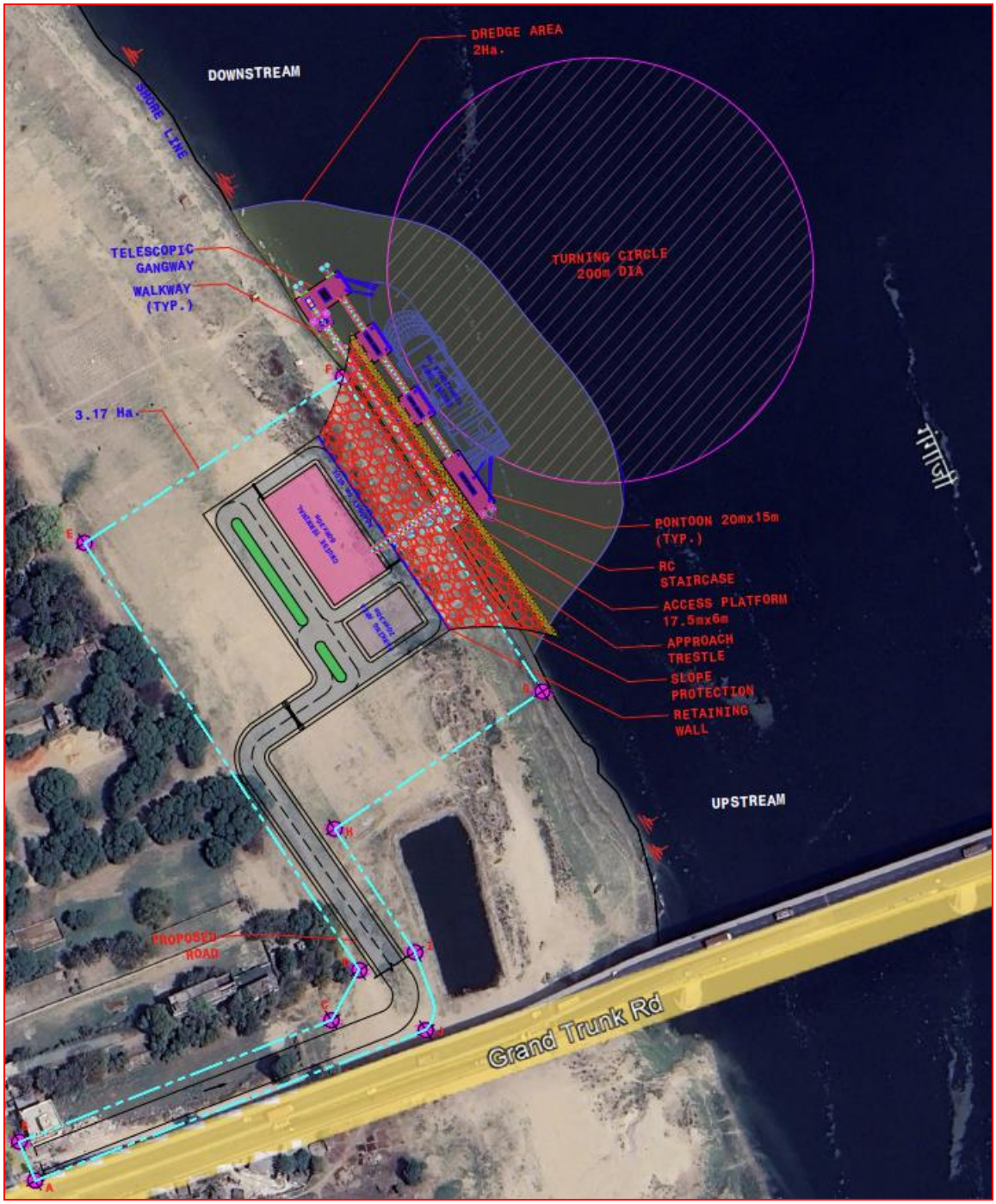


Figure 4.4 Layout of Cruise Terminal for Location D/s of Vishwasudnari Bridge

Mertis

- ✓ Less crowded area.
- ✓ Naturally reclaimed for the ancillary development.

- ✓ It was also observed from the layout that a land area of about 3.15 ha is required for the development of a cruise terminal. Additional land areas may be available for future expansion.
- ✓ This location has sufficient access from the National Highway. Hence, the project may be completed within the stipulated time without much delay. However, internal roads are to be developed to connect them same.
- ✓ Therefore, the identified site would be an ideal location for the development of the Cruise Terminal.

Demerits

- ✓ This location is located slightly on the outskirts of Varanasi city.
- ✓ This location is far from the Kasi Vishwanath temple.
- ✓ Short journey cruise vessels may not be utilised as the facility is far away from the temple.
- ✓ Studies need to be carried out to ascertain the siltation during river run-off.

The coordinates for the same are shown in Table 4.3.

Table 4.3 Coordinates of Location 3 (D/s of Vishwasundari Bridge)

Location	Easting (m)	Northing (m)
A	703695.43 E	2794661.00 N
B	703688.02 E	2794679.31 N
C	703834.54 E	2794736.37 N
D	703847.62 E	2794759.93 N
E	703728.18 E	2794944.97 N
F	703840.00 E	2795038.72 N
G	703933.67 E	2794890.96 N
H	703847.78 E	2794816.06 N
I	703873.82 E	2794768.37 N
J	703878.82 E	2794731.76 N

This location could be the ideal option for developing a cruise terminal. But, the identified area is far from the Kasi Viswanath temple, which may not attract the day cruise operators. The land at the identified location doesn't belong to IWAI/UP Government. Hence, this location wouldn't be feasible regarding the operation and land acquisition.

4.6 Assessment of Location 4 – Upstream of Vishwasundari Bridge

The location at upstream of Vishwasundari Bridge has been identified for the development of the Cruise terminal. The following merits and demerits were evaluated by visual inspection for their feasibility.

Mertis

- ✓ This location is observed to be accessible directly from the National highway. This location is also opposite to the multi-model terminal(MMT).
- ✓ This location has moderately reclaimed land for the development of a terminal building as well as other utilities. A land area of about 1.8 ha shall be required for the development of a cruise terminal.
- ✓ This location may be a potential option similar to Downstream of Viswasundari Bridge, where all the utilities can be planned and developed.

Demerits

- ✓ It was also observed that the identified location is located on the outskirts of Varanasi.
- ✓ This location is very close to the bridge and may cause disturbance to the terminal.
- ✓ This location is opposite to the existing MMT terminal and may disturb the operations of MMT cargo vessels. This may also cause disturbance to vessels during turning.

The coordinates for the same are shown in table 4.4.

Table 4.4 Coordinates of Location 4 (U/s of Vishwasundari Bridge)

Location	Easting (m)	Northing (m)
A	704061.66 E	2794485.82 N
B	703983.24 E	2794457.32 N
C	703896.47 E	2794696.09 N
D	703861.36 E	2794732.30 N
E	703855.53 E	2794749.57 N
F	703875.32 E	2794743.85 N
G	703913.42 E	2794703.85 N
H	703938.30 E	2794639.94 N
I	704014.73 E	2794667.65 N

The positioning of the cruise terminal for the identified location 3 is shown in Figure 4.5.

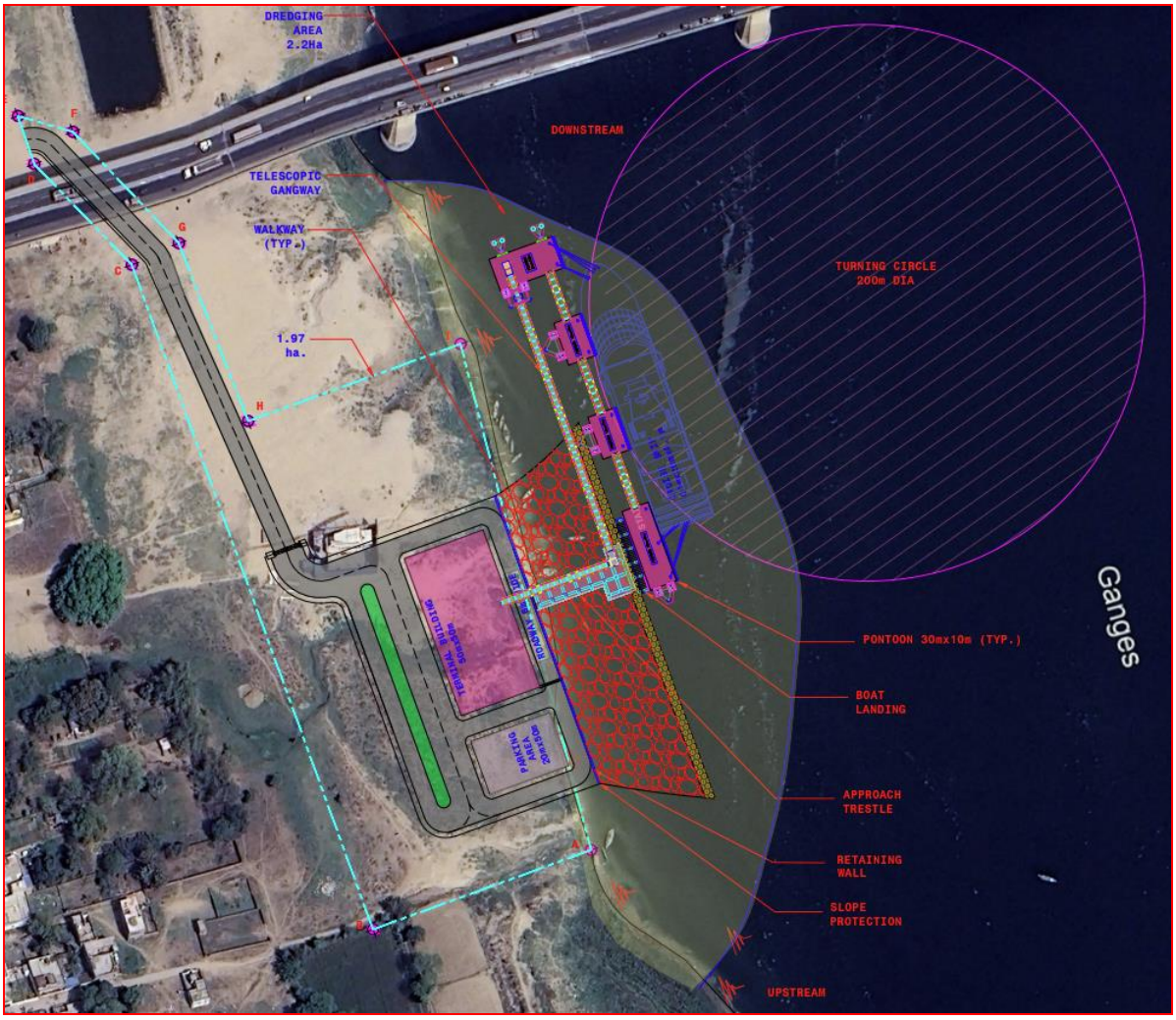


Figure 4.5 Layout of Cruise Terminal for Location at U/s of Vishwasudnari Bridge

Since, this location is located exactly opposite to the MMT Terminal, the channel would be seen with heavy traffic and difficult for approaching cruise vessels. This location is seen far from the Kasi Viswanath temple, which may not attract the day cruise operators. The land at the identified location doesn't belong to the IWAI/UP Government. Hence, this location wouldn't be feasible regarding the operation and land acquisition.

4.7 Assessment of Location 5 – Assi Ghat

The location Assi Ghat is located about 3.5 km from Kasi Vishwanath temple and identified for the proposal of a cruise Terminal.

The following merits and demerits were evaluated by visual inspection for its feasibility.

Mertis

- ✓ The identified location is viewed to be in a prime location, near the Kasi Vishwanath Temple. Since this location is very close to the Kasi Vishwanath temple, this location will be surrounded by pilgrims throughout the year, which attracts cruise tourism.
- ✓ This location is presently being used as a berthing facility for the Day cruises sailing in the Varanasi region.
- ✓ The land area of about 1.76 ha shall be required for development. IWAI authorities also informed that the land available at the identified location belongs to the UP government and could be used for the development of the Cruise Terminal.

Demerits

- ✓ The land area available at this location is very limited, and hence future expansion would be difficult.
- ✓ The width of the approach channel at this location is narrow and could make it difficult to provide a turning circle for the maximum vessel size.
- ✓ The existing road network to the identified location is narrow and shall pass through a residential area. This may be inconvenient for the vehicles approaching the terminal. However, this location attracts tourists to experience a river cruise as it is close to Kasi Viswanath temple.
- ✓ Future expansion of the terminal building may be difficult as the adjacent land belongs to private ownership.
- ✓ This location doesn't have reclaimed land and has a steep slope. Additional reclamation and inclusion of Diaphragm wall may be required to facilitate the berthing facility in varying water levels.

The proposed cruise terminal at this location shall be developed for short journey cruises/Day cruises. The berthing infrastructure has also been developed with the addition of a ramp for the berthing of ROPAX vessels.

The cruise terminal and its berthing facility shall include the following facilities.

- Berthing pontoons for about 138m.
- Ramp of 165m for Ro-pax vessels.
- Berthing of 4 Nos of 30m cruise vessels.

The coordinates for the same are shown in Table 4.5.

Table 4.5 Coordinates of Location 5 (Assi Ghat)

Location	Easting (m)	Northing (m)
A	702208.56	2797952.60
B	702224.86	2797983.94
C	702153.60	2798130.67
D	702157.79	2798132.79
E	702143.38	2798162.95
F	702194.12	2798187.54
G	702284.92	2798000.57
H	702242.65	2797980.06
J	702231.92	2797959.30

The positioning of the cruise terminal for the identified location 5 is shown in Figure 4.6

Figure 4.6 Layout of Cruise Terminal for Location at Assi Ghat

This site is located very close to the Kashi Vishwanath Temple, a major attraction for tourists and cruise operators. According to the authorities, the land at this location is owned by the

Uttar Pradesh Government. However, its narrow width poses challenges for future development. Therefore, the identified location would be feasible for developing a cruise terminal for short journey ferries.

4.8 Assessment of Location 6 – Adjacent to MMT Terminal

The location adjacent to the MMT terminal is located about 7.5 km from the Kasi Vishwanath temple and has been identified for the operation of long journey cruise vessels.

The existing ferry pontoon at Ramnagar MMT Terminal was visited and evaluated for the development of a cruise terminal and its utilisation. It is seen that the land at the existing gangway location has been established with a DGPS station and a Nitrogen filling station. Therefore, the proposal for the development of a cruise terminal couldn't be made possible at the pontoon ferry location.

As an alternative, the location adjacent to the MMT berth has been identified for the development of the cruise terminal. The following merits and demerits for the identified location have been evaluated for its feasibility.

Mertis

- ✓ The land area of about 3.18 ha is available for the development of a cruise terminal.
- ✓ The cruise terminal may be designed as a multi-purpose facility like a shopping mall, consisting of entertainment activities. This helps to yield additional revenue when the cruise terminal is unused. This shall be developed in discussion with various stakeholders seeking the multi-purpose facility.
- ✓ Sufficient backup area available for future expansion.

Demerits

- ✓ This location is located on the outskirts of Varanasi, which consumes more time for passengers to approach the Terminal building. However, this may be suitable for long journey cruise passengers.
- ✓ The development of an independent berthing facility for long journey cruises involves an additional cost in addition to the berthing facility proposed at Assi Ghat. The same may be ascertained by IWAI using traffic projections. Day cruises may not utilise this facility since it is far away from the Ghats.
- ✓ The berth occupancy may need to be carried out to ascertain the utilisation of the berthing facility. At present, the number of long journey cruise vessels sailing to Kolkata and other cities is limited. The berthing facility may be unutilized during the

non-operation of long journey cruise vessels. Therefore, the same may be developed in future phases based on the requirement.

- ✓ The identified land is covered with bushes and trees. Hence, necessary permission may be required to be obtained from the concerned authorities for the development of cruise terminal.

The coordinates for the same are shown in Table 4.6.

Table 4.6 Coordinates of Location 6(Adjacent o MMT Terminal)

Location	Easting (m)	Northing (m)
A	704564.23	2794625.18
B	704572.16	2794608.97
C	704479.94	2794584.67
D	704429.68	2794788.96
E	704488.49	2794803.36
F	704533.60	2794619.18

The positioning of the cruise terminal for the identified location 6 is shown in Figure 4.7

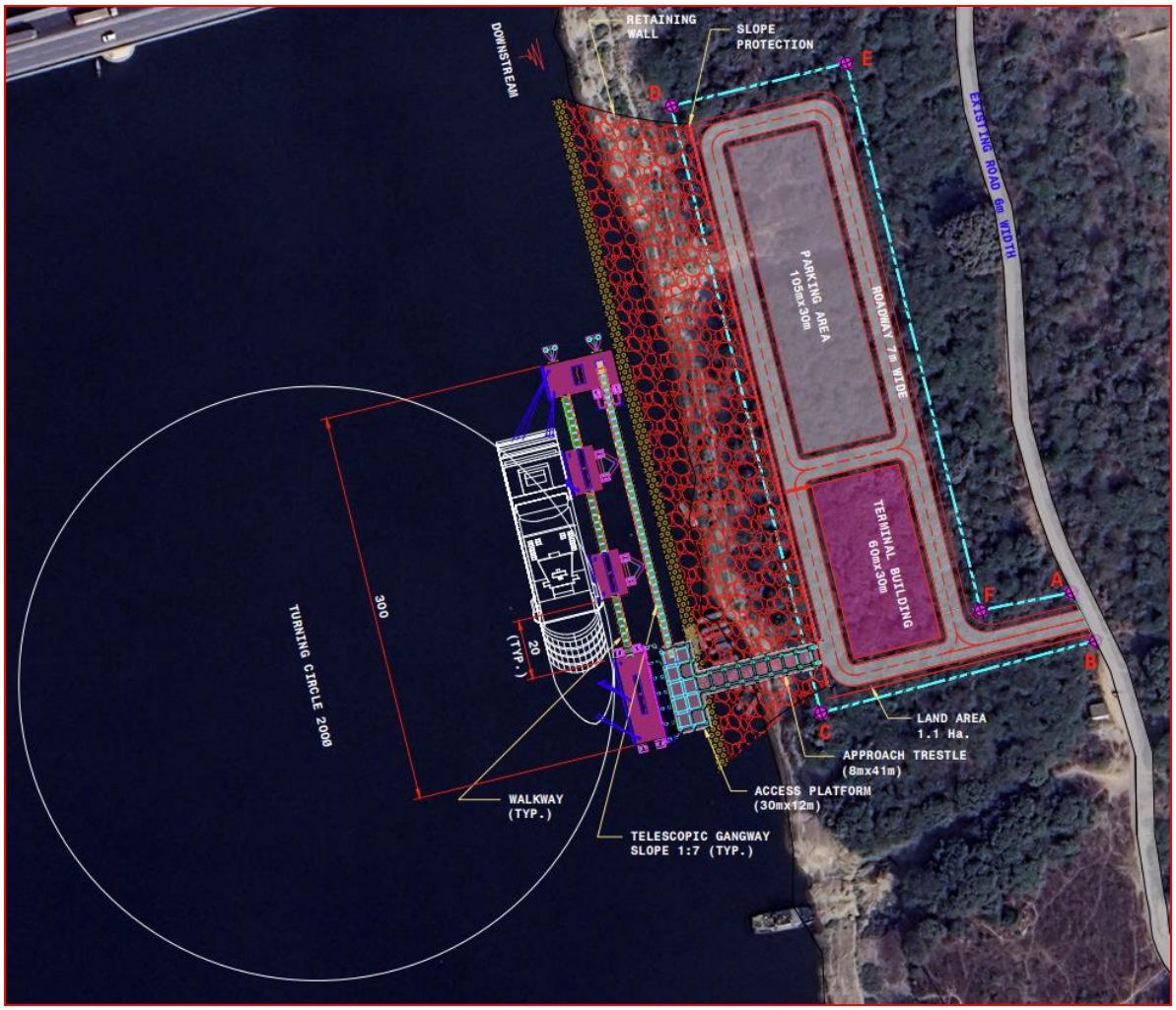


Figure 4.7 Layout of Cruise Terminal for Location adjacent to MMT Terminal

As per the authorities, the land at this location is owned by the Inland Waterways Authority of India (IWAI), making it a suitable option for developing a cruise terminal. However, the site poses accessibility challenges for passengers and short journey cruise operators. Therefore, this location is more appropriate for the development of a terminal catering to long-journey cruise operations.

4.9 Assessment of Location 7 – Upstream of MMT Ramnagar

The location Upstream of MMT terminal is identified for the development of cruise terminal. However, the same was not accessible due to insufficient access to the location. The same was also surrounded by land farms and houses. This location is also situated very far from the Vishwasundari Bridge (NH 44) well as from the Kasi Viswanath temple. Therefore, the same has not been considered for its feasibility.

4.10 Assessment of Location 8 – Upstream of Ramnagar - Samneghat Bridge

The location Upstream of Ramnagar - Samneghat Bridge is identified for the development of a cruise terminal. The access approaching the identified location doesn't have any roadways and is surrounded with bushes. Therefore, the same couldn't be assessed for its feasibility.

4.11 Assessment Matrix

The summary of evaluation for all 5 locations is given in Table 4.6.

Table 4.7 Assessment Matrix

Sl. No	Item Description	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6
1	Ease of construction	**2**	**1**	**3**	**3**	**2**	**3**
2	Ease of future expansion	**2**	**1**	**3**	**3**	**2**	**3**
3	Operation during high and low water	**2**	**2**	**2**	**2**	**2**	**2**
4	Access road construction	**1**	**1**	**2**	**2**	**3**	**3**
5	Distance from temple	**1**	**2**	**1**	**1**	**3**	**1**
6	Construction schedule	**1**	**2**	**2**	**2**	**2**	**3**
7	Ease of access	**1**	**2**	**2**	**2**	**3**	**2**
8	Capital dredging	**1**	**2**	**2**	**2**	**3**	**2**

Sl. No	Item Description	Location 1	Location 2	Location 3	Location 4	Location 5	Location 6
9	Frequency of dredging	2	3	2	2	2	2
10	Capital investment	2	2	2	2	2	2
11	Availability of Government Land	1	1	1	1	3	3
	Total score	16	19	22	23	25	24
	Rank	6	5	3	4	1	2

Scoring base: 1 – Poor/Low/Long; 2- Good/Medium; 3 – Excellent/High/Short

It can be inferred from the above matrix that locations 1, 2, 3 and 4 don't have the availability of government land; whereas the land at locations 5&6 belongs to the government. Hence, the land acquisition wouldn't be a challenge. It shall also be noted that the locations 1&2 don't have direct access to the National highway. Therefore, locations 5 and 6 would be an ideal location for the development of a cruise terminal.

As per the discussion with cruise operators and their requirements, it can be noted that the short journey cruises require a location close to the temple, whereas the long journey cruises require a berthing platform for berthing bigger cruises. To satisfy the requirement and for the utilisation of the berthing facility, the cruise terminal can be developed in two phases.

a) Phase I – Development of Cruise Terminal for Day Cruises at Assi Ghat
b) Phase II – Development of Cruise Terminal for Long Journey Cruises at MMT Terminal

The parameter matrix presented in Table 4.7 indicates that Locations 5 and 6 are the most suitable options for short and long journey cruise operations, respectively. Accordingly, these locations shall be selected for further evaluation, including the development of a preliminary layout, design, and block cost estimate.

5. PRELIMINARY LAYOUT AND DESIGN

5.1 Phase I -Development of Cruise Terminal at Assi Ghat – Day Cruises

5.1.1 Location

The proposed location can be identified between the Assi Ghat and Ravidass Ghat as shown in Figure 5.1. The width of the river at this location is approximately 400m. The proposed location has a shore length of about 350m.

Figure 5.1 Location of site for Phase I – Assi Ghat

5.1.2 Site Parameters

The proposed site is located along the banks of the river Ganga upstream of the Assi Ghat is shown in Figure 5.2. The road approaching the site is narrow and in a busy area. However, this location facilitates the long shore length for the development of berthing facilities for an increased number of ferries. The length and width of the proposed location are about 320 m x 55 m having area of about 17600 sqm. Sufficient space is available in the area for the development of the terminal. The general ground conditions are steep, with a ground level of +70m. The level is with respect to the reduced level indicated by the local authorities and is related to the high and low flood levels.

Figure 5.2 Location Map of Proposed Cruise Terminal at Assi Ghat

5.1.3 Overall Layout of Terminal at Assi Ghat

The major components of the cruise terminal development include the following aspects.

- Approach and Access Platform.
- Modular Pontoons with Guide pin piles
- Ramp
- Diaphragm wall
- Terminal building and approach roads, including all facilities and utilities.
- Steel Pedestrian Walkway(Ramp) from RC Platform to Pontoons
- Staircase (Secondary Access)
- Dredging berth pocket
- Roads and Other Utilities

The overall layout of the proposed cruise terminal is depicted in Figure 5.3.

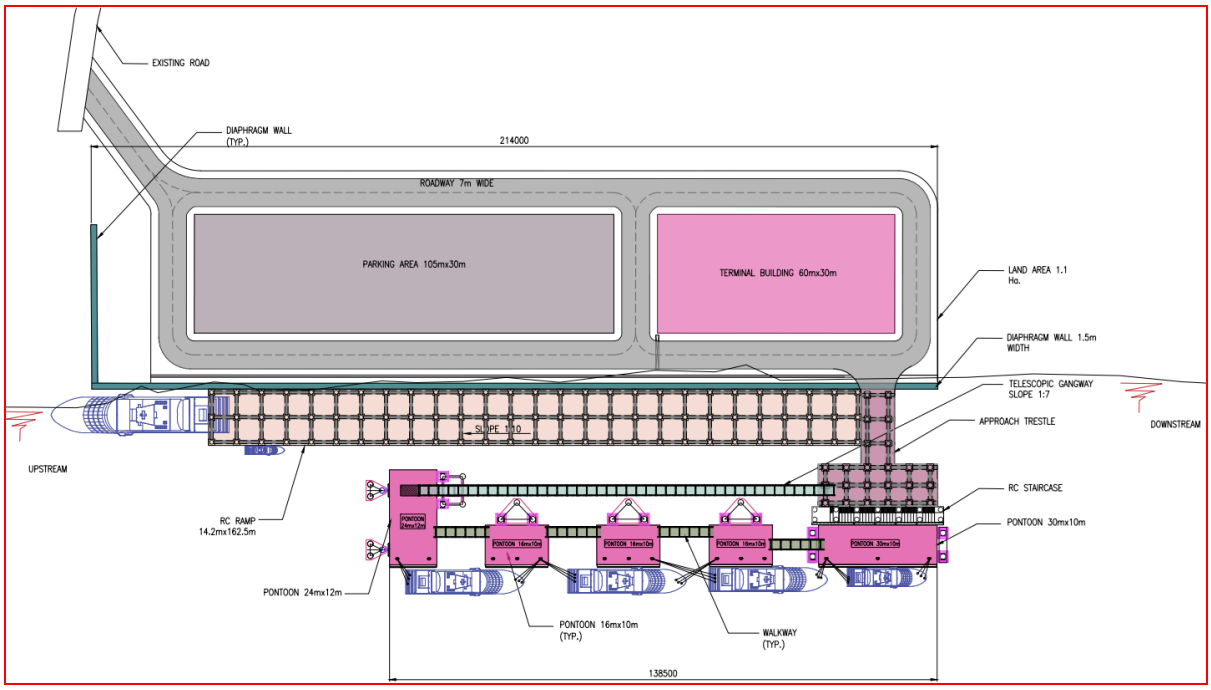


Figure 5.3 Overall Layout of Proposed Cruise Terminal – Assi Ghat

The terminal facilitates the following features.

- Berthing Infrastructure of 138.5m to satisfy the present requirement
- Ramp of 165m for Ro-pax vessels.
- Berthing of 3 Nos of 30m and 1 Nos of 20m cruise vessels.

The proposed Cruise Terminal at the identified location has sufficient waterfront of about 200m. Therefore, the berthing of vessels and turning circles may not be affected considerably. The turning circle of the cruise terminal have been provided with 200m in diameter.

The water level variation between the lowest low water level and the highest high water is observed to be 15.68m. It may be noted that the development of a fixed concrete platform would make it difficult to access between the vessel and the platform. To utilise the facility all around the year, floating options shall be preferred as an alternative to concrete structures. Therefore, the berthing infrastructure has been proposed with floating pontoons. The pontoons are connected by an Access platform and further with the Approach Trestle using Steel Gangways. Also, it shall be noted that the pontoons are arranged close to the access platform for the loading and unloading of goods using mobile cranes.

As an additional requirement, the area available between the shore and the platform at south of the Approach platform has been proposed for the development of an RC-piled ramp for the

berthing of ROPAX vessels. This ramp also facilitates the entry of vehicles to the ROPAX vessels. The ramp has been provided for a dimension of 165m in length and 14.2m in width, having a slope of 1 in 10.

The peripheral length of the shore has been provided with a Diaphragm wall to retain the soil on the land side for the reclamation. The replacement of the Diaphragm wall against shore protection provides additional waterfront. The development of the Diaphragm wall along the shore would facilitate the berthing of additional boats/vessels along the D-wall for idling and maintenance. However, barking and debarking of passengers can be made from the pontoons.

In addition to the berthing platform, the berthing infrastructure also includes a fixed RC stairway adjacent to the Access platform. This stairway may be used as a secondary access to the pontoon for passengers' entry or exit from the platform. The steps have been provided with two partitions. Partition 1 stair shall have a riser of 178mm and a tread of 250mm, having a width of 1.5m. Partition II stair shall have a riser of 535mm and a tread of 750mm, having a width of 2.5m. This serves as a mid-landing between the stairs and the pontoons, providing additional safety for the passengers accessing the vessels. The overall height of the stairs has been provided as 6.95m to access during a low water level.

Furthermore, the proposed cruise terminal is provided with sufficient internal roads 7m wide for the movement of vehicles.

5.1.4 Layout of pontoons

The layout of pontoons, guide pile system, together with fixed and movable gangway to accommodate the water level variations, is shown in Figure 5.4.

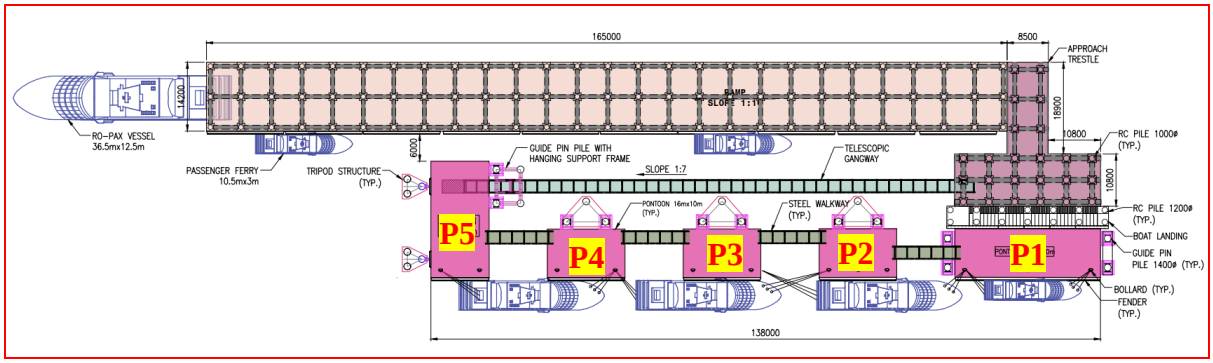


Figure 5.4 Layout of berthing pontoons and guide pile system at Assi Ghat

5.1.5 Structural Arrangement

RC Platform

The RC platform shall consist of an Approach trestle and an Access platform. Approach Trestle shall be provided for a length of 19 m and 8 m wide, whereas the Access platform is provided with a dimension of 30 m x 11m. However, entry to the vessel shall be made from the terminal building through a steel gangway. A steel gangway between the pontoon and the RC platform is provided with a length of 100m, having a slope of 1:7.

The piles of the RC Approach platform are provided with 1200mm dia piles spacing at 6.1m in the longitudinal direction and 5.3m in the transverse direction to cater for the sufficient shaft length above the dredged level against the current during flood. The piles of the access platform have been provided with 4.5m c/c in the transverse direction and 5.3m in the longitudinal direction. The dimensions of the transverse and longitudinal beams shall be provided with a dimension of 0.8m x 1m.

This ensures the movement of the pontoon upward and downward in a systematic manner. The plan view of the RC platform and the typical cross-section of the berthing facility are shown in figure 5.5, 5.6 and 5.7.

RC Stairway

The RC stairway is positioned in front of the Access platform to facilitate secondary access to the cruise vessels with the help of Pontoons P1(30 m x 10 m). RC stair is provided with a pile dia of 1200mm spaced at 5.3m c/c with a waist slab of 300mm thick across the width of the Access Platform. The RC stairs have been provided for a total length of 25m for accessing pontoons between low and high flood levels. Since the pontoons are positioned close to the RC stair, the waist slab is provided with a 150mm DD fender.

Ramp

The ramp has been provided for a length of 165m, having a width of 14.2m. The toe end of the ramp has been provided at +58.22m CD with a slope of 1 in 10 for berthing of vessels at low water level. The piles at longitudinal and transverse shall be spaced at 6.3m in both directions. The dia of the pile has been provided with 1000mm with a varying cut-off level. The beams at the ramp have been provided with a dimension of 0.8m x 1m. The thickness of the slab has been provided as 350mm. The edge of the slab along the river-side shall be provided with a square fender for berthing of small crafts.

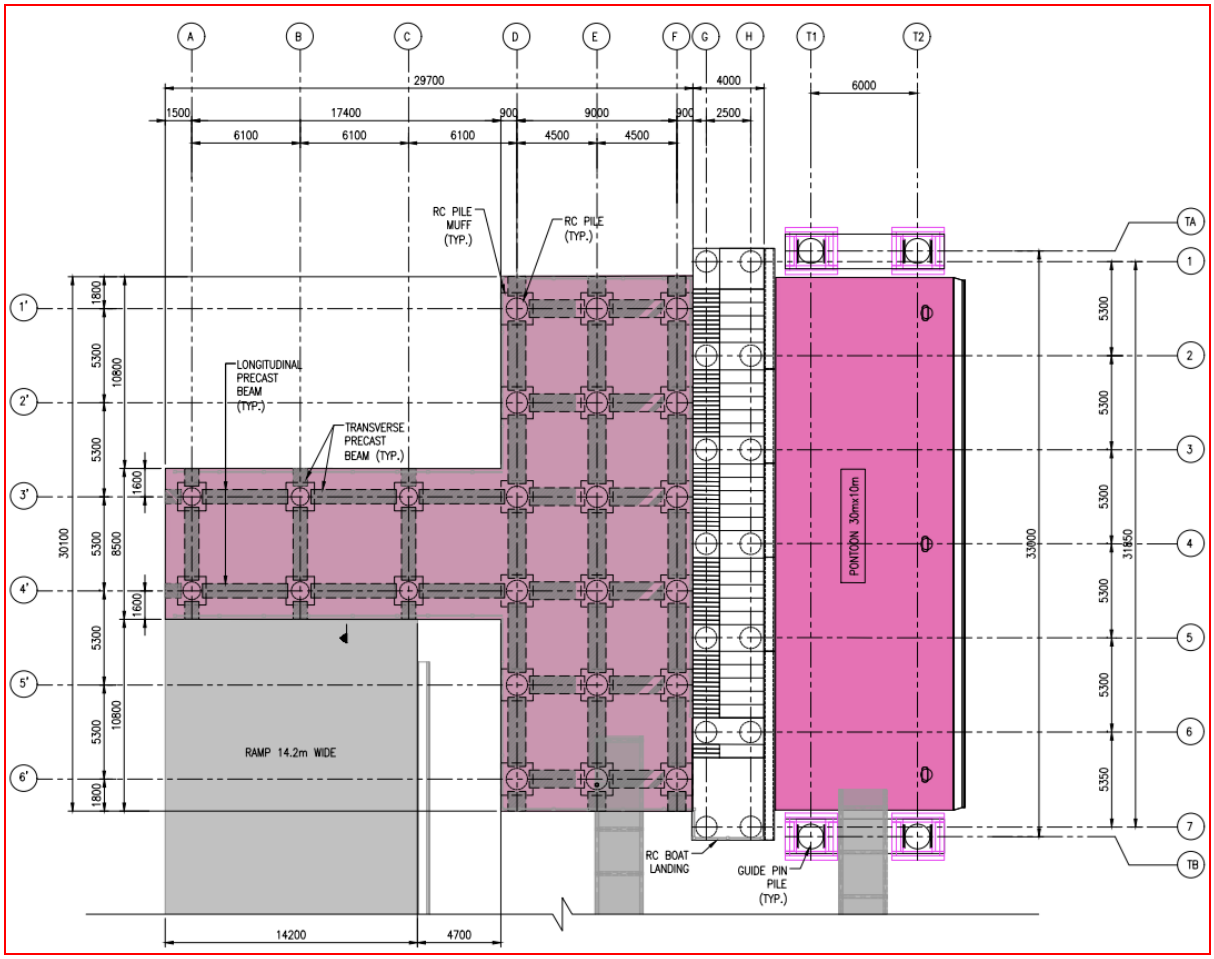


Figure 5.5 Plan View of RC Platform

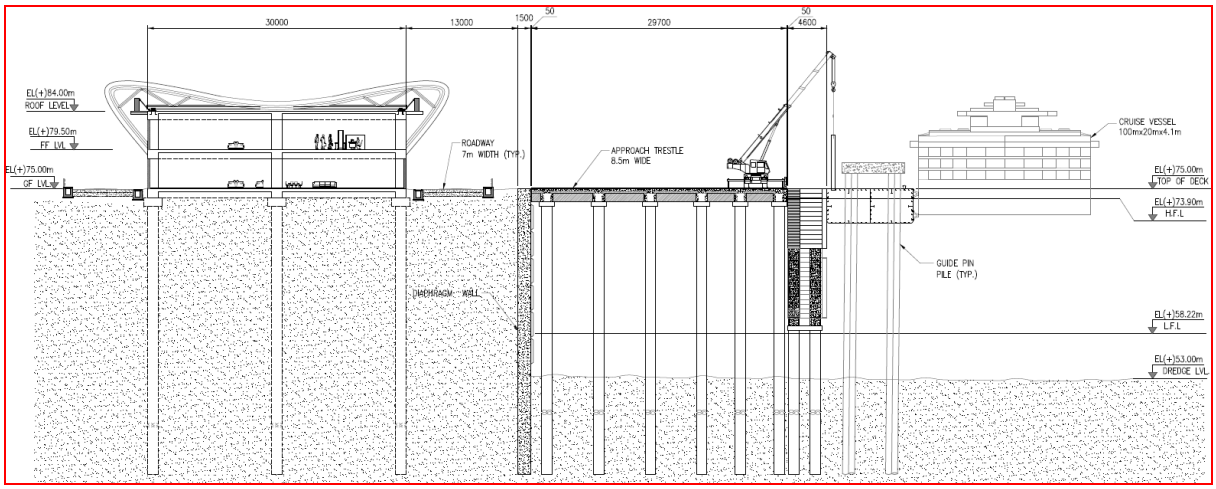


Figure 5.6 Typical Cross-section of Berthing facility at High Flood level (+) 73.9m CD

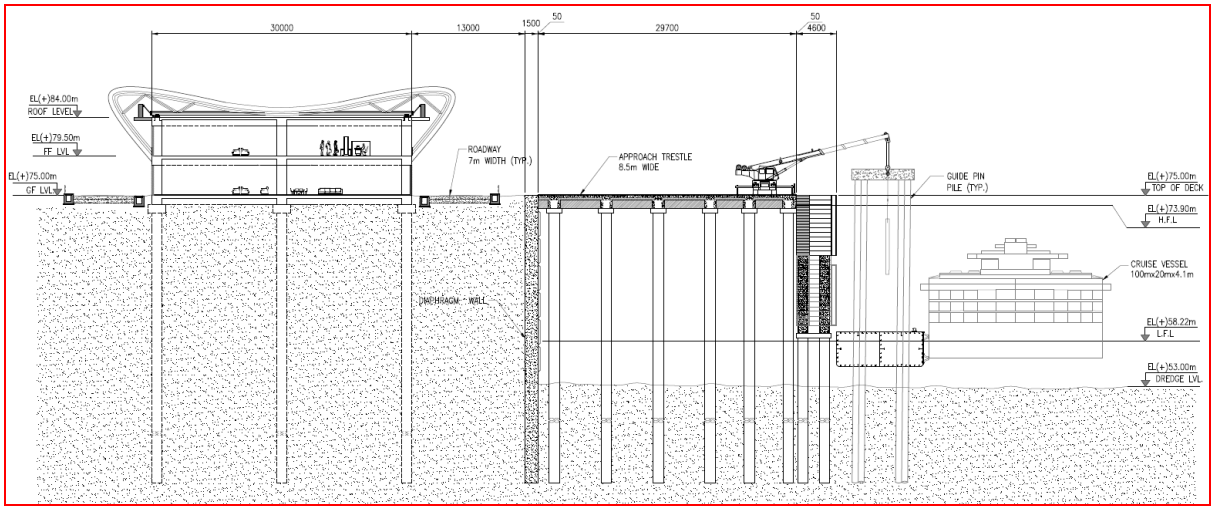


Figure 5.7 Typical Cross-section of Berthing facility at Low Flood level (+) 58.22m CD

The longitudinal sections of the berthing facility along the pontoons during high tide and low tide are shown in Figures 5.8 and 5.9.

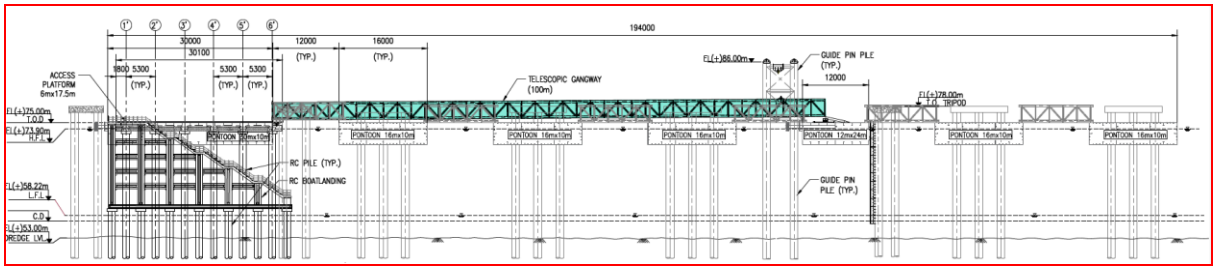


Figure 5.8 Longitudinal section of Berthing facility at High Flood level (+) 73.9m CD

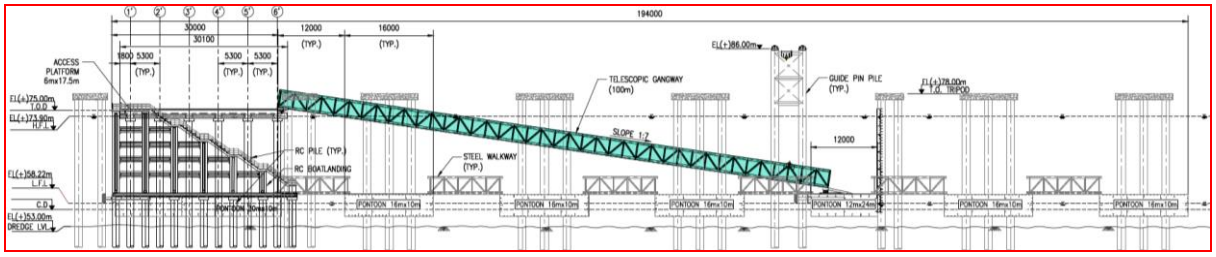


Figure 5.9 Longitudinal section of Berthing facility at Low Flood level (+) 58.22m CD

5.1.6 Diaphragm Wall

The riverbank shall be protected against erosion in the future by providing an RC Diaphragm wall along the bank. The diaphragm wall retains the reclaimed earth behind the berthing facility, subjected to large horizontal forces due to earth pressure. The thickness of the Diaphragm wall shall be 1.5m. The provision of a D-wall provides space to berth the vessel berth along the shore. This also eliminates the area occupied by the shore protection. The D-wall shall be designed as per the guidelines specified in IS 14344 and IS 9556.

5.2 Phase II – Development of Terminal at MMT Terminal (Long Journey Cruise)

5.2.1 Location

The proposed location can be identified adjacent to the MMT Terminal as shown in Figure 5.10 and figure 5.11. The width of the river at this location is approximately 385m. The proposed location has a shore length of about 300m.

Figure 5.10 Location of site for Phase II – MMT Terminal

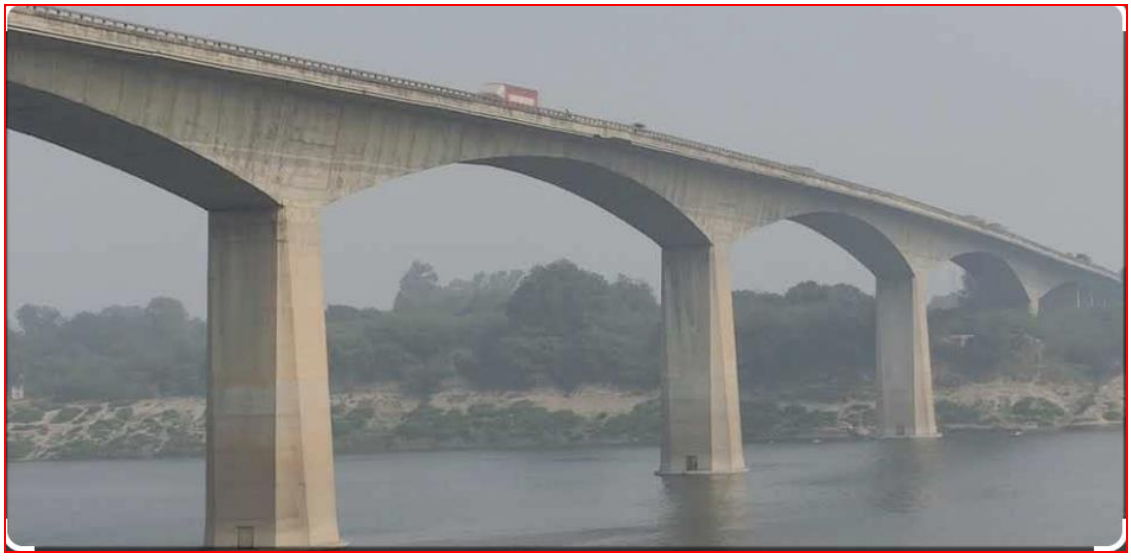


Figure 5.11 Elevation of Viswasundari Bridge

5.2.2 Site Parameters

The proposed site is on the banks of the river Ganga upstream of the Viswasundari Bridge, which is adjacent to the MMT Terminal, as shown in Figure 5.12. The proposed location has an existing bitumen road from the National highway. This location also facilitates the long shore length of about 300m for the development of berthing facilities for cruise vessels. The length and width of the proposed location are about 320 m x 80 m having area of about 25600 sqm available for development. The general ground conditions are steep, with a ground level of +70m. The level is with respect to the reduced level indicated by the local authorities and is related to the high and low flood levels.

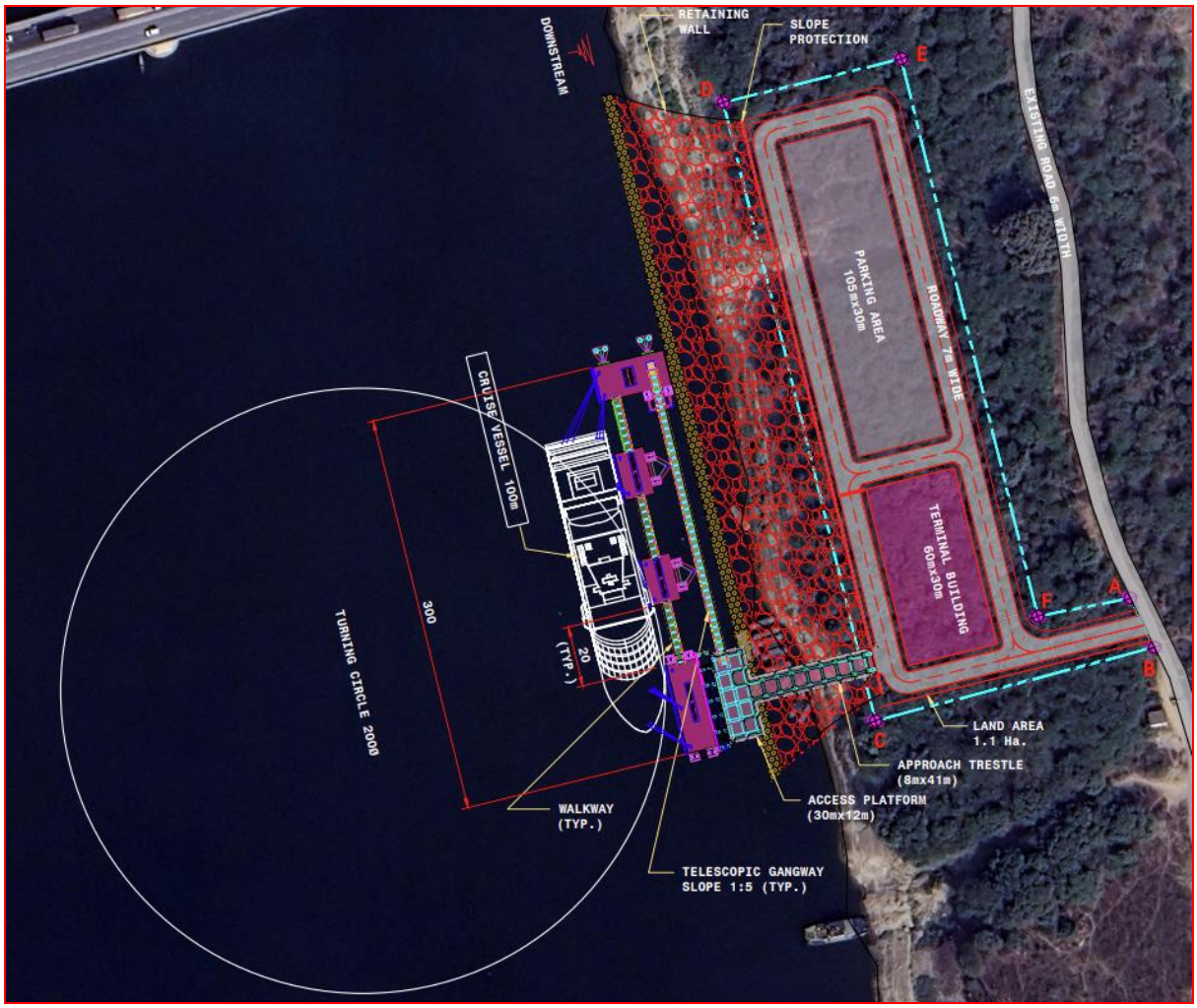


Figure 5.12 Location of Proposed Cruise Terminal

5.2.3 Overall Layout of Terminal at MMT Terminal

The major components of the cruise terminal development include the following aspects.

- Approach and Access Platform.
- Modular Pontoons with Guide pin piles
- Shore Protection
- Terminal building and approach roads, including all facilities and utilities.
- Steel Pedestrian Walkway(Ramp) from RC Platform to Pontoons
- Staircase (Secondary Access)
- Dredging berth pocket

The overall layout of the proposed cruise terminal is depicted in Figure 5.13.

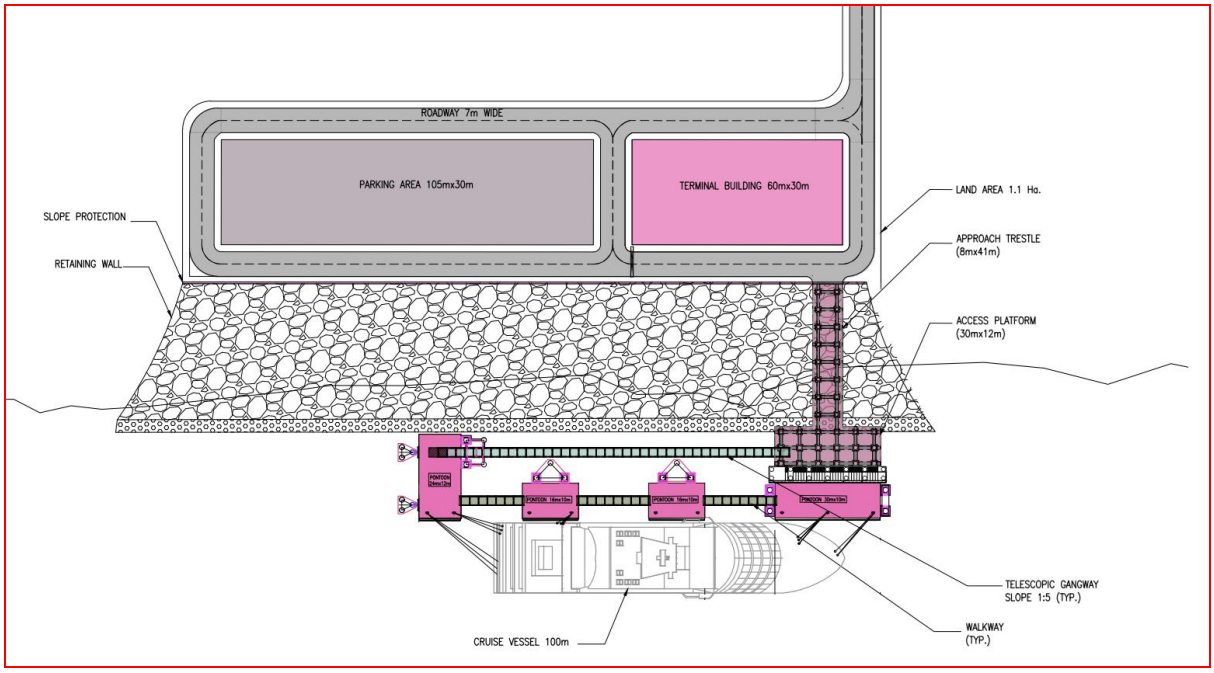


Figure 5.13 Overall Layout of Proposed Cruise Terminal at MMT Terminal

The identified location has sufficient waterfront of about 200m. Therefore, the berthing of vessels and turning circles may not be affected considerably. The turning circle of the cruise terminal have been provided with 200m in diameter.

The water level variation between the lowest low water level and the highest high water is noted to be as that of the Assi Ghat. The arrangement of the berthing infrastructure shall be adopted as same as that of the Assi Ghat. However, the adoption of Diaphragm wall at Assi ghat have been replaced with shore protection as the identified location has sufficient availability of land for development.

5.2.4 Layout of pontoons

The layout of pontoons, guide pile system, together with fixed and movable gangway to accommodate the water level variations, is shown in Figure 5.14.

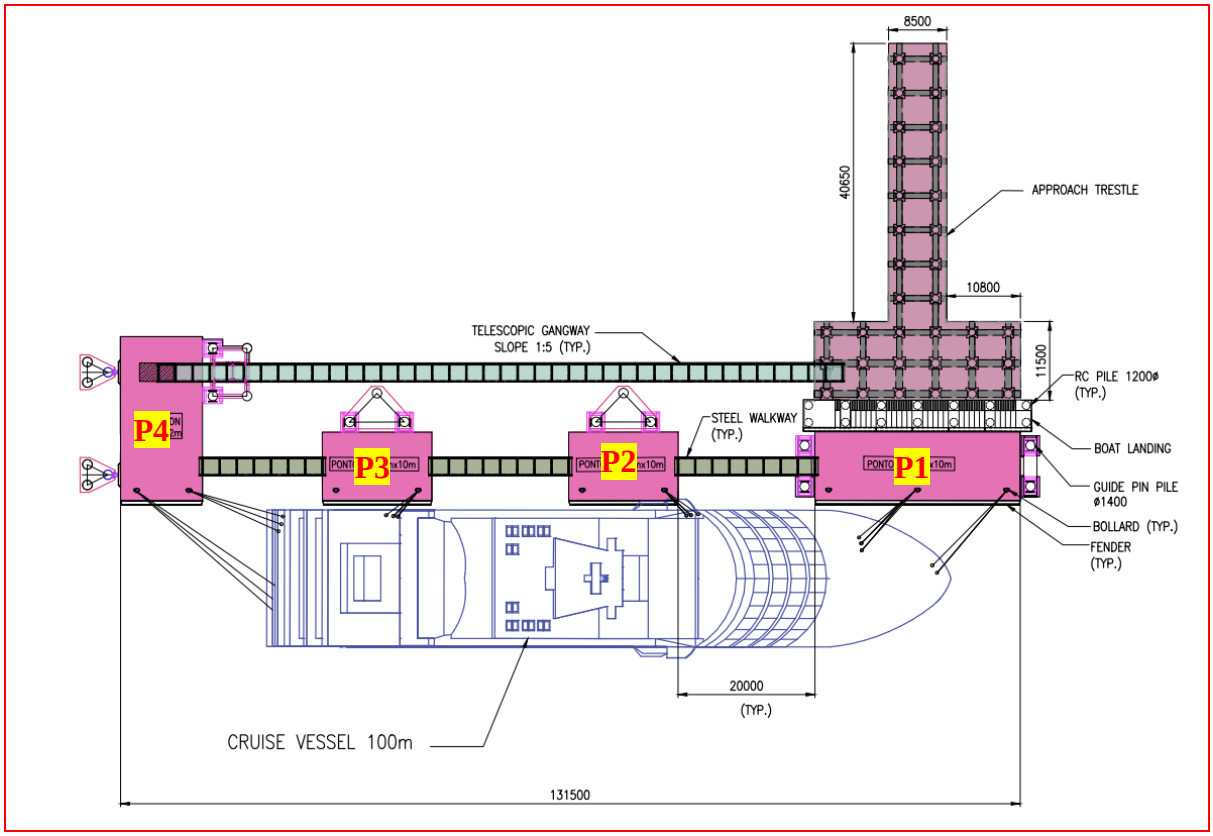


Figure 5.14 Layout of berthing pontoons and guide pile system (100m cruise)

5.2.5 Structural Arrangement at MMT Terminal

RC Platform

The structural arrangement of the RC platform proposed at the MMT terminal is the same as that of the RC platform proposed at Assi Ghat. However, the length of the approach from the riverbank to the access platform varied depending on the requirements of the site conditions. Approach Trestle shall be provided for a dimension of 41mx8m, whereas the Access platform is provided with a dimension of 30 m x 12m. The RC platform has been proposed as a T-shaped structure for the provision of future expansion of the berthing facility in the near future. Additional pontoons can be attached to the structure to increase berth length. The total length of about 132m of berthing infrastructure has been provided at MMT terminal for facilitating long journey cruise vessels utpo 100m. A steel gangway between the pontoon and the RC platform is provided with a length of 100m, having a slope of 1:7.

The piles of the RC access platform have been provided with 1200mm dia piles spacing at 6.1m in the longitudinal direction and 5.3m in the transverse direction to cater for the slender section for the sufficient shaft length above the dredged level against the current during flood. The piles of the access platform have been provided with 4.5m c/c in the transverse direction and 5.3m in the longitudinal direction. The dimensions of the transverse and longitudinal beams have been provided with a dimension of 0.8m x 1m. The plan view of the RC platform and the typical cross-section of the berthing facility are shown in Figures 5.15, 5.16 and 5.17.

RC Stairway

The RC stairway proposed at the MMT Terminal is the same as that of the stairway proposed at Assi Ghat. The RC stairway is positioned in front of the Access platform to facilitate access to the cruise vessels with the help of Pontoon P1(30 m x 10 m). RC stair is provided with a pile dia of 1200mm spaced at 5.3m c/c with a waist slab of 300mm thick across the width of the Access Platform. The RC stairs have been provided for a total length of 25m for accessing pontoons between low and high flood levels. Since the pontoons are positioned close to the RC stair, the waist slab is provided with a 150mm DD fender.

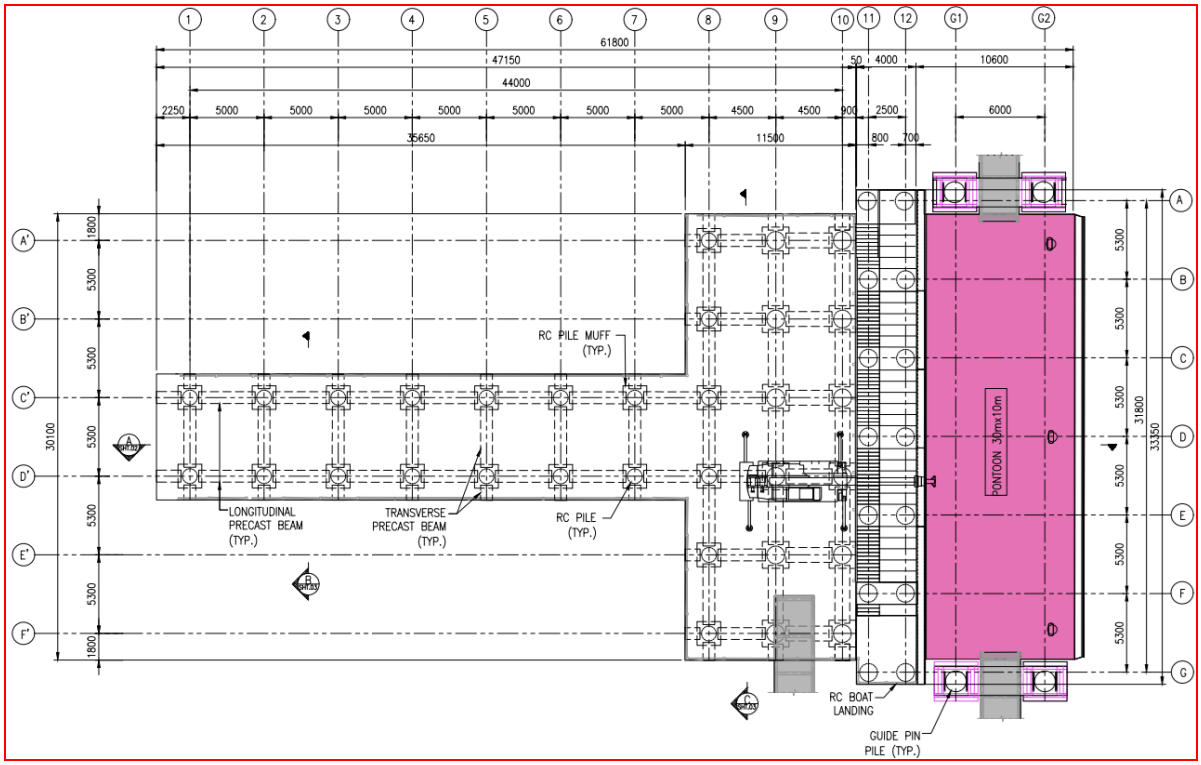


Figure 5.15 Plan View of RC Platform

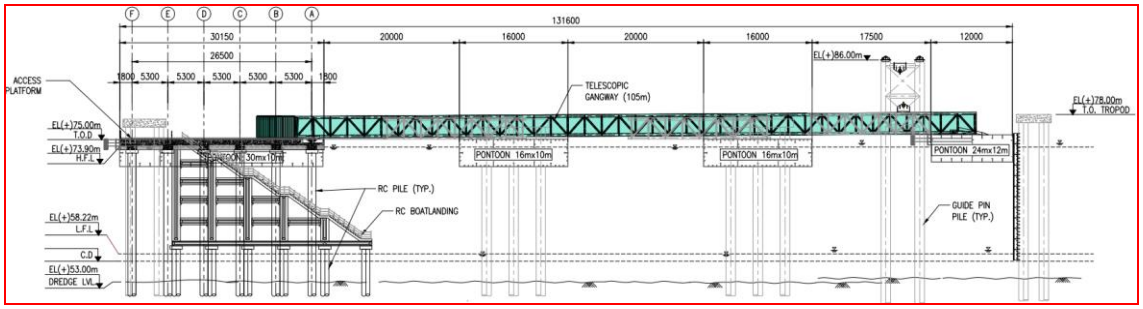


Figure 5.16 Typical Cross-section of Berthing facility at High Flood level (+) 73.9m CD

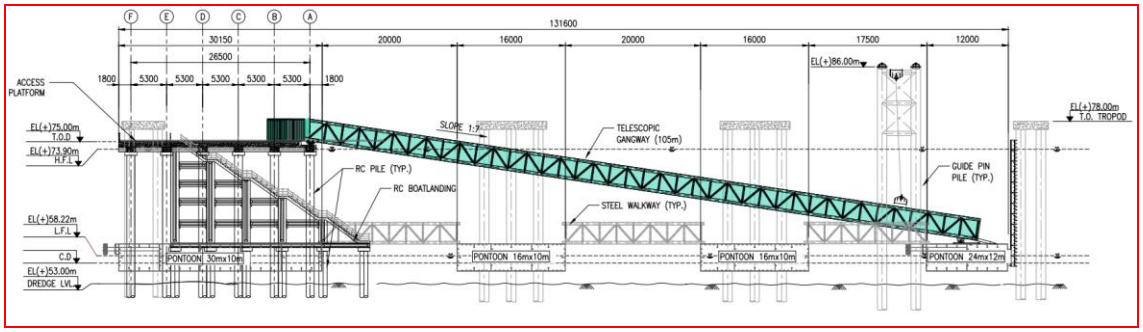


Figure 5.17 Typical Cross-section of Berthing facility at Low Flood level (+) 58.22m CD

The longitudinal sections of the berthing facility along the pontoons during high tide and low tide are shown in Figures 5.18 and 5.19.

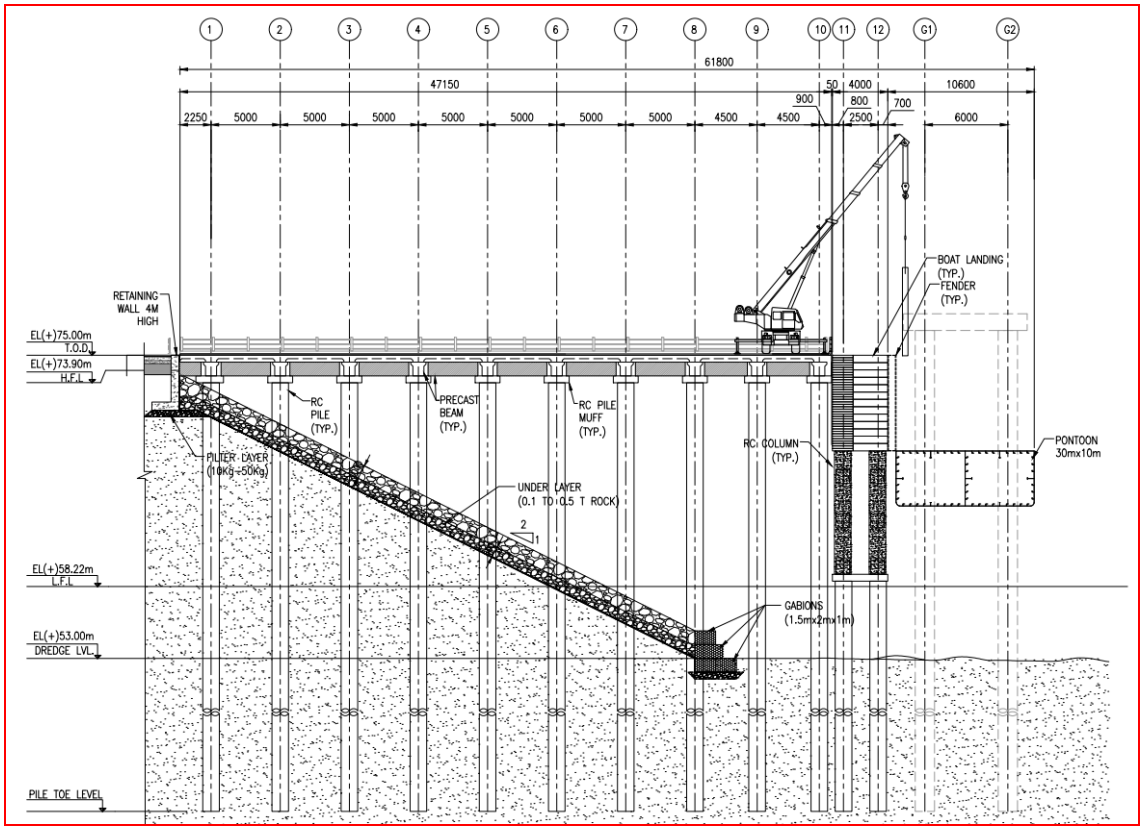


Figure 5.18 Longitudinal section of Berthing facility at High Flood level (+) 73.9m CD

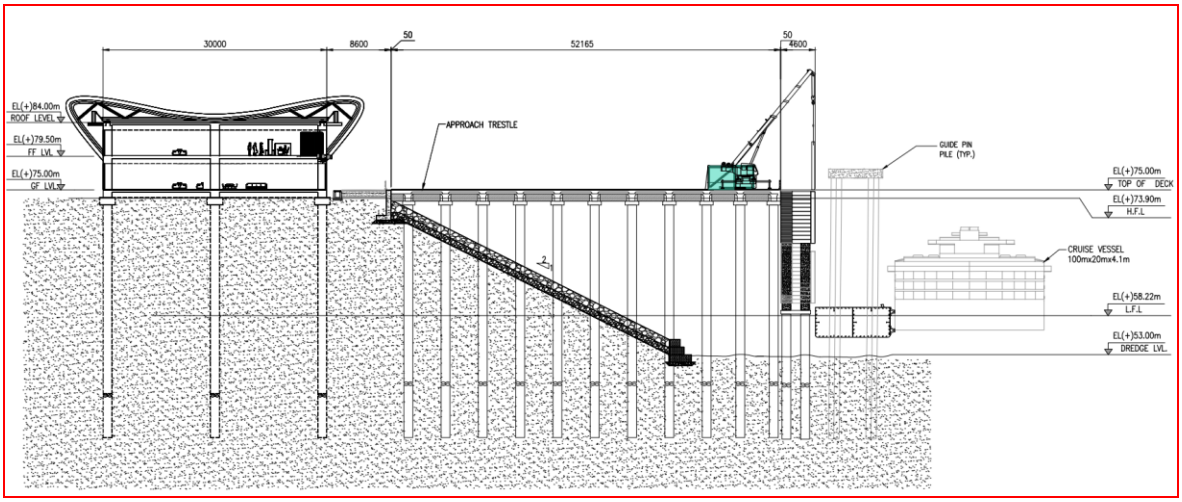


Figure 5.19 Longitudinal section of Berthing facility at Low Flood level (+) 58.22m CD

5.2.6 River Bank Protection

The riverbank shall be protected against any erosion in future and slope protection with toe protection shall be provided. The riverbank has been provided with a slope of 1:2 having 2 layers of stone pitching (Underlayer and Armour Layer). The stone pitching for the under layer shall have a grading from 500-1000kg, whereas the Armour layer shall have 500-1000kg. The toe of the slope protection is provided with gabions to retain the slope of the stone packing. Filter layer have been provided under the gabion. The gabions are made by mechanically woven double twisted hexagonal-shaped wire mesh gabion boxes as per IS 16014, having a mesh of dia 3.7mm. The gabions are sized with a dimension of 2mx1mx1m typically and are packed with stone filling. The toe end of the slope protection shall be slightly excavated and placed with a gabion. The typical cross-section of slope protection is shown in Figure 5.20.

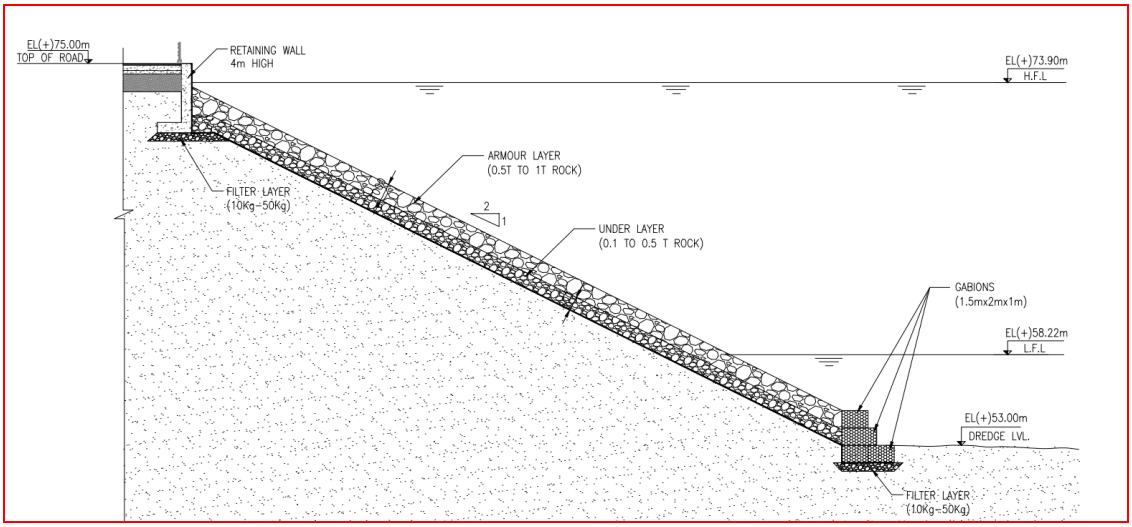


Figure 5.20 Typical Cross-section of Slope Protection

5.3 Deck Level Evaluation

The evaluation of the deck level is given in Table 5.1.

Table 5.1 Deck Level Evaluation

Tide level	Elevation (m) with respect to CD
High Flood Level (HFL)	+73.90
Effects of Flood	1.00
Margin	0.10
Total	**+75.00**

Thus, the deck level of the Approach Platform shall be fixed at +75.00 wrt. C.D.

5.4 Vessel Characteristics

The cruise ship characteristics considered for the planning are summarised in Table 5.2.

Table 5.2 Vessel Characteristics

Ship type	GRT	LOA (m)	Beam (m)	Loaded draft (m)
MV Ganga Vilas	1,000	62	12	1.4
Vessel Anticipated	5,000	100	20	2.5
Alaknanda	-	30	6	1.5
Bhagirathi	-	20	8	1.3
Swami Vivekanand/Sam Manekshaw	-	36.5	12.5	1.4
Banaras Buxer	-	10.5	3	0.95

However, the cruise vessel, having a maximum length of 100m has been considered for the long journey cruise vessels; whereas a vessel length of 30m and 20m have been considered for the short journey cruise vessels.

5.5 Water Depth Requirements

The water depth required for cruise vessels is calculated based on the maximum vessel size calling the berth viz. (MV Ganga Vilas of 62m length). It is also proposed to accommodate for the maximum vessel length of 100m. The calculation for the same is summarised in Table 5.3.

Table 5.3 Water depth requirements

Description	Cruise vessel
Loaded Draft (m)	1.40
Under keel clearance - 10% of draft (m)	0.14
Water Depth Required (m)	**1.54**
Low tide level (m)	**+57.60**
Riverbed level required (m)	**+56.06**
Airgap	1.06
River bed level provided	**+55.00**

Hence the dredged level required for the cruise vessel shall be maintained as (+) 55m. However, it may be noted that the depth of pontoons sized up to 4m having 2.9m draft. The keel clearance for the proposed pontoons shall be maintained as 2m. Therefore, the dredge level shall be proposed at (+) 53m CD.

5.6 Berthing and Mooring Facility

5.6.1 Pontoons

The pontoons are designed using steel members and plates. Alternative construction materials such as FRP and concrete can also be used. However, considering the hull strength requirements, it is proposed to use steel pontoons. The pontoons will be locally designed for 10 kPa loading in addition to the passenger loading. The pontoons provide an interface with the cruise vessel and the ship shore connecting gangways.

Phase I – Assi Ghat – Short Journey Cruises

Pontoon 1 : 30m x 10m x 2.5m
Pontoon 2 : 16m x 10m x 2.5m
Pontoon 3 : 16m x 10m x 2.5m
Pontoon 4 : 16m x 10m x 2.5m
Pontoon 5 : 24m x 12m x 2.5m

The disembarkation and embarkation of passengers shall be made through the pontoons. The hinged gangway at the RC platform is supported on Pontoon No. 5 (24m x 12m) and is allowed to slide during the water level variations.

A staircase landing with steps has been provided at pontoon No. 1 for direct access from the pontoon to the RC apron platform. The pontoon No. 2, 3 and 4 are connected by fixed walkways with a covered shed. All pontoons will be provided with fenders and bollards for berthing and mooring of cruise vessels and ferries.

Phase II – MMT Terminal – Long Journey Cruises

Pontoon 1 : 30m x 10m x 2.5m
Pontoon 2 : 16m x 10m x 2.5m
Pontoon 3 : 16m x 10m x 2.5m
Pontoon 4 : 24m x 12m x 2.5m

The hinged gangway at the RC platform is supported on Pontoon No. 4 (24m x 12m) and is allowed to slide during the water level variations. The pontoon No. 2 and 3 are connected by fixed walkways with a covered shed. All pontoons will be provided with fenders and bollards for berthing and mooring of cruise vessels and ferries.

5.6.2 Guide Pile systems

The guide pile system comprises three pile arrangements, including bracing connections at the top to provide adequate strength and stability against the pontoon forces during berthing and to sustain the mooring loads from cruise vessels.

The pontoons are supported by a tripod structure supported by 3 piles of 1400mm diameter to resist the lateral force due to wind and current. The top of the deck for the tripod structure provided with (+) 78m provided necessary allowances for the pontoons during the highest flood level. The tripod structure is capped by a capping platform for a depth of 1.5m to provide a monolithic action. The piles at the tripod structure are typically spaced at 5.3m.

5.6.3 Bollards

The bollards of 50T capacity are provided at the designated location for safe berthing and mooring of cruise vessels. The bollard capacity considered is for the larger cruise vessels up to 100m.

5.6.4 Fenders

Rubber fenders shall be provided to absorb the energy of impact of carriers. Arch fenders of 400H shall be provided along the length of the pontoons. DD fenders of 150mm shall be provided along the waist slab to absorb the energy of the pontoon during currents. The fenders shall be designed for a range of vessels at the berth with IS 4651 Part 3 and design to satisfy the requirements of PIANC guidelines.

5.6.5 Shore to ship crane

The proposed location has large differences between the floating pontoon and the shore and transfer of luggage and any provisions and supplies to the ship shall be through a dedicated crane arrangement fixed on the approach apron platform. This shall be used for such transfers to floating pontoons and to be taken to the cruise vessels.

5.7 Terminal Building

The terminal building is designed for a length of 60m and 30m wide. The building shall be of 2 floors supporting on a pile foundation. The area required for the terminal building including parking is about 2.5Ha. The ground floor shall have the following facilities.

(a) Check-in area
(b) Baggage drops counters.
(c) Security check
(d) Waiting area
(e) Toilets
(f) Office Cabins
(g) Baggage collection
(h) Shops
(i) Control Room
(j) Domestic departure gates
(k) Domestic arrival gates
(l) Immigration for foreign tourists
(m) Substation
(n) Cruise operators' area
(o) DG Room
(p) STP Tank and other Utilities

The first floor shall have the following facilities.

(a) Food court
(b) Waiting Area
(c) Shops
(d) VIP Longue
(e) Office Rooms
(f) Storeroom, Record Room
(g) Chiller plants on top of substation area

The total floor area at each floor is approximately 1800 square metres excluding the substation and utility structure. The substation and other utility facilities is located at the extreme end with an estimated area of 600 square meters. A total built-up area of about 3600sqmts has been proposed for the development of a cruise terminal.

The immigration for foreign tourists is provided as part of the development even though the foreign tourists might have cleared immigration in the nearby airports. However, if the tourists are arriving from neighbouring countries, this provision may help clear immigration in the cruise terminal. As the business grows in future, this requirement will be essential.
Sufficient commercial space shall be provided as part of the development for the operator to bring a shopping experience to the passengers arriving and departing from the terminal. The passenger experience at the terminal shall be similar to the of international airports and the building is provided with world-class faced and architecture is unique as per tradition of Varanasi.

The electrical room/substation will have HV/LV switch gear panels, transformers and utilities required for the power supply to the whole terminal including the marine Infrastructure. Lifts and stairways are provided as per the safety norms and the National Building Code 2016. The floor plans and typical longitudinal-section of the terminal building is shown in figure 5.21, 5.22, 5.23 and 5.24 respectively.

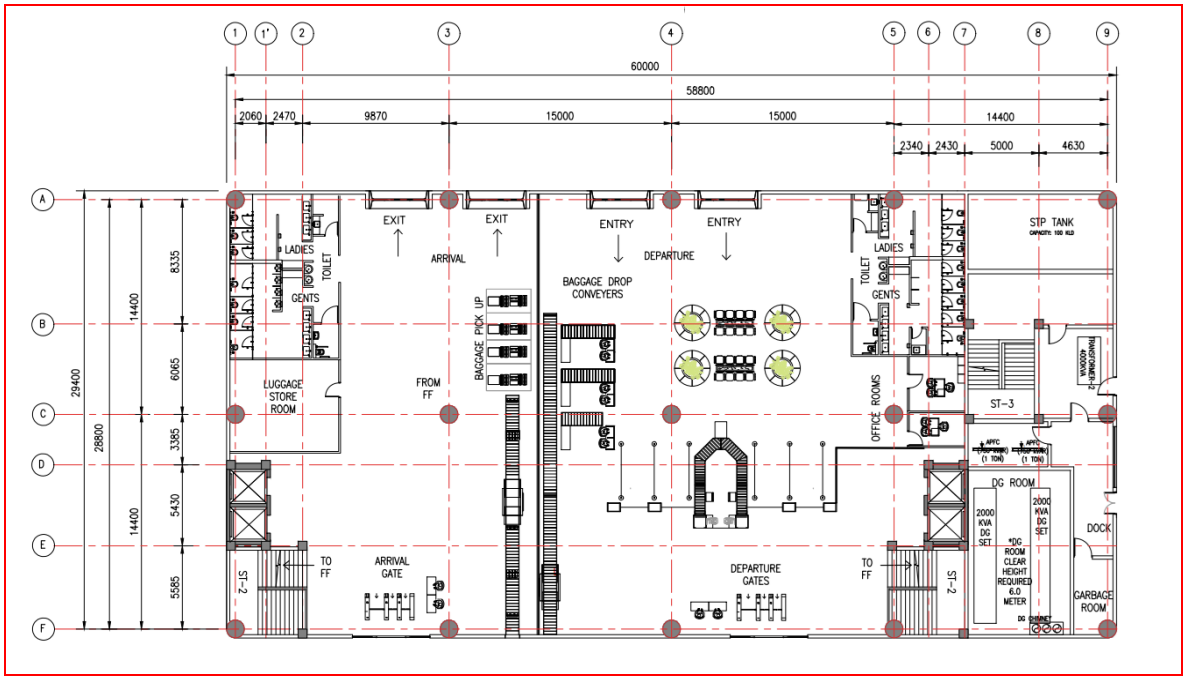


Figure 5.21 Ground Floor Plan

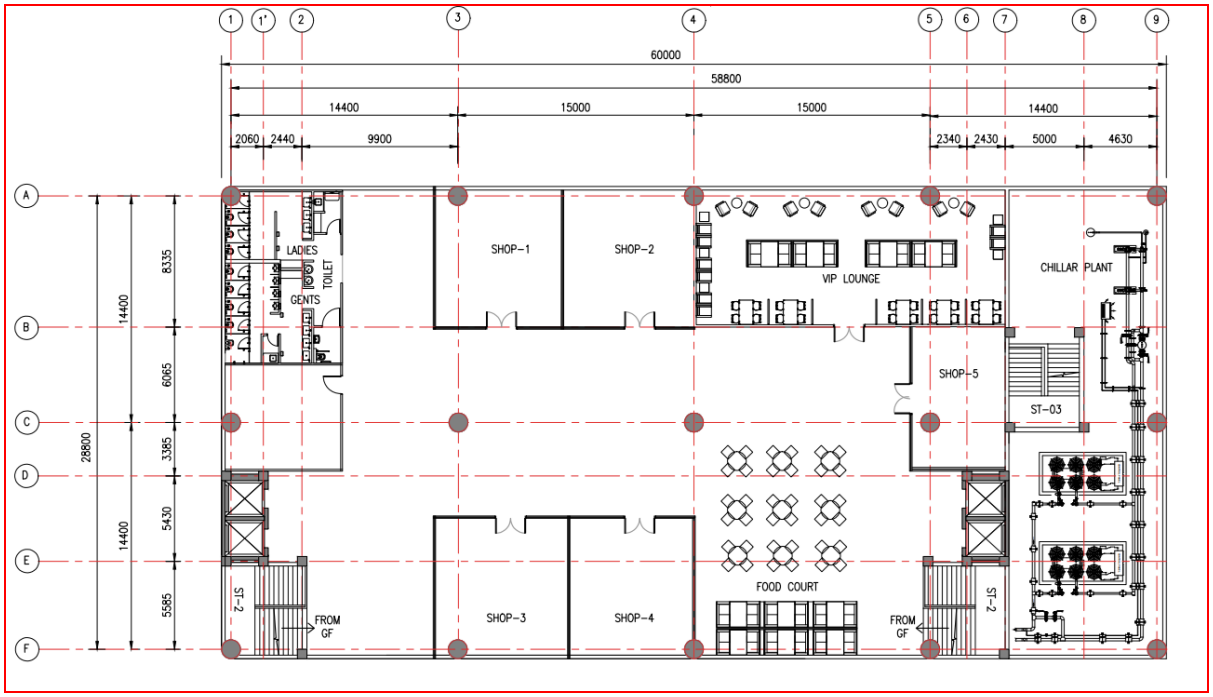


Figure 5.22 First Floor Plan

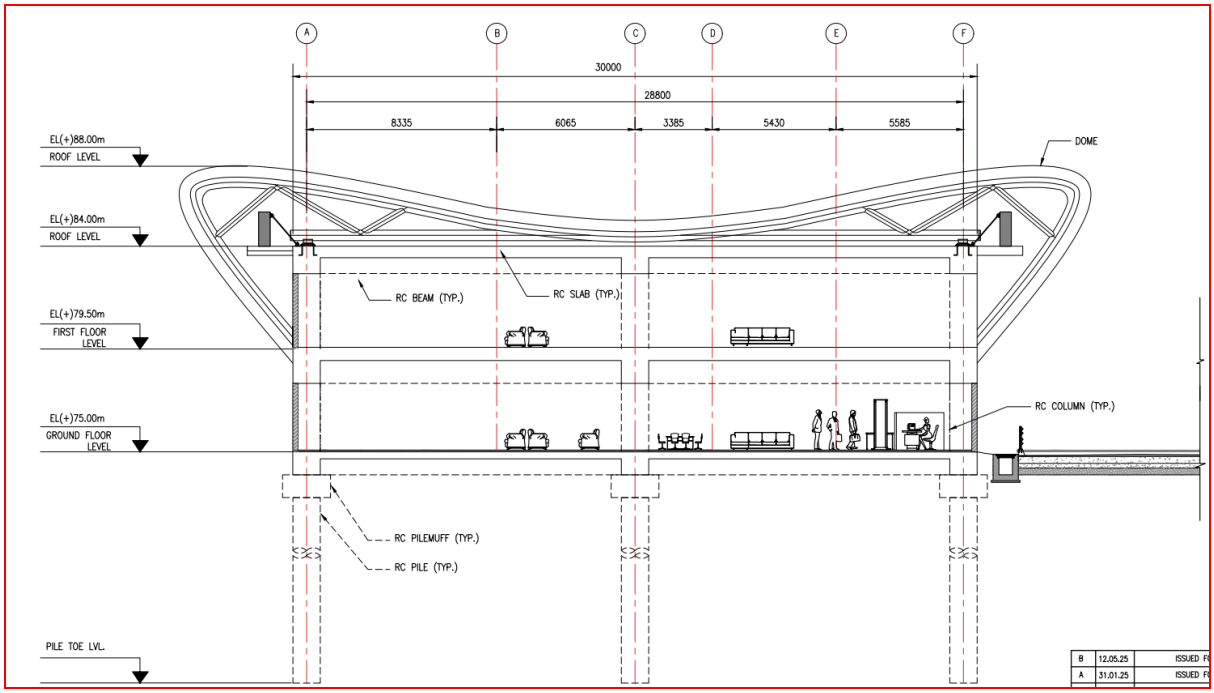


Figure 5.23 Longitudinal section of Terminal Building

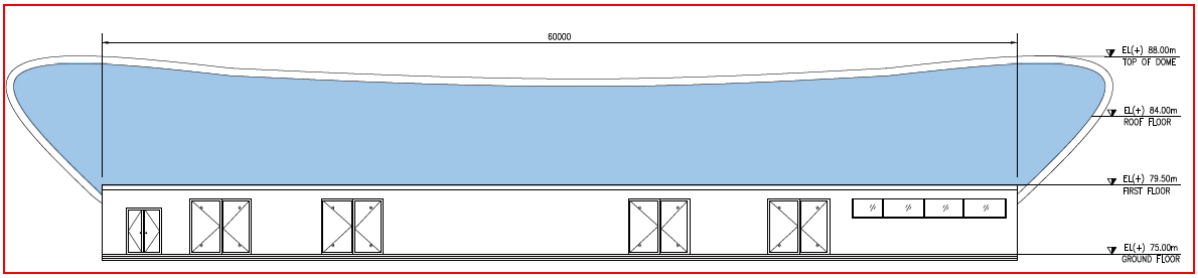


Figure 5.24 Elevation of Terminal Building

5.8 Roads and Utilities

5.8.1 Civil Works

The entire onshore facility will be fenced on all four sides with a minimum of 3m high compound wall and barbed wire. The roads shall be laid connecting the onshore facilities to all the Berths proposed. All the primary roads will be 10.5m wide.

5.8.2 Firefighting system

The firefighting system for the onshore facilities shall be designed and provided in accordance with the OISD-144. The firefighting system consists of the following.

- Fixed firefighting system
- Fire hydrants and monitors for offsite facilities
- Storage tanks for fire water
- Fire pump house & Air Compressor Shed
- Water spray system It is proposed to use fresh water from municipal supply.

5.8.3 Electrical Requirements

The electrical power requirement shall be calculated after finalizing the equipment and other infrastructure facilities for cruise terminals. However, tentatively, the power requirement for the cruise terminal will be of the order of 1 MW. An electrical power supply through a dedicated power generation facility is required for the cruise terminal. The electric power requirements of the cruise terminal shall be met by a new substation. Electric power distribution equipment at the substation shall comprise of 11 kV switchgear panels, 11 kV / 0.433 kV step down transformers and 415 V Power & Motor Control Centre.

5.8.4 Control System

The Automation Control room is located adjacent to the administration building. The control room shall have the following equipment located.

- Remote Control panels for CCTV system
- Remote Control Panels for Fire and Gas detection system
- Panels for PA/GA system
- Remote Control Panels for Fire alarm system
- Display panels for CCTV

The control room should be elevated and should have a full view of the area. All four sides of the room shall be fully glazed for a clear view.

5.9 Dredging

The riverbed levels at the location proposed for the development, including approach from the main navigational channel, are not available. Hence, a bathymetry survey shall be carried out, and an assessment of dredging shall be carried out.

5.10 Preliminary design drawings

The preliminary general arrangement drawings were prepared for developing the pre-feasibility report.

Table 5.4 Preliminary drawings

S. No.	Drawing No.	Description	Rev
1.	IITM-IWAI-VCT-DWG-001	Drawing List	B
2.	IITM-IWAI-VCT-DWG-002	Identification of Locations for Cruise Terminal, Varanasi	B
3.	IITM-IWAI-VCT-DWG-003	Overall Layouts of Cruise Terminal Facility (6 sheets)	B
4.	IITM-IWAI-VCT-DWG-004	Layout and Sections of Terminal at Assi Ghat (Location 5) (4 sheets)	B
5.	IITM-IWAI-VCT-DWG-005	General Arrangement of RC Platform at Assi Ghat (3 sheets)	B
6.	IITM-IWAI-VCT-DWG-006	General Arrangement of Ramp at Assi Ghat (2 sheets)	B
7.	IITM-IWAI-VCT-DWG-007	Layout and Sections of Terminal at MMT Terminal (Location 6) (4 sheets)	A
8.	IITM-IWAI-VCT-DWG-008	General Arrangement of RC Platform at MMT Terminal (3 sheets)	A
9.	IITM-IWAI-VCT-DWG-009	General Arrangement of Cruise Terminal Building (5 sheets)	B

6. COST ESTIMATE

6.1. Components of facility

The components of cruise terminal development include the following work elements.

- Preliminary works
- Marine infrastructure including Piled RC Platform, Approach Trestle
- Diaphragm wall at Assi Ghat
- Shore Protection at MMT Terminal
- Pontoons
- Pedestrian Walkway between approach platform and pontoon
- Dredging
- Roads and civil works
- Electrical facilities
- Firefighting facilities
- Navigational Aids

6.2. Preliminary Cost Estimate Summary

The block cost estimation is divided in following groups.

- Berthing structure and pontoons
- Approach Platform and Pedestrian linkspan
- Diaphragm Wall at Assi Ghat for Short Journey cruise terminal
- Shore Protection works – Long Journey cruise terminal
- Terminal Building
- Architectural and landscape
- Roads and drainage
- Electrical and Lighting (10% of building cost)
- Substation Facilities
- Dredging and Navigational Aids

The preliminary cost estimate is based on the following assumptions.

- *The cost estimate for berth foundations is made based on available in-house data from other projects in the region. Final cost estimate shall be carried out after the geotechnical investigation for the project.*
- The cost estimate is approximate based on preliminary sizing of the berth and shall be subject to a variation of **±25%.**
- Unit rates for concrete, steel and pile installation is taken from in-house data using Indian projects.

The preliminary project cost is estimated based on preliminary layout drawings attached in Appendix A.

The following additional charges shall apply to the estimated cost.

- *3% charges for PMC on overall project cost*
- *3% Contingency on overall project cost*
- *18% GST for government and PSUs*

The detailed worksheets of all the cost computations are attached in Appendix B. The summary of the cost estimate is given in Table 6.1.

Table 6.1 Preliminary Project Cost Estimate Summary

Sl. No	Description of Work / Item	Estimated Cost (Rs in Crores)	
		Assi Ghat	MMT Terminal
A)	Steel Pontoons	50.65	43.09
B)	Steel Walkway	3.00	3.00
C)	RC Approach and Access Platform	13.60	13.64
D)	Guide Pin Pile Structure	18.08	15.49
E)	Tripod Structure	4.62	4.62
F)	Catwalk Between Pontoons	4.88	2.68
G)	Dredging	7.25	7.25
H)	Roads, Drainage	2.67	2.67
I)	Main terminal building	33.40	33.40
J)	RC Stairway	5.09	5.09
K)	RC Ramp	30.01	-
L)	Diaphragm Wall	13.17	-
M)	Shore Protection Works	-	4.55
N)	Reclamation	3.35	3.35
O)	Air conditioning and Chiller Plants	5.00	5.00
P)	Architectural and landscaping works	2.00	2.00
Q)	Electrical and lighting works (10% of H)	3.00	3.00
R)	Substation Facilities	5.00	5.00
T)	Firefighting and Safety	3.00	3.00
U)	Preliminary works (survey and setting up)	1.50	1.50
	Total value of Works and Materials (In Rupees Crores)	**209.27**	**158.32**
	Contingencies (3%)	**6.28**	**4.75**
	PMC (3%)	**6.28**	**4.75**
	GST (18%)	**40.00**	**30.00**
	Grand total (in Rupees Crores)	**261.82**	**197.82**

The unit rates used for the cost estimate for various items are summarized in Appendix B. Based on the unit rates of raw materials, item rate for driven steel pile, RC bored pile, concrete for beams and slab including reinforcement is calculated and summarized in Appendix B.

7. RECOMMENDATION AND FUTURE PLANNING

In order to implement the project, following future action can be taken.

a) Land allocation by local authorities.
b) Field Studies discussion with local authorities
   -Topographic study
   -Bathymetry
   -Geotechnical investigation

c) Detailed design marine structures.
d) Detailed design of terminal building including architectural assessment and planning
e) Detailed planning of equipment and infrastructure
f) Cost Estimates for the project
g) Implementation scheme and schedule

APPENDIX A
DRAWINGS

LIST OF DRAWINGS

S.NO.	DRAWING NO.	DESCRIPTIONS	DATE	REV
1	IITM-IWAI-VCT-DWG-001	DRAWING LIST	13.05.25	B
2	IITM-IWAI-VCT-DWG-002	IDENTIFICATION OF LOCATIONS FOR CRUISE TERMINAL, VARANASI	13.05.25	B
3	IITM-IWAI-VCT-DWG-003-01	OVERALL LAYOUT OF CRUISE TERMINAL FACILITY LOCATION-1 (SHEET 1 OF 6)	13.05.25	B
4	IITM-IWAI-VCT-DWG-003-02	OVERALL LAYOUT OF CRUISE TERMINAL FACILITY LOCATION-2 (SHEET 2 OF 6)	13.05.25	B
5	IITM-IWAI-VCT-DWG-003-03	OVERALL LAYOUT OF CRUISE TERMINAL FACILITY LOCATION-3 (SHEET 3 OF 6)	13.05.25	B
6	IITM-IWAI-VCT-DWG-003-04	OVERALL LAYOUT OF CRUISE TERMINAL FACILITY LOCATION-4 (SHEET 4 OF 6)	13.05.25	B
7	IITM-IWAI-VCT-DWG-003-05	OVERALL LAYOUT OF CRUISE TERMINAL FACILITY LOCATION-5 (SHEET 5 OF 6)	13.05.25	B
8	IITM-IWAI-VCT-DWG-003-06	OVERALL LAYOUT OF CRUISE TERMINAL FACILITY LOCATION-6 (SHEET 6 OF 6)	13.05.25	A
9	IITM-IWAI-VCT-DWG-004-01	LAYOUT AND SECTIONS OF CRUISE TERMINAL AT ASSI GHAT (SHEET 1 OF 4)	13.05.25	B
10	IITM-IWAI-VCT-DWG-004-02	LAYOUT AND SECTIONS OF CRUISE TERMINAL AT ASSI GHAT (SHEET 2 OF 4)	13.05.25	B
11	IITM-IWAI-VCT-DWG-004-03	LAYOUT AND SECTIONS OF CRUISE TERMINAL AT ASSI GHAT (SHEET 3 OF 4)	13.05.25	B
12	IITM-IWAI-VCT-DWG-004-04	LAYOUT AND SECTIONS OF CRUISE TERMINAL AT ASSI GHAT (SHEET 4 OF 4)	13.05.25	B
13	IITM-IWAI-VCT-DWG-005-01	GENERAL ARRANGEMENT OF RC PLATFORM AT ASSI GHAT (SHEET 1 OF 3)	13.05.25	B
14	IITM-IWAI-VCT-DWG-005-02	GENERAL ARRANGEMENT OF RC PLATFORM AT ASSI GHAT (SHEET 2 OF 3)	13.05.25	B
15	IITM-IWAI-VCT-DWG-005-03	GENERAL ARRANGEMENT OF RC PLATFORM AT ASSI GHAT (SHEET 3 OF 3)	13.05.25	B
16	IITM-IWAI-VCT-DWG-006-01	GENERAL ARRANGEMENT OF RAMP AT ASSI GHAT (SHEET 1 OF 2)	13.05.25	B
17	IITM-IWAI-VCT-DWG-006-02	GENERAL ARRANGEMENT OF RAMP AT ASSI GHAT (SHEET 2 OF 2)	13.05.25	B
18	IITM-IWAI-VCT-DWG-007-01	LAYOUT AND SECTIONS OF CRUISE TERMINAL ADJACENT TO MMT TERMINAL (SHEET 1 OF 4)	13.05.25	A
19	IITM-IWAI-VCT-DWG-007-02	LAYOUT AND SECTIONS OF CRUISE TERMINAL ADJACENT TO MMT TERMINAL (SHEET 2 OF 4)	13.05.25	A
20	IITM-IWAI-VCT-DWG-007-03	LAYOUT AND SECTIONS OF CRUISE TERMINAL ADJACENT TO MMT TERMINAL (SHEET 3 OF 4)	13.05.25	A
21	IITM-IWAI-VCT-DWG-007-04	LAYOUT AND SECTIONS OF CRUISE TERMINAL ADJACENT TO MMT TERMINAL (SHEET 4 OF 4)	13.05.25	A
22	IITM-IWAI-VCT-DWG-008-01	GENERAL ARRANGEMENT OF RC PLATFORM ADJACENT TO MMT TERMINAL (SHEET 1 OF 3)	13.05.25	A
23	IITM-IWAI-VCT-DWG-008-02	GENERAL ARRANGEMENT OF RC PLATFORM ADJACENT TO MMT TERMINAL (SHEET 2 OF 3)	13.05.25	A
24	IITM-IWAI-VCT-DWG-008-03	GENERAL ARRANGEMENT OF RC PLATFORM ADJACENT TO MMT TERMINAL (SHEET 3 OF 3)	13.05.25	A
25	IITM-IWAI-VCT-DWG-009-01	GENERAL ARRANGEMENT OF CRUISE TERMINAL BUILDING (SHEET 1 OF 5)	13.05.25	B
26	IITM-IWAI-VCT-DWG-009-02	GENERAL ARRANGEMENT OF CRUISE TERMINAL BUILDING (SHEET 2 OF 5)	13.05.25	B
27	IITM-IWAI-VCT-DWG-009-03	GENERAL ARRANGEMENT OF CRUISE TERMINAL BUILDING (SHEET 3 OF 5)	13.05.25	B
28	IITM-IWAI-VCT-DWG-009-04	GENERAL ARRANGEMENT OF CRUISE TERMINAL BUILDING (SHEET 4 OF 5)	13.05.25	B
29	IITM-IWAI-VCT-DWG-009-05	GENERAL ARRANGEMENT OF CRUISE TERMINAL BUILDING (SHEET 5 OF 5)	13.05.25	B

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	SM	SR
A	31.01.25	ISSUED FOR REVIEW	AS	SR

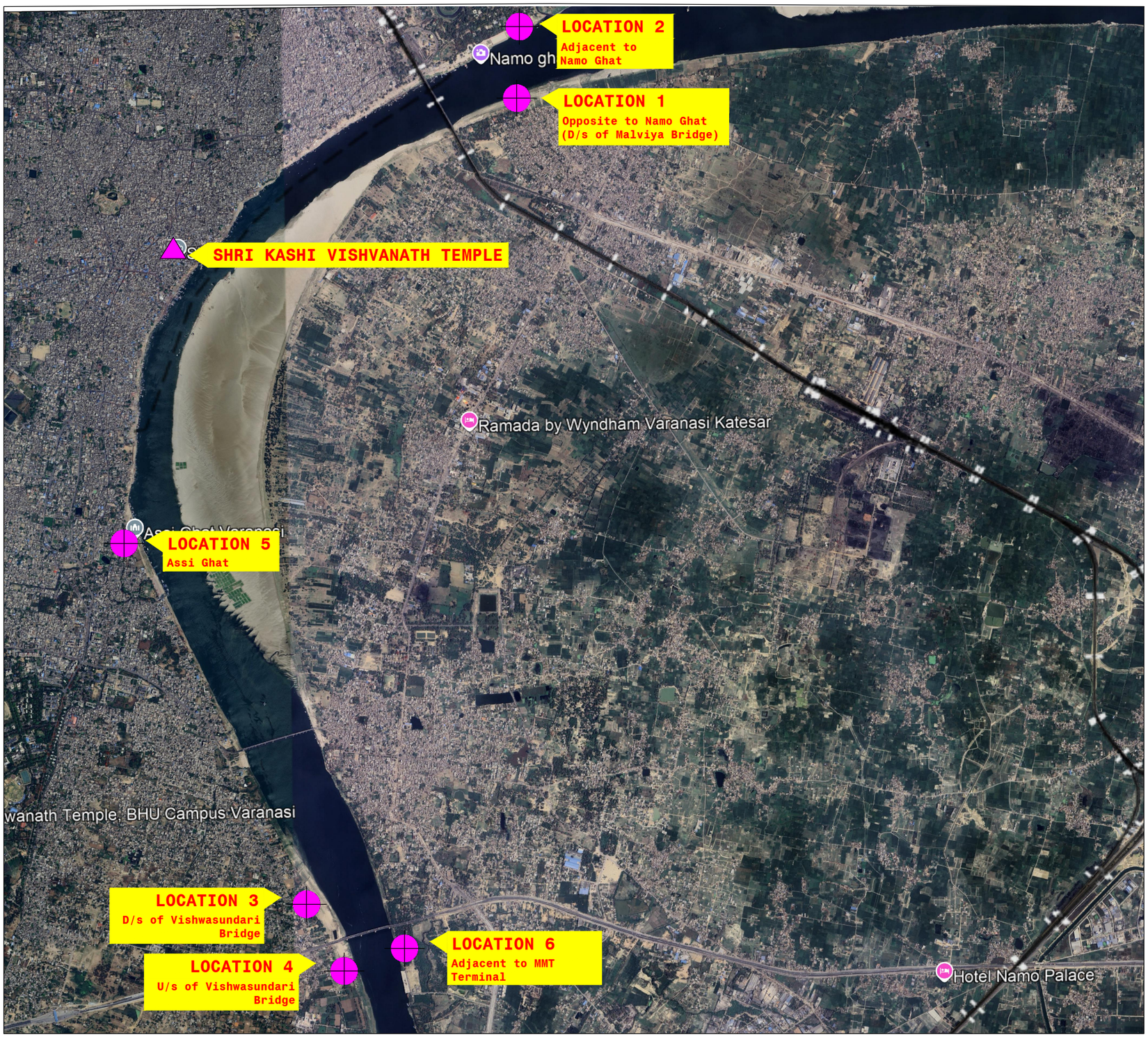
CONSULTANT:
PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

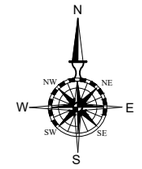
TITLE:
DRAWING LIST

DRAWING NO. IITM-IWAI-VCT-DWG-001	DATE: 13.05.25	REV: C



IDENTIFICATION OF LOCATIONS FOR CRUISE TERMINAL

SCALE 1:35



DETAILS OF LOCATIONS

LOCATION 1	Opposite to Namo Ghat (D/s of Malviya Bridge)
LOCATION 2	Adjacent to Namo Ghat
LOCATION 3	D/s of Vishwasundari Bridge
LOCATION 4	U/s of Vishwasundari Bridge
LOCATION 5	Assi Ghat
LOCATION 6	Adjacent to MMT Terminal

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	AS	SR
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CONSULTANT:
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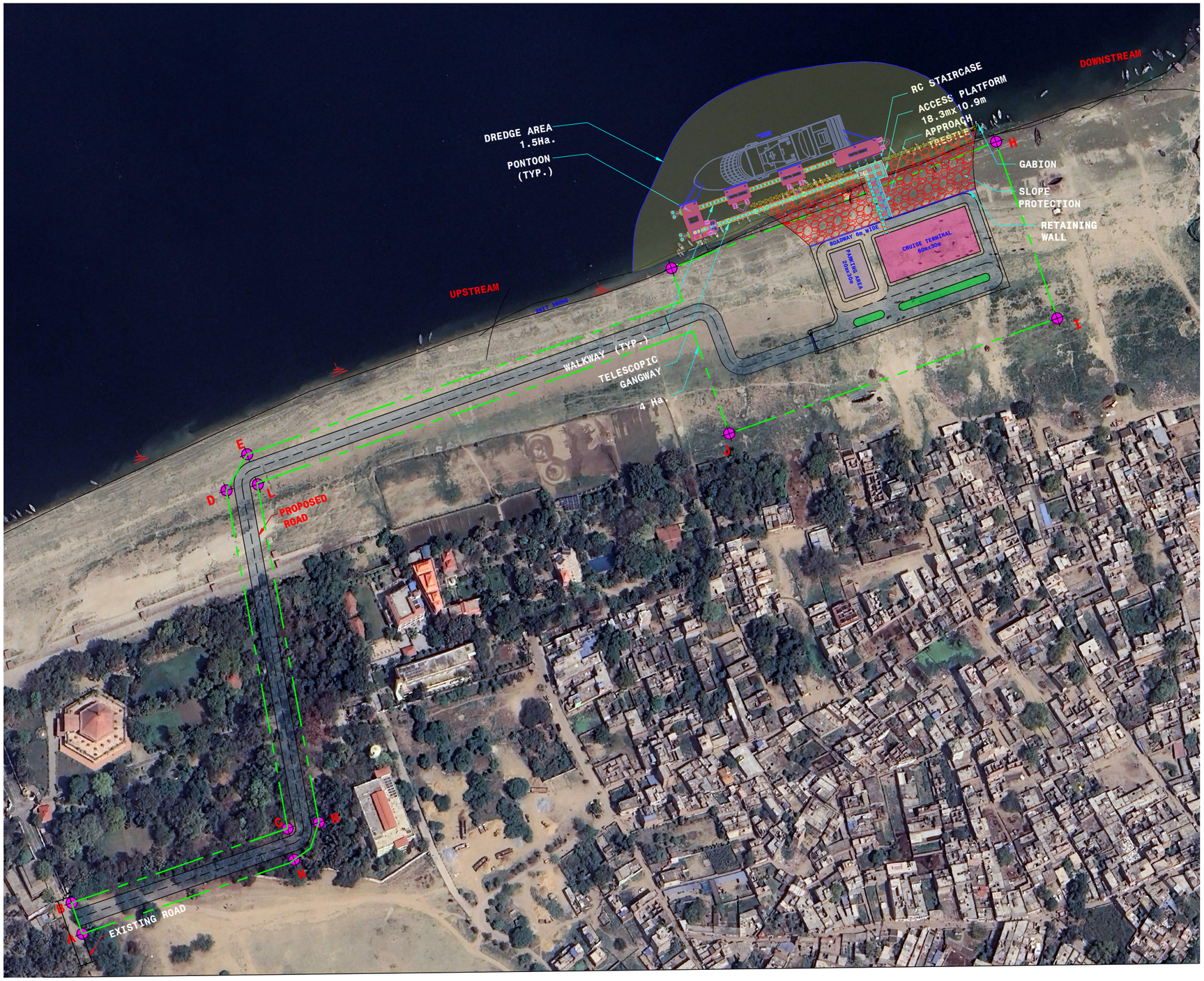
PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
IDENTIFICATION OF LOCATIONS FOR CRUISE TERMINAL, VARANASI

DRAWING NO.	DATE	REV.
IITM-IWAI-VCT-DWG-002	DATE: 13.05.25	REV: B



LOCATION–1 OPPOSITE TO NAMO GHAT (D/S OF MALVIYA BRIDGE)

(SCALE 1:2.25)

N

NW NE W E SW SE S

POINT CO–ORDINATE:

LOCATION	EASTING (m)	NORTHING (m)
A	705095.66 E	2801827.47 N
B	705088.99 E	2801846.84 N
C	705224.32 E	2801893.41 N
D	705186.00 E	2802105.25 N
E	705199.01 E	2802127.91 N
F	705472.10 E	2802223.91 N
G	705465.01 E	2802244.51 N
H	705668.51 E	2802323.77 N
I	705706.94 E	2802213.10 N
J	705501.25 E	2802140.88 N
K	705478.69 E	2802205.03 N
L	705205.65 E	2802109.04 N
M	705243.96 E	2801897.20 N
N	705228.52 E	2801873.86 N

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	SM	SR
A	31.01.25	ISSUED FOR REVIEW	SM	SR

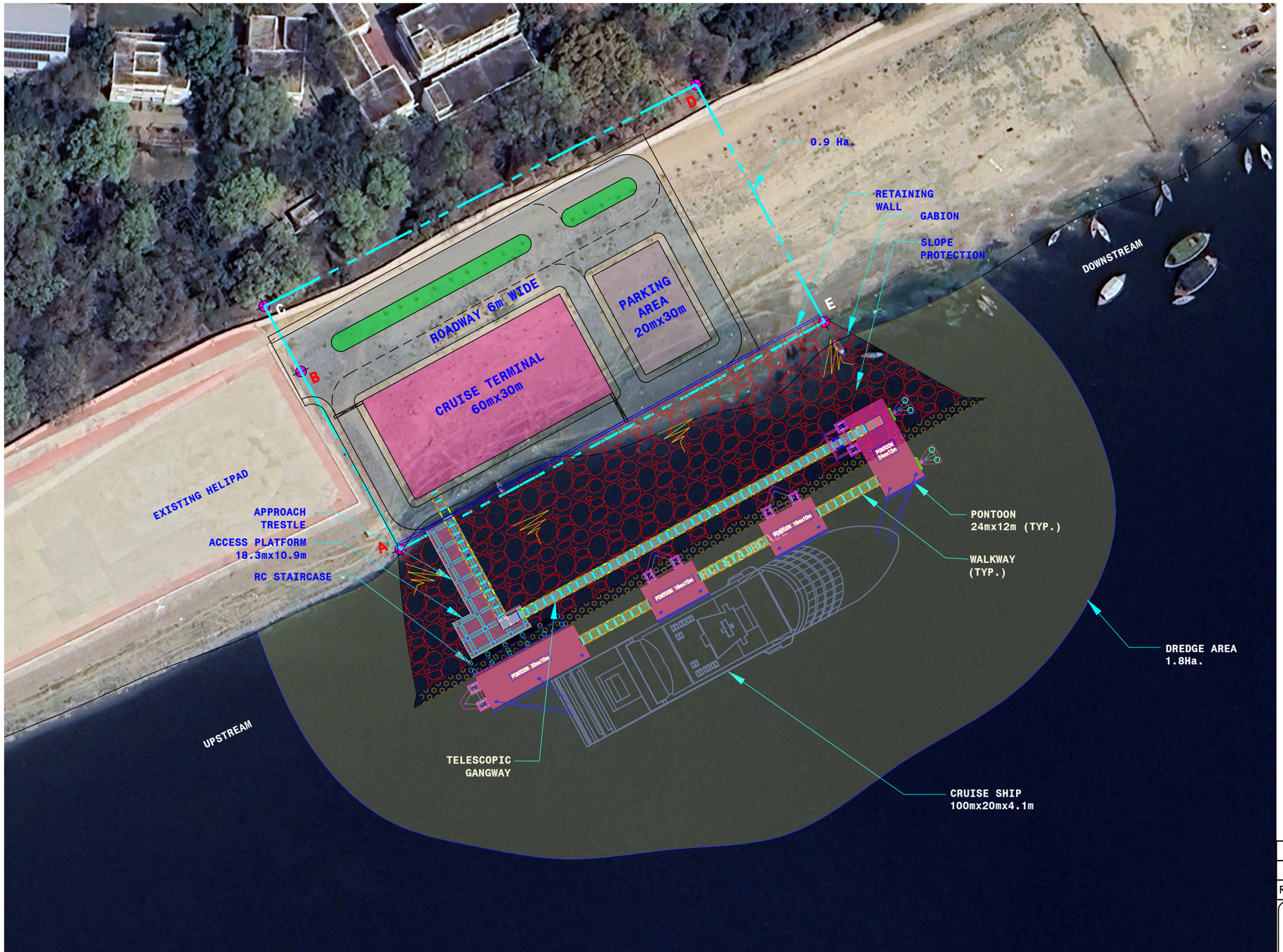
CONSULTANT:
PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD–CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
OVERALL LAYOUT OF CRUISE TERMINAL FACILITY LOCATION–1 (SHEET 1 OF 6)

DRAWING NO. IITM–IWAI–VCT–DWG–003–01 | DATE: 13.05.25 | REV: B



LOCATION–2 ADJACENT TO NAMO GHAT

(SCALE 1:1)

N

NW NE W E SW SE S

POINT CO–ORDINATE:

LOCATION	EASTING (m)	NORTHING (m)
A	705434.06 E	2802768.36 N
B	705407.50 E	2802815.85 N
C	705397.72 E	2802833.34 N
D	705513.13 E	2802892.54 N
E	705547.43 E	2802829.15 N

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	RN	SR
A	31.01.25	ISSUED FOR REVIEW	RN	SR

CONSULTANT:
PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD–CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
OVERALL LAYOUT OF CRUISE TERMINAL FACILITY LOCATION–2 (SHEET 2 OF 6)

DRAWING NO. IITM–IWAI–VCT–DWG–003–02	DATE: 13.05.25	REV: B

N

NW NE W E SW SE S

POINT CO-ORDINATE:

LOCATION	EASTING (m)	NORTHING (m)
A	703695.43 E	2794661.00 N
B	703688.02 E	2794679.31 N
C	703834.54 E	2794736.37 N
D	703847.62 E	2794759.93 N
E	703718.67 E	2794960.79 N
F	703840.00 E	2795038.72 N
G	703933.67 E	2794890.96 N
H	703836.10 E	2794826.33 N
I	703873.82 E	2794768.37 N
J	703878.824 E	2794731.76 N

LOCATION-3 DOWNSTREAM OF VISHWASUNDARI BRIDGE

(SCALE 1:1.5)

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	SM	SR
A	31.01.25	ISSUED FOR REVIEW	SM	SR

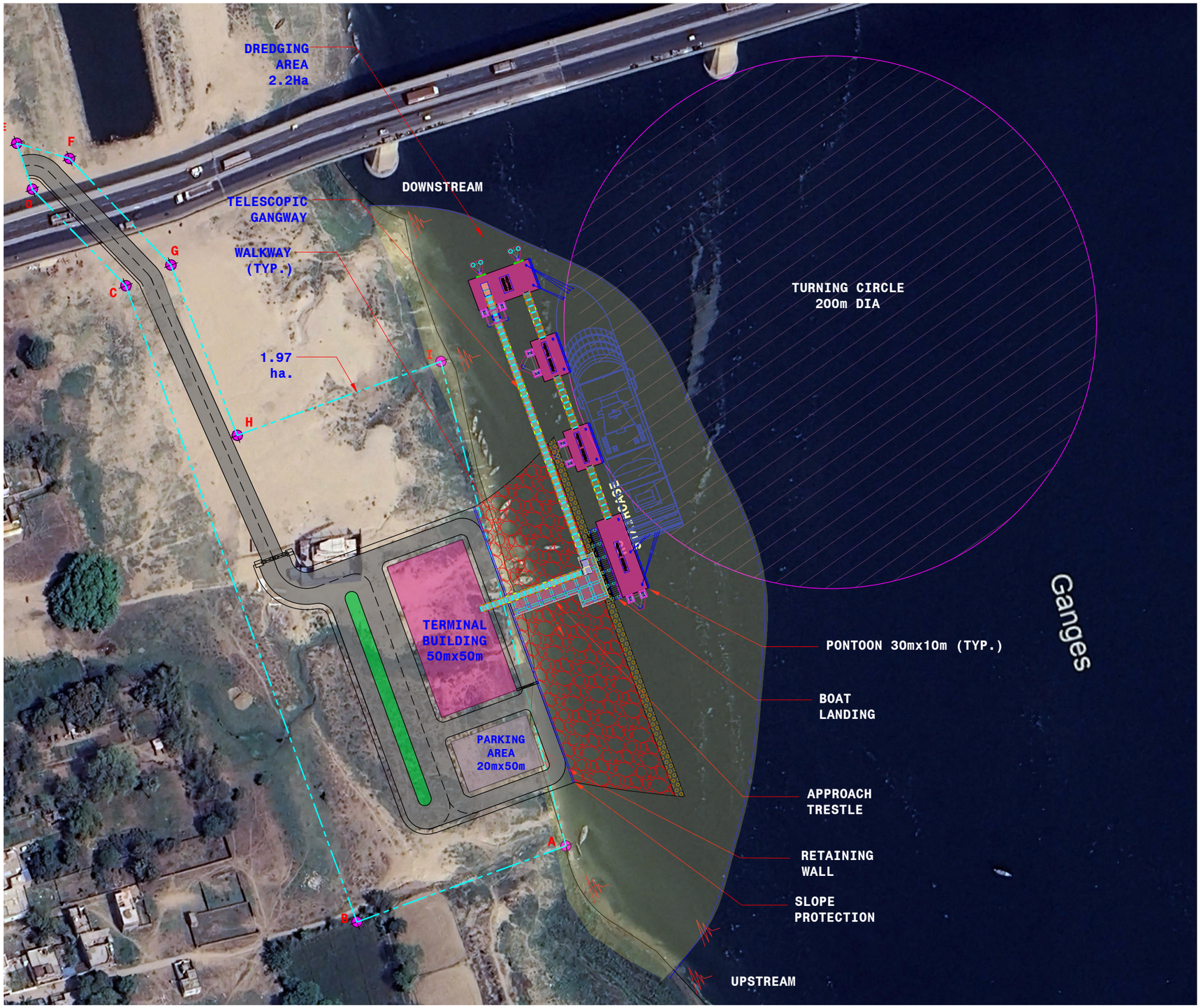
CONSULTANT:
PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

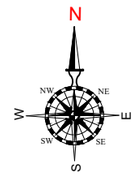
TITLE:
OVERALL LAYOUT OF CRUISE TERMINAL FACILITY
LOCATION-3 (SHEET 3 OF 6)

DRAWING NO. IITM-IWAI-VCT-DWG-003-03 | DATE: 13.05.25 | REV: B



LOCATION–4 UPSTREAM OF VISHWASUNDARI BRIDGE

(SCALE 1:1)



POINT CO–ORDINATE:

LOCATION	EASTING (m)	NORTHING (m)
A	704061.66 E	2794485.82 N
B	703983.24 E	2794457.32 N
C	703896.47 E	2794696.09 N
D	703861.36 E	2794732.30 N
E	703855.53 E	2794749.57 N
F	703875.32 E	2794743.85 N
G	703913.42 E	2794703.85 N
H	703938.30 E	2794639.94 N
I	704014.73 E	2794667.65 N

NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	RN	SR
A	31.01.25	ISSUED FOR REVIEW	RN	SR

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PROJECT:
DEVELOPMENT OF WORLD–CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
OVERALL LAYOUT OF CRUISE TERMINAL FACILITY LOCATION–4 (SHEET 4 OF 6)

DRAWING NO. IITM–IWAI–VCT–DWG–003–04 | DATE: 13.05.25 | REV: B

LOCATION–5 ASSI GHAT
(SCALE 1:1)

N
NW NE
W E
SW SE
S

POINT CO–ORDINATE:

LOCATION	EASTING (m)	NORTHING (m)
A	702208.56 E	2797952.60 N
B	702224.86 E	2797983.94 N
C	702153.60 E	2798130.67 N
D	702157.79 E	2798132.79 N
E	702143.38 E	2798162.95 N
F	702194.12 E	2798187.54 N
G	702284.92 E	2798000.57 N
H	702242.65 E	2797980.06 N
J	702231.92 E	2797959.30 N

NOTES:
1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	RN	SR
A	31.01.25	ISSUED FOR REVIEW	RN	SR

CONSULTANT:
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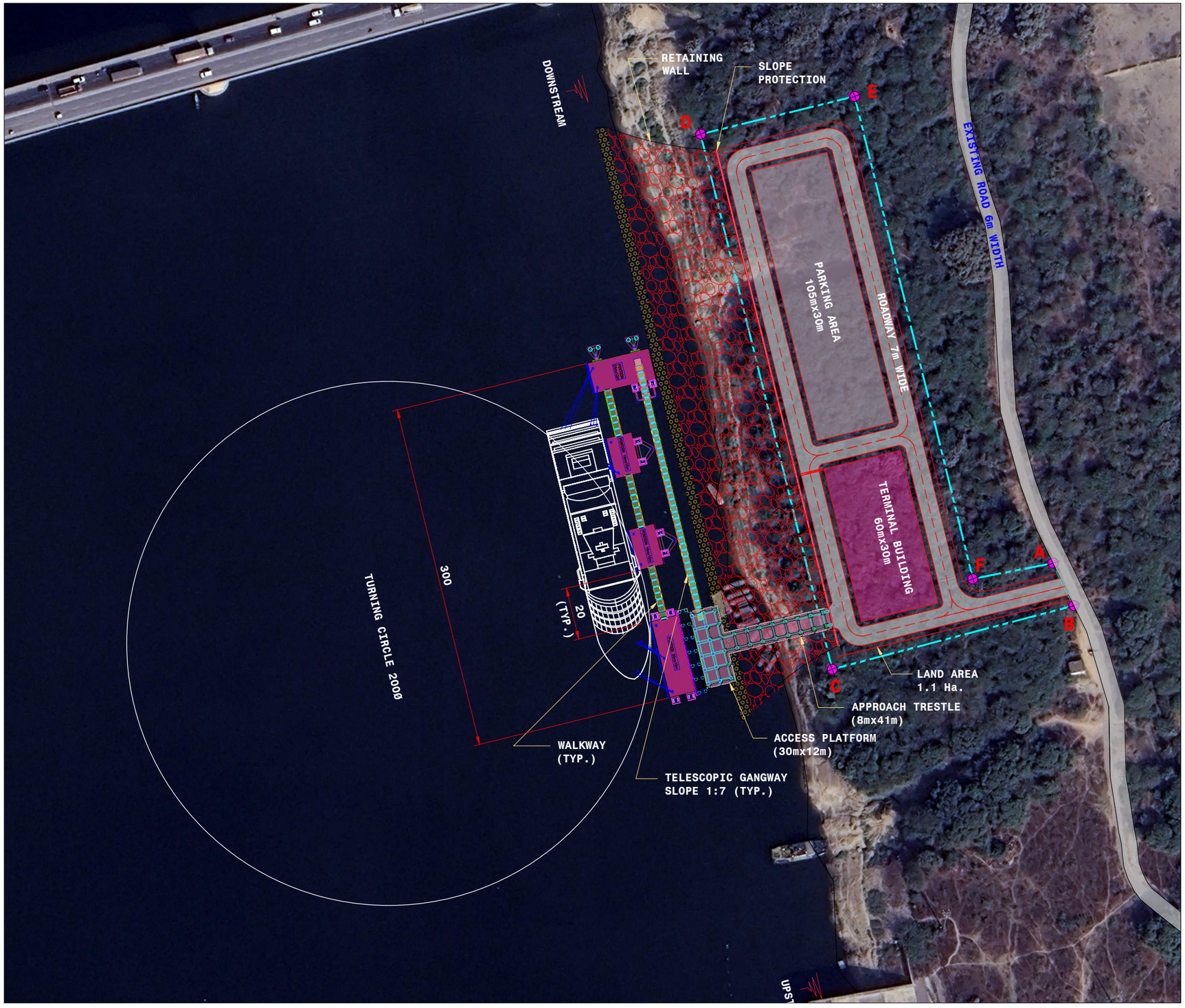
IIT MADRAS, CHENNAI

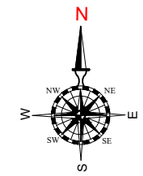
OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD–CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
OVERALL LAYOUT OF CRUISE TERMINAL FACILITY
LOCATION–5 (SHEET 5 OF 6)

DRAWING NO.	DATE	REV.
IITM–IWAI–VCT–DWG–003–05	DATE: 13.05.25	REV: B





POINT CO-ORDINATE:

LOCATION	EASTING (m)	NORTHING (m)
A	704564.23 E	2794625.18 N
B	704572.16 E	2794608.97 N
C	704479.94 E	2794584.67 N
D	704429.68 E	2794788.96 N
E	704488.49 E	2794803.36 N
F	704533.60 E	2794619.18 N

LOCATION-6 ADJACENT TO MMT TERMINAL (LONG JOURNEY CRUISES)
(SCALE 1:1.5)

NOTES:
1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
A	13.05.25	ISSUED FOR REVIEW	SM	SR

CONSULTANT:
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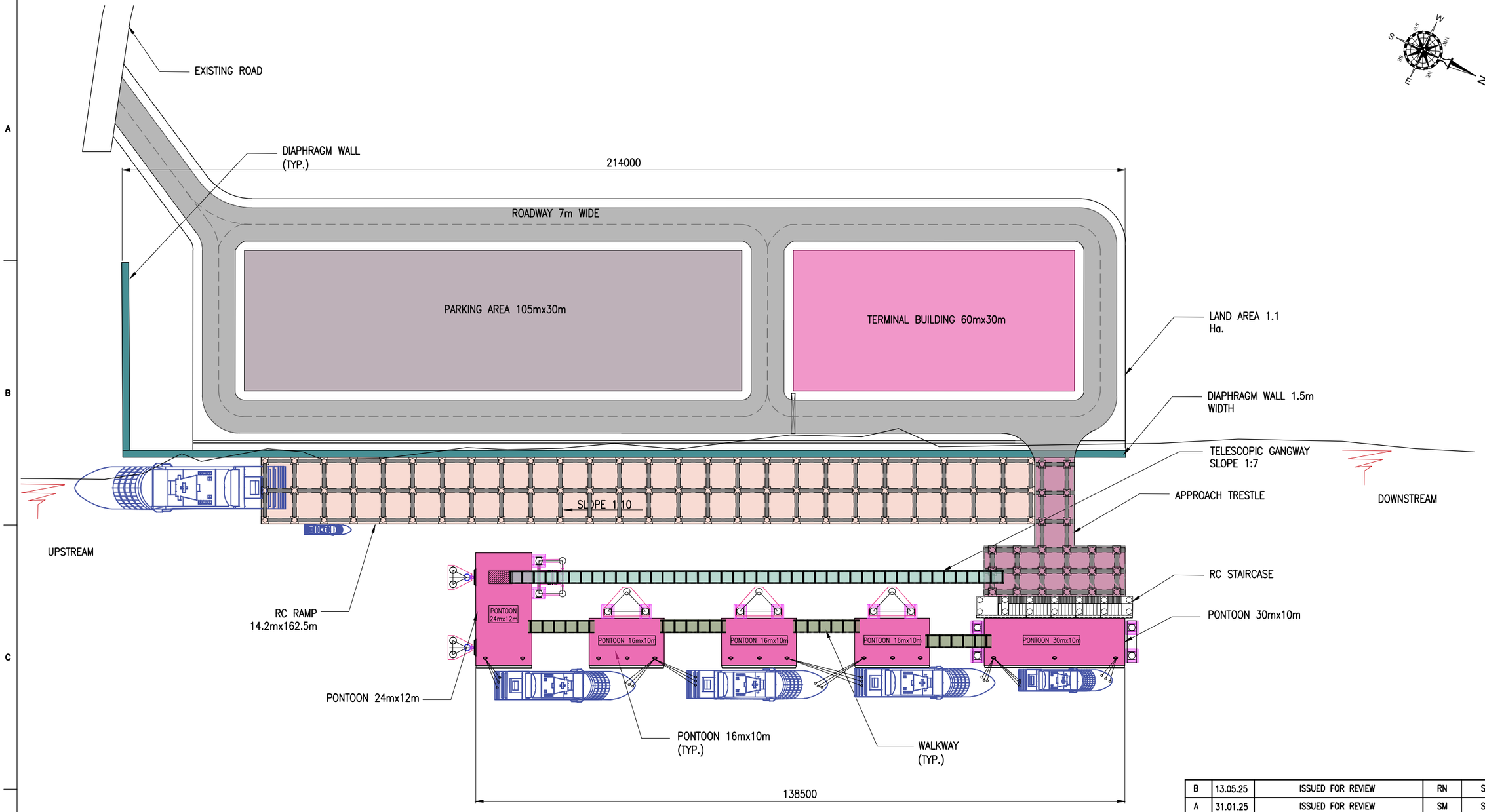
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
OVERALL LAYOUT OF CRUISE TERMINAL FACILITY LOCATION-6 (SHEET 6 OF 6)

DRAWING NO. IITM-IWAI-VCT-DWG-003-06	DATE: 13.05.25	REV: B



OVERALL LAYOUT

(SCALE 1:800)

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	RN	SR
A	31.01.25	ISSUED FOR REVIEW	SM	SR

CONSULTANT:
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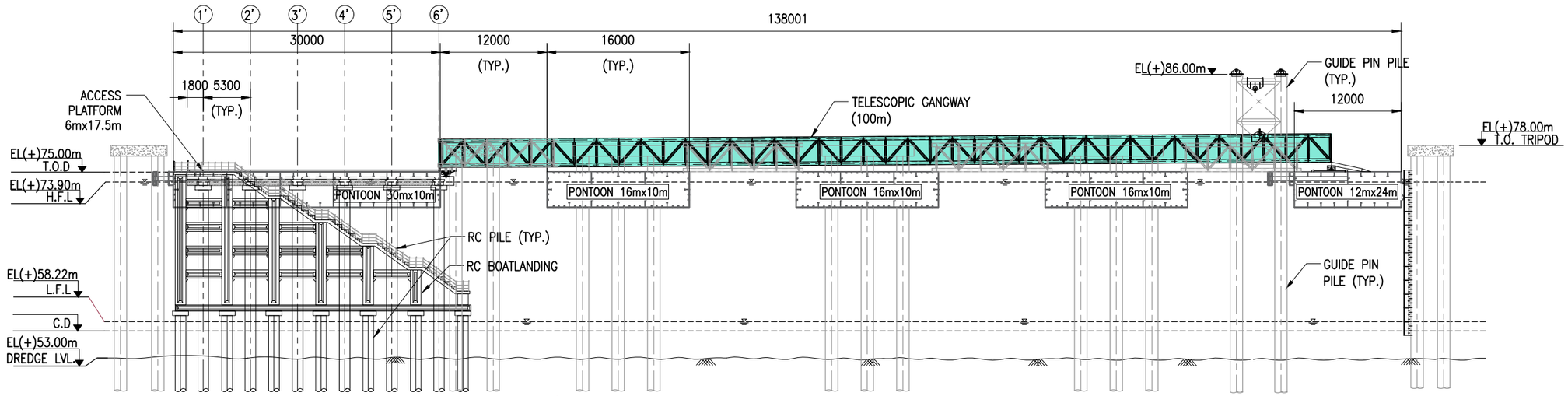
OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

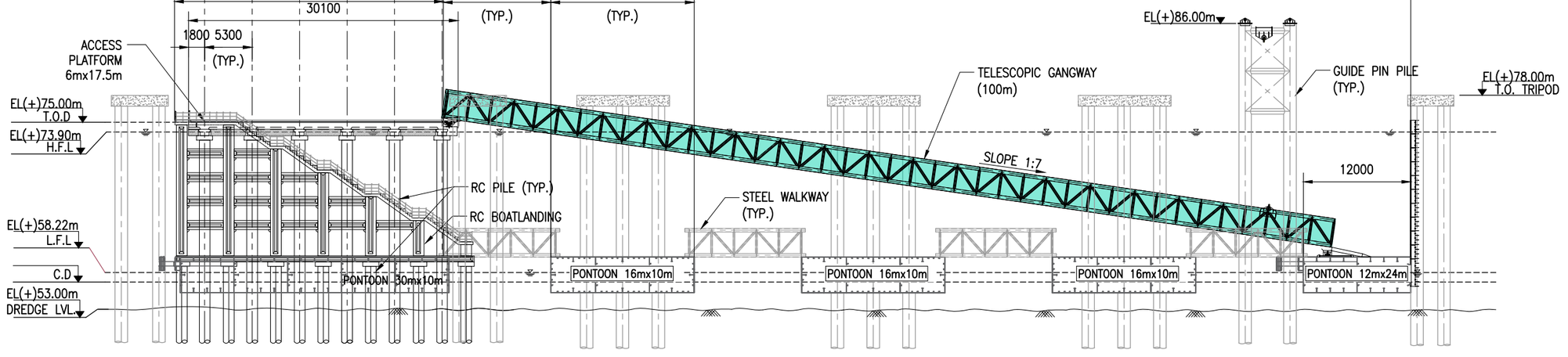
TITLE:
LAYOUT AND SECTIONS OF CRUISE TERMINAL AT ASSI GHAT (SHEET 1 OF 4)

DRAWING NO. IITM-IWAI-VCT-DWG-004-01	DATE: 13.05.25	REV: B



LONGITUDINAL SECTION AT HIGH FLOOD LEVEL (EL+73.90m)

SCALE 1:450



LONGITUDINAL SECTION AT LOW FLOOD LEVEL (EL+58.22m)

SCALE 1:500

NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	RN	SR
A	31.01.25	ISSUED FOR REVIEW	DKV	SR

CONSULTANT:
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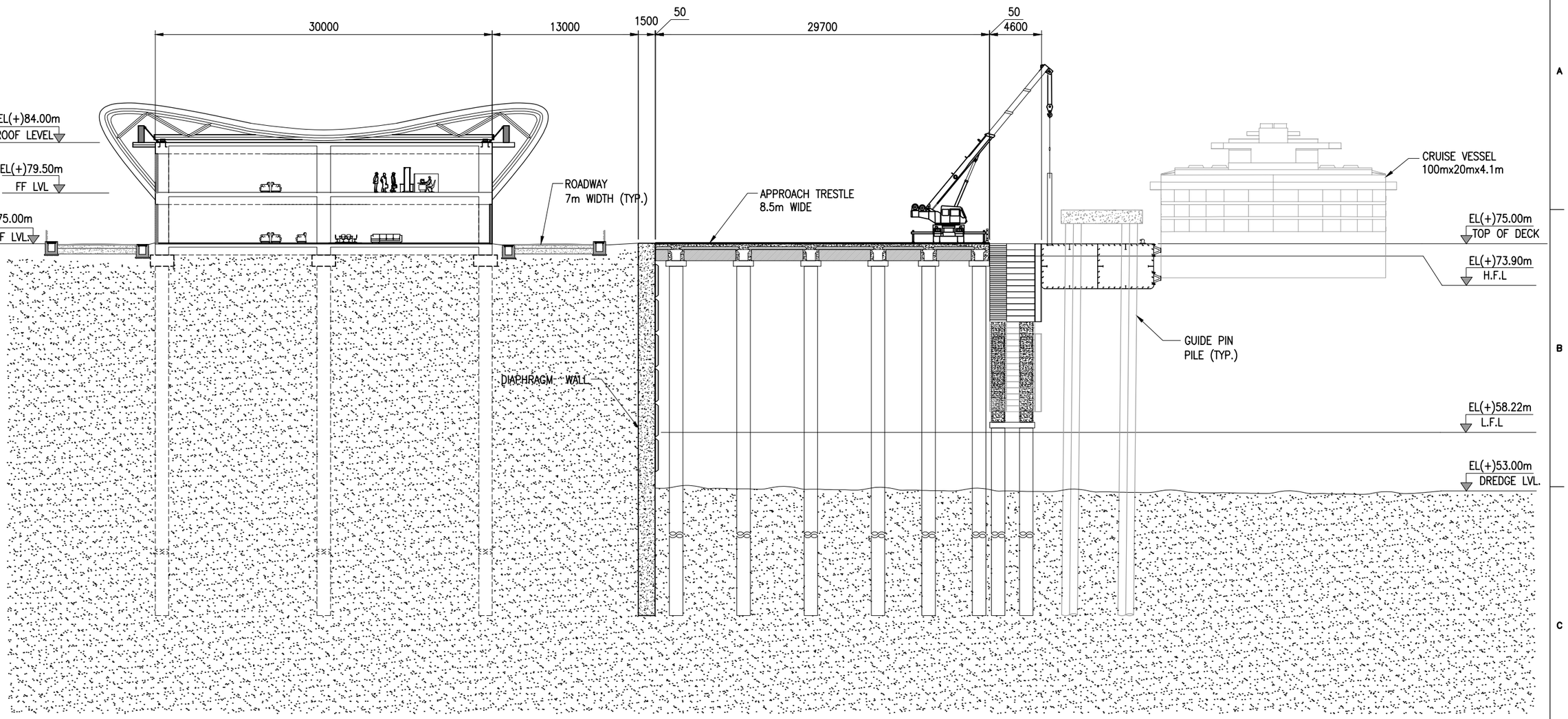
PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
LAYOUT AND SECTIONS OF CRUISE TERMINAL AT ASSI GHAT (SHEET 2 OF 4)

DRAWING NO. IITM-IWAI-VCT-DWG-004-02	DATE: 13.05.25	REV: B



TYPICAL CROSS SECTION AT HIGH FLOOD LEVEL EL(+)73.90M

SCALE 1:350

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	RN	SR
A	31.01.25	ISSUED FOR REVIEW	AS	SR

CONSULTANT:
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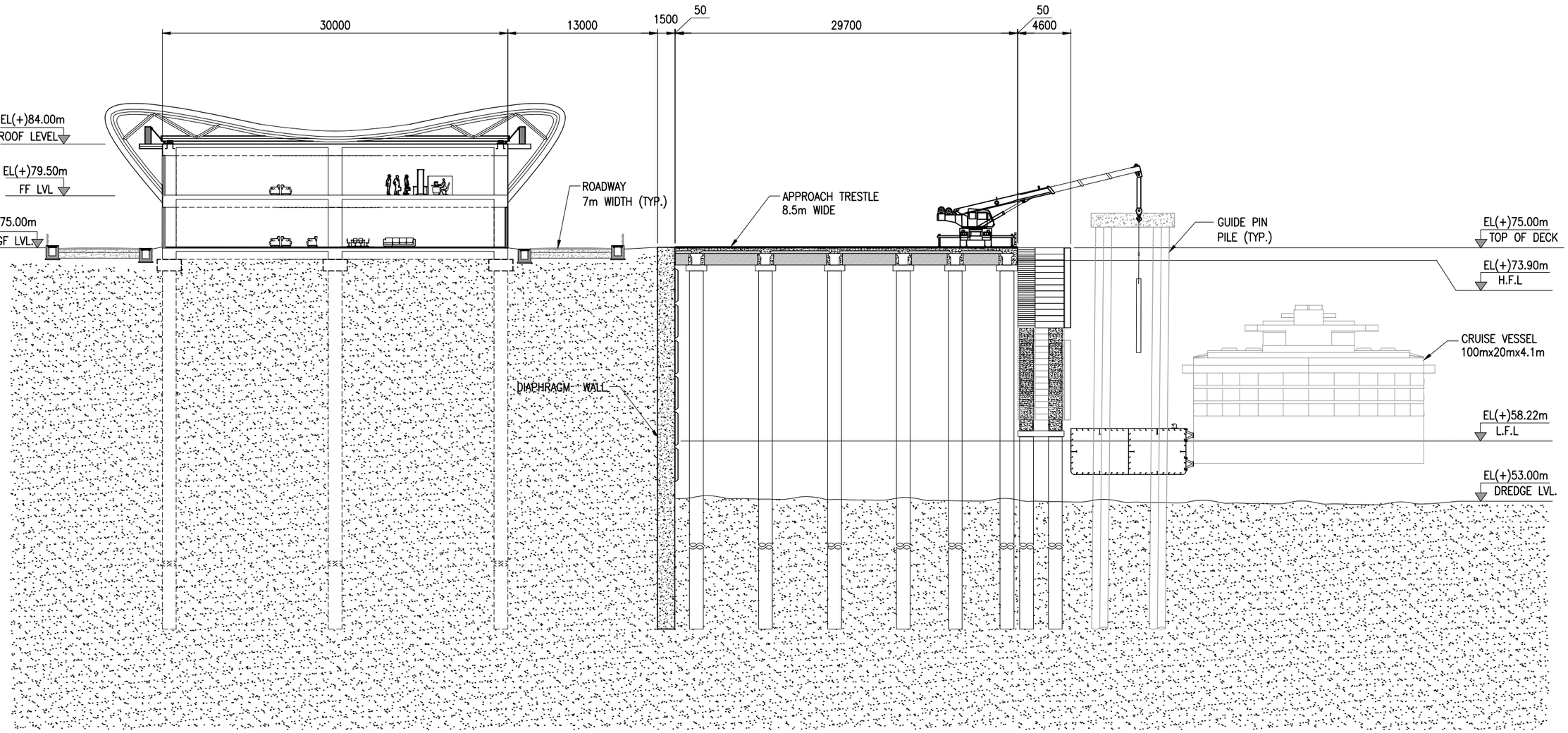
PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
LAYOUT AND SECTIONS OF CRUISE TERMINAL AT ASSI GHAT (SHEET 3 OF 4)

DRAWING NO.	DATE	REV.
IITM-IWAI-VCT-DWG-004-03	DATE: 13.05.25	REV: B



TYPICAL CROSS SECTION AT LOW FLOOD LEVEL EL(+)58.220M

SCALE 1:350

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	RN	SR
A	31.01.25	ISSUED FOR REVIEW	AS	SR

CONSULTANT:
PROF.S.NALLAYARASU
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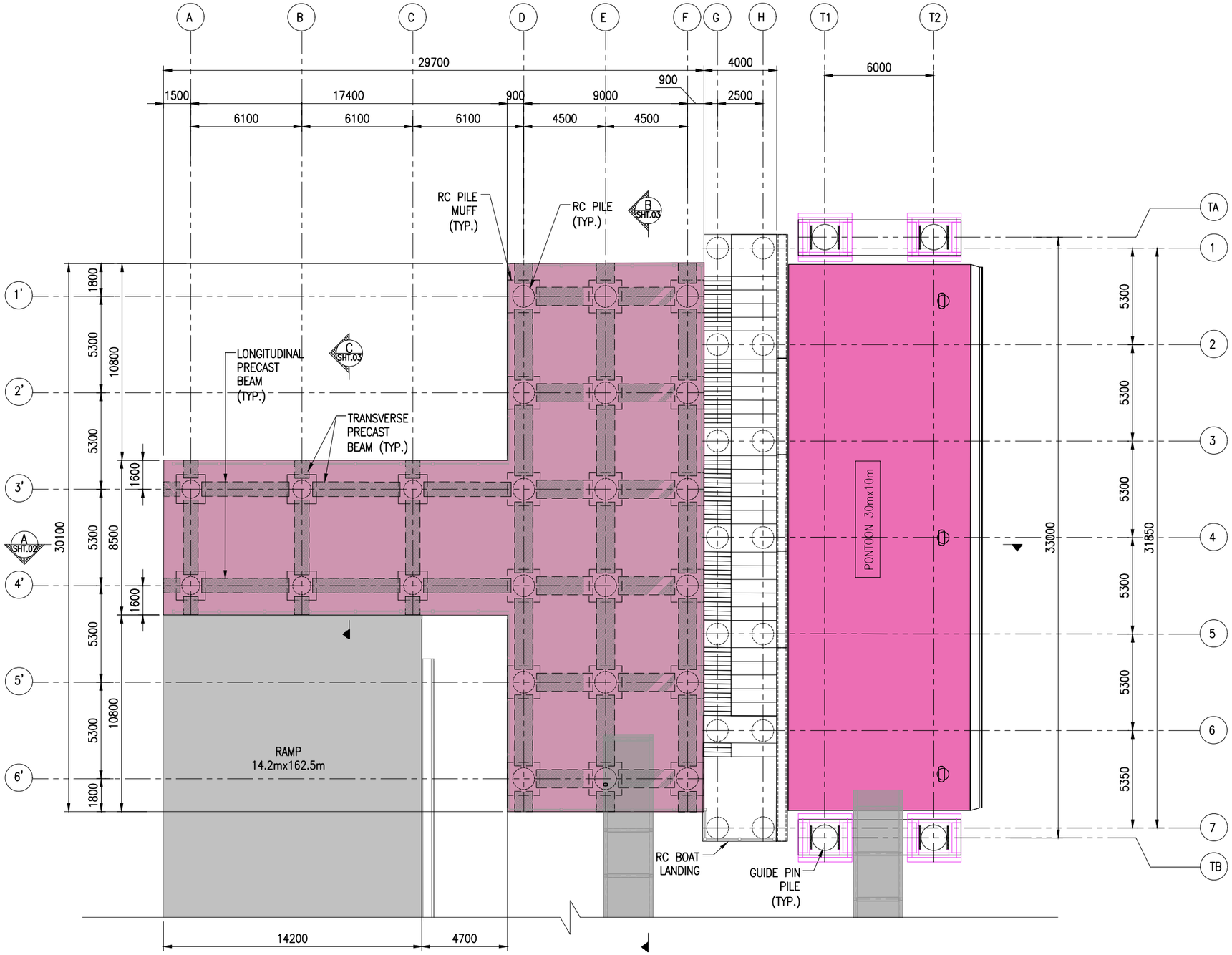
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
LAYOUT AND SECTIONS OF CRUISE TERMINAL AT ASSI GHAT (SHEET 4 OF 4)

DRAWING NO.	DATE	REV.
IITM-IWAI-VCT-DWG-004-04	DATE: 13.05.25	REV: B



PLAN VIEW OF APPROACH TRESTLE

(SCALE 1:225)

NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	SM	SR
A	31.01.25	ISSUED FOR REVIEW	AS	SR

CONSULTANT:
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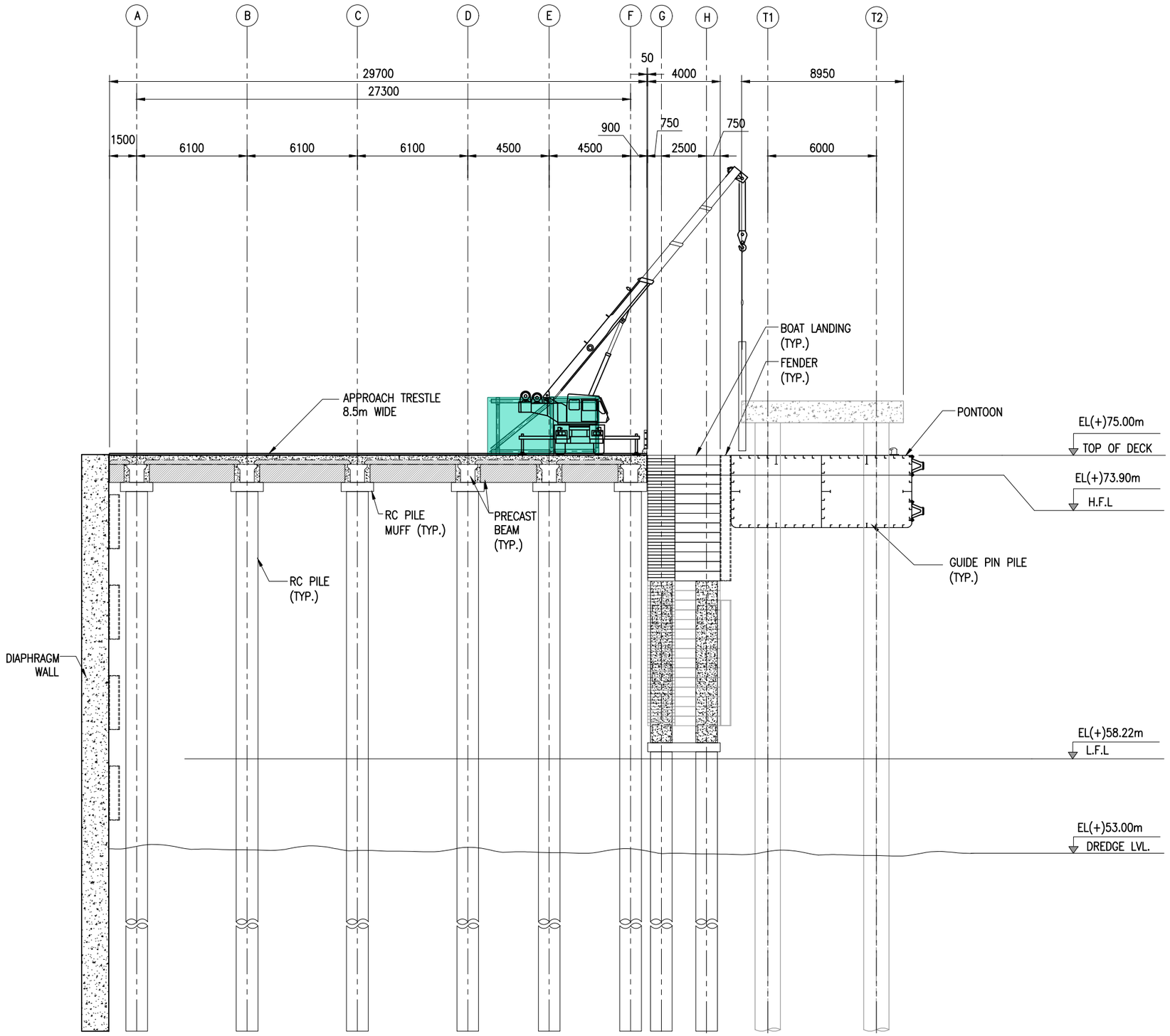
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
GENERAL ARRANGEMENT OF RC PLATFORM AT ASSI GHAT (SHEET 1 OF 3)

DRAWING NO.	DATE	REV.
IITM-IWAI-VCT-DWG-005-01	DATE: 13.05.25	REV: B



SECTION A
SCALE 1:225 SHT.01

NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	SM	SR
A	31.01.25	ISSUED FOR REVIEW	AS	SR

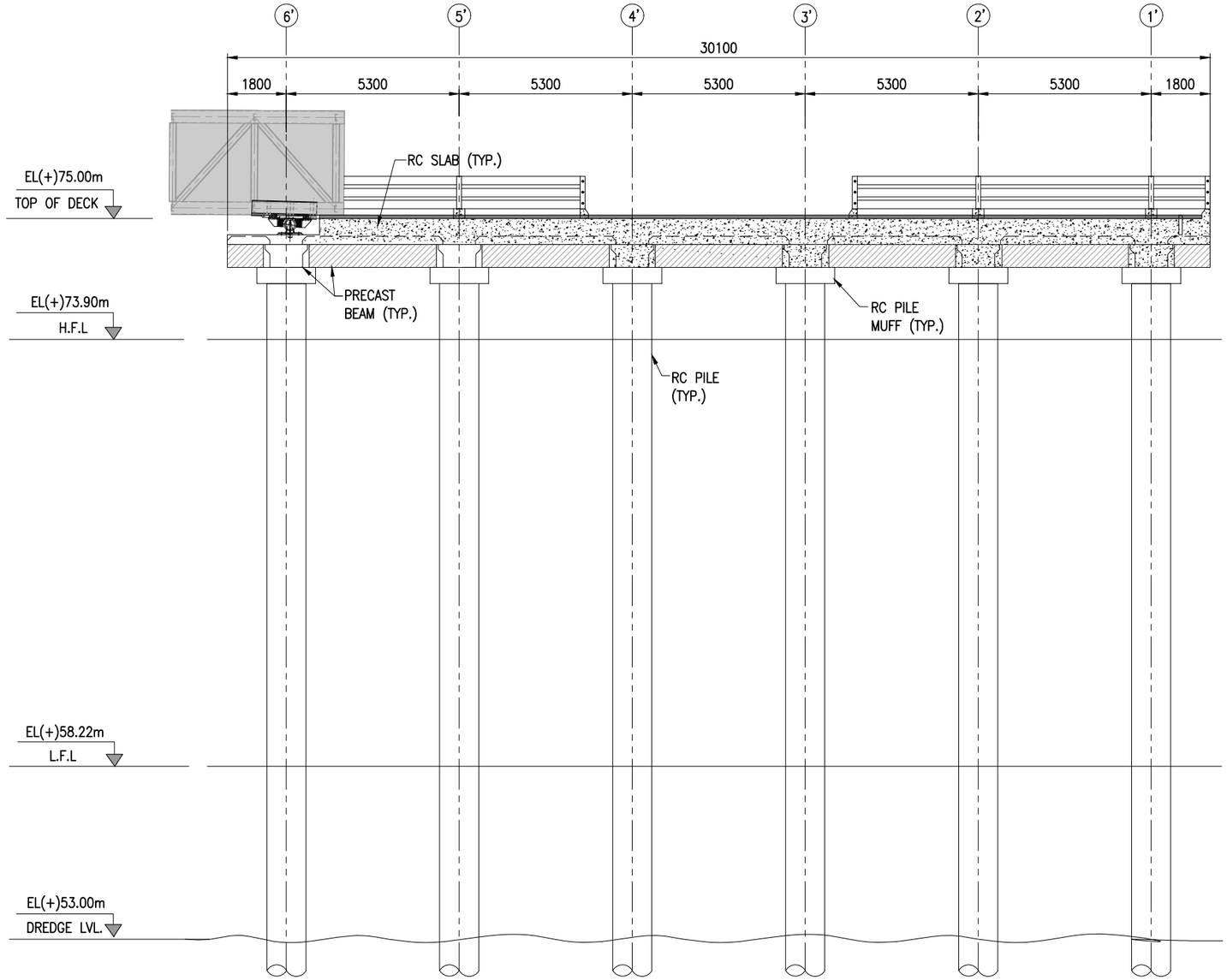
CONSULTANT:
PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

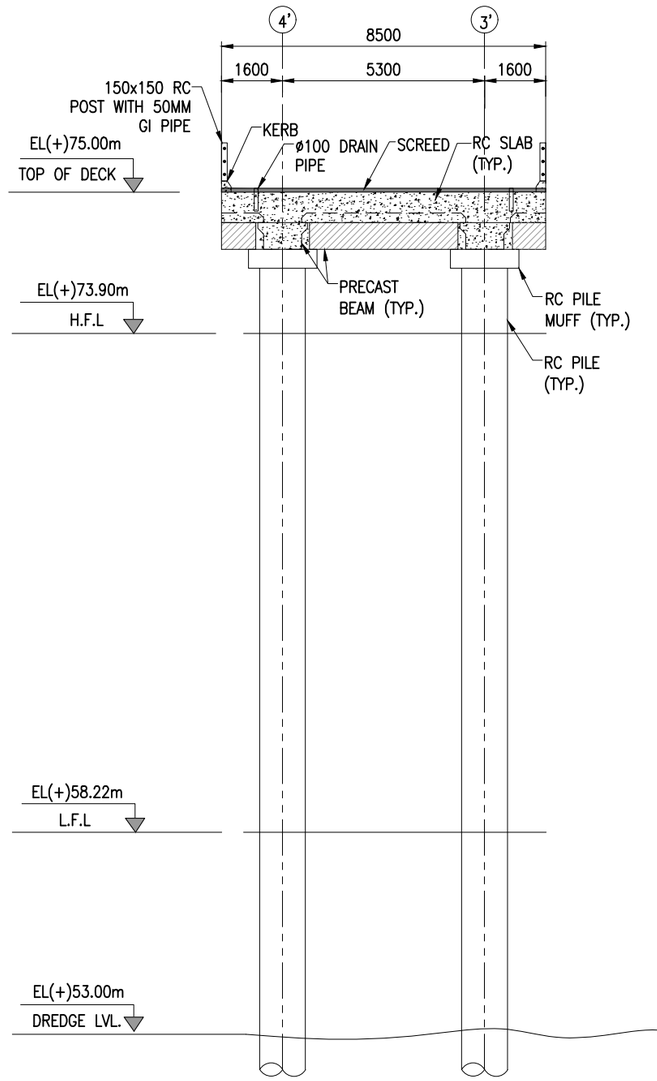
PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
GENERAL ARRANGEMENT OF RC PLATFORM AT ASSI GHAT (SHEET 2 OF 3)

DRAWING NO. IITM-IWAI-VCT-DWG-005-02	DATE: 13.05.25	REV: B



SECTION B
SCALE 1:125 SHT.01



SECTION C
SCALE 1:125 SHT.01

NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	SM	SR
A	31.01.25	ISSUED FOR REVIEW	AS	SR

CONSULTANT:
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OWNER:
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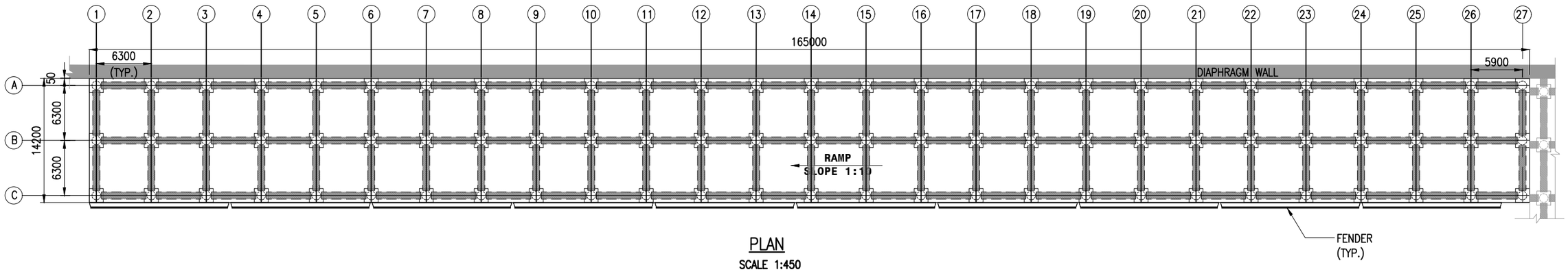
PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

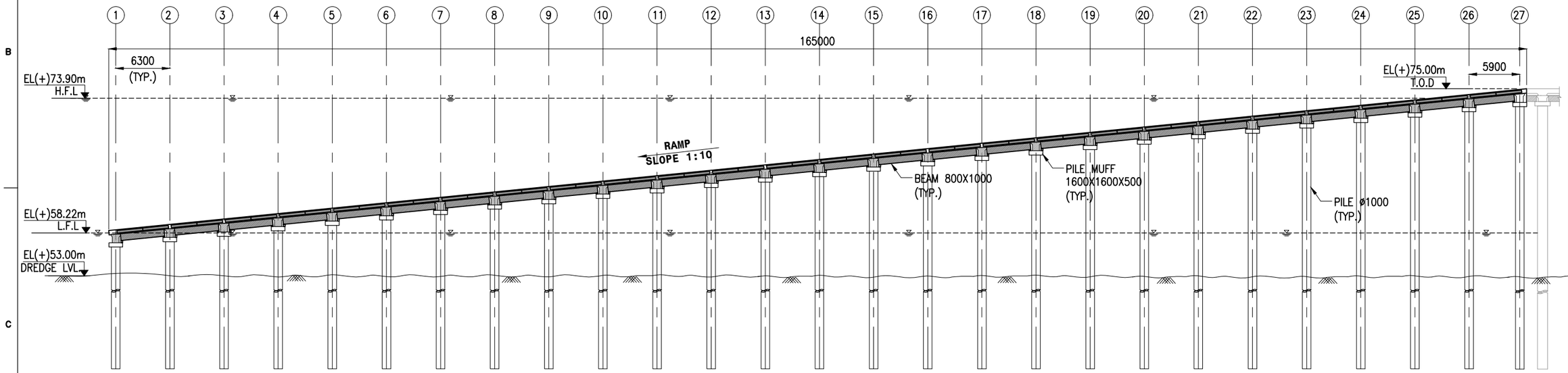
TITLE:
GENERAL ARRANGEMENT OF RC PLATFORM AT ASSI GHAT (SHEET 3 OF 3)

DRAWING NO. IITM-IWAI-VCT-DWG-005-03	DATE: 13.05.25	REV: B



PLAN

SCALE 1:450



ELEVATION

SCALE 1:450

NOTES:

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2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	RN	SR
A	31.01.25	ISSUED FOR REVIEW	RN	SR

CONSULTANT:

PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
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OWNER:

INLAND WATERWAY AUTHORITH OF INDIA

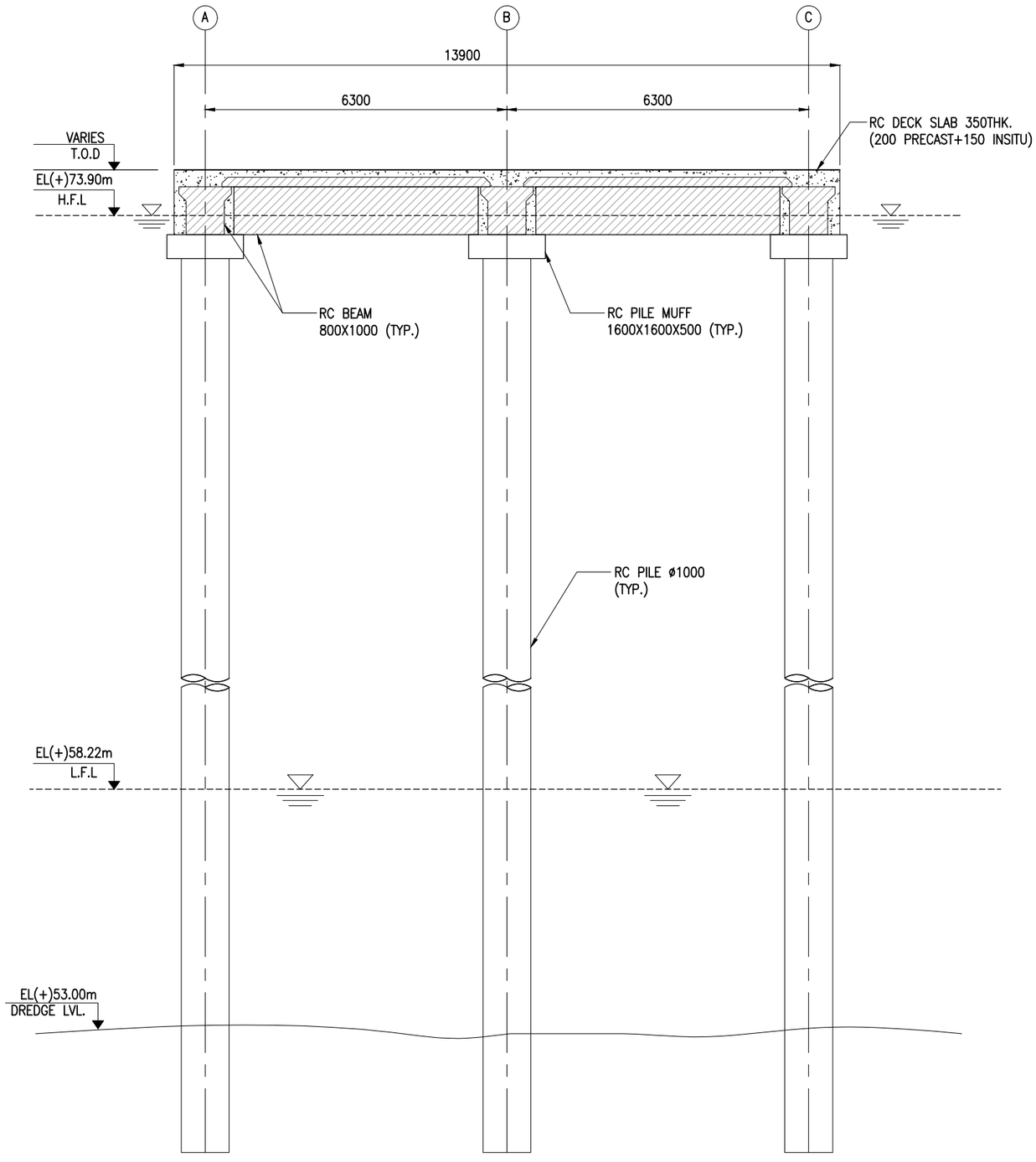
PROJECT:

DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:

GENERAL ARRANGEMENT OF RAMP AT ASSI GHAT (SHEET 1 OF 2)

DRAWING NO.	DATE	REV.
IITM-IWAI-VCT-DWG-006-01	DATE: 13.05.25	REV: B



TYPICAL CROSS SECTION

SCALE 1:100

NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	RN	SR
A	31.01.25	ISSUED FOR REVIEW	RN	SR

CONSULTANT:
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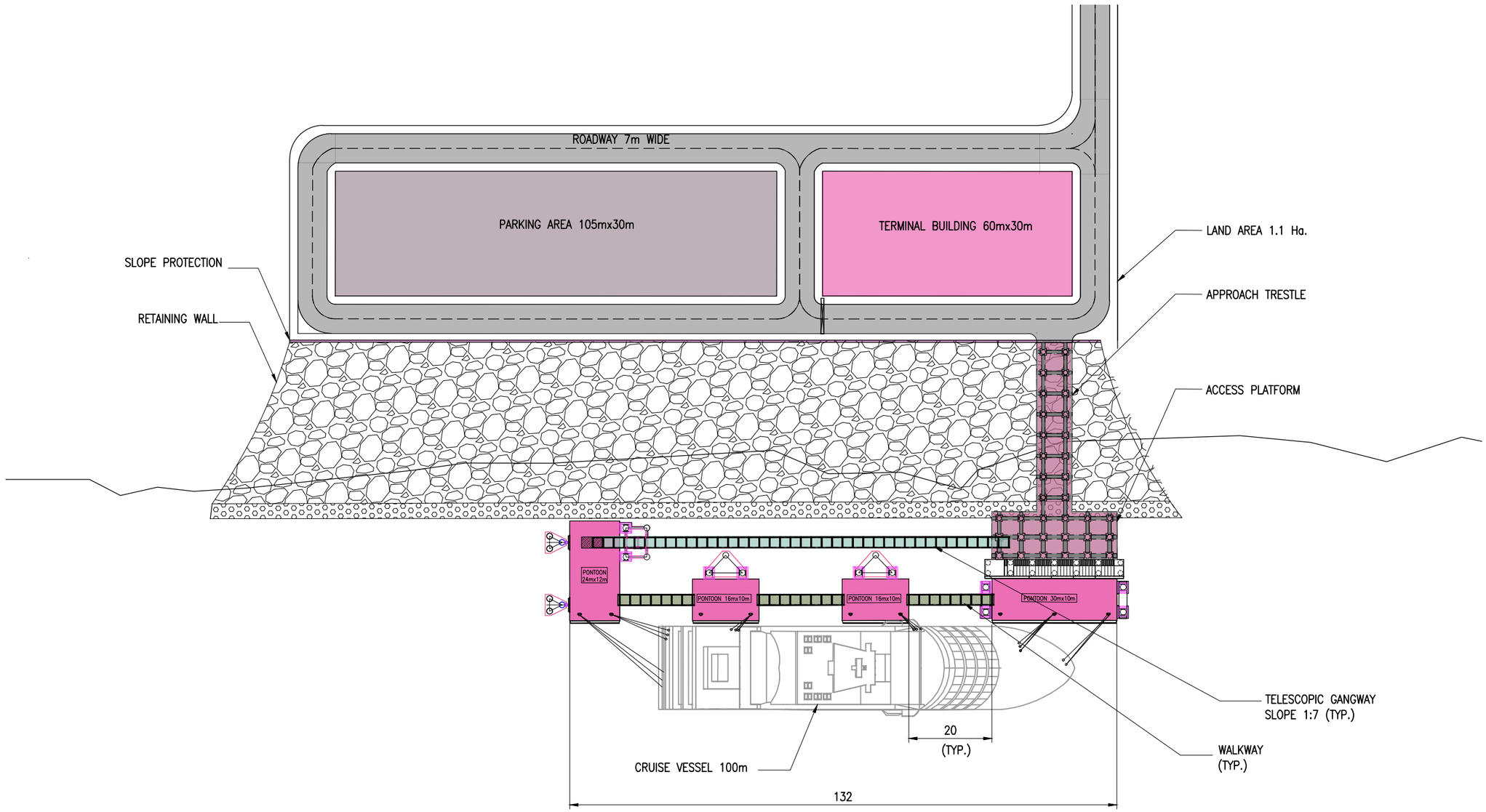
PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
GENERAL ARRANGEMENT OF RAMP AT ASSI GHAT (SHEET 2 OF 2)

DRAWING NO. IITM-IWAI-VCT-DWG-006-02	DATE: 13.05.25	REV: B



OVERALL LAYOUT
SCALE 1:1

NOTES:
1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
A	13.05.25	ISSUED FOR REVIEW	SM	SR

CONSULTANT:
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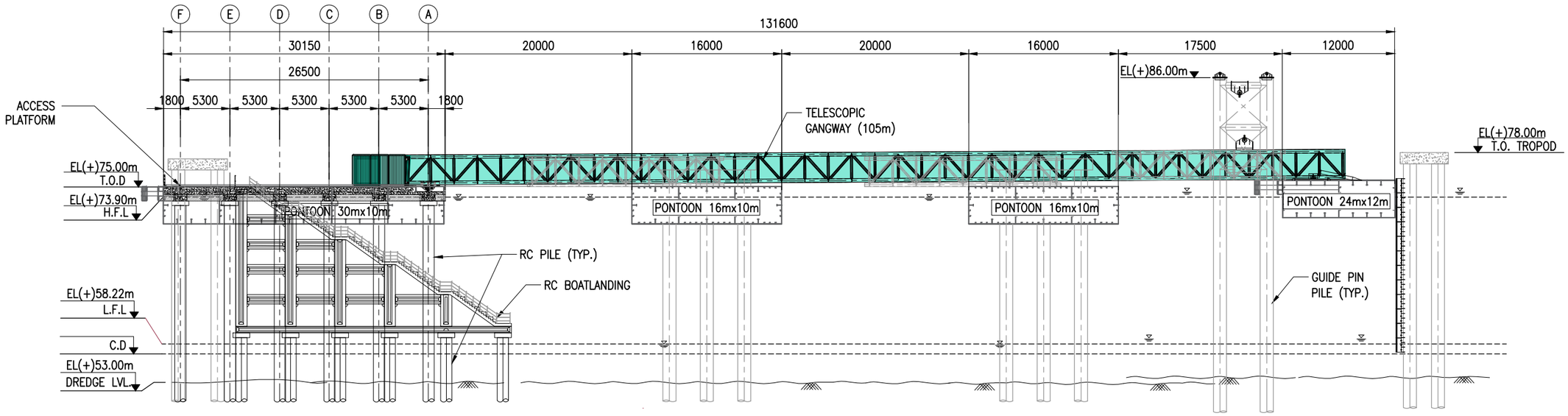
OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

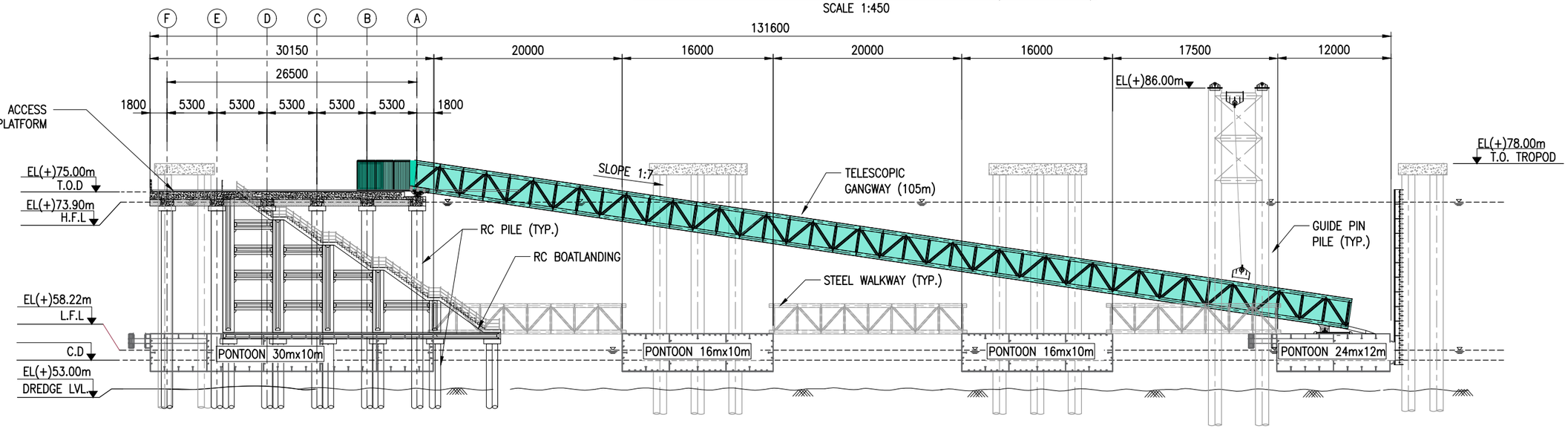
TITLE:
LAYOUT AND SECTIONS OF CRUISE TERMINAL ADJACENT TO MMT TERMINAL (SHEET 1 OF 4)

DRAWING NO. IITM-IWAI-VCT-DWG-007-01	DATE: 13.05.25	REV: A



LONGITUDINAL SECTION AT HIGH FLOOD LEVEL(EL+73.90m)

SCALE 1:450



LONGITUDINAL SECTION AT LOW FLOOD LEVEL(EL+58.22m)

SCALE 1:450

NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
A	13.05.25	ISSUED FOR REVIEW	SM	SR

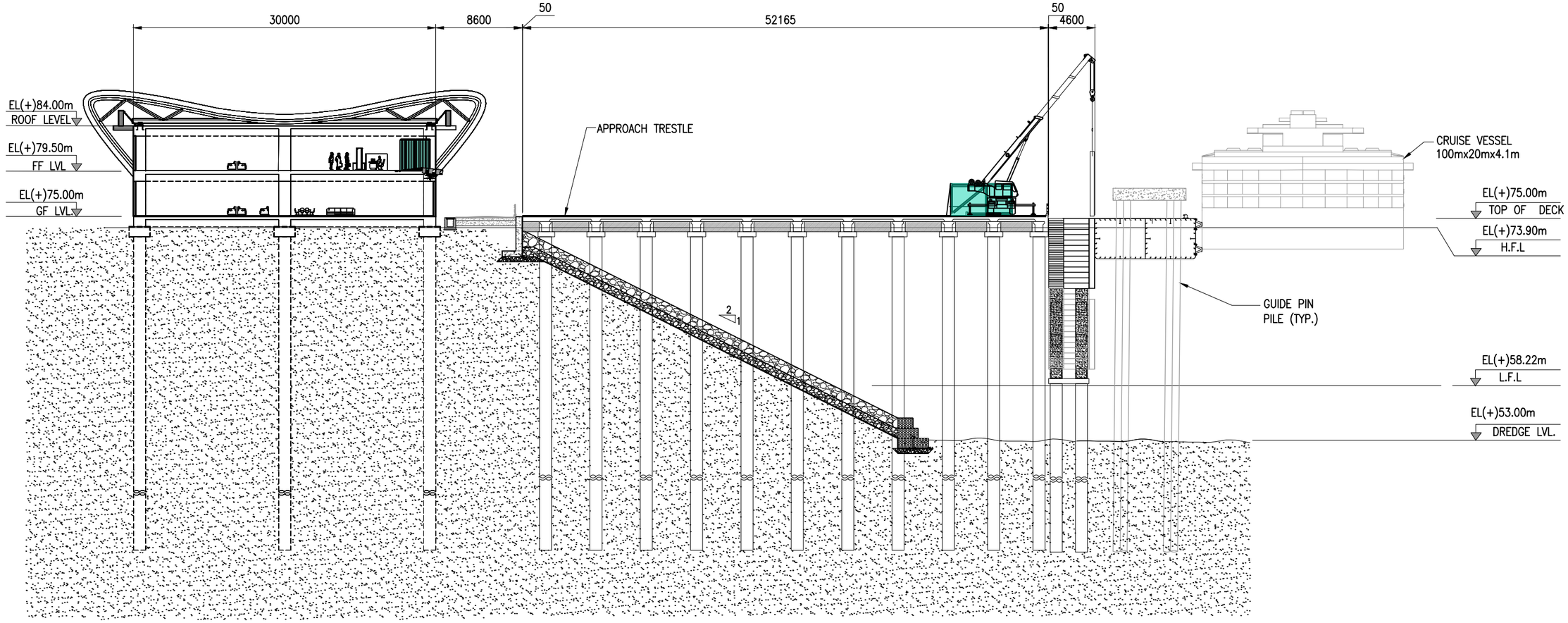
CONSULTANT:
PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
LAYOUT AND SECTIONS OF CRUISE TERMINAL ADJACENT TO MMT TERMINAL (SHEET 2 OF 4)

DRAWING NO. IITM-IWAI-VCT-DWG-007-02	DATE: 13.05.25	REV: A



TYPICAL CROSS SECTION AT HIGH FLOOD LEVEL EL(+)73.90M

SCALE 1:400

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
A	13.05.25	ISSUED FOR REVIEW	SM	SR

CONSULTANT:

PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:

INLAND WATERWAY AUTHORITH OF INDIA

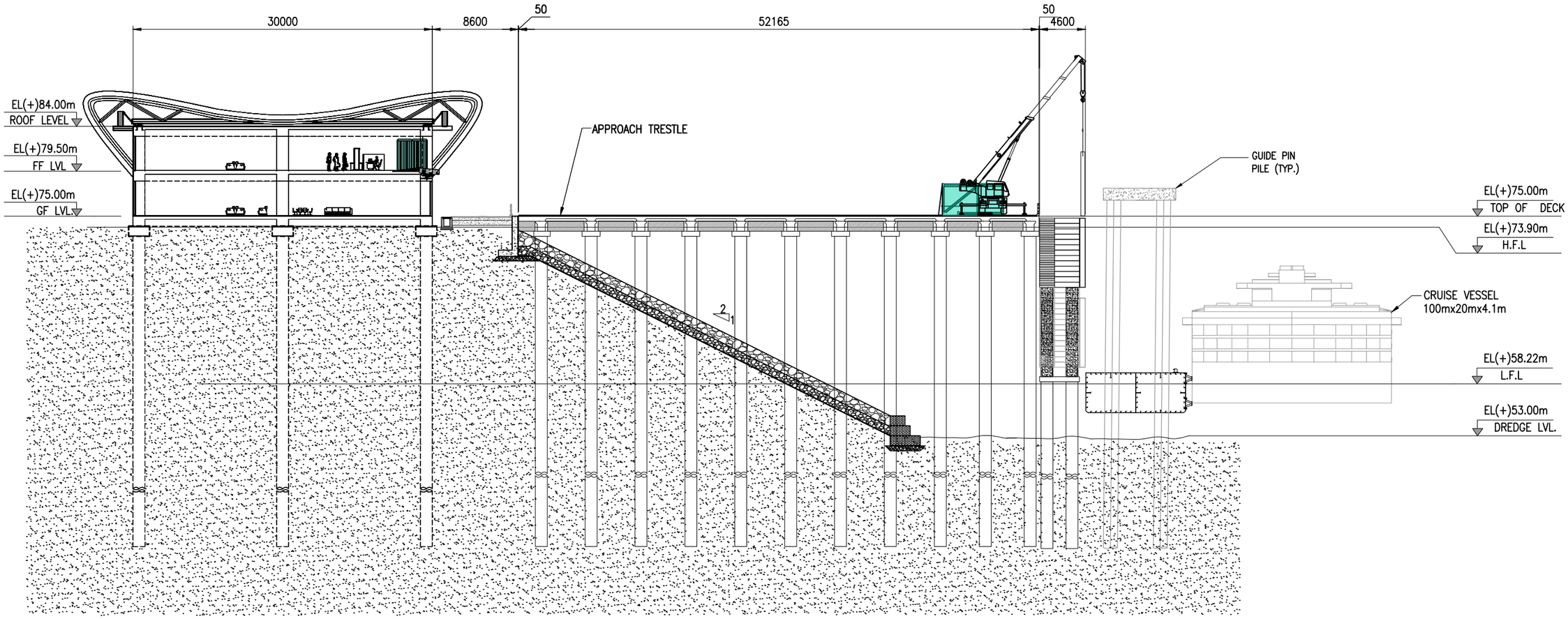
PROJECT:

DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:

LAYOUT AND SECTIONS OF CRUISE TERMINAL ADJACENT TO MMT TERMINAL (SHEET 3 OF 4)

DRAWING NO. IITM-IWAI-VCT-DWG-007-03	DATE: 13.05.25	REV: A



TYPICAL CROSS SECTION AT HIGH FLOOD LEVEL EL(+)73.90M

SCALE 1:400

NOTES:

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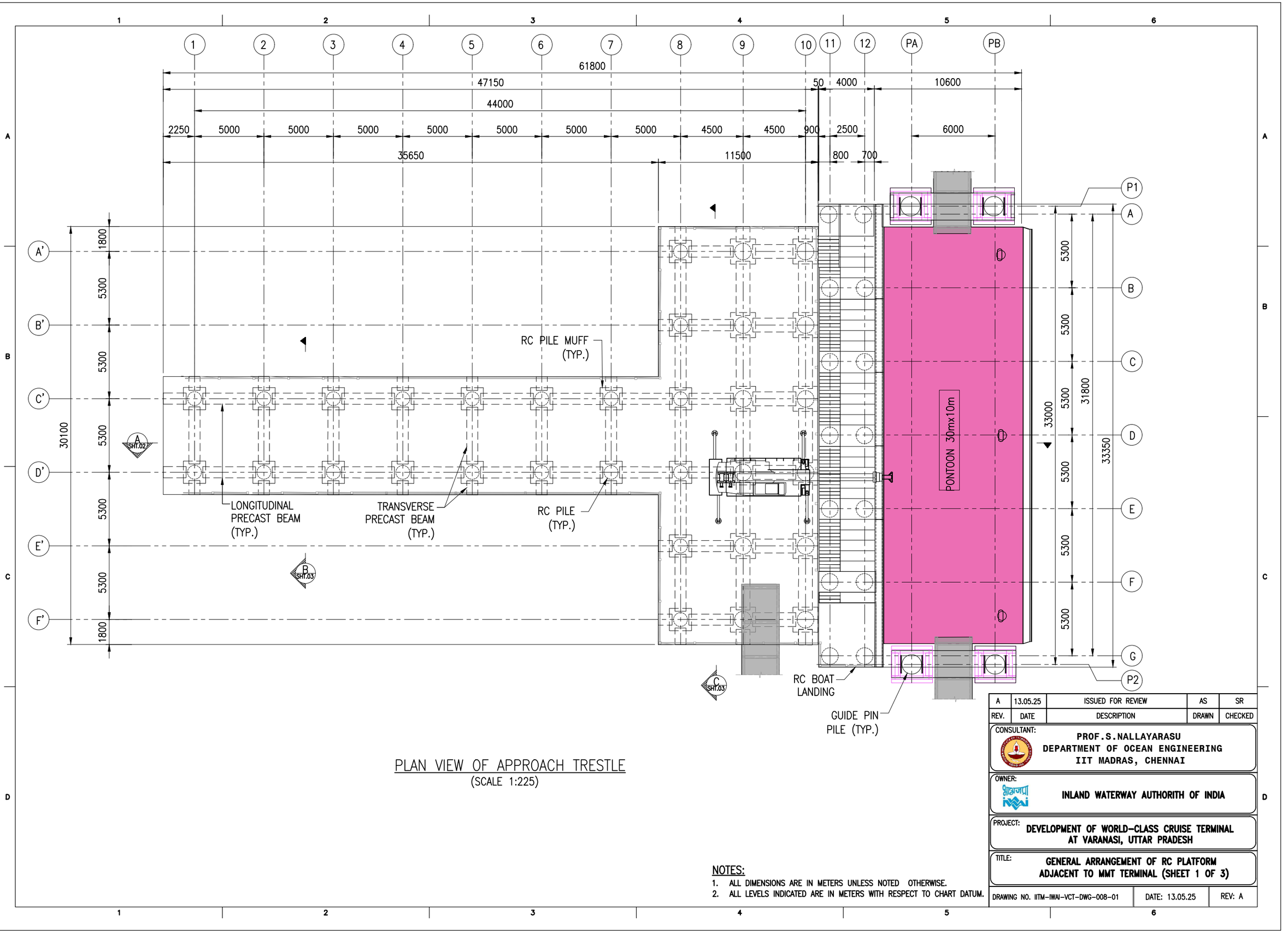
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:

LAYOUT AND SECTIONS OF CRUISE TERMINAL ADJACENT TO MMT TERMINAL (SHEET 4 OF 4)

DRAWING NO. IITM-IWAI-VCT-DWG-007-04	DATE: 13.05.25	REV: A



PLAN VIEW OF APPROACH TRESTLE
(SCALE 1:225)

NOTES:
1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
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REV.	DATE	DESCRIPTION	DRAWN	CHECKED
A	13.05.25	ISSUED FOR REVIEW	AS	SR

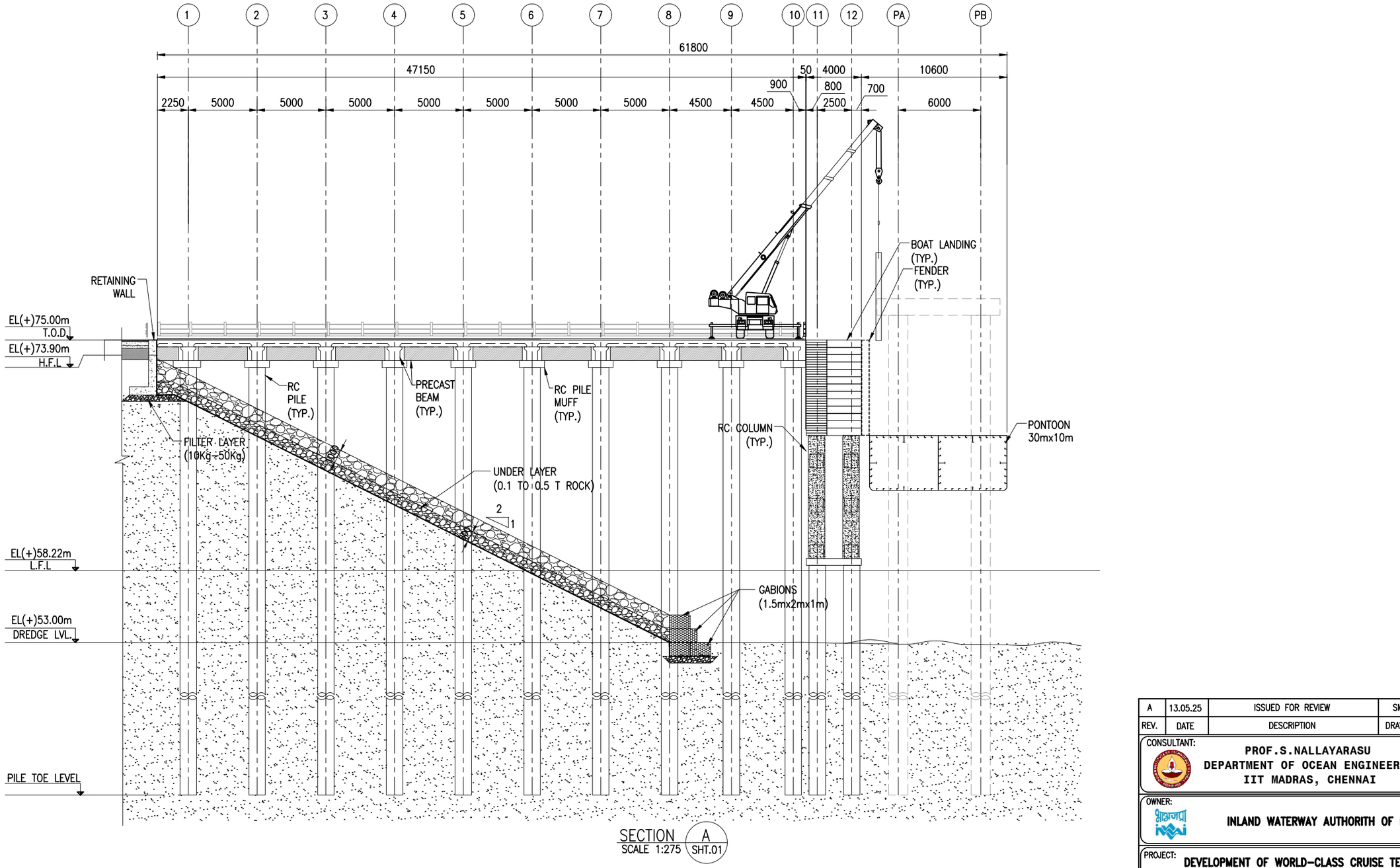
CONSULTANT:
PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL
AT VARANASI, UTTAR PRADESH

TITLE:
GENERAL ARRANGEMENT OF RC PLATFORM
ADJACENT TO MMT TERMINAL (SHEET 1 OF 3)

DRAWING NO. IITM-IWAI-VCT-DWG-008-01	DATE: 13.05.25	REV: A



SECTION A
SCALE 1:275 SHT.01

NOTES:

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REV.	DATE	DESCRIPTION	DRAWN	CHECKED
A	13.05.25	ISSUED FOR REVIEW	SM	SR

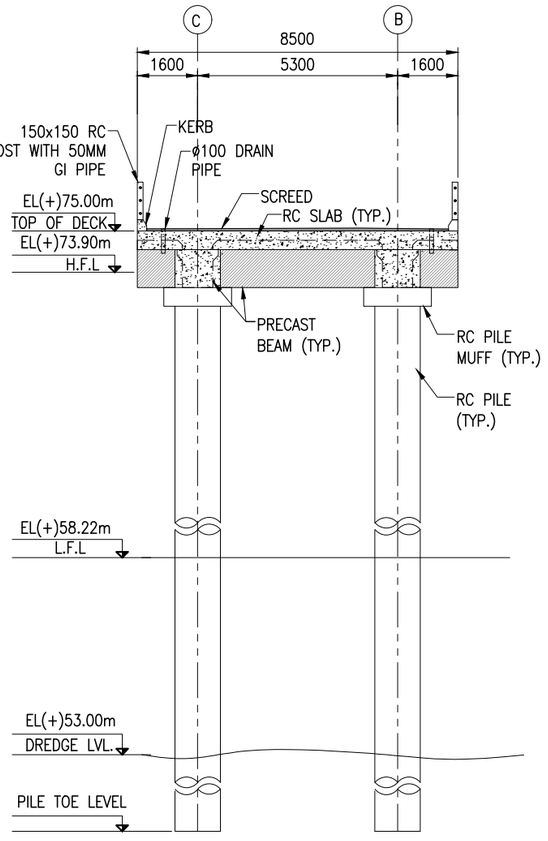
CONSULTANT:
PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

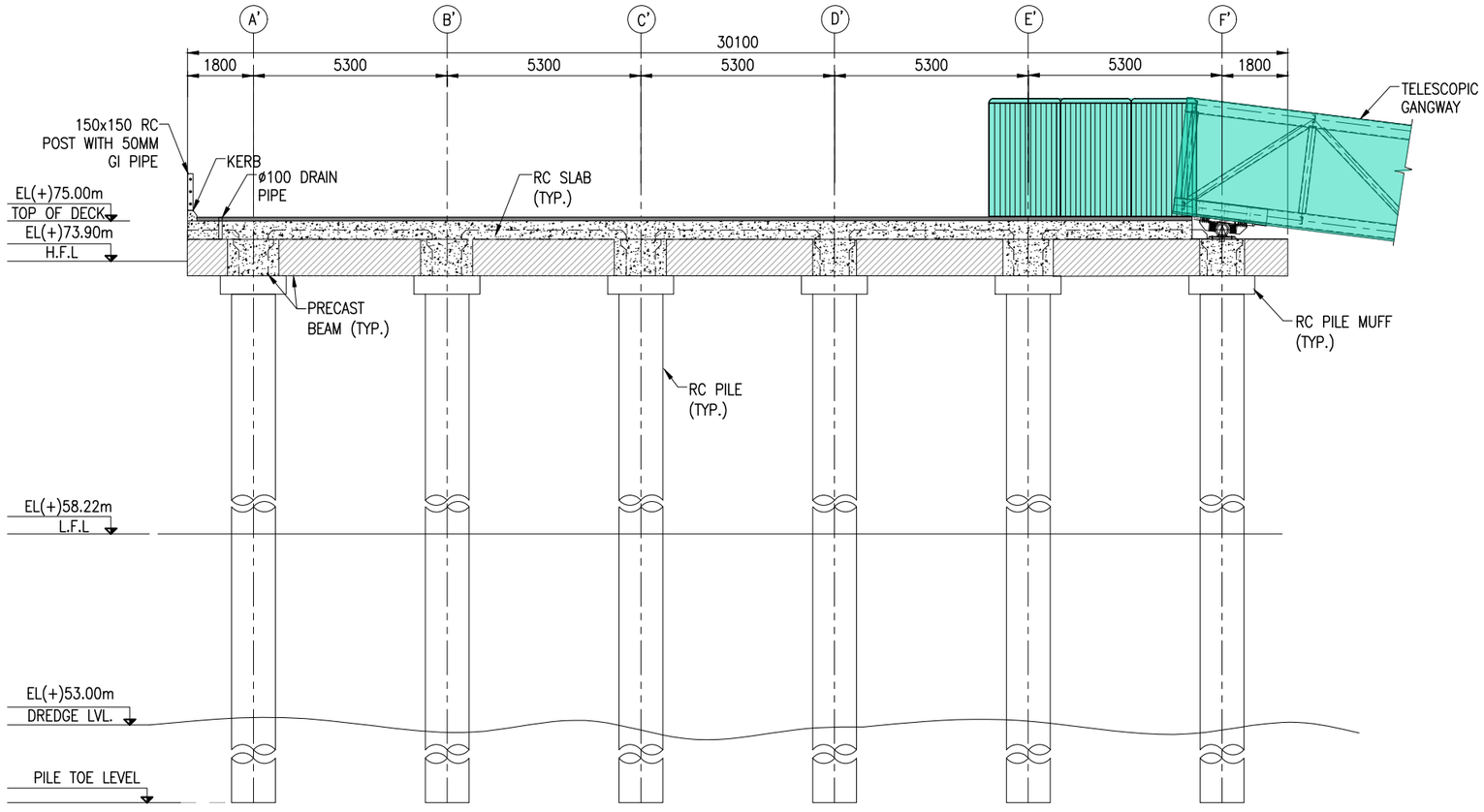
PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
GENERAL ARRANGEMENT OF RC PLATFORM ADJACENT TO MMT TERMINAL (SHEET 2 OF 3)

DRAWING NO. IITM-IWAI-VCT-DWG-008-02	DATE: 13.05.25	REV: A



SECTION B
SCALE 1:125 SHT.01



SECTION C
SCALE 1:125 SHT.01

NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
A	13.05.25	ISSUED FOR REVIEW	AS	SR

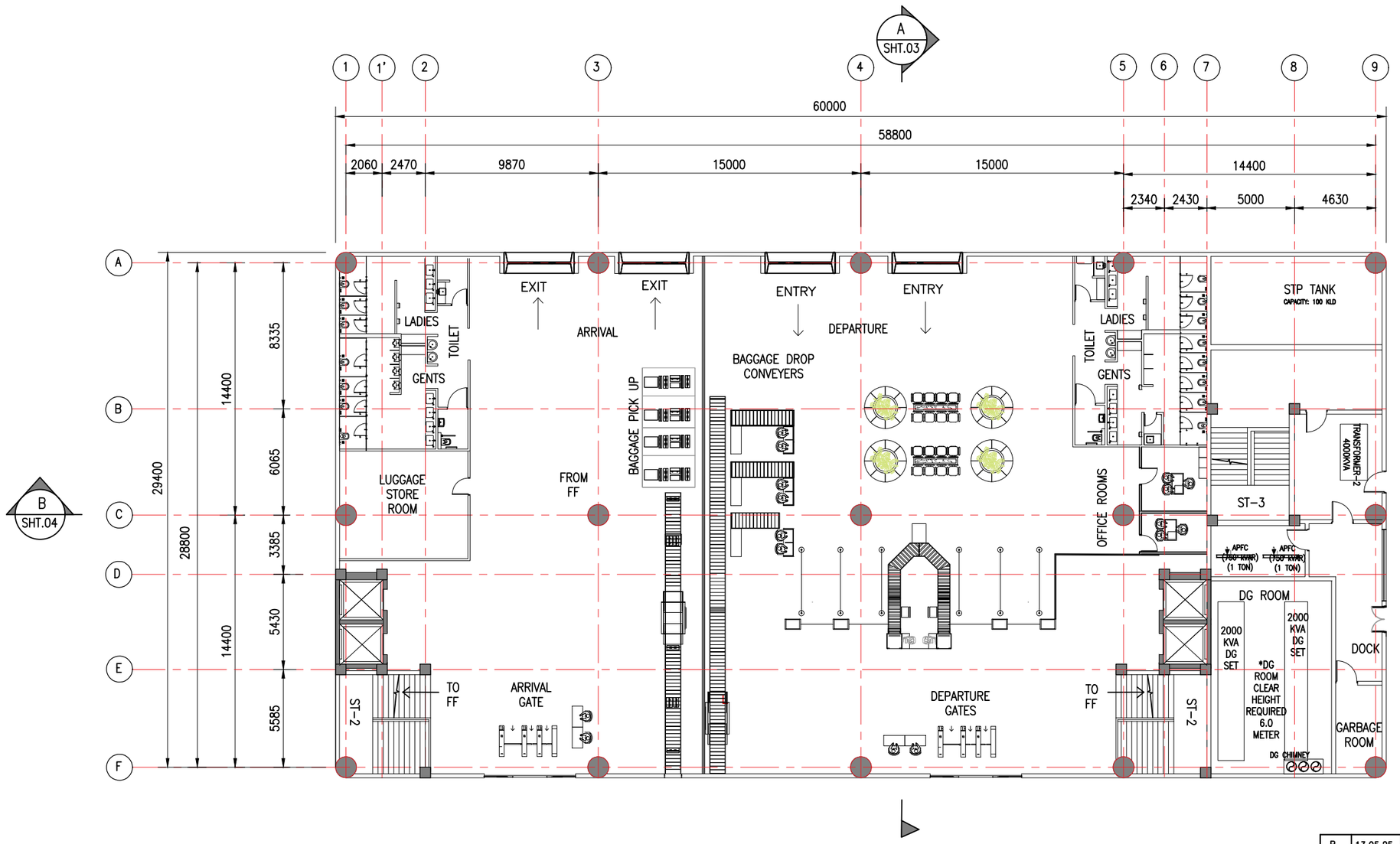
CONSULTANT:
PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL
AT VARANASI, UTTAR PRADESH

TITLE:
GENERAL ARRANGEMENT OF RC PLATFORM
ADJACENT TO MMT TERMINAL (SHEET 3 OF 3)

DRAWING NO. IITM-IWAI-VCT-DWG-008-03	DATE: 13.05.25	REV: A



GROUND FLOOR PLAN

SCALE 1:250

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	SM	SR
A	31.01.25	ISSUED FOR REVIEW	SM	SR

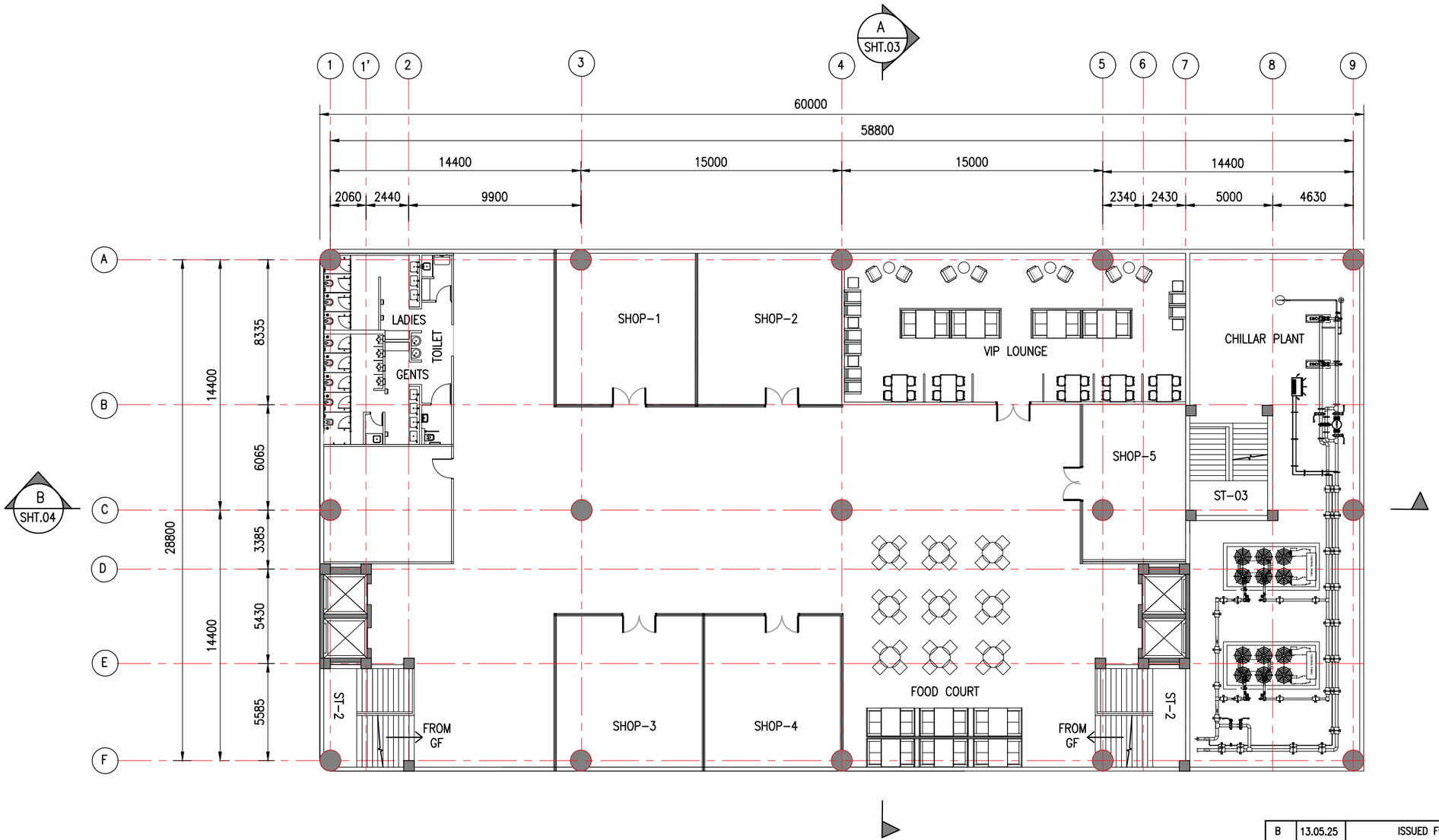
CONSULTANT:
PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
GENERAL ARRANGEMENT OF CRUISE TERMINAL BUILDING (SHEET 1 OF 5)

DRAWING NO. IITM-IWAI-VCT-DWG-009-01	DATE: 13.05.25	REV: B



FIRST FLOOR PLAN
SCALE 1:250

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	SM	SR
A	31.01.25	ISSUED FOR REVIEW	SM	SR

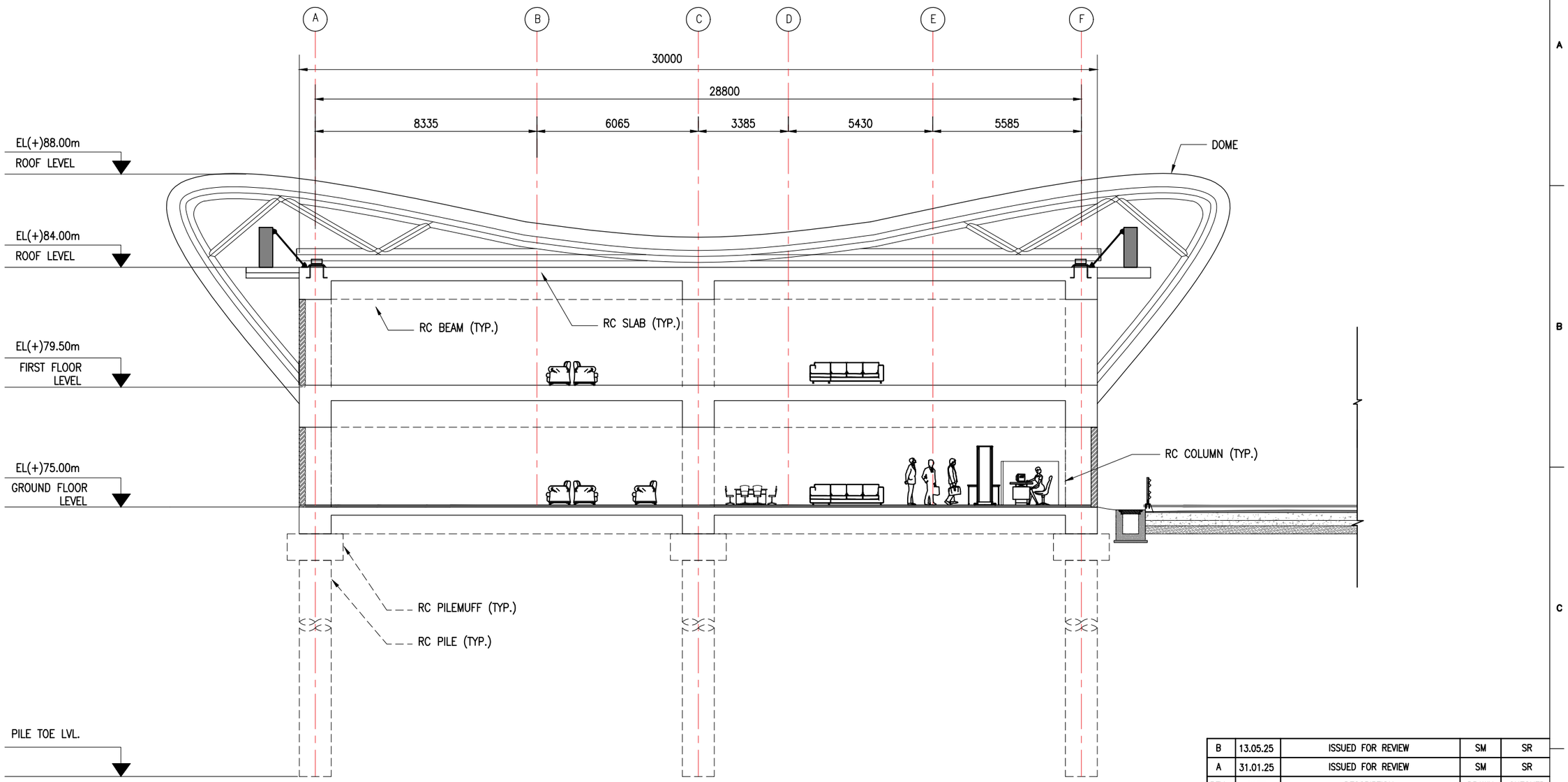
CONSULTANT:
PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
GENERAL ARRANGEMENT OF CRUISE TERMINAL BUILDING (SHEET 2 OF 5)

DRAWING NO. IITM-IWAI-VCT-DWG-009-02	DATE: 13.05.25	REV: B



SECTION A
SCALE 1:150 SHT.01 & 02

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	SM	SR
A	31.01.25	ISSUED FOR REVIEW	SM	SR

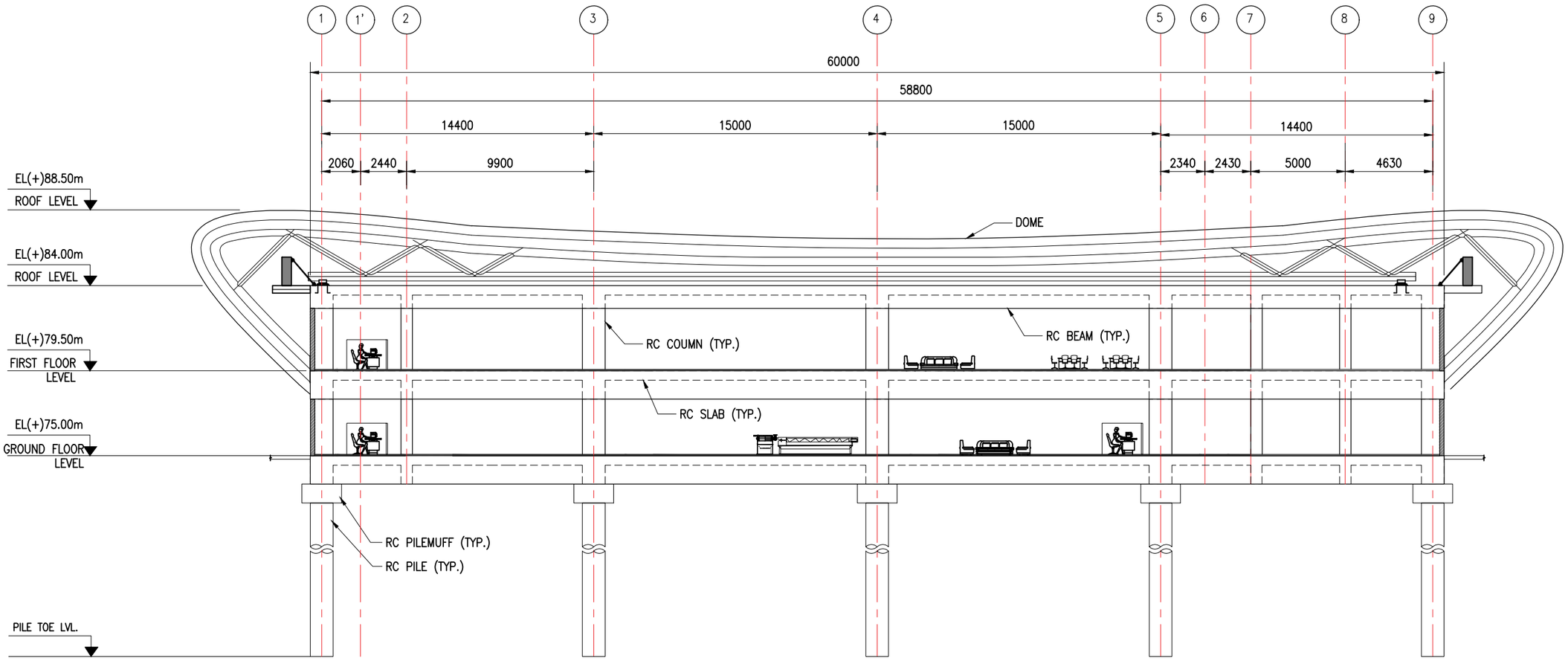
CONSULTANT:
PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
GENERAL ARRANGEMENT OF CRUISE TERMINAL BUILDING (SHEET 3 OF 5)

DRAWING NO. IITM-IWAI-VCT-DWG-009-03	DATE: 13.05.25	REV: B



SECTION B
SCALE 1:225 SHT.01 & 02

NOTES:
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2. ALL LEVELS INDICATED ARE IN METERS WITH RESPECT TO CHART DATUM.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	RN	SR
A	31.01.25	ISSUED FOR REVIEW	SM	SR

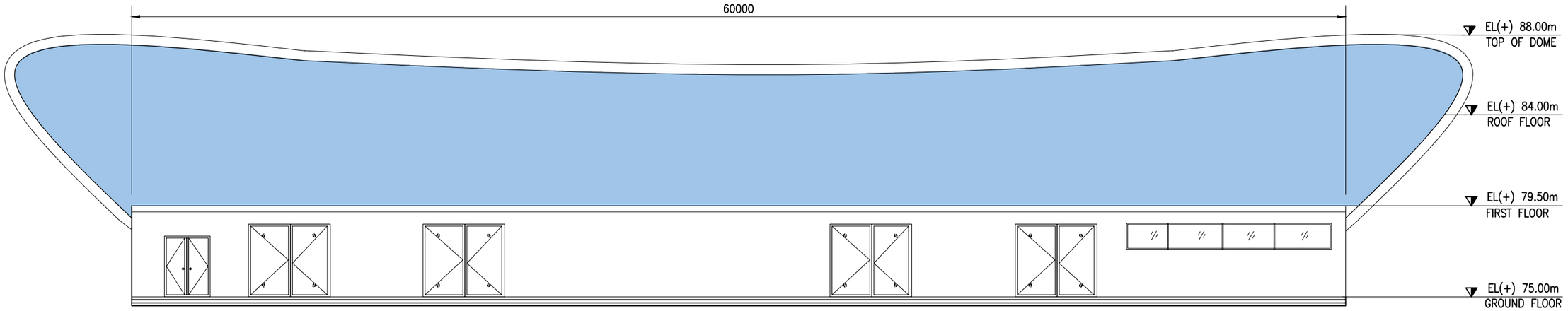
CONSULTANT:
PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
GENERAL ARRANGEMENT OF CRUISE TERMINAL BUILDING (SHEET 4 OF 5)

DRAWING NO.	DATE	REV.
IITM-IWAI-VCT-DWG-009-04	DATE: 13.05.25	REV: B



FRONT ELEVATION
SCALE 1:200

NOTES:
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REV.	DATE	DESCRIPTION	DRAWN	CHECKED
B	13.05.25	ISSUED FOR REVIEW	RN	SR
A	01.02.25	ISSUED FOR REVIEW	SM	SR

CONSULTANT:
PROF.S.NALLAYARASU
DEPARTMENT OF OCEAN ENGINEERING
IIT MADRAS, CHENNAI

OWNER:
INLAND WATERWAY AUTHORITH OF INDIA

PROJECT:
DEVELOPMENT OF WORLD-CLASS CRUISE TERMINAL AT VARANASI, UTTAR PRADESH

TITLE:
GENERAL ARRANGEMENT OF CRUISE TERMINAL BUILDING (SHEET 5 OF 5)

DRAWING NO.	DATE	REV.
IITM-IWAI-VCT-DWG-009-05	DATE: 13.05.25	REV: B

APPENDIX B
COST ESTIMATE

DEVELOPMENT OF WORLD CLASS CRUISE TERMINAL AT VARANASI

TERMINAL AT ASSI GHAT FOR SHORT JOURNEY CRUISES

BLOCK COST ESTIMATE SUMMARY

Sl No	Name of the work	Total cost (in crores)	Remarks
A)	Steel Pontoons	50.65	
B)	Steel Walkway	3.00	
C)	RC Approach and Access Platform	13.60	
D)	Guide Pin Pile Structure	18.08	
E)	Tripod Structure	4.62	
F)	Catwalk Between Pontoons	4.88	
G)	Dredging	7.25	
H)	Roads	2.67	
I)	Main terminal building	33.40	
J)	RC Stairway	5.09	
K)	RC Ramp	30.01	
L)	Diaphragm Wall	13.17	
M)	Reclamation	3.35	
N)	Airconditioning and Chiller Plants	5.00	
O)	Architectural and landscaping works	2.00	
P)	Electrical and lighting works (10% of H)	3.00	
Q)	Substation Facilities	5.00	
R)	Firefighting and Safety	3.00	
S)	Preliminary works(survey and setting up)	1.50	
	Total Cost of the works	**209.27**	
	Contingency (3%)	**6.28**	
	PMC (3%)	**6.28**	
	GST (18%)	**40.00**	
	Total Cost of the project (In Crores)	**261.82**	

DEVELOPMENT OF WORLD CLASS CRUISE TERMINAL AT VARANASI

TERMINAL AT MMT TERMINAL - LONG JOURNEY CRUISES

BLOCK COST ESTIMATE SUMMARY

Sl No	Name of the work	Total cost (in crores)	Remarks
A)	Steel Pontoons	43.09	
B)	Steel Walkway	3.00	
C)	RC Approach and Access Platform	13.64	
D)	Guide Pin Pile Structure	15.49	
E)	Tripod Structure	4.62	
F)	Catwalk Between Pontoons	2.68	
G)	Dredging	7.25	
H)	Roads and Drainage	2.67	
I)	Main terminal building	33.40	
J)	RC Stairway	5.09	
K)	Slope Protection	4.55	
L)	Reclamation	3.35	
M)	Airconditioning and Chiller Plants	5.00	
N)	Architectural and landscaping works	2.00	
O)	Electrical and lighting works (10% of H)	3.00	
P)	Substation Facilities	5.00	
Q)	Firefighting and Safety	3.00	
R)	Preliminary works(survey and setting up)	1.50	
	Total Cost of the works	**158.32**	
	Contingency (3%)	**4.75**	
	PMC (3%)	**4.75**	
	GST (18%)	**30.00**	
	Total Cost of the project (In Crores)	**197.82**	

APPENDIX C
MINUTES OF MEETING

भारतीय अन्तर्देशीय जलमार्ग प्राधिकरण
(पत्तन, पोत परिवहन और जलमार्ग मंत्रालय, भारत सरकार)
मुख्यालय: जलमार्ग भवन, ए-13, सैक्टर-1, नौएडा-201 301 (उ0प्र0)
INLAND WATERWAYS AUTHORITY OF INDIA
(Ministry of Ports, Shipping and Waterways, Govt. of India)
Head Office : Jalmarg Bhawan, A-13, Sector-1, Noida-201 301 (U.P.)
Website: www.iwai.gov.in | www.iwai.nic.in
Tel. : +91-120-2544036, 2543972, 2527667, 2448101 Fax : +91-120-2544009, 2544041, 2543973, 2521764

No. IWAI/JMVP-II/CruiseTerminal/Consultancy/2023 Date: 25.03.2025

Through Email

Circular

Sub: Consultancy services for the Development of World Class Cruise Terminal at Varanasi (Uttar Pradesh) - reg. **Minutes of the Meeting.**

The Minutes of the Meeting chaired by Chairman, IWAI dated 12.03.2025 at IWAI, Noida in hybrid mode on the subject, is attached herewith for necessary action by the concerned.

20/03/25

(Karor Singh)
Dy. Director (JMVP)
E-mail: ksingh@iwai.gov.in

Encl: As above

To,

(i) Principal Investigator, Indian Institute of Technology, Madras
(ii) Director, IWAI, Kolkata
(iii) Director, IWAI Patna
(iv) Officer-in-Charge, IWAI, Varanasi
(v) M/s Alaknanda Cruise, Varanasi
(vi) M/s Heritage River Journeys Pvt. Ltd.
(vii) M/s Ayodhya Cruise Line Jetty

Copy for kind information to:

(i) Chief Engineer & Project Manager (JMVP), IWAI
(ii) Chief Engineer (Traffic), IWAI
(iii) Director, IWAI Kochi
(iv) PPS to Chairman, IWAI
(v) PS to Vice Chairman /Member (Tech.)/Member (Traffic), IWAI

Record notes of the meeting

for

Consultancy services for the Development of World Class Cruise Terminal at Varanasi (Uttar Pradesh) regarding submission of feasibility study report

A meeting on the subject was held on 12.03.2025 under the Chairmanship of Chairman, IWAI with IITM Chennai, cruise operators and Regional Offices of IWAI.

2. The following were present in the meeting/discussion:

Physical:

(i) Chairman, IWAI - In the Chair
(ii) VC&PD (JMVP), IWAI
(iii) Member (Traffic), IWAI
(iv) CE&PM (JMVP)
(v) CE(Traffic), IWAI
(vi) Director (JMVP), IWAI
(vii) Consultant (JMVP), IWAI

Online:

(i) Prof. Nallayarasu, IIT Madras
(ii) Sh. Surjith, IIT Madras
(iii) Director, IWAI Patna
(iv) Director, IWAI Kolkata
(v) Director (I/c), IWAI Varanasi
(vi) Director, IWAI Kochi
(vii) Representative from M/s Alaknanda Cruise
(viii) Representative from M/s Heritage River Journey
(ix) Representative from M/s Ayodhya Cruise Line

3. The following action points emerged during the discussion for consideration by the Consultant (IIT Madras):

(i) The ownership of the identified land i.e. private or Govt, to be given. First priority should be to use land that IWAI or UP government already have.
(ii) The land in possession of IWAI at MMT & FV Varanasi should also be examined for the purpose.
(iii) Feasibility of providing 300 m berthing jetty as suggested by cruise operators.
(iv) Feasibility of extension of facilities at Assi Ghat
(v) Feasibility of berthing of Ro-Pax vessels to be incorporated on the proposed cruise terminal
(vi) Geotechnical Investigation data to be shared by IWAI.
(vii) The terminal may be designed taking into account the larger cruise ships and short-run cruises.
(viii) IIT Chennai to conduct a meeting with cruise operators plying in the Varanasi region and incorporate their comments the in FSR.

(ix) IWAI to share the Draft Feasibility Report to all the cruise operators and State Govt. for their comments.

(x) Regional office, IWAI Patna, Varanasi and Kolkata to coordinate with the cruise operators and state govt. for their comments on the report.

(xi) The revised FSR to be submitted in 2 weeks time.

The meeting concluded with a vote of thanks to and from the Chair.

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