

# **EXECUTIVE SUMMARY**

of

## **DRAFT ENVIRONMENT IMPACTASSESSMENT (EIA)**

for

### **WIDENING OF EXISTING CONTAINER BERTH AT JAWAHARLAL NEHRU PORT, NAVI MUMBAI, MAHARASHTRA (CARGO HANDLING CAPACITY= 22.1 MTPA)**

(Received Terms of Reference from MoEF&CC, 01/09/2023)

at

Navi Mumbai, Dist -Raigad, Maharashtra.



**PROPOSED BY**



**JAWAHARLAL NEHRU PORT AUTHORITY**

**PREPARED BY**

**MANTEC CONSULTANTS PVT. LTD.**

*(QCI Accredited EIA Consultant at Vide letter no. QCI/NABET/ENV/ACO/23/2799 as per List of Accredited Consultant Organizations/Certificate no. NABET/EIA2023/RA 0205 on dated 16/OCTOBER, 2023)*

**(NABET Accredited EIA Consultant, MoEF&CC and NABL approved Laboratory)  
Environment Division, D-36, Sector-6, Noida-201 301, U.P, Ph. 0120-4215000,  
0120-4215807 Fax. 0120-4215809,**

***E-mail: [environment@mantecconsultants.com](mailto:environment@mantecconsultants.com)***

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## **ABBREVIATIONS USED**

<b>Short Form</b>	<b>Long Form</b>
GDP	Gross Domestic Product
JNPA	Jawaharlal Nehru Port Authority
ISO	International Organization for Standardization
JNP	Jawaharlal Nehru Port
JNPA	Jawaharlal Nehru Port Authority
NSICT	Nhava Sheva International Container Terminal
CIDCO	City and Industrial Development Corporation of Maharashtra Limited
MSEDCL	Maharashtra State Electricity Distribution Co. Ltd
MoEFCC	Ministry of Environment, Forest and Climate Change
CPCB	Central Pollution Control Board
SPCB	State Pollution Control board
IMD	Indian Metrological Department
RH	Relative Humidity
NAAQS	National Ambient Air Quality Standards
IS	Indian Standard
ASTM	American Society for Testing and Materials
EMP	Environmental Management Plan
DG	Diesel Generator
PM	Particulate Matter
PPE	Personal Protective Equipment
STP	Sewage Treatment Plant
MIDC	Maharashtra Industrial Development Corporation
DMP	Disaster Management Plan
EMC	Environmental Management Cell

## INTRODUCTION

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The importance of ports and its related infrastructure plays a vital role in the growth of a nation and its economy. Indian Ports sector plays a crucial role in increasing the country's Gross Domestic Product <sup>1</sup>(GDP). About 95% by volume and 70% by value of the country's international trade is carried on through maritime transport.

The transportation sector is a strong factor in terms of economic and regional balanced development, as well as also having a great influence on national integration to the world economic market. India has a rich history of trade across seas. Ports constitute an important economic activity in coastal areas. Ports are also important for the support of economic activities in the hinterland since they act as a crucial connection between sea and land transport. In terms of load carried, seaway transportation is the cheapest and most effective transportation system compared to other systems. Industries require a safe and cheap means of exporting finished goods and importing raw materials. Hence the majority of industries in the world are located in the coastal belts, in the vicinity of major ports. These industries in turn, influence the lives of the employees and indirect benefactors. Maharashtra State has a coastline of 720km with two major and 48 minor ports.

Jawaharlal Nehru Port Authority, hereinafter referred as <sup>2</sup>JNPA or "Port" is one of the major Indian Ports located on the east side of Mumbai Harbour adjoining the main land of the West Coast of India and was commissioned on 26<sup>th</sup> May 1989. It is about 6 nautical miles by water route from Gateway of India. It is a fast growing and <sup>3</sup>ISO 9001:2000 certified Port with single window operations, round the clock pilotage, good vessel traffic management system and dedicated facilities for handling containers, dry bulk and liquid bulk.

Jawaharlal Nehru Port (<sup>4</sup>JNP), is one of the twelve major ports of India. JNP has five terminals Three terminals for handling container cargo, one terminal for handling liquid cargo and one shallow water terminal for handling dry & break-bulk cargo. JN Port handled 6.05 million TEUs of container traffic during the financial year 2022-23, increase of 6.44 % from the previous annual container handling of 5.68 million TEUs during the year 2021-22.

## NEED FOR EXPANSION

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The Jawaharlal Nehru Port Authority (<sup>5</sup>JNPA) is one of the largest container ports in India, located in Navi Mumbai, Maharashtra. The need for the expansion of the JNPA project can be attributed to several factors:

- **Rising Cargo Volumes:** India's international trade has been steadily growing, and JNPA plays a crucial role in handling a significant portion of the country's import and export cargo. As trade volumes increase, there is a need to expand the port's capacity to accommodate more goods efficiently.

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<sup>1</sup> GDP-Gross Domestic Product

<sup>2</sup> JNPA-Jawaharlal Nehru Port Authority

<sup>3</sup> ISO-International Organization for Standardization

<sup>4</sup> JNP-Jawaharlal Nehru Port

<sup>5</sup> JNPA-Jawaharlal Nehru Port Authority

- **Economic Growth:** India's economic growth and industrialization have led to increased demand for the import and export of goods. Expanding JNPA can support this economic growth by providing the necessary infrastructure for smooth cargo handling.
- **Infrastructure Development:** Modernizing and expanding the port's infrastructure is essential to keep pace with global standards and technological advancements in the maritime industry. This includes upgrading container terminals, enhancing transportation connectivity, and improving logistics efficiency.
- **Reducing Congestion:** JNPA has faced congestion issues in the past due to its high utilization. Expanding the port can help alleviate congestion, reduce waiting times for vessels, and enhance the overall operational efficiency of the port.
- **Competitiveness:** In an increasingly competitive global trade environment, ports must remain competitive to attract shipping lines and businesses. Expanding and modernizing JNPA can help maintain its competitiveness and attract more international trade.
- **Job Creation:** The expansion of JNPA will lead to increased economic activity in the region, which, in turn, can create jobs and stimulate economic development in the surrounding areas.
- **Environmental Considerations:** Modern port expansions often come with a focus on environmental sustainability. New projects may incorporate eco-friendly technologies and practices to minimize the ecological impact of port operations.
- **Government Initiatives:** The Indian government has been promoting initiatives such as "Sagarmala" to develop the country's maritime infrastructure, improve port connectivity, and boost coastal and inland shipping. Expanding JNPA aligns with these national goals.
- **Capacity Planning:** Adequate capacity planning is essential to handle future growth and ensure that the port remains a reliable gateway for international trade.
- **Trade Diversification:** Expanding the port's capacity can accommodate a wider variety of goods and trade routes, supporting trade diversification efforts.

The expansion of the JNPA project is driven by the need to accommodate growing trade volumes, improve infrastructure, enhance competitiveness, create jobs, and align with government initiatives for maritime development. It is essential for sustaining and fostering India's economic growth and global trade connections.

## **PROJECT LOCATION**

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The project is located between <sup>6</sup>NSICT existing container berth and existing Shallow water Berth of JNPA in Navi Mumbai district of Maharashtra State. The berth is located at a distance of approx. 11 kms from Navi Mumbai in South West. The geographical location of the project site is as follows:

**Latitude from 18°57'9.50"N to 18°57'28.38"N**

**Longitude from 72°56'43.99"E to 72°56'53.46"E**

Location of JNPA port is presented below in Figure 1

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<sup>6</sup> NSICT-Nhava Sheva International Container Terminal

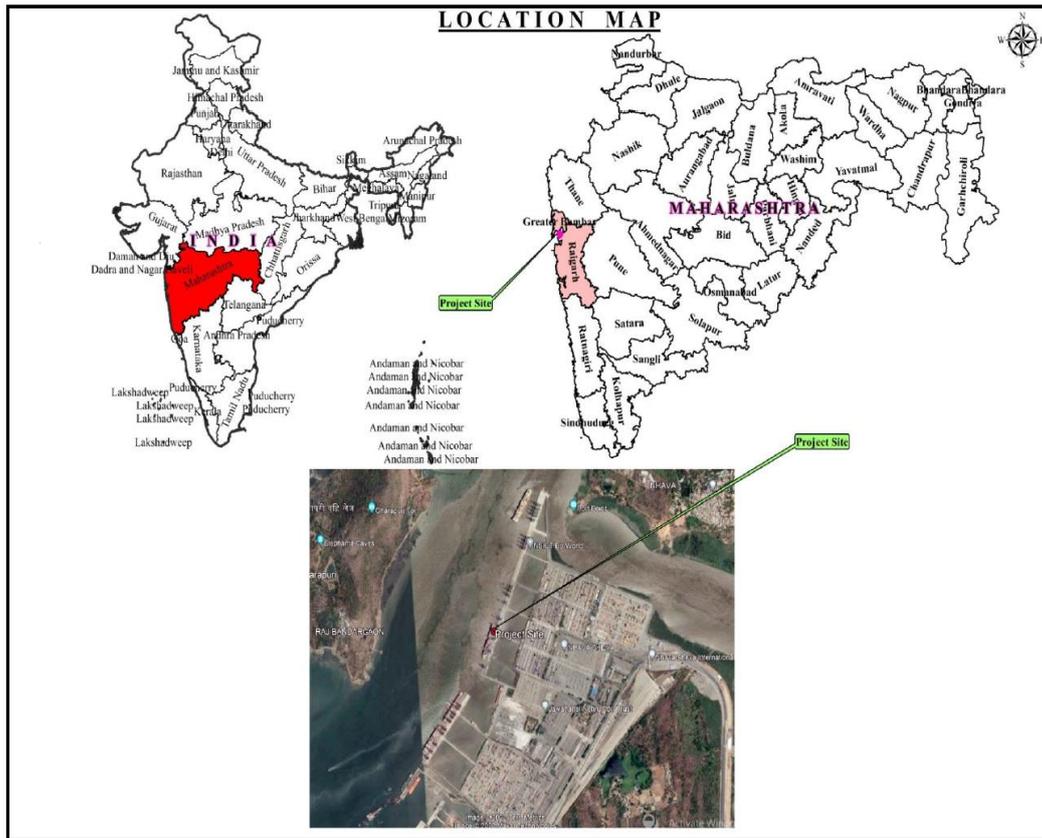


Figure 1: Location of JNPA Port

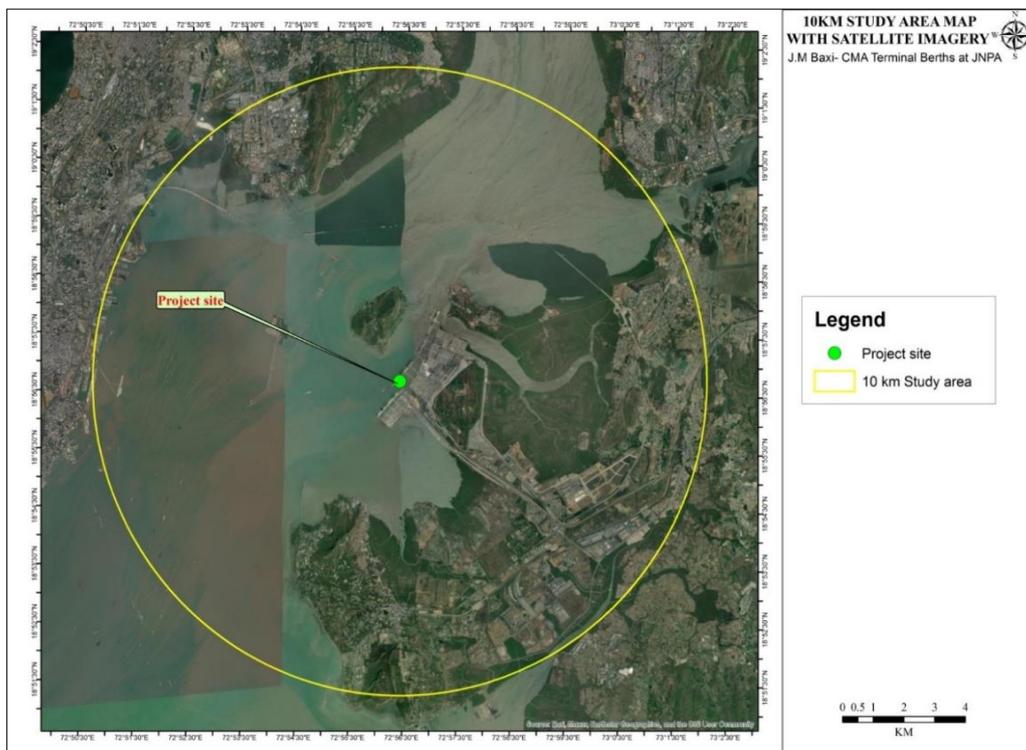


Figure 2 : Satellite Image

## CONNECTIVITYASPECT

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JNPA has very good road and rail linkages with hinterland as well as important business centres like Thane, Pune, Nashik, Aurangabad and Ahmadabad, which facilitate excellent port -industry interface. District headquarter Alibaug town is about 60 km distance from the site and 40.5 km from Mumbai.

Connectivity is a crucial aspect of the Jawaharlal Nehru Port Authority (JNPA) project's expansion and development. Ensuring efficient transportation links to and from the port is essential for its success and the facilitation of international trade. Here are several connectivity aspects to consider:

**A. Road Connectivity:** Improving Road connectivity to JNPA is vital for the seamless movement of cargo. The construction and expansion of highways, expressways, and dedicated road corridors leading to and from the port are often part of such projects. These road networks help reduce transit times and congestion, making it easier for goods to reach their destinations.

**B. Railway Connectivity:** Enhancing rail connectivity is equally important. JNPA has rail links that connect it to various parts of India's hinterland. Expanding and modernizing these rail links, as well as building dedicated freight corridors, can significantly boost the volume of cargo transported by rail, which is typically more cost-effective and environmentally friendly.

**C. Inland Waterways:** India is developing its inland waterways, and JNPA is strategically located along the west coast. Integrating inland waterways into the port's operations can provide an alternative, eco-friendly mode of transport, reducing road and rail congestion and lowering logistics costs.

**D. Pipeline Connectivity:** Depending on the types of cargo handled at JNPA, pipelines may be necessary to transport liquid goods, such as petroleum products, chemicals, or natural gas, to and from the port. Developing and maintaining pipeline infrastructure ensures a safe and efficient transport mode.

**E. Port-Adjacent Infrastructure:** The development of logistics parks, warehouses, and container freight stations in proximity to the port enhances the overall efficiency of cargo handling and distribution. It also reduces the need for long-haul transportation of goods.

**F. Multimodal Transport:** Promoting multimodal transportation, where cargo seamlessly moves between different modes (e.g., ship to rail to road), is crucial for optimizing logistics efficiency and reducing costs.

**G. Customs and Regulatory Integration:** Integration of customs and regulatory processes with the port's operations can facilitate faster clearance of goods and reduce delays in transportation.

**H. Technological Integration:** Implementing technology solutions like GPS tracking, electronic toll collection, and cargo tracking systems can improve real-time monitoring and management of cargo movement, ensuring smooth connectivity.

**I. Last-Mile Connectivity:** Addressing the last-mile connectivity challenge is essential to ensure that cargo reaches its final destination efficiently. This often involves improving road networks within industrial and urban areas surrounding the port.

**J. Environmental Considerations:** As part of connectivity planning, efforts should be made to minimize the environmental impact. This includes measures to reduce emissions from transportation, protect nearby ecosystems, and promote sustainable transportation options.

## **EXISTING & PROPOSED PROJECT DETAILS**

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**Jawaharlal Nehru Port Authority** now involves various aspects to be considered for expansion project.

- a. Increase of crane Rail span from 20m to 30.50m for 680m berth length.
- b. Increase of deck width of the berth by 15m on land side for smooth vehicle manoeuvring & for keeping vessels hatch covers
- c. Up-gradation and strengthening of existing 530m berth and 150m wharf to accommodate design vessels of size 12200 <sup>7</sup>TEU for which the facility was originally designed & commissioned etc.

## **NEED FOR THE DEVELOPMENT**

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The expansion and modernization of JNPA port will meet the capacity requirements of Maharashtra State and in turn is expected to boost the economy.

## **WATER SUPPLY**

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Total water requirement for widening purpose would be 50 KLD which will be sourced from M/s Maharashtra Jeevan Pradhikaran / City and Industrial Development Corporation of Maharashtra Limited (<sup>8</sup>CIDCO) through JNPA.

## **POWER REQUIREMENTS**

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200 KVA/KW will be required for widening purpose. This power shall be provided from <sup>9</sup>MSEDCL through JNPA.

## **WATER REQUIREMENT**

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Total water requirement for expansion purpose would be 50 KLD which will be sourced from M/s Maharashtra Jeevan Pradhikaran / City and Industrial Development Corporation of Maharashtra Limited (CIDCO) through JNPA.

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<sup>7</sup> TEU-Twenty foot equivalent Unit

<sup>8</sup> CIDCO-City and Industrial Development Corporation of Maharashtra Limited

<sup>9</sup> MSEDCL-Maharashtra State Electricity Distribution Co. Ltd

## LAND REQUIREMENT

The project is located between NSICT existing container berth and existing Shallow Water Berth of JNPA This is JNPA's Existing container berth with a quay length of 680 m was commissioned in 1989.

## PROJECT COST

Project Cost for proposed project is estimated as Rs. 196.82 Crore.

## PROPOSED PROJECT DETAILS

**Table 1: Proposed Project Details**

S. No.	Particulars	Details
	Type of Project	<b>7(e) Ports, Harbours, breakwaters, dredging</b>
<b>A.</b>	<b>Nature and Size of the Project</b>	Widening of Existing Container Berth at Jawaharlal Nehru Port Authority, Navi Mumbai, Maharashtra.
<b>B.</b>	<b>Location</b>	
	Village	Nhava
	City	Navi Mumbai
	District	Raigad
	State	Maharashtra
	Geographical Coordinates	Latitude from 18°57'9.50"N to 18°57'28.38"N Longitude from 72°56'43.99"E to 72°56'53.46"E
	Manpower Requirement	<b>Constructional Phase-</b> Permanent Employment- 10 nos. Contractual Employment- 360 nos. <b>Operational phase-</b> Existing Permanent Employment- 125 nos. Proposed Permanent Employment- 15 nos. Contractual Employment- 360 nos.
	Water Requirement	Total water requirement for widening purpose for existing would be 50 KLD and 30 KLD for expansion phase which will be sourced from M/s Maharashtra Jeevan Pradhikaran /City and Industrial Development Corporation of Maharashtra Limited (CIDCO) through JNPA.
<b>C.</b>	<b>Cost of the project</b>	Existing- Rs. 675.34 Crores Proposed- Rs. 196.82 Crores

		Total- Rs. 872.16 Crores
	Cost for EMP	Rs. 17.9 Lakhs (During Construction phase) Rs. 6.3 Lakhs (During Construction phase)
<b>D.</b>	<b>Environmental Settings of the area</b>	
	Location of National Park/Wild life sanctuary/ Reserve Forest within 10Km radius of the project.	No national park/ Wildlife Sanctuary/ Reserve Forest within 10Km radius of the project site is envisaged
	Inter-state boundary within 5 Km radius.	No Interstate Boundary is present within 10 km radius of the study area.
	Nearest Town/Major City with 200000 population	Navi Mumbai is at approx. 20 kms in ENE.
	Nearest State Highway/ National Highway	National Highway- NH 348 is at approx 5.0 kms in East direction.
	Nearest Airport	Chatrapati Shivaji International Airport ~ Approx. 50 kms in NNW direction.
	Seismic Zone	Zone III

## BASELINE ENVIRONMENT

Various Environmental factors as existing in the study area which are liable to be affected by the activities have been assessed both quantitatively and qualitatively. Baseline environmental data generation of study area was carried out during the period from September 15<sup>th</sup>2022 to December 05<sup>th</sup>2022.

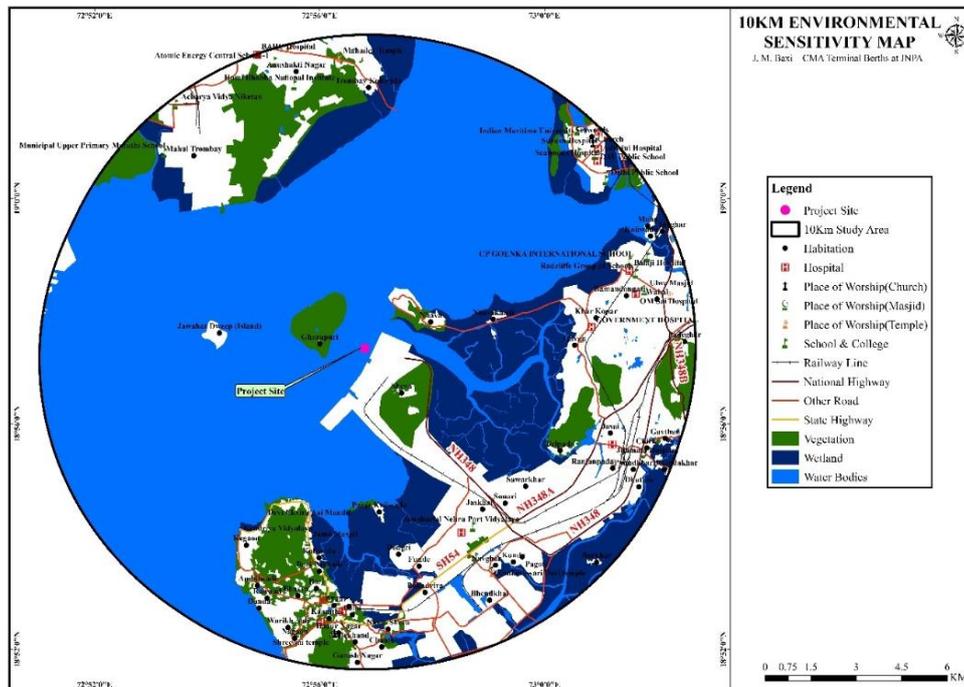


Figure 3-10km Environmental Sensitivity Map

**Table 2 :Ambient Air Quality**

<b>Sr. No</b>	<b>Location</b>	<b>PM10 (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>PM25 (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>SO<sub>2</sub> (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>NO<sub>2</sub> (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>CO (<math>\text{mg}/\text{m}^3</math>)</b>
AQ-1	Project site	145.3	66.0	30.0	35.00	0.86
AQ-2	Lady Khatun Marium School, Nhava	172.0	63.50	20.0	33.50	0.82
AQ-3	SBI, Naval Station, Karanja	190.0	44.50	15.0	43.50	0.81
AQ-4	Bhawra Shafi Jama Masjid	172.0	57.00	29.0	64.50	0.70
AQ-5	Zpd School, Sonari	110.0	35.00	15.5	56.00	1.00
AQ-6	Angalaparameshwari (Periyayi) Temple, Trombay	61.5	60.00	29.5	20.50	0.69

AQI: Good (0–50); Satisfactory (51–100); moderately polluted (101–200); Poor (201–300); Very Poor (301–400); Severe (401–500)

## **SITSETTING**

The Jawaharlal Nehru Port Authority (JNPA) is located on the west coast of India, near Mumbai, in the state of Maharashtra. It is situated in the Konkan region and is strategically positioned along the Arabian Sea. Here is a description of the site setting of JNPA:

### **Geographic Location:**

- JNPA is located on the mainland of India, approximately 25 kilometres east of Mumbai, one of India's largest cities.
- It is situated within the Raigad district of Maharashtra.

### **Accessibility:**

- JNPA is well-connected to major cities and industrial regions in India through an extensive road and rail network.
- The Mumbai-Pune Expressway provides efficient road connectivity to JNPA.
- A dedicated railway line connects JNPA to the Indian Railways network, allowing for the transportation of cargo by train.

### **Proximity to Mumbai:**

- JNPA is in close proximity to Mumbai, India's financial capital, which provides access to a large consumer market and industrial hub.
- The port's strategic location near Mumbai contributes to its importance in handling import and export cargo.

#### **Coastal Location:**

- JNPA is situated along the west coast of India, overlooking the Arabian Sea.
- Its coastal location allows for maritime trade with countries in the Middle East, Africa, Europe, and other regions.

#### **Land Area:**

- JNPA encompasses a significant land area that includes port facilities, container terminals, warehouses, and logistics parks.
- The land area is continuously expanded and developed to meet the growing demands of international trade.

#### **Strategic Importance:**

- JNPA is strategically important not only for India but also for global trade routes, serving as a key gateway for goods entering and leaving the country.
- It handles a substantial portion of India's containerized cargo and contributes significantly to the nation's economy.

#### **Environmental Considerations:**

- Being located near the coast, JNPA is mindful of environmental sustainability and has implemented measures to minimize the ecological impact of port operations, including coastal protection and pollution control initiatives.

### **DATASOURCES**

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The monitoring of environmental parameters was conducted within the study area of 10km around the project site in accordance with the guidelines issued by the <sup>10</sup>MoEF&CC, <sup>11</sup>CPCB, and <sup>12</sup>SPCB during the study period (Post Monsoon- September 15th 2022 to December 05th 2022). Baseline Environmental status in and around the site, depicts the existing quality of Air, Noise, Water (terrestrial & marine), Soil, Ecology & Biodiversity and Socio-economic environment.

### **METEOROLOGY:**

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#### **1. Temperature**

India Meteorological Department (<sup>13</sup>IMD) records indicate that the area experiences tropical coastal climate. The moderating effects of the nearby sea and the fairly high

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<sup>10</sup> MoEFCC- Ministry of Environment, Forest and Climate Change

<sup>11</sup> CPCB- Central Pollution Control Board

<sup>12</sup> SPCB- State Pollution Control board

<sup>13</sup> IMD- Indian Metrological Department

amount of relative humidity in the atmosphere have restricted the variability. The seasonal variations of temperature follow closely the course of the sun. January is invariably the coldest month and May the warmest.

With the onset of monsoon in early June there is a reversal of the temperature curve and the temperature during the period of monsoon remains very nearly uniform at about 27°C. The slight rise in temperature in October falls gradually till it reaches the coldest month in January. The maximum monthly average temperature of 38.25°C and monthly average temperature of 35.20°C was recorded for September 2022 month. The maximum monthly average temperature of 33.15°C and monthly average temperature of 30.54°C was recorded for October 2022 month. The maximum monthly average temperature of 32.95°C and monthly average temperature of 30.52°C was recorded for November 2022. The maximum monthly average temperature of 31.36°C and minimum monthly average temperature of 24.92°C was recorded for December 2022.

## **2. Wind speed and direction**

The monthly average wind speed for October & November 2022 was recorded as 2.57m/s and maximum wind speed was 6.94m/s. The monthly average wind speed for December 2022 was recorded as 0.82m/s and the maximum wind speed was 1.27m/s. Comparative account of study period shows higher Transport and dispersion of air pollutants are mainly governed by wind speed. Higher the wind speed significant number of pollutants will transport away from source. Gaseous dilutions will be more in the atmosphere hence satisfactory air quality status @7.40% for October & November 2022 and @ 14.48 %of the total observations recorded by for December 2022 of the total observations at the met station were represented as calm period. The prominent wind direction was from the West (W) accounting for about 42.58% of wind reaching at the JN Port during the month October, 2022.

## **3. Humidity**

The humidity is moderate to high throughout the year with the mornings being more humid than Evenings. The mean relative humidity for each month in a year measured during mornings and evenings. The monthly average relative humidity (<sup>14</sup>RH) for October 2022 was recorded to be 73.75., the maximum daily average RH of 88.44% was recorded. The monthly average relative humidity (RH) for November 2022 was recorded to be 59.80%., the maximum daily average RH of 83.44% was recorded. The monthly average relative humidity (RH) for December 2022 was recorded to be 67.16 %. The maximum daily average RH of 87.33% was recorded.

## **AMBIENT AIR QUALITY**

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Ambient air quality monitoring is done to determine the general background concentration levels of pollutant. The prime objective of the ambient air quality study is to assess the existing air quality of study area and to establish the existing ambient air quality within the study area and its conformity to <sup>15</sup>NAAQS.

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<sup>14</sup> RH-Relative Humidity

<sup>15</sup> NAAQS-National Ambient Air Quality Standards

### **Selection of Sampling Location:**

The sampling equipment was placed at a height of 3 to 3.5 meters above ground level at each monitoring station. The equipment was placed at open space free from trees and vegetation which otherwise act as a sink of pollutants resulting in lower levels in monitoring results. At locations close to internal roads, the equipment was placed at least 10m away from such roads to avoid influence of traffic exhaust emissions. The Ambient Air Quality Monitoring locations have been presented in Table 4

Ambient Air Quality Monitoring reveals that the minimum and maximum concentrations of PM<sub>10</sub> for all the 6 Air Quality monitoring stations were found to be 260.0g/m<sup>3</sup> and 50.0g/m<sup>3</sup> respectively, while for PM<sub>2.5</sub> varies between 82.0g/m<sup>3</sup> and 24.0g/m<sup>3</sup>. As far as the gaseous pollutants SO<sub>2</sub>, NO<sub>2</sub>, & CO are concerned, the prescribed limits under NAAQ Standards for residential and rural areas has never surpassed at any station. The minimum and maximum concentrations of NO<sub>2</sub> were found to be 84.0g/m<sup>3</sup> and 11.0g/m<sup>3</sup> respectively. The minimum and maximum concentrations of SO<sub>2</sub> were found to be 42.0g/m<sup>3</sup> and 8.0g/m<sup>3</sup> respectively. The minimum and maximum concentrations of CO were found to be 2.0mg/m<sup>3</sup> and 0.43 mg/m<sup>3</sup> respectively.

### **NOISE QUALITY**

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The intensity of sound energy in the environment is measured on a logarithmic scale and is expressed in a decibel (dB) scale. Ordinary sound level meter measures the sound energy that reaches the microphone by converting it into electrical energy and then measures the magnitude in dB. In a sophisticated type of sound level meter, an additional circuit (filters) is provided, which modifies the received signal in such a way that it replicates the sound signal as received by the human ear and the magnitude of sound level in this scale is denoted as dB(A). The sound levels are expressed in dB(A) scale. Noise levels were measured using an Integrating sound level meter, with an indicating mode of Lp and Leq. Keeping the mode in Lp for few minutes and setting the corresponding range and the weighting network in "A" weighting set the sound level meter was run for one hour time and Leq was measured at all locations. Day time Leq and night time Leq values were computed from these measured 1-hour Leq values. The day noise levels represent the value during 6.00am to 10.00pm and night noise levels, during 10.00pm to 6.00am at all the eight locations covered under the study.

- The noise levels are found between 42.6 to 64.6 and 37.2 to 52.8 for day and night time respectively.
- The high levels of noise in day at Project Site can be attributed due to, construction operation and vehicular activities. The night levels of Noise are low since the more activities are carried out in day time.
- The noise levels at all location are well below the NAAQS standards w.r.t. noise.

### **WATER QUALITY**

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Water of high quality is essential to human life, and water of acceptable quality is essential for agricultural, industrial, domestic and commercial uses; in addition, most recreation is water-based; therefore, major activities having potential effects on surface water are certain to be of appreciable concern to the consumers.

Water samples were collected from 11 locations (6 Surface Water & 5 Ground water). Samples were collected as per IS: 3025 (Part 1) methodology. Necessary precautions were taken while collecting, preserving, and transporting the samples. The parameters like pH, temperature and DO were measured at the site while collecting the sample. For analyzing other parameters, the samples were brought to Head Laboratory situated in Noida. All the parameters were analyzed as per "Methods of Sampling and Test (Physical and Chemical) for Water and waste water" IS: 3025 and 'Standard Methods for the Examination of Water and Waste water' APHA. The results are then compared with the CPCB Water Quality Criteria of water. Water samples were collected from the study area to assess the water quality during the study period.

#### Interpretation of surface water Results

- The analysis results indicate that the pH value is 7.69 to 8.45.
- The TDS was observed as 24560 to 30850 mg/L.
- The sulphate was found as 36 to 64 mg/L.
- Total hardness ranges between 115 to 154 mg/L.
- COD ranges between 35 to 88 mg/L
- BOD ranges between 2.4 to 6.5 mg/L

Analysis results of ground water reveal the following:

- The analysis results indicate that the pH value is 7.32 to 7.62 which is well within the specified standard of 6.5 to 8.5.
- The TDS was observed as 160 to 300mg/L.
- The chlorides were found as 74 to 106mg/L.
- The sulphate was found as 28 to 41mg/L.
- Total hardness ranges between 202 to 302mg/L.
- Metals: Iron is found as <0.2mg/L.

### **MARINE WATER SAMPLE**

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The physico- chemical properties of the creeks and marine water were studied to understand the water quality of the region. This would also help to adopt the mitigation measures during the project activities.

#### **Marine Water Quality**

In the present survey sites pH varied between 7.37 to 7.92 and dissolved oxygen was 6.6 to 7.1mg/l which is ideal for a marine ecosystem. Dissolved oxygen levels are not reduced to anoxic conditions. Under these circumstances, there is no possibility of any of the chemicals or metals being leached into the water. Moreover, sediment samples collected from all the sites were uncontaminated. As such no adverse impact due to the construction of project on the chemical characteristics of water or sediment is expected.

## **LANDUSE/LAND COVER BASED ON THE SATELLITE IMAGE:**

Total area considered for land use is 45230.05ha (~10 km radius). Out of this, Contribution of Agriculture land is 0.83 %, Settlement is 19.12 %, Vegetation is of 7.96 %, Wetland and waste land contribution is about 14.63 % and 6.85 % Respectively.

**Table 3 :Land Use**

<b>Class name</b>	<b>Area in Ha</b>	<b>Area in km<sup>2</sup></b>	<b>Area%</b>
Agriculture	376.29	3.76	0.83
Settlement	8650.05	86.50	19.12
Vegetation	3601.06	36.01	7.96
Wetland	6616.23	66.16	14.63
Waste Land	3099.47	30.99	6.85
<b>TOTAL</b>	<b>45230.05</b>	<b>452.23</b>	<b>100</b>

## **FLORA AND FAUNA**

The flora shall be covered with the sediments that will be suspended and dispersed due to construction activities. The fish and other nektonic organisms shall move away from the area to avoid the change in the environment. The benthos includes the organisms that live on or in the sediment at the bottom of the sea. The benthic community is complex and is composed of a wide range of plants, animals and bacteria from all levels of the food chain. It can be differentiated by their habitat: in fauna are animals and bacteria of any size that live in bottom sediments, such as worms and clams. They form their own community structures within bottom sediments, connected to the water by tubes and tunnels. Epifauna are animals that live either attached to a hard surface (for example, on rocks or pilings) or move on the surface of bottom sediments. Epifauna include oysters, mussels, barnacles, snails, starfish, sponges and many other marine invertebrates. The construction work phase would increase temporarily the water turbidity. The organisms in these environments have adapted themselves to tolerate exposure to high turbidity for a longer time. Therefore, organisms are less prone to disturbance by construction activities. The Benthic organisms found in the study area include commonly occurring local species that does not fall under the category of endangered species. Thus, minimum impact is envisaged on the local benthic species at the project site. No new or alien species are expected to be introduced during or after the completion of project construction.

The flora and fauna in and around the JNPA area are influenced by its coastal location and industrial activities

### **Flora:**

1. **Mangroves:** The coastal areas around JNPA are home to mangrove forests. Mangroves play a vital role in maintaining coastal ecosystems, providing habitats for various species and protecting the shoreline from erosion.
2. **Salt-Tolerant Vegetation:** Given the saline nature of the coastal environment, you'll find various salt-tolerant plants and grasses adapted to these conditions.

3. Seagrasses: In the shallow coastal waters, seagrass beds can be found. These serve as important habitats for marine life, including small fish and invertebrates.

4. Coastal Plants: Various coastal plants like the screw pine (*Pandanus tectorius*), casuarina trees, and beach morning glory may be found in the vicinity.

#### **Fauna:**

5. Birdlife: The JNPA area attracts a variety of migratory and resident birds. You can spot waterfowl, waders, and shorebirds in and around the wetlands and coastal areas. Some common species include herons, egrets, gulls, terns, and plovers.

6. Fish and Marine Life: The coastal waters of JNPA are home to a diverse range of fish species, including commercially important ones like mackerel, pomfret, and prawns. You may also find crabs, lobsters, and various mollusks.

7. Insects and Invertebrates: Coastal regions are rich in insect and invertebrate life. You can find crabs, snails, and various insects that are adapted to the coastal environment.

8. Marine Mammals: Occasionally, marine mammals like dolphins can be spotted in the waters near JNPA.

## **MARINE ECOLOGY**

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### **I) PHYTOPLANKTON**

Phytoplankton population and diversity was comparatively good during this sampling. The phytoplankton was represented by 21 genera. Phytoplankton of the sampling stations at sub surface layer was varying from 40-2715 units/cells/L in harbour area. In the present investigation, the diatoms were found to be the dominant group. *Biddulphi* sp., *Pleurosigma* sp., *Coscinodiscus* sp., *Cyclotella* sp., *Hemodiscus* sp., *Thalassiosira* sp., *Skeletonema* sp. and *Navicula* sp. etc. were prominent genera. Harrison et al (1991) reported that the rapid proliferation of *Skeletonema* in nutrient rich areas is due to the input of organic waste. Indiscriminate disposal of sewage and industrial waste have been the major cause for the nutrient enrichment in coastal waters leading to reduction in diversity but with increase in total biomass, promoting some opportunistic algal species to dominate and suppress others (Dedegren, 1992 and Kimor, 1991).

### **II) Zooplankton**

Zooplankton is an important constituent of pelagic ecosystems. Zooplankton feed on the phytoplankton, bacteria, microorganism and all fresh water fishes feed on zooplankton at some stages in their life history. Zooplankton population and diversity was comparatively good during this sampling. The zooplankton was represented by 13 genera.

The marine ecology of the Jawaharlal Nehru Port Authority (JNPA) area is influenced by its location along the Arabian Sea and its status as one of India's busiest ports. Here are some key aspects of the marine ecology of JNPA:

1. **Marine Biodiversity:** The waters around JNPA support a diverse range of marine life, including fish, invertebrates, and various species of plankton. The Arabian Sea is known for its rich biodiversity, and JNPA plays a role in both the conservation and management of these resources.
2. **Mangrove Ecosystems:** Mangrove forests are an essential part of the coastal marine ecology in the JNPA region. Mangroves serve as breeding grounds for various fish species, provide habitat for birds, and act as a natural buffer against coastal erosion and storm surges.
3. **Coral Reefs:** While the immediate vicinity of JNPA does not have coral reefs, the Arabian Sea, including areas farther offshore, does have coral reef ecosystems. These reefs are important for marine biodiversity and the local economy, as they support tourism and fisheries.
4. **Fisheries:** The waters around JNPA are vital for commercial and artisanal fisheries. Local fishermen rely on these waters for their livelihoods, and the port plays a role in managing and sustaining these fisheries.
5. **Migratory Species:** The Arabian Sea serves as a migration route for various marine species, including whales, dolphins, and sea turtles. These animals may pass through or inhabit the waters around JNPA during certain times of the year.
6. **Pollution and Conservation:** The industrial activities associated with the port can have negative impacts on marine ecology, including water pollution and habitat disturbance. Efforts are made to minimize these impacts through environmental regulations and conservation initiatives.
7. **Coastal Erosion and Sedimentation:** The construction and maintenance of port infrastructure can alter coastal dynamics, leading to erosion in some areas and sedimentation in others. These changes can affect marine ecosystems and require management measures.
8. **Environmental Monitoring:** JNPA conducts environmental monitoring to assess the health of its marine ecosystems. This includes water quality assessments, biodiversity studies, and habitat mapping.
9. **Conservation Efforts:** Conservation organizations and government agencies work to protect and conserve marine life in the Arabian Sea, including areas near JNPA. These efforts may include the establishment of marine protected areas, habitat restoration, and sustainable fisheries management.

## **SOILQUALITY:**

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A number of parameters were determined, which are indicative of physical, chemical and fertility characteristics. Sampling and analysis was conducted as per established

standard methods and procedures prescribed in <sup>16</sup>IS 2720 and <sup>17</sup>ASTM. Soil samples were collected by ramming a hand auger into the soil up to a depth of 90cm. At each of the sampling location, soil samples were collected from three different depth viz. 30 cm, 60 cm and 90cm below the surface and homogenized. The homogenized samples were then packed in a polythene plastic bag and sealed. The sealed samples were sent to the Laboratory for analysis. The physical and chemical characteristics were determined for all the samples.

- The analysis results show that soil is basic in nature as pH value ranges from 7.42 to 7.62 with organic matter 1.74% - 1.96%.
- The concentration of Nitrogen (10.26 mg/100gm to 11.00 mg/100gm) Phosphorus (0.62 to 0.80mg/100gm) and Potassium (7.96 to 9.37 mg/100gm) has been found to be in good amount in the soil samples. The soil is found to be suitable for agricultural purpose.
- The soil will not be affected by proposed project since the project & its allied activities will not affect the nearby soil quality of area.

## **SOCIO-ECONOMIC ENVIRONMENT**

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Proposed project will require number of workers to be employed by the contractor. The contractor shall mobilize local manpower and provide them with clean and sanitation facilities. Supply of clean fuel such as PG/Kerosene to labourers for cooking shall also be encouraged so as to avoid loss of green cover and better occupational health of the workers during construction. During the operation phase, a small number of skilled and unskilled workers may get direct and indirect employment, which will have positive impact on society.

The other indirect employment opportunities in the area are also likely to be generated after the project implementation.

## **IMPACT ANTICIPATED**

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### **Potential Impacts and Mitigation Measures of various Project Activities during**

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<sup>16</sup>IS-Indian Standard

<sup>17</sup>ASTM-American Society for Testing and Materials.

## OPERATIONPHASE

**Table 4: Anticipated Impact during Operation Phase**

Sr.	Activity	Components likely to be impacted	Impacts	Mitigation Measures	Responsible Agency
1	Cargo handling, DG sets, storage areas & Transportation vehicles	Air Quality	Emissions from DG sets (during Power failure), Vehicular emissions Emissions from Cargo Handling	Use of low Sulphur diesel fuel is proposed Wind screens will be effectively used to reduce fugitive dispersion Regularization of truck movement Use of tarpaulin covers to avoid fugitive dust Speed regulations for vehicles engaged in transportation Greenbelt Development	JNPA

Sr.	Activity	Components likely to be impacted	Impacts	Mitigation Measures	Responsible Agency
		Noise	Due to equipment handling and vehicular movement	Acoustic Barriers and Enclosures Personal Protecting Equipment(PPE) Greenbelt Development	JNPA
		Traffic Addition	Cargo movement from/to port	A dedicated road network for the movement of trucks. Regularization of truck movement	JNPA
2	Cargo and Oil spills	Marine water quality and ecology	Change in marine water quality	<p>Wastewater/sewage have a potential to pollute marine water or soil, if disposed untreated. However, the treatment of sewage in STP will minimize the impact &amp; increase availability of water for greenbelt development.</p> <p>In case of any cargo spillage during transfer from/to ships, it will be attempted to recover the spills.</p> <p>Oil spill control equipment such as booms / barriers will be provided for containment and skimmers will be provided for recovery.</p>	JNPA
3	Water Supply	Water Resource	Impact on existing water resource	<p>Water requirement 50 KLD during operation phase and this water will be met from MJP water supply.</p> <p>Water treatment plant, storage and distribution network will be developed.</p>	JNPA/ Port Operator

Sr.	Activity	Components likely to be impacted	Impacts	Mitigation Measures	Responsible Agency
4	Waste water Discharge	Water Quality	Impact due to discharge of runoff from container storage and sewage from port and port premises	<p>Separate Collection and treatment for oil and grease for runoff from workshop area, truck parking etc.</p> <p>Sewage treatment plant will be constructed within port area and port colony area</p> <p>Treated waste water from STP will be used for irrigating the greenbelt</p>	JNPA
5	Solid waste Management	Ground water and Soil quality	Impact due to disposal of solid waste on ground without treatment	<p>An integrated solid waste management at JNPA.</p> <p>Composted bio-degradable waste will be used as manure in greenbelt. Other recyclable wastes will be sold.</p>	JNPA
6	Handling of hazardous wastes	Fire accidents due to products handling	Human life and loss of property	<p>Hazardous materials if any will be stored as per the prescribed/approved safety norms.</p> <p>Hazardous wastes (used oil) will be sent to MPCB/CPCB approved recyclers.</p> <p>Medical facilities including first aid will be available for attending to injured workers</p> <p>Emergency alarms, provision of fire hydrant system and fire station.</p> <p>Recovery of spills to the extent possible.</p>	JNPA

<b>Sr.</b>	<b>Activity</b>	<b>Components likely to be impacted</b>	<b>Impacts</b>	<b>Mitigation Measures</b>	<b>Responsible Agency</b>
7	Operation of port	Socio-economic conditions of the region	During operational phase, the port is likely to generate direct employment of 450-500Nos. Local people will be given preference based on their qualification and skill set. Together with this employment potential, project will help to enhance the socio-economic conditions of the area with better schooling, communication and transport facilities that will be developed as a part of overall economic development of the region.		

## **ENVIRONMENT MANAGEMENT PLAN**

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Environmental Management Plan (<sup>18</sup>EMP) reviews the adequacy of various pollution control measures envisaged for the project mitigating various environmental impacts identified and assessed. Additional mitigation measures, if required to ensure sustainable power generation are also suggested. EMP has been prepared separately for construction and operation phases. It describes administrative aspects of ensuring that mitigation measures are implemented and their effectiveness is monitored. It also includes green belt development plan. Each of the mitigation measure has been assessed with respect to:

- Adoption of state of art technological measures
- Identification of human resources for its effective implementation
- Allocation of financial resources for its effective implementation and
- Effectiveness of mitigation measure in mitigation of impacts

EMP specifies various technological measures for pollution prevention, waste minimization, end-of-pipe treatment, attenuation etc. proposed to be undertaken to mitigate the environmental impacts on each sector of environment during each phase of the project, i.e., construction phase and operation phase.

### **Environmental Management Plan during Operation Phase**

**Air environment:** The major source of air pollution will be dust from Cargo handling and emissions from <sup>19</sup>DG sets and vehicles. Use of low Sulphur diesel, regularization of truck movement, use of tarpaulin covers, use of grab unloaders or clamp-shell buckets, closed conveyor can avoid dust emission in atmosphere. Speed regulations will be imposed on vehicles engaged in transportation. Control measures during loading cargo to minimize <sup>20</sup>PM concentrations will be in place. Stock piles, excavated earthen materials etc. shall be managed with water sprinkling to avoid dust /soil being airborne from the specific site.

Material Handling Cranes have been considered using grab unloaders or clamp- shell buckets during cargo handling from barges to the jetty / berth. The aim is to make use of Grab unloaders or clamp-shell buckets to reduce dust, spillage, handling loss etc. during cargo discharging from the barges at Jetties.

Liquid tank farm facilities along with loading bays are planned and will be connected to the berths via pipelines running along the approach trestle.

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<sup>18</sup>EMP-Environmental Management Plan

<sup>19</sup>DG-Diesel Generator

<sup>20</sup>PM-Particulate Matter

**Noise Environment:** The major noise sources will be machinery and DG set. The employees working near the noise generating sources will be provided with earplugs/<sup>21</sup>PPE. The additional extensive greenbelt proposed to be developed around the plant will also help in attenuating the noise levels further.

**Marine water Environment:** Sewage have a potential to pollute marine water or soil, if disposed untreated. However the treatment of sewage in 22STP will minimize the impact & increase availability of water for flushing, greenbelt development/ dust suppression measures. In case of any cargo spillage during transfer from/to ships, it will be recovered to the possible extent. Oil spill control equipment such as booms / barriers, skimmers, absorption pads etc. will be provided for recovery of spilled oil. The Oil spill contingency plan will be framed to provide quick response to oil spill for efficient recovery.

- Ships will be prohibited from discharging waste-water (except treated sewage), bilge, oil wastes, etc. into the near-shore as well as harbor waters.
- As a mitigation measure for spillages an Oil spill Contingency Plan will be prepared and implemented.
- Storage areas will be protected using garland drains so as to avoid mixing of runoff from these areas.
- A comprehensive greenbelt will be developed within the premises as per CPCB guidelines.
- Native species for plantation and creation of perching sites for birds for birds will be promoted.
- Regular monitoring of the local area will be done to inspect any residual impacts on ecology or marine environment caused by the project operation.

**Water Environment:** Water requirement will be 50 KLD during operation phase and that will be met from MJP water supply scheme at the project site or Tanker water supply. Sewage treatment plant will be constructed within port area. Treated wastewater from STP will be used for flushing, greenbelt or dust suppression measures.

**Land Environment:** The project is located between NSICT existing container berth and existing Shallow water Berth of JNPA.

All air emission control systems will be installed and operated to comply with the CPCB/MPCB norms. Sewage treatment plant system will be installed and operated to comply with the norms. All the solid waste will be disposed as per norms. Hence there will not be any adverse impact on land environment due to the present proposal.

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<sup>21</sup>PPE-Personal Protective Equipment

<sup>22</sup>STP-Sewage Treatment Plant

**Hazardous wastes** (used oil from DG etc.) will be sent to MPCB/CPCB approved recyclers. Medical facilities including first aid will be available for attending to injured workers. Emergency alarms, provision of fire hydrant system and fire extinguisher will be installed. Effective Disaster Management Plan (<sup>23</sup>DMP) which covers onsite and offsite emergency plans. Oil Spill Contingency Plan will be in place to combat an accidental oil spill and containment and recovery of the spilled oil to the extent possible will be the preferred/approach. Dust suppression measures such as water foggers, etc. will be used and will be set at effective height to cover maximum stockpile area.

**Green belt development:** green belt development will further enhance the environment quality through limitation of air emissions, attenuation of noise levels, balancing eco-environment, prevention of soil erosion and creation of aesthetic environment.

### **Occupational Safety & Health**

During operational phase, the port is likely to generate direct & indirect employment of 450-500 Nos. Rules and Safety guidelines as stipulated in the Indian Factories Act, 1948 will be followed. Risk assessment will be carried out in the yard on a regular basis. The goal for each risk assessment session is to identify hazards, determine risk ratings and controls and to review the implementation of risk controls from previous risk assessment sessions. Assessed risks and steps for prevention and control of loss/damage due to accidents will be communicated to employees through hoardings, boards, posters and internal company communications. Control room will be provided at Admin & Main building. First Aid Centres will be established at different strategic locations.

## **ENVIRONMENTAL MANAGEMENT AND MONITORING**

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Regular monitoring of the various environmental parameters is necessary to evaluate the effectiveness of the management programme so that the necessary corrective measures can be taken in case there are some drawbacks in the proposed programme. Since environmental quality parameters at work zone and surrounding area are important for maintaining sound operating practices of the project in conformity with environmental regulations, the post project monitoring work forms part of Environmental Monitoring Program. Environmental Monitoring Program will be implemented once the project activity commences. Environmental Monitoring Program includes: (i) environmental surveillance (ii) analysis and interpretation of data (iii) preparation of reports to support environmental management system and (iv) organizational set up responsible for the Implementation of the programme.

The Continuous monitoring of Environmental parameters like air, water, noise, soil, and meteorological data and performance of pollution control facilities and safety measures

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<sup>23</sup>DMP-Disaster Management Plan

for the project are vital for Environmental management of any project. JNPA will carry out environmental monitoring facilities by the environmental and safety department to monitor air and water pollutants as per the guideline. Moreover, air, noise, drinking water, and soil is being monitored by outside agencies authorized by Pollution Control Board at regular frequencies.

In order to maintain the environmental quality within the standards, regular monitoring of various environmental components is necessary. In Jawaharlal Nehru Port Authority, an Environment Management Cell (<sup>24</sup>EMC) for environment monitoring and control already exists. Groups of qualified and efficient engineers with supporting staff are deputed for maintenance, up keeping and monitoring the pollution control equipment, to keep them in working at the best of their efficiencies. The environment monitoring and ambient air quality monitoring is being done by authorized laboratories approved by MoEF&CC as well as State pollution control board.

### **BUDGET FOR ENVIRONMENTAL MANAGEMENT PLAN**

**Table 5 : Budget for EMP**

<b>Sr.</b>	<b>Items</b>	<b>Cost (in lakhs) During Construction</b>	<b>Cost (in Lakhs) During Operation</b>
1	Air Environment	3.5	1.3
2	Water Environment	3.5	1.5
3	Noise Environment	2.5	1.2
4	Ecology Management	2.9	1.3
5	Training and Education	2.5	--
6	Social Awareness	3.0	1.0
	<b>Total EMP Cost</b>	<b>17.9</b>	<b>6.3</b>

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<sup>24</sup>EMC-Environmental Management Cell