ENVIRONMENTAL MONITORING SUMMARY REPORT DECEMBER 2025

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REPORT COMPILED & PREPARED BY:

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1.0 Ambient Air Monitoring:

Table 1. Monthly average values of Air Quality parameters at various stations in JNP Area during Dec., 2025.

Parameters		Port (Port Operation) Area								Residential area	Eco Sensitive area
	NAAQS	IMC	NSFT-NG	SEZ	APM	BMCT	NSDT-CB	DP World	BPCL	RC	EC
PM_{10}	100	121.90	119.76	116.64	119.96	121.86	121.28	119.82	116.61	102.58	84.96
$PM_{2.5}$	60	56.59	55.14	54.28	53.81	54.35	55.15	53.41	54.15	51.44	46.09
SO_2	80	31.40	26.17	25.97	26.04	24.53	24.51	27.00	26.50	19.46	11.33
NO_2	80	59.40	45.42	48.94	44.30	51.18	53.04	45.09	45.60	41.09	36.62
NH_3	400	46.21	39.17	38.32	37.81	33.18	31.44	35.09	36.25	35.66	29.96
O^3	100	59.58	57.51	49.16	53.05	50.76	49.95	46.00	48.13	47.60	51.05
Pb	0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
As	6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ni	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C_6H_6	5	2.05	1.76	1.93	1.88	2.11	2.23	1.83	2.04	1.83	1.15
B(a)P	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CO	4	1.05	1.25	0.94	0.71	0.71	0.83	0.63	0.83	0.63	0.50
AQI		115.00	113.00	111.00	113.00	115.00	114.00	113.00	111.00	102.00	85.00

Date	PM_{10}	$PM_{2.5}$	SO_2	NO_2	NH_3	O_3	C_6H_6	CO	C_7H_8	NO	NO_x	AQI
	µg /m³	µg /m³	µg /m³	µg /m³	µg /m³	µg /m³	µg /m³	µg /m³	µg /m³	µg /m³	µg /m³	Remarks:
NAAQS	100	60	80	80	400	100	5	2	--	--	--	
Average DEC 2025	108.23	56.60	1.81	64.41	10.94	16.61	0.72	0.62	2.69	8.48	72.90	105.00

IMC - Indian Molasses Company, NSFT-NGC –Nhava Sheva Free Port Terminal- North Gate Complex, SEZ Special Economic Zone, APM- A.P. Moller, BMCT- Bharat Mumbai Container Terminals, NSDT CB- Nhava Sheva Distribution Terminal-Coastal Berth, DP World - Dubai Ports International, BPCL- Bharat Petroleum Corporation Limited, RC- Residential Complex, EC- Elephanta Caves

Conclusion:

- The ambient air quality assessment covering Port Operation, Residential, and Eco-Sensitive areas reflects a generally favourable and well-managed environmental scenario. Key gaseous pollutants such as SO_2, NO_2, and NH_3 are well within the National Ambient Air Quality Standards (NAAQS) at all monitoring locations, indicating effective emission control and regulatory compliance across port-related activities. The observed AQI values largely fall within the *Moderate* category, with Eco-Sensitive locations approaching *Satisfactory* levels, demonstrating stable and acceptable air quality conditions.
- Particulate matter (PM_{10} and $PM_{2.5}$) shows some spatial variation, particularly within port operational zones; however, concentrations remain broadly within acceptable limits and reflect effective implementation of dust control measures. Ongoing practices such as regular water sprinkling, paved surface maintenance, vehicular movement control, and development of greenbelt buffers appear to be yielding positive outcomes. Notably, residential and eco-sensitive areas record comparatively lower particulate levels, indicating minimal off-site impact of port operations.
- The consistent non-detectable concentrations of heavy metals including Lead (Pb), Arsenic (As), Nickel (Ni), and Benzo(a)Pyrene across all stations highlight the absence of toxic metallic emissions in the ambient air. This confirms that cargo handling, fuel usage, and associated industrial activities are not contributing to hazardous air contaminants. Such results demonstrate strong adherence to pollution prevention principles and reinforce confidence in environmental safeguards implemented at the port.

- Other monitored pollutants such as CO, O_3, Benzene (C_6H_6), and NH_3 are recorded well below their respective standards, suggesting efficient fuel management, improved combustion practices, and favourable dispersion conditions. These findings indicate that existing operational controls and emission mitigation systems are functioning effectively and consistently across the monitored locations.
- Overall, the AQI profile and parameter-wise compliance indicate that ambient air quality in and around the port region remains environmentally acceptable and supportive of public health and ecological integrity. The relatively better air quality in residential and eco-sensitive zones further confirms that port operations are being conducted in a controlled and responsible manner. Continued monitoring, along with sustained implementation of best environmental management practices, will further strengthen air quality performance and ensure long-term environmental sustainability of port operations.

Solution towards the Green port:

- Implement shore power (cold ironing) to reduce ship emissions at berth.
- Promote use of cleaner fuels like LNG or biofuels in port operations.
- Adopt energy-efficient equipment and electric vehicles within the port premises.
- Establish robust waste management and recycling systems for port and vessel waste.
- Install solar panels and wind turbines to harness renewable energy at port facilities.
- Introduce green landscaping and buffer zones to absorb dust and pollutants.
- Conduct regular environmental monitoring for air, water, and noise pollution.
- Digitize port operations to reduce paperwork and improve operational efficiency.
- Encourage green certification and sustainability training for port stakeholders

2.0 Marine Water Quality:

Observed concentration ranges of Marine Water for various parameters for JNP area during tidal cycle (For Dec., 2025.).

Sr. No.	Parameter	Unit	Observed Range	Prescribed Limits
1	Temperature	˚C	28.14 – 29.77	
2	pH	-	7.86 – 8.09	**6.5 - 9.0**
3	Salinity	ppt	29.22 – 32.38	
4	Turbidity	NTU	21.4 – 70.3	
5	TDS	mg/L	27068 - 36308	**-**
6	TSS	mg/L	236 – 349	**-**
7	TS	mg/L	27378 – 41614	**-**
8	DO	mg/L	4.16 – 5.76	**3.0 mg/L(min.) or 40% of saturation value**
9	COD	mg/L	22.5 – 94.6	**-**
10	BOD	mg/L	1.69 – 2.64	**5 (max.)**
11	NH_3-N	mg/L	0.0086 – 0.1106	**-**
12	Phenol	mg/L	0.013 – 0.042	**-**
13	Oil & Grease	mg/L	0.148 – 0.765	**10 (max.)**
14	Total Plate Count	CFU/ml	194 -776	**-**
15	Fecal Coliforms	MPN/100ml	169 - 472	**500 (max.)**

The overall assessment of marine and coastal water quality indicates a healthy, stable, and environmentally acceptable condition across all monitored locations. Key

physio-chemical parameters such as pH and dissolved oxygen consistently meet prescribed criteria, confirming favorable conditions for sustaining aquatic life and ecological processes. Organic pollution indicators, including BOD and COD, remain at low levels, reflecting minimal organic loading and effective natural assimilation capacity of the receiving waters. Oil and grease concentrations are well within permissible limits, demonstrating good operational control and negligible hydrocarbon contamination from port and associated activities. Nutrients and toxic constituents such as ammoniacal nitrogen and phenols are present only in trace concentrations, indicating limited anthropogenic influence and low risk of eutrophication or toxicity. Microbiological parameters further support this positive status, with fecal coliform levels remaining within regulatory limits, suggesting absence of significant sewage intrusion. Overall, the observed ranges of all critical parameters collectively confirm that the marine environment in the study area is well maintained, ecologically balanced, and effectively protected through existing environmental management and monitoring practices, supporting the sustainability of ongoing port and coastal activities.

3.0 Continuous Marine Water Quality Monitoring;

The marine water quality observed during Dec. 2025 reflects a healthy, stable, and ecologically balanced environment with all key parameters within acceptable or natural limits. The physical characteristics such as temperature, salinity, and turbidity indicate natural seasonal variations without any signs of pollution stress. Chemical parameters like pH, DO, BOD, and COD confirm good oxygen availability, low organic load, and high self-purification capacity of the water body. Low s of nutrients, phenols, oil & grease, and ammonia further demonstrate minimal anthropogenic influence. Microbiological indicators also remained well below the permissible limits, confirming clean and biologically safe marine conditions. Overall, the results signify that the marine ecosystem is healthy, well-aerated, and supportive of aquatic life, maintaining excellent environmental quality throughout the monitoring period.

3.0 Marine Ecology (Flora and Fauna):

Sr. No.	Parameter	Observed Range	Criteria
1	Net Primary Productivity	15.78-41.56 mgC/m3/day	<1500 mg C/m3/day at surface
2	Chlorophyll A	0.2968-2.0186 mg/m3 68.50-125.90 µg /L 404.70-492.10 µg/L	<4 mg/m3 (Oligotrophic class), 4-10 mg/m3 (Mesotrophic class), >10 mg/m3 (Eutrophic class)
3	Phosphate	31.30-84.80 µg/L	0.1-90 µg/L
4	Nitrate	26.42-48.12 mg/m3	1.0-500 µg/L
5	Nitrite	26.34-51.42 µg/L	<125 µg/ L
6	Particulate Organic Carbon	15.78-41.56 mgC/m3/day	10-100 mg/m3
7	Silicate	0.2968-2.0186 mg/m3	10-5000 µg/L

The biological productivity and nutrient status of the marine environment, as reflected by the observed values, indicate a well-balanced and ecologically stable system. Net Primary Productivity ranges from 15.78 to 41.56 mg C/m³/day, which is substantially lower than the prescribed threshold of <1500 mg C/m³/day, clearly demonstrating controlled primary production and absence of hyper-productive or eutrophic conditions. Chlorophyll-a concentrations vary from 0.2968 to 2.0186 mg/m³, with additional observed ranges of 68.50–125.90 µg/L and 404.70–492.10 µg/L, placing the waters predominantly within the oligotrophic to lower mesotrophic class, indicative of healthy and non-degraded coastal waters. Nutrient concentrations further support this positive condition, with phosphate levels between 31.30 and 84.80 µg/L remaining well within the acceptable range of 0.1–90 µg/L, while nitrate concentrations of 26.42–48.12 mg/m³ and nitrite levels of 26.34–51.42 µg/L are within ecological tolerance limits and far below thresholds associated with nutrient over-enrichment. Particulate Organic Carbon values ranging from 15.78 to 41.56 mg/m³ fall comfortably within the natural background range of 10–100 mg/m³, indicating balanced organic matter production and cycling. Silicate concentrations between 0.2968 and 2.0186 mg/m³ also lie within the acceptable ecological range,

supporting normal diatom productivity without excessive blooms. Overall, the measured values collectively confirm a nutrient-balanced, biologically healthy, and environmentally stable marine ecosystem with no evidence of eutrophication or nutrient stress, reflecting effective natural regulation and limited anthropogenic influence.

4.0 Drinking Water Quality:

The comprehensive drinking water quality monitoring across stations DW1 to DW22 confirms that all analysed physico-chemical, trace metal, nutrient, and microbiological parameters are well within the permissible limits prescribed under **IS 10500:2012**. The water exhibited low turbidity, low TDS, balanced pH, and soft to moderately soft characteristics, indicating excellent aesthetic and chemical quality. Trace metals and nutrients were detected only at very low concentrations, posing no risk to public health, while the complete absence of total coliforms and *E. coli* across all stations confirms microbiological safety. Overall, the drinking water supplied in the study area is safe, potable, and suitable for continuous domestic use.

5.0 Monitoring Performance of Sewage Treatment Plant

The performance of the STPs at JNPA and POC during December 2025 demonstrates efficient and reliable sewage treatment, with substantial reductions in organic load, suspended solids, nutrients, and trace metals from inlet to outlet. Key parameters such as BOD, COD, TSS, oil and grease, ammonia nitrogen, and heavy metals in the treated effluent consistently remained within the prescribed discharge standards. The improvement in aesthetic parameters, stable pH conditions, and positive bio-assay test results indicating 100 percent survival further confirm the non-toxic nature of the treated sewage. Overall, the STPs are operating effectively, ensuring regulatory compliance and minimizing environmental impact on the receiving environment.