JSW Dharamtar Port Pvt. Ltd

Regd. Office : JSW Centre,
Bandra Kurla Complex,
Bandra (East), Mumbai - 400 051
CIN. : U93030MH2012PTC236083
Phone : +91 22 4286 1000
Fax : +91 22 4286 3000
Website : www.jsw.in

10th June, 2019

To,
The Director
Ministry of Environment, Forest & Climate Change,
Regional Office,
Ground Floor, East Wing,
New Secretariat Building, Civil Lines,
Nagpur – 440 001

Subject: **Compliance status of Environmental Clearance for Captive jetty at Dharamtar, Dolvi, Raigad, Maharashtra**

Reference: **i. Ministry of Environment & Forest (MoEF) Clearance vide no. J- 16011/6/94-IA.III dated 4th January, 1995**

ii. Ministry of Surface Transport (MoST) Clearance vide no. J-16011/6/94-IA-III/PD.IV dated 12th January, 1997

iii. Ministry of Environment, Forest & Climate Change, Government of India. Letter F.No. 11-79/2013-IA.III dated 26th November, 2015.

Dear Sir,

You are aware that JSW Dharamtar Port Private Limited is operating the Dharamtar jetty at Dolvi, district Raigad, Maharashtra. The environmental clearance for the same was obtained as per the reference I, II and III mentioned above.

We are hereby submitting the six monthly compliance report for the months December 2018 to May 2019.

Yours faithfully,

For **JSW Dharamtar Port Private Limited**

(Authorized Signatory)

COMPLIANCE STATUS OF CAPTIVE JETTY AS PER ENVIRONMENTAL CLEARANCE UPTO MAY, 2019

Ref: Clearance for existing Captive Jetty by M/s. JSW DHARAMTAR PORT PRIVATE LIMITED (Formerly known as M/s Nippon Denro Ispat Ltd.) in Raigad District of Maharashtra.

Ref: MOEF Letter No J-16011 / 6 / 94 - IA - III dated 04-01-1995.

Clause No.	Clearance Condition As per MoEF Letter No. J-16011/6/94-1A.III dated 4th January, 1995	Compliance Status up to May 2019
2 - i)	The materials will be carried to and from Sponge Iron Plant by a closed conveyer belt system without causing any dust or spillage to avoid environmental damage. Transfer points must have adequate dust extraction and control systems.	The cross-country conveyer and the conveyor belt is covered from all sides to protect spillage of materials and dust in order to control the pollution. The dust suppression system is provided at the transfer points.
ii)	Dredging operations should be undertaken in consultation with an Expert Institute such as Central Water and Power Research Station (CWPRS) Pune, or any other institute, to ensure that dredging operations do not cause any adverse impact on surface and ground water and marine productivity in the vicinity.	Dredging operation was undertaken in consultation with M/s Maharashtra Maritime Board. (A Govt. of Maharashtra Undertaking). Maintenance dredging is carried out annually with permission from Maharashtra Maritime Board. Adequate mitigation measures are implemented to ensure that there is no adverse impact on surface and ground water. The marine productivity in the vicinity is not impacted.
iii)	The dredged material shall be dumped only at the dumping sites approved by Mumbai Port Trust.	The dredged material is disposed at the site designated by CWPRS. The site is designated by CWPRS through mathematical model studies conducted as a part for obtaining Environmental and CRZ Clearance for the expansion of the jetty.
iv)	During dredging, construction and maintenance stages, the water quality parameters at the bottom level should be inspected and periodic records be maintained. Tests should be carried out to measure water quality parameters viz. Turbidity, Dissolved Oxygen, Ammonical Nitrogen and other parameters which must be maintained within the prescribed standards issued under GSR 422 (E) dated 19-05-1993 as amended on 31-12-1993.	The Jetty water quality monitoring was carried out during dredging & construction activities at Jetty area. Jetty water quality monitoring is done on monthly basis and reports are submitted to MoEF&CC every six months.
v)	The project authority would install a	Jetty water quality monitoring is done

	monitoring system, so that loading / unloading operations at jetty do not cause any damage to the sea water quality and that the water quality should be maintained as per the standards prescribed by Maharashtra Pollution Control Board / Central Pollution Control Board.	on monthly basis and reports are submitted to MoEF&CC regularly. Adequate measures are adopted to prevent any fall out into the water bodies during the loading and unloading activities. The reports reveal that the parameters are well within the standards prescribed by Maharashtra Pollution Control Board / Central Pollution Control Board.
vi)	Screening of pollutants in the harbor water should be taken up by the project authorities and periodical monitoring reports on water quality parameters must be forwarded to this Ministry at the six monthly intervals.	Adequate measures are adopted to prevent any run off into the water. Jetty water quality monitoring is done on monthly basis and reports are submitted to MoEF&CC every six months' interval.
vii)	To prevent discharge to sewage, bilge wastes and other liquid wastes into the marine environment, adequate system for collection, treatment and disposal of liquid wastes including shoreline inter sector for receiving liquid wastes from all shore line installations and special hose connection for ships to allow for discharge of sewage must be provided.	No discharge of sewage, bilge wastes and other liquid wastes is done at Jetty area.
viii)	The quality of treated effluent, solid waste, emission and noise level must confirm to the standards laid down by competent authorities including Central / State Pollution Control Boards and under the Environment Protection Act, 1986 whichever are most stringent.	JSW DPPL is engaged in cargo handling at the jetty. No manufacturing is carried out at the jetty, thus no effluents are generated. The sewage is treated in septic tanks and then sent to STP at the steel plant for further processing. Solid waste is segregated and disposed as per the norms. The noise level in the Jetty area is maintained as per standards. Wind shields are installed at strategic locations to minimize the impact of the emissions from the cargo handling activities. Trees with thick foliage are maintained along the boundary. Ambient Air Quality monitoring is done on regular basis at Jetty. The reports are well within stipulated norms and

		reports are submitted to MoEF&CC every six months.
ix)	Appropriate devices such as oil water separator, oil monitor, oil skimmer etc. must be provided to remove all floatable material including oil spills while refueling of vessels, because of operations of cargo handling equipments and allied machinery, cranes, tractors etc., to tackle the oil pollution in the port area and marine environment.	Adequate preventive measures are adopted to avoid any oil spill due to jetty operations. An Oil Spill Contingency plan for the Jetty is in place. The jetty is well equipped with requisite equipment to curtail any incidences of oil spill.
x)	Proper fire fighting arrangement must be ensured by providing adequate number of fire hydrants in fire prone areas. The entire fire fighting line must be maintained under pressure through jockey pump and appropriate volume of dead storage water must be ensured for this purpose. The employees must be kept alert and trained to combat fire by conducting regular fire drills to keep this facility in working conditions.	Adequate fire fighting arrangement has been provided at Jetty. Fire hydrant lines are provided at the jetty. Proper training is imparted to the concerned personnel and mock drills are conducted at regular intervals.
xi)	The jetty will not be used for transporting Hazardous Material.	No hazardous material is handled at Jetty.
3	The project authorities must create sufficient in-house capability (Environmental Cell) and full-fledged laboratory to monitor and implement compliance to the prescribed safeguards and programmes related to pollution control and environmental conservation.	An Environment Cell comprising qualified personnel in the fields supervise the environmental aspects of the Jetty.
4	Adequate financial provisions must be made for implementation of the above stipulations.	Adequate financial provisions are ear marked in the annual budget.
5	In case of any deviation / alterations in the project proposal from those submitted to this Ministry for clearance, these stipulations may be modified and / or new ones imposed or the environmental clearance revoked for ensuring environmental protection.	There is no deviation / alteration in the project proposal as submitted for clearance. However, JSW Dharamtar Port Private Limited has proposed expansion of the jetty. The Environmental and CRZ Clearance for the is accorded by the Ministry of Environment, Forest & Climate Change vide letter dated 26th November, 2015. The consent to establish for the expansion project has also been granted by the Maharashtra Pollution Control Board.

6	These stipulations will be enforced among others under the Water (Prevention & Control of Pollution) Act, 1974, The Air (Prevention & Control of Pollution) Act, 1981 and the Environmental (Protection) Act, 1986.	We Regularly comply with the following Environmental Acts: i) Water (Prevention and Control of Pollution) Act, 1974. ii) Air (Prevention and Control of Pollution) Act, 1981. iii) Environmental (Protection) Act 1986. iv) Other general conditions laid down by Maharashtra Pollution Control Board.

COMPLIANCE STATUS OF CAPTIVE JETTY AS PER ENVIRONMENTAL CLEARANCE UPTO MAY, 2019

Ref: Clearance for Expansion of Captive Jetty by M/s. JSW Dharamtar Port Private Limited (Formerly known as M/s Nippon Denro Ispat Ltd.) in Raigad District of Maharashtra.

Ref: Ministry of Surface Transport Letter No J-16011 / 6 / 94 - IA - III /PD IV, New Delhi dated 12th January 1997.

Clause No.	Clearance Condition as per MoST Letter No J-16011 / 6 / 94 - IA - III /PD IV, New Delhi dated 12th January 1997.	Compliance Status up to May, 2019
2 - i)	The materials will be carried to and from Sponge Iron Plant by a closed conveyer belt system without causing any dust or spillage to avoid environmental damage. Transfer points must have adequate dust extraction and control systems.	The cross-country conveyer and the conveyor belt is covered from all sides to protect spillage of materials and dust in order to control the pollution. The dust suppression system is provided at the transfer points.
ii)	Dredging operations should be undertaken in consultation with an Expert Institute such as Central Water and Power Research Station (CWPRS) Pune, or any other institute, to ensure that dredging operations do not cause any adverse impact on surface and ground water and marine productivity in the vicinity.	Dredging operation was undertaken in consultation with M/s Maharashtra Maritime Board. (A Govt. of Maharashtra Undertaking). Adequate mitigation measures are implemented to ensure that there is no adverse impact on surface and ground water. The marine productivity in the vicinity is not impacted.
iii)	The dredged material shall be dumped only at the dumping sites approved by Mumbai Port Trust.	The dredged material is disposed at the site designated by CWPRS. The site is designated by CWPRS through mathematical model studies conducted as a part for obtaining Environmental and CRZ Clearance for the expansion of the jetty.
iv)	During dredging, construction and maintenance stages, the water quality parameters at the bottom level should be inspected and periodic records be maintained. Tests should be carried out to measure water quality parameters viz. Turbidity, Dissolved Oxygen, Ammonical Nitrogen and other parameters which must be maintained within the prescribed standards issued under GSR 422 (E) dated 19-05-1993 as amended on 31-12-1993.	The Jetty water quality monitoring has been carried out during dredging & construction activities at Jetty area. Jetty water quality monitoring is done on monthly basis and reports are submitted to MoEF&CC every six months.
v)	The project authority would install a monitoring system, so that loading /	Jetty water quality monitoring is done on monthly basis and reports are submitted

	unloading operations at jetty do not cause any damage to the sea water quality and that the water quality should be maintained as per the standards prescribed by Maharashtra Pollution Control Board / Central Pollution Control Board.	to MoEF&CC regularly. Adequate measures are adopted to prevent any fall out into the water bodies during the loading and unloading activities. The reports reveal that the parameters are well within the standards prescribed by Maharashtra Pollution Control Board / Central Pollution Control Board.
vi)	Screening of pollutants in the harbor water should be taken up by the project authorities and periodical monitoring reports on water quality parameters must be forwarded to this Ministry at the six monthly intervals.	No pollutants are being discharged at Harbor water. Jetty water quality monitoring is done on monthly basis and reports are submitted to MoEF&CC every six month's interval.
vii)	To prevent discharge to sewage, bilge wastes and other liquid wastes into the marine environment, adequate system for collection, treatment and disposal of liquid wastes including shoreline inter sector for receiving liquid wastes from all shore line installations and special hose connection for ships to allow for discharge of sewage must be provided.	No discharge of sewage, bilge wastes and other liquid wastes are done at Jetty area.
viii)	The quality of treated effluent, solid waste, emission and noise level must confirm to the standards laid down by competent authorities including Central / State Pollution Control Boards and under the Environment Protection Act, 1986 whichever are most stringent.	No effluents are generated at the jetty. The sewage is treated in septic tanks and then sent to STP for further processing. Solid waste is segregated and dispersed as per the norms. The noise level in the Jetty area is maintained as per standards. Wind shield are installed at strategic locations to minimize the impact of the emissions from the cargo handling activities. Ambient Air Quality monitoring is done on regular basis at Jetty. The reports are well within stipulated norms and reports are submitted to MoEF&CC every six months.
ix)	Appropriate devices such as oil water separator, oil monitor, oil skimmer etc. must be provided to remove all floatable material including oil spills while refueling of vessels, because of operations of cargo handling equipments and allied machinery, cranes, tractors etc., to tackle the oil pollution in the	Adequate preventive measures are adopted to avoid any oil spill due to jetty operations. An Oil Spill Contingency plan for the Jetty is in place. The jetty is well equipped with requisite equipment to curtail any

	port area and marine environment.	incidences of oil spill.
x)	Proper fire fighting arrangement must be ensured by providing adequate number of fire hydrants in fire prone areas. The entire fire fighting line must be maintained under pressure through jockey pump and appropriate volume of dead storage water must be ensured for this purpose. The employees must be kept alert and trained to combat fire by conducting regular fire drills to keep this facility in working conditions.	Adequate fire-fighting arrangement has been provided at Jetty. Fire hydrant lines are provided at the jetty. Proper training is imparted to the concerned personnel and mock drills are conducted at regular intervals.
xi)	The jetty will not be used for transporting Hazardous Material.	No hazardous material is handled at Jetty.
xii)	The approval is subject to classification of the Dharamtar as CRZ –III on final approval of CZMP of the Maharashtra Govt. If the area is classified as CRZ- I (i) under CZMP the sanction would stand cancelled.	According to the CZMP as obtained from the Town Planning department, the jetty facilities fall in the CRZ I (a permissible activity) and the backshore facilities at Dharamtar fall in the CRZ III.
xiii)	The proponent would ensure that conveyor system and other facilities as provided are in consonant with the activities deemed to be permissible under the law and regulations.	The conveyor system passes through CRZ III and is a permissible activity as per the CRZ Notification.
xiv)	Third party inspection should be ensured during construction and operational phases with adequate Insurance cover. The port authorities should confirm on regular intervals of six months to the Ministry about implementation of the suggested safeguard measures and the data / report should be open for inspection by the team which would be constituted by the Ministry if found necessary.	Sampling and analysis of creek water has been carried out and submitted regularly to the Regional Office of MoEF&CC, Bhopal at six monthly intervals.
xv)	Full support should be extended to the officials of the Regional Office, of the Ministry of Environment and Forests at Bhopal during inspection of the project for monitoring purpose by the project proponents by furnishing full details and action plans including action taken report on mitigative measures.	Will be complied.
3	The project authorities must create sufficient in-house capability (Environmental Cell) and full-fledged laboratory to monitor and implement compliance to the prescribed safeguards and programmes related to	Environment Cell headed by Joint CEO and manned with qualified peoples are looking after the environmental aspects and Jetty. A full-fledged Environmental laboratory is

	pollution control and environmental conservation.	established to monitor and implement compliance to the prescribed safe guards and programs related to pollution control and environment conservation.
4	Adequate financial provisions must be made for implementation of the above stipulations.	Adequate financial provisions are ear marked in the annual budget.
5	In case of any deviation / alterations in the project proposal from those submitted to this Ministry for clearance, these stipulations may be modified and / or new ones imposed or the environmental clearance revoked for ensuring environmental protection.	There is no deviation / alteration in the project proposal as submitted for clearance. However, JSW Dharamtar Port has proposed expansion of the jetty. The Environmental and CRZ Clearance for the is accorded by the Ministry of Environment, Forest & Climate Change vide letter dated 26th November, 2015. The consent to establish for the expansion project has also been granted by the Maharashtra Pollution Control Board.
6	These stipulations will be enforced among others under the Water (Prevention & Control of Pollution) Act, 1974, The Air (Prevention & Control of Pollution) Act, 1981 and the Environmental (Protection) Act, 1986.	We are regularly complying with the following Environmental Acts: i) Water (Prevention and Control of Pollution) Act, 1974. ii) Air (Prevention and Control of Pollution) Act, 1981. iii) Environmental (Protection) Act 1986. iv) Other general conditions laid down by Maharashtra Pollution Control Board.

COMPLIANCE STATUS OF CAPTIVE JETTY AS PER ENVIRONMENTAL CLEARANCE UPTO MAY, 2019

Ref: Clearance for Expansion of Dharamtar Jetty facility in Village Dolvi of district Raigad (Maharashtra) by M/s. JSW Dharamtar Port Private Limited – Environmental and CRZ Clearance – Reg

Ref: Ministry of Environment, Forest & Climate Change, Government of India. Letter F.No. 11-79/2013-IA.III dated 26th November, 2015.

A. SPECIFIC CONDITIONS

Clause No.	Clearance Condition as per MoEF&CC Letter F.No. 11-79/2013-IA.III dated 26th November, 2015.	Compliance Status up to May, 2019
i.	'Consent to Establish' shall be obtained from Pollution Control Board under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974.	Maharashtra Pollution Control Board has accorded 'Consent to Establish' for the Expansion of the jetty from 331.5m to 1750m under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974 vide their consent order no. Format 1.0/BO/CAC-cell/EICno.RD-2792-14/E(amendment)/ CAC-10000 dated 30th October, 2014. The expansion work is still under process. Thereby, the Consent to Establish was revalidated through MPCB vide Consent no: Format1.0/BO/CAC-Cell/UAN No. 23048/CAC-1905000980 dated 16th May, 2019.
ii.	No mangroves shall be cut during project implementation and utmost care shall be taken to conserve them. Also, in view of the likely impact of the proposed construction methodology, National Centre for Sustainable Coastal Management (NCSCM) may carry out a study for suggesting measures for mangrove protection.	The project does not envisage any mangrove cutting. NCSCM has commenced the studies at the site and submitted their quarterly study report. The further studies are still being carried out. Report annexed along as **Annexure I**
iii.	There shall be no disposal of dredged material into the sea, but to be reused for reclamation and for shore enrichment based on its characteristics, as committed.	The condition of the EC has been amended vide MoEF&CC letter dated FNo.11-79/2013-IA.III dated 26th March, 2016. The letter is annexed along as **Annexure II**. The amendment pertains to reuse of dredged material for reclamation and shore enrichment. According granular

		and rocky materials shall be used for landfilling and grading. The remaining material shall be disposed at the grounds designated by CWPRS and accepted by EAC, MoEF&CC.
iv.	Total water requirement of 800KLD after the proposed expansion, shall be met from the existing source of K.T. Bandhara, MIDC. There shall not be any abstraction from any other surface water body or ground water to avoid depletion of the existing local water resources. The wastewater from washing and other construction activities shall be treated to meet the prescribed norms and shall be reused. There shall be no discharge of untreated effluents into the marine environment.	The water requirement shall be met through existing source of K.T. Bandhara, MIDC. The project does not envisage any abstraction from surface water body or ground water. The local water resources will not be altered. The waste water is treated in the soak pit and the treated water is used for sprinkling and gardening. No effluents are generated at the jetty area and no waste water is discharged into the marine environment.
v.	Adequate scour protection shall be applied to prevent damage due to scouring and bathymetric survey will be carried out to ensure that any accretion creates no risk to navigation/sediment transport of the jetty.	Shall be complied Bathymetric survey for the region is carried out. Mathematical model studies for the rate of accretion is done by Central Water and Power Research Station, Pune.
vi.	The PP shall undertake the environmental monitoring programme, as committed in the EIA study. This shall also include continuous measurements of underwater vibration and noise levels by installing appropriate measuring instruments immediately at Piles and thereafter at a distance of 2 km from that Piles.	The environmental monitoring programme is being implemented. The survey for carrying out Underwater vibration and noise level is undertaken. The report is annexed along as **Annexure III**.
vii.	As committed under the EIA study, necessary arrangements for the treatment of effluents and solid wastes shall be made and it shall be ensured that the untreated effluents and solid wastes are not discharged into the water/CRZ area.	Adequate mitigation measures as mentioned in the EIA study is being taken. The project is cargo handling at the jetty facilities in which no effluents are generated. The solid waste generated at the premises is segregated and disposed as per the norms/ guidelines of the CPCB. No solid waste is discharged into the water/CRZ area.
viii.	Ships/ barges shall not be allowed to release any oily bilge waste or ballast water in the sea. Any effluents from the jetty which have leachable characteristics shall be segregated and recycled/disposed as per MPCB guidelines.	Only barges enter to the jetty area. Release of oily bilge waste or ballast water from these barges is not be permitted. Only handling of cargo is carried out at the jetty. The process does not involve any manufacturing process

		that generate effluents. Thus no effluents are generated at the jetty.
ix.	Location of DG sets and other emission generating equipment shall be decided keeping in view the predominant wind direction so that emissions do not effect nearby residential areas. Installation and operation of DG sets shall comply with the guidelines of CPCB.	Shall be complied
x.	All the mechanized handling systems and other associated equipments such as hoppers, belt conveyors, stacker cum reclaimers shall have integrated dust suppression systems. Dust suppression systems shall be provided at all transfer points.	Shall be complied. All the mechanized handling systems and other associated equipments such as hoppers, belt conveyors, stacker cum reclaimers installed at the jetty as a part of jetty expansion have integrated dust suppression systems. Dust suppression systems are also provided at all transfer points. Other measures for dust suppression are also implemented.
xi.	A windshield of appropriate height shall be provided around the coal/other bulk stack yard for control of wind generated dust.	Windshields of appropriate height is provided around the coal/other bulk stack yard.
xii.	All the conditions stipulated by the MCZMA vide their letter no. CRZ-2014/CR-41/TC-4 dated 24.02.2015, shall be strictly complied with.	Is complied.
xiii.	No product other than permitted under the CRZ Notification, 2011 shall be stored in CRZ area.	Shall be adhered
xiv.	The project affected people, if any, due to the land acquisition shall be rehabilitated or compensated as per the norms laid down by the concerned agency of State/Central Government.	No R & R involved. Land will be purchased from private owners as per the prevailing rate.
xv.	The quality of treated effluents, solid wastes, emissions and noise levels and the like, from the project area must conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986.	Shall be adhered

xvi.	All the mitigation measures suggested in the EIA report and the marine environment study of CWPRS, Pune shall be implemented. The compliance for each of those measures shall be submitted to concerned SPCB and R.O. of this Ministry along with six monthly compliance reports.	Shall be adhered. The compliance report is regularly submitted to MPCB and RO, Nagpur along with the six monthly compliance reports.
xvii.	There shall be no drawal of ground water in CRZ area.	No ground water shall be drawn from the CRZ area.
xviii.	Periodical study on shoreline changes shall be conducted and mitigation carried out, if necessary. The details shall be submitted along with the six monthly monitoring report.	No shoreline changes are envisaged.
xix.	It shall be ensured by the Project Proponent that the activities do not cause any disturbance to the fishing activity, movements of fishing boats and destruction of mangroves during construction and operation phase.	The barges navigate only through the demarcated channel. Fishing activities will not be disturbed due to the upcoming jetty. The project development does not envisage any mangrove cutting.
xx.	All the recommendation of the EMP including dust control at storage and handling of cargos shall be complied with letter and spirit. The Project Proponent may be asked to submit all the EMPs mentioned in the EIA report and during the subsequent presentations made before the EAC shall be submitted in a tabular format with budgetary provisions and the same shall be submitted to Ministry and with a copy to R.O., MoEF&CC within two months.	The recommendation of the Environmental Management Plan suggested in the EIA is implemented.
xxi.	The project Proponent shall take up and earmark adequate fund for socio-economic development and welfare measures as proposed under the CSR Programme. This shall be taken up on priority.	The funds are earmarked. JSW Dharamtar Port is actively involved in CSR activities like supplying water tankers to the villages, holding cultural activities in the vicinity, sports development, women empowerment etc.
xxii.	The Project Proponent shall set up separate environmental management cell for effective implementation of the stipulated environmental safeguards under the supervision of a Senior Executive.	An Environment Cell comprising qualified personnel is formed at the site for monitoring the stipulated environmental safeguards.
xxiii.	The funds earmarked for environment management plan shall be included in the budget and this shall not be diverted for any other purposes.	Funds for environment management plan is included in the annual budget.

xxiv.	The responses/commitments made to the issues raised during public hearing shall be complied with in letter and spirit. A hard copy of the action taken shall be submitted to the Ministry.	Shall be complied as committed. JSW proactively provides water tankers to the nearby villages. Also other activities like aids in educational facilities, aid in acquiring technical qualification to the youth, women empowerment is implemented.
xxv.	The proponent shall abide by all the commitments and recommendations made in the EIA/EMP report so also during their presentations	Shall be complied
xxvi.	The PP shall engage NCSCM, Chennai to carry out the monitoring at their own cost to ensure proper implementation of the construction methodology and construction of the Jetty without disturbing the existing mangroves, natural resources and other environmental safeguards.	NCSCM is carrying out the study for proper implementation of the construction methodology. No mangroves are disturbed/ cut for project development.
xxvii.	Corporate Social Responsibility; a. The Company shall have a well laid down Environment Policy approved by the Board of Directors. b. The Environment Policy shall prescribe for standard operating process/ procedures to bring into focus any infringements/ deviation/ violation of the environmental or forest norms/conditions. c. The hierarchical system or Administrative Order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance conditions shall be furnished. d. To have proper checks and balances, the company shall have a well laid down system of reporting of non-compliances/violations of environmental norms to the Board of Directors of the company and/or shareholders or stakeholders at large.	The Safety, Health and Environment Policy is in place. Considering the proposed expansion, the policy shall be updated.

B. GENERAL CONDITIONS

Clause No.	Clearance Condition as per MoEF&CC Letter F.No. 11-79/2013-IA.III dated 26th November, 2015.	Compliance Status up to May, 2018
i.	Appropriate measures must be taken while undertaking digging activities to avoid any	Shall be complied

	likely degradation of water quality	
ii.	Full support shall be extended to the officers of this Ministry/Regional Office at Nagpur by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environmental protection activities.	Noted and shall be adhered to during the visit of the official during the site inspection.
iii.	A six monthly monitoring report shall need to be submitted by the project proponents to the Regional Office of this Ministry at Nagpur regarding the implementation of the stipulated conditions.	Is being complied regularly. The last report from June 2018 to November 2018 was submitted to MoEF&CC, Regional Office Nagpur in December, 2018.
iv.	Ministry of Environment, Forest and Climate Change or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary in the interest of environment and the same shall be complied with.	Noted
v.	The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied with satisfaction of the Ministry.	Noted
vi.	In the event of a change in project profile or change in the implementation agency, a fresh reference shall be made to the Ministry of Environment, Forest and Climate Change	Noted and shall be complied to.
vii.	The project proponents shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of land development work	Noted and shall be adhered
viii.	A copy of the clearance letter shall be marked to concerned Panchayat/local NGO, if any, from whom any suggestion/representation has been made received while processing the proposal.	Complied. A copy of the environmental clearance was submitted to panchayat office as well as the collector's office.
ix.	A copy of the environmental clearance letter shall also be displayed on the website of the concerned State Pollution Control Board. The EC letter shall also be displayed at the Regional office/ Tehsildar's office for 30 days.	Complied. A copy of the environmental clearance was submitted to Maharashtra Pollution Control Board for display. A copy was also submitted to MPCB Regional Office and Tehsildar's office for display as per the requisite condition.

ANNEXURE I

Report on

Monitoring - Expansion of Dharamtar Jetty facility at Dolvi, Raigad, Maharashtra

National Centre for Sustainable Coastal Management
Ministry of Environment, Forest & Climate Change

March 2017

FOREWORD

Being one of the leading maritime countries in the South Asian region, India has a profound interest in the ocean and related activities. Coastal zones of the country are among the world's most diverse, dynamic and productive environments. Besides supporting the vast human population, they also nurture the fragile ecosystems encompassing the marine flora and fauna. Ecosystem services such as storm buffering, fisheries production, water quality, biological productivity etc., can be largely accomplished by maintaining the sustainability of the coastal environment. Ports and harbours have increased in recent times signifying growth in economy but pose environmental concerns that require periodic environmental monitoring to ensure sustainability of the coast and its resources.

JSW Dharamtar Port Private Limited (JSWDPPL), a Special Purpose Vehicle under the aegis of JSWIL is located on the bank of Amba River, 22 km from its mouth. National Centre for Sustainable Coastal Management (NCSCM), has carried out a detailed survey on mangrove health and environmental monitoring as per the recommendations of EAC, the Ministry of Environment, Forest& Climate Change (Environmental and CRZ Clearance to the project 'Expansion of Dharamtar Jetty facility' in Village Dolvi of District Raigad (Maharashtra) by M/s JSW Dharamtar Port Pvt Ltd, vide MoEF &CC letter No. F. No. 11 - 79 / 2013 - IA.III dated 26/11/2015).

This Environment Monitoring Report provided by NCSCM has been prepared taking in account the key environmental variables in an organised manner considering the on-going construction activities, and associated impact on the ecosystem health (including mangroves). This report provides a comprehensive evaluation which is grounded to the core themes of ecosystem management considering the berth expansion and associated impacts by holistically integrating environmental sustainability and economic progress for the benefit of coastal ecosystems, economy and the livelihood.

R. Ramesh

Director, NCSCM

NCSCM

Contents

1. Background

The JSW Steel Limited, Dolvi Works, Maharashtra, JSWSL produces about 3.3 MTPA of steel and generates 55 MW of power, involving about 9.69 MTPA of raw materials. The raw material is received at the existing 331.5 m jetty, owned and operated by JSW Dharamtar Port Private Limited (JSWDPPL), a Special Purpose Vehicle under the aegis of JSWIL to handle the proposed EXIM cargo of the JSW Steel Limited, Dolvi works. This jetty is located on the right bank of Amba River, 22km from its mouth (Fig 1). The jetty is located equidistant about 33 km nautical miles from Jawaharlal Nehru Port and Mumbai Port. Another port in vicinity is PNP port located opposite to the JSW port on the left bank of Amba River. The jetty is accessible by road and is 80 km from Mumbai. It is well connected to national highway NH-17 that joins the coastal highway.

Fig. 1: Panoramic View of JSW Port, Dharamtar

A simple logistic chain is followed at the JSW Dharamtar facility. During fair weather conditions, mother vessels are moored at the Mumbai Offshore anchorage whereas during monsoon, the inner anchorage opposite Nhava Island is used. The load from the mother ships is transferred into the barges using ship's gears. The barges travel to the JSW berth through the creek where it gets and gets unloaded. The unloaded materials are sent to the plant storage through the jetty and the cross country conveyors. Currently, there is no storage at the berth. JSWSL has proposed to increase the plant capacity to 10 MTPA which will trigger expansion of the captive port to handle the increased raw material requirements. The volume of total cargo is expected to increase from present 9.69 MTPA to 33.95 MTPA.

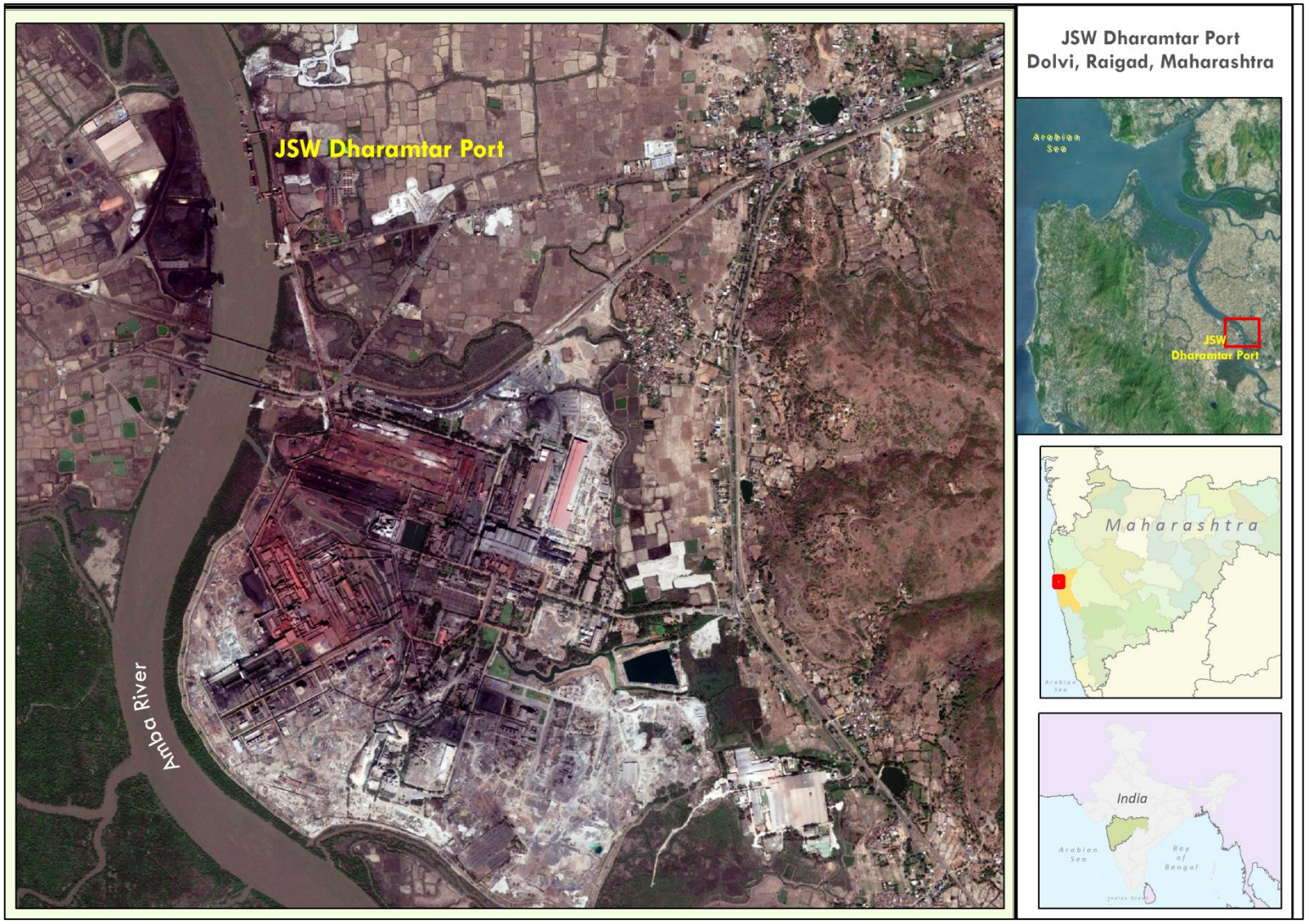

Fig. 2: Location map of JSW Dharamtar Port

The existing barge handling facility at Dharamtar was originally designed for barge sizes of 2500 DWT and presently is handling barges up to 3700 DWT. Hence, JSWDPPL has planned to increase the existing 331.5 m long berth to 1750m in three developmental phases (Fig3):

Existing Operations (Phase – I): The present jetty is about 331.5 m long and is designated as berth 1 to 4. The raw material at present is handled using 2 barge unloaders on rail and two static Mobile Harbour Cranes. Present handling capacity 8.24 MTPA of raw materials annually.

Phase – II (On-going Expansions): In phase II, which is the *on-going expansion phase*, a new berth of 718.5 m long is being constructed, taking the total length of the berth to 1050 m. The phase II operations is expected to increase the import raw material volume from present 8.24 MTPA to 14.2 MTPA and finished product to be exported from 1.45 MTPA to 2.6 MTPA. Accordingly, about 53 ha back up storage area would be required for the same in this phase (Fig 3).

Phase – III Operations

In this phase, it is expected that approximately 33.95 MTPA of cargo would be required to be handled. It is proposed to construct 700 m of berth in this phase, taking the total length of the berth to 1750 m. In tandem, the backup area requirement would go up to 84 ha from the 53 ha required in phase II.

Cargo Handling

The import cargo includes Iron Bearing Raw Materials (IBRM), Coal Bearing Raw Materials (CBRM), container and clinker. The export cargo will include HR coils, container, cement and slag. In the existing phase the raw materials are directly fed through conveyer belts from the port. In the process of expansion, a port backup containing bulk stockyard for the raw materials will be provided behind the berths to increase the efficiency and operational flexibility of raw material handling at the port.

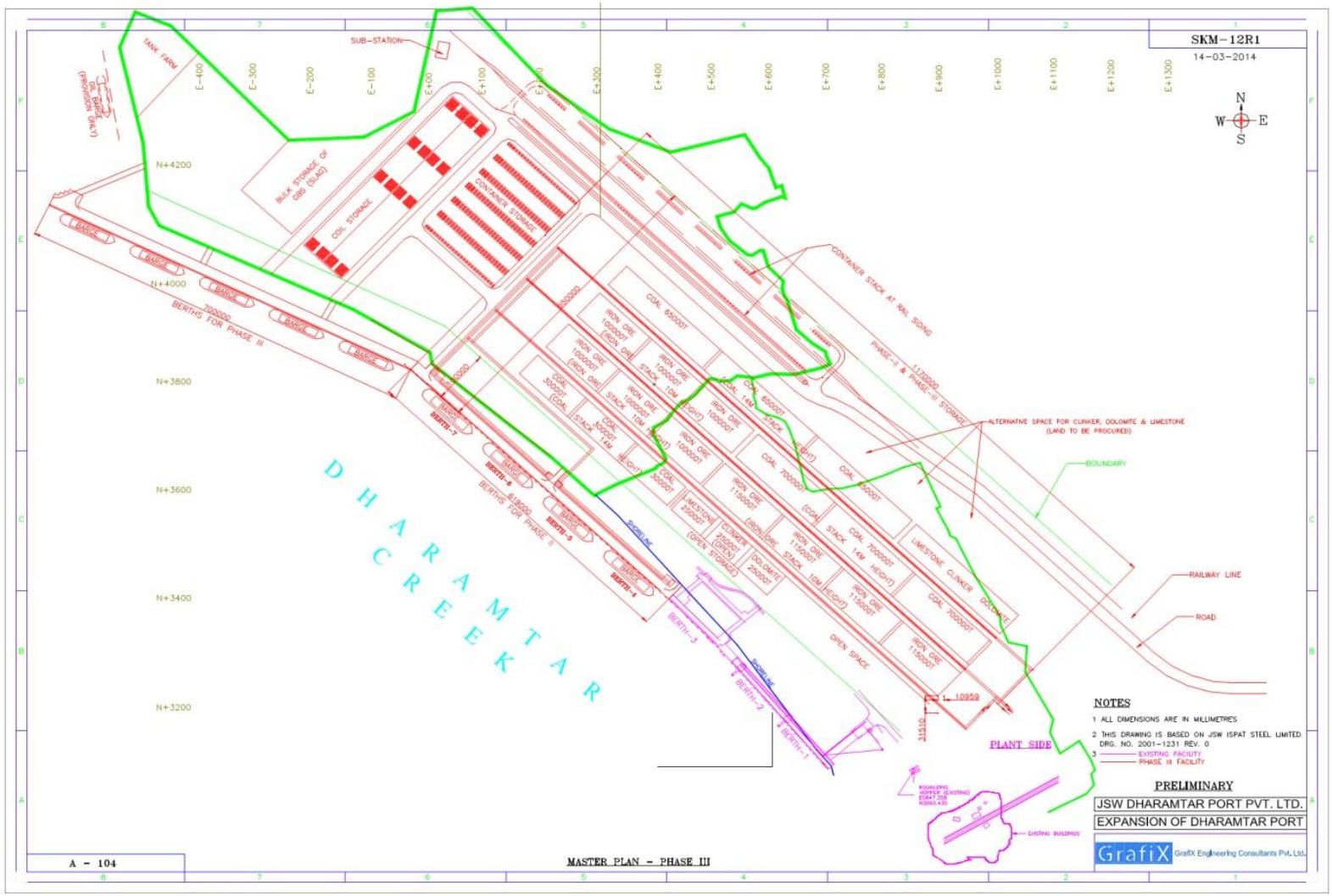

Fig. 3: Proposed Layout of the Dharamtar Facility

Fig. 4: JSW Dharamtar Port Private Limited showing the existing berth and ongoing construction (as on 22nd Oct 2016; Google Earth Image)

2. Monitoring Framework

As per the recommendations of EAC, the Ministry of Environment, Forest& Climate Change hereby accorded Environmental and CRZ Clearance to the project 'Expansion of Dharamtar Jetty facility' in Village Dolvi of District Raigad (Maharashtra) by M/s JSW Dharamtar Port Pvt Ltd, vide MoEF&CC letter No. F. No. 11 - 79 / 2013 - IA.III dated 26/11/2015.

It was specified that NCSCM shall carry out the study for suggesting measures for mangrove protection, in view of the likely impact of the proposed construction methodology as well as to carry out monitoring to ensure proper implementation of the construction methodology and construction of the Jetty without disturbing the existing mangroves, natural resources and other environmental safeguards, as stipulated in MoEF&CC's EC letter cited as above.

EC Conditions for Environmental Monitoring

The Special Conditions of the EC state "*The PP shall engage NCSCM, Chennai to carry out the monitoring at their own cost to ensure proper implementation of the construction methodology and construction of the Jetty without disturbing the existing mangroves, natural resources and other environmental safeguards*".

Hence, NCSCM has undertaken the task of period monitoring of construction activities during Phase-II with following objectives:

2.1 Monitoring of site during construction phase:

It was proposed that environmental monitoring of the stations during Phase-II construction will be carried out with increased number of locations (at least 6), the rationale being that the distance from the project site to river mouth and upstream need to be covered.

Following Components were proposed for monitoring with frequency once in three months

1. **Water:**
    a. **Physico-Chemical** (pH, Salinity, Conductivity, TDS, Turbidity, DO, BOD, Phosphates, Nitrates, Sulphates, Chlorides)

b. **Biological** (Transparency, Chlorophyll ,Phytoplankton (density, diversity), Zooplankton (density, diversity)

2. **Marine Sediment:**
   a. Physico-Chemical (Texture, pH, TKN, COD, Sodium, Potassium, Phosphates, Chlorides, Sulphates)

   b. Biological(Benthic meiofauna, Benthic macro fauna)

3. Air quality(PM_{10}, $PM_{2.5}$, SO2, NOx)

4. Noise

5. Greenbelt development

2.2 Suggested measures for mangrove protection and other environmental safeguards during the construction phase

This activity involves mapping of the mangroves in the localities up to 10km from project site boundary as well as mapping of flow conditions in the Amba River, modelling changed flow patterns due to dredging and assessing potential impacts on the mangroves due to potential changed flow regime. It was proposed that detailed mangrove management plan will be prepared.

The proposed schedule for environmental monitoring is mentioned as follow:

S.No	Tasks	
1	First Site visit	January 2017
3	First Quarterly sampling and analysis	March 2017
4	Second Quarterly sampling and analysis	June 2017
5	Third Quarterly sampling and analysis	September 2017
6	Fourth Quarterly sampling and analysis	December 2017

3. Site Visit (survey)

A field visit to JSW Dharamtar Port Private Limited was carried out from 7th to 9th January 2017 by a team of scientists from NCSCM. The team included

(1). Prof Dr. Ramesh Ramachandran, Director, NCSCM
(2). Dr. Purvaja Ramachandran
(3). Dr. Deepak Samuel. V.
(4). Dr. Robin R.S.
(5). Dr. Dipnarayan Ganguly
(6). Dr. Gurmeet Singh

The objectives of the survey were:

- Carry out a survey for the assessment of the site
- Identifying sampling stations for continuous monitoring. These locations were in addition to the locations mentioned in EIA.

The team was assisted by the Officials from JSW Dharamtar

Panoramic view of JSW Dharamtar Port

4. Environmental Monitoring

The team made a detailed survey at existing jetty facility as well as of the on-going construction work. The team also surveyed the status and health of mangrove ecosystem along the construction area. It was followed by the spatial survey in the Amba River. Following first-hand observations were made during the visit:

- The project site is located at 18°42'520" N and 73°1'620" E, located at the right bank of Amba River, at a distance of 22 km from its mouth.
- On the other side of the bank of Amba River, PNP Port is located. Length of the existing Jetty is 331.5 m. In Phase-II, expansion of jetty to the north by 718.5 m is under progress.
- The construction of the jetty is being carried out by self-supported Cantilever Gantry Construction method which is known to cause minimal disturbance to environmentally sensitive areas, and does not require load-out facilities a smaller assembly zone.
- About 20 m wide strip of mangroves were observed all along the river bank. Observations indicated that mangroves were intact near the construction site.
- At some locations, along the Amba River (downstream) , reduction in tidal flushing to mangroves through smaller creeks was observed due to the presence of bunds.
- The leaves of mangroves and other terrestrial vegetation near the jetty were covered with a layer of fine black dust, which is considered to affect photosynthesis if exposed for prolonged period of time
- The depth of Amba River is well maintained. It was approximately 6 m at the deepest part and one dredger was also observed in the river.
- In the upstream region, approximately 1-2 km away from jetty; numerous boats that were used for mining sand was observed
- Coastal erosion was observed near Bhal on the right bank of Amba River (18°46.98'N, 73°0.052'E),
- A total 10 stations covering the upstream, port and downstream regions of Amba River were selected for periodic monitoring (Fig 5).

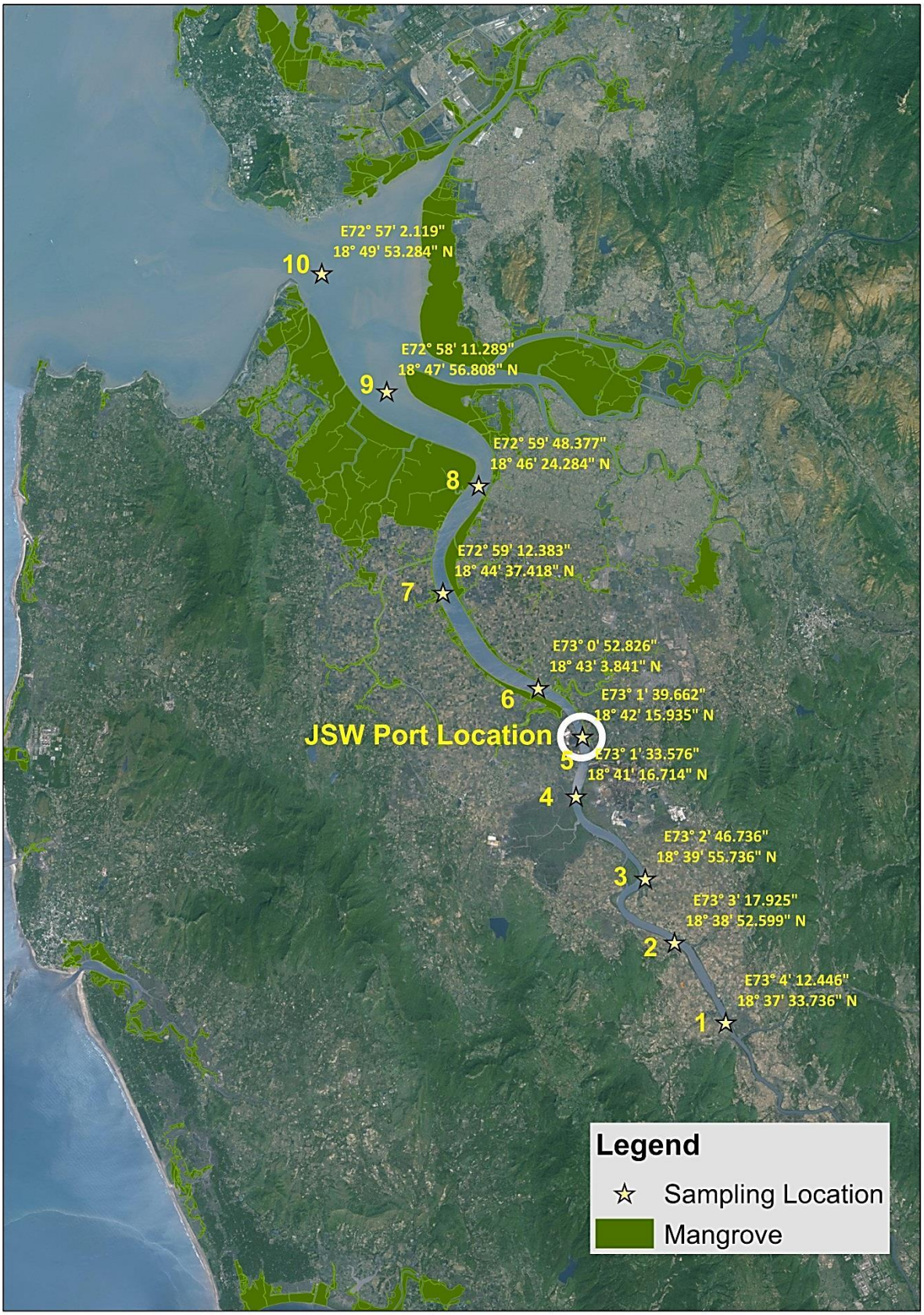

Fig.5: Sampling locations for periodic monitoring in Amba River

4.1 Air Quality

Particulate matter (PM) present in ambient air is a prime concern in ports and harbours, where dust emissions arise during loading, un-loading, transportation and storage of cargo; like coal, ores, etc. Particulate matter which consists of both Suspended Particulate Matter (>10µm) and Respirable Suspended Particulate Matter (<10 µm), act as an irritant and even penetrate into the human respiratory system, causing serious health hazards. Once airborne, fine dust can be carried hundreds of meters, if not kilometers, which has an adverse impact on neighbours' buildings, processes and, most importantly, human health. Any fine dust, less than 10 microns in diameter can penetrate deep into the lungs. Prolonged exposure will result in Chronic Obstructive Pulmonary Disease (COPD), which is similar to asbestosis.

When handling coal and other minerals, there are a number of sources of dust, and hence needs to be addressed individually to arrive at an environmentally sustainable and professional operation. For various operations inside the port area the dust prone zones need to be identified and the potential sources could be as follows:

1. Loading/Unloading at the ship
2. Reception at the wharf side
3. Transfer to conveyor belt
4. Possible spillage/dispersion from closed conveyor belt
5. Open/ exposed Conveyor Belt
6. Conveyor belt to stockpile
7. Residence time at stockpile
8. Vehicle movement around stockpile
9. Transfer to other modes of transportation

In view of this, both nationally and internationally, the monitoring for PM_{10} (<10 µm) is considered as a good method of determining the community's exposure to potentially harmful dust. Recently the monitoring has been shifted from PM_{10} (<10 µm) to $PM_{2.5}$ (<2.5 µm) of finer particles based on the relevance in direct health consequences. This was significantly noted in the inclusion of PM_{10} (2000) and $PM_{2.5}$ (2009) in the National Ambient Air Quality Standards (NAAQS).

In order to ensure sustainable port activities, concentration of the following air quality parameters in the ambient air within the premises and a distance of 10 meters from the identified sources (other than the stack/vent) should not be allowed to exceed the levels mentioned in revised National Ambient Air Quality Standards (NAAQS) [NAAQS Notification dated 18th November, 2009]. As per

NAAQS Central Pollution Control Board notification (2009), the permissible limit of PM_{10} is 100 µg/m^3 and $PM_{2.5}$ is 60 µg/m^3 on a 24 hour basis for industrial areas/ports and harbours.

Following observations were made during air quality monitoring at the site:

- Measurements of air quality (suspended particles, PM) were made (for 6 hours) within the port premises at the new jetty construction site using laser sensor, calibrated for Indian conditions against BAM (Beta attenuation Monitor-most advanced system for measuring ambient air quality).
- For the measurement of ambient SO_x and NO_x, concentrations, improved West and Gaeke method and Jacob &Hochheiser modified (Na-Arsenite) methods were followed (CPCB publications No. 520 NAAQS).
- The major pollutant sources inside the port area were identified as follows:
  - Vehicular emissions from tanker and truck traffic
  - Transport of dust particle from adjacent industries
  - Dust(coal/ore) from adjacent ports
  - Occasional spill from closed conveyor belt etc.
- During the study period, the wind speed ranged between 0.8 to 5.8 m/s and it was predominantly from the SW direction.
- Prominent pollutant sources included emissions from construction activities and regular loading/unloading of coal materials from the adjacent ports (located at the opposite bank of Amba River.
- Although Dharamtar Port has sealed conveyor belt system for the transport of coal, frequent monitoring for the detection of any spillage/dispersion from the closed conveyor belt is essential for pollution free operation
- Transport and dispersion of dust in the ambient environment is controlled by atmospheric diffusion factors such as wind speed and direction, temperature, rainfall and humidity. The dispersion from open coal stacks at neighbouring ports and other stockyard may result in its deposition on the vegetation of the surrounding areas (Fig 6 & 7). A detailed study will be carried out using wind flow pattern and dispersion of Suspended Particulate Matter (SPM).
- Monitoring inside the port at the selected air quality measurement stations reveal that the mean for PM_{10} and $PM_{2.5}$ concentrations were well within the permissible limits prescribed for the industrial areas defined by CPCB.
- During the early morning, higher PM_{10} (up to 132 µg/m^3) and $PM_{2.5}$ (upto 88 µg/m^3) concentrations were recorded. As the day progressed the SPM level reduced gradually with strong wind from seaward direction. It was also observed that high SPM concentrations were closely associated with

industrial activities at the nearby coal loading/unloading site in the other bank of Amba River (Table 1).

- Detailed and periodic surveys on 24hr basis within the jetty premises and the adjacent locations are necessary to conclude the daily and seasonal air conditions with respect to the CPCB standards during the construction activities at Dharamtar port.

Table 1: Air Quality at Dharamtar Port near the berth construction site

Air quality stations	PM_{10}	$PM_{2.5}$	SO_X	NO_x
National Ambient Air Quality Standards				
Annual	60	40	50	40
24 hrs average	100	60	80	80
Observation at Dharamtar Port (construction site)				
Minimum	65	34	9.8	11.1
Maximum	132	88	17.4	22.4
Average	95	53	14.8	16.3

Fig. 6: Deposition of fine dust on mangrove leaves near Dharamtar Jetty.

Fig. 7: Coal/ Ore stack (uncovered) as observed in the bank of across JSW Port

4.2 Noise level

Day time monitoring of noise level was carried out on 8th January, 2016. The measurements were carried out by installing sound level meter (Optimus, G066918, CR:162C) near the new berth construction site (18° 42.598'N, 73°1.642'E). The results were compared to standards defined by CPCB for industrial category (Table 2).

Table 2: Ambient Noise Quality Standards in respect of Noise (Noise pollution (regulation and control) rules, 2000)

Area Code	Category of Area / Zone	Limits in dB(A) Leq*	
		Day Time	Night time
(A)	**Industrial area**	**75**	**70**
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

Following observations were made:

- The energy mean of the noise level over the specified period was found to be 58.6 dB with the peak value of 98.5dB (table 3).
- The projected noise exposure was calculated to be 60.4 dB which was well below the CPCB limit for day time of 75 dB fixed for Industrial areas(Fig 8)

- These results indicated that the noise pollution level is satisfactory with respect to the CPCB standard.
- Detailed measurement will be carried out in the subsequent surveys

Table 3: Noise values from the construction site at Dharamtar Jetty

	LA_{eq}	LC_{Peak}	LEX8	LAFMax
Basic Values	58.6 dB	98.5 dB	57.3 dB	83.3 dB

LAeq = Equivalent Continuous Level; LC_{Peak}= peak sound pressure level;
LEX8: L_{eq}- Equivalent Continuous Sound Level corrected for 8 hour;
LAF_{max} : A-weighted Fast, Maximum, Sound Level.

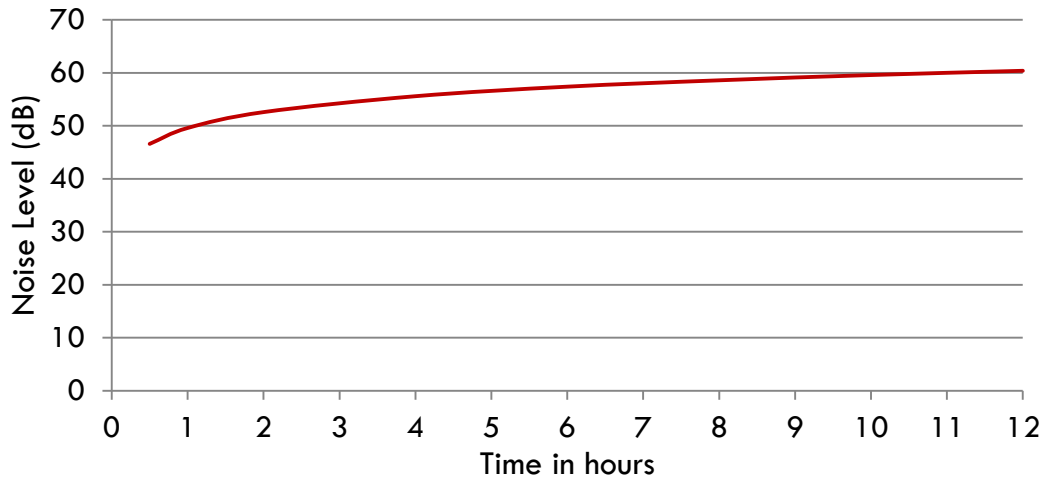

Fig. 8: Noise values from the construction site at Dharamtar Jetty

4.3 Water and Sediment Quality

Water samples were collected from 10 sampling stations in the Amba River. *In situ* measurements were made with Hydrolab ® sonde whereas measurement of other parameters were carried out using standard procedures as mentioned in "Standard methods for the examination of water and wastewater." American Public Health Association (APHA): Washington, DC, USA (2005). Summary of the observations made during the field survey in the Amba River is given in Table 4. Overall, the water quality was as per Class D of CPCB norms for surface water (Table 5) indicating that water was suitable for propagation of Wild life and Fisheries. High EC was observed as Amba river is tidally active and the tidal influence was observed at Station 1 and beyond.

i. Temperature

Surface water temperature ranged between 24.8 to 25.3 There was marginal difference in the water temperature at different locations which can be attributed to the different time of observations.

Table 4: Water quality variation in Amba River

	Upstream	Port	Downstream
Water Temp.	23.54	24.43	24.75
pH	7.29	7.33	7.36
ORP (mV)	462.55	437.00	438.40
Specific Conductivity (mS/Cm)	32.03	44.30	47.19
Salinity	20.10	28.37	30.35
TDS (g/L)	17.39	27.24	27.25
D.O. (mg/L)	5.01	4.16	4.66
BOD	3.14	3.12	4.32
Chl a	1.70	2.06	2.18
NH_4 (mg/L)	0.13	0.10	0.11
Cl (%)	3.86	4.16	4.39
Turbidity	11.50	7.20	17.24
NO_3 (µmol/L)	137.99	496.61	382.68
PO_4 (µmol/L)	9.64	3.56	2.24

Table 5: The water quality of Amba compared with CPCB norm for surface water

	Parameters	pH	DO (mg/L)	5-day BOD	Free NH_4^+ (mg/L)	EC µ mho /com
Standard Values	Class A	6.5-8.5	6	2		
	Class B	6.5-8.5	5	3		
	Class C	6.5-9.0	4	3		
	Class D	6.5-8.5	4		1.2	
	Class E	6.5-8.5				2250
Field Observation	Upstream	7.29	5.01	3.14	0.13	32030
	Dharamtar Port	7.33	4.16	3.12	0.1	44300
	Downstream	7.36	4.66	4.32	0.11	47190

ii. pH

No significant spatial variation was observed for pH. pH recorded in surface waters showed very marginal difference and ranged between 7.26 and 7.47 indicating that water was nearly neutral. pH was within the range as given by CPCB and was 7.33 near the Dharamtar Port.

iii. Salinity

The salinity of water increased towards the sea, ranging from 11.06 to 31.95 and was 28.37 at the port. Tidal influence was observed even in the upstream areas (e.g. at station 1).

iv. Oxidation Reduction Potential

The water column was well mixed and oxic in nature irrespective of the locations. Mean ORP at upstream was 463 mV whereas downstream it was 438 mV.

v. Dissolved Oxygen

Average Dissolved Oxygen (DO) content of surface water (upstream) was 5.01mg/l, which is within the prescribed limits; whereas for surface water samples collected from the port region and downstream was higher (give numbers) than those given for class C and class D.

vi. Conductivity

The conductivity of the surface water at all samples was higher (give numbers) than the values prescribed by CPCB for Class E (2.25 mmho/Cm). High conductivity is attributed to the salinity of the river/tidal water (Table 4).

vii. Biological Oxygen Demand

In all the surface water samples collected, BOD (5 days) was observed marginally higher (3.8) than the norms mentioned by CPCB. BOD values were high in samples collected from downstream (3.10-6.8) as compared to upstream (3.02-3.26).

viii. Chloride and Sulphate

Chloride and sulphate were the most dominant anion owing to the influence of the seawater. The values increased with salinity and highest were observed at sea mouth. Detailed water quality analysis will be carried out during the first field visit to Dharamtar port and reported subsequently.

ix. Sediment Quality

The sediment samples were collected for the bed of Amba River using grab sampler. The colour of the sediment was blackish grey. Silt dominated the grain size fractions along with sand. Clay fraction was less in the deeper, dredged part of the river but increased towards bank or the river. Sediments were near neutral to alkaline with pH varying from 7.2 to 7.8. Carbon was high (2.9%) in the sediment samples collected from the port. Mean carbon content in the sediment samples from upstream (mean value = 2.37%) was higher than those collected from downstream (mean value =1.42%).

4.4 Biological Observations (Water and Sediments)

(a) Phytoplankton

i. Species composition

A total of 35 phytoplankton species under 24 genera were recorded. The distribution of phytoplankton in Amba River is represented in Table 6. Phytoplankton was represented by two main groups namely diatom (centric and pennate diatom) and dinoflagellate. 99 % of the phytoplankton diversity was dominated by diatoms, and dinoflagellates contributed less than 1% of the total count. Diatoms dominated with diversity of 30 species (representing 20 genera). Pinnate diatoms were more common (16 species, 11 genera) than centric diatoms (14 species; 9 genera). Low diversity of dinoflagellates was observed in Amba River (5 species; 4 genera).

ii. Phytoplankton density

In Amba River, the phytoplankton density ranged from 2340 to 350280 Cells/L. The population density was high near the Amba River mouth with highest population density at St.10 (350280 Cells/L). With decrease in salinity, a reduction in population density was observed with lowest values observed at station 2 (2340 Cells/L) (Fig.9-10).

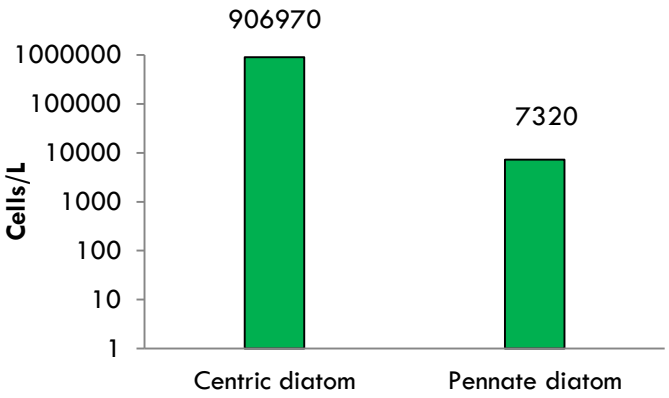

Fig. 9: Composition of phytoplankton in all the Stations

Table 6: Check list of phytoplankton in the Amba River

Phytoplankton	St.1	St.2	St.3	St.4	St.5	St.6	St.7	St.8	St.9	St.10
Diatom										
Amphora sp.	+	+	+	+	+	-	-	-	-	-
Biddulphia sp.	-	-	+	-	-	-	-	-	-	-
Chaetoceros affine	+	-	+	-	-	-	-	-	-	-
Chaetocero slorenzianus	+	+	-	-	+	-	-	-	-	-
Chaetoceros sp.	+	+	+	+	+	-	+	+	-	+
Coscinodiscus centralis	+	-	-	+	+	+	+	-	-	-
Coscinodiscus oculus-iridis	++	++	++	++	++	++	++	+++	+++	+++
Coscinodiscus sp.	+	+	+	+	+	+	+	+	+	+
Cymbella sp.	-	-	-	-	+	-	+	-	-	-
Cylindrotheca closterium	-	-	-	-	+	-	-	-	-	-
Ditylum brightwellii	+	-	-	-	+	-	-	+	-	-
Leptocylindrus danicus	-	-	-	-	-	+	-	-	-	-
Mastogloia sp.	+	-	-	-	-	-	-	-	-	-
Navicula sp.	-	+	+	+	-	+	+	+	-	-
Nitzschiasp.	+	+	+	+	-	+	+	-	-	-
Nitzschia longissima	+	-	-	-	-	-	-	-	-	-
Nitzschia sigma	+	-	+	-	+	-	+	+	-	-
Odontella aurita	-	-	-	+	-	-	-	-	-	-
Odontella mobiliensis	+	-	-	-	-	-	-	-	-	-
Paralia sulcata	+	+	-	+	-	+	+	+	-	-
Pleurosigma affine	+	-	+	-	-	-	-	-	+	+
Pleurosigma cf. longatum	+	+	+	+	-	-	++	+	+	+
Pleurosigma sp.	-	+	+	+	+	+	-	+	+	+
Pseudo-nitzschia sp.	+	+	-	-	+	+	-	-	-	-
Rhizosolenia setigera	+	+	+	+	+	+	+	-	-	-
Surirella fastuosa	+	+	+	+	+	-	-	-	-	-
Thalassio siraeccentrica	+	+	+	+	+	-	+	+	-	-
Thalassio nemafrauenfedii	+	-	-	-	-	+	-	-	-	-
Thalassio nemanitzschioides	-	-	-	+	-	+	-	-	-	-
Triceratium sp.	-	-	-	-	-	+	-	-	-	-
Dinoflagellates										
Ceratium furca	-	-	+	-	-	-	-	-	-	-
Ceratium lineatum	-	-	-	-	-	+	-	-	-	-
Gonyaulax sp.	+	+	-	-	-	-	-	-	-	-
Gymnodinium sp.	-	+	-	-	-	+	-	-	-	-
Protoperidinium sp.	-	-	-	+	-	-	-	-	-	-

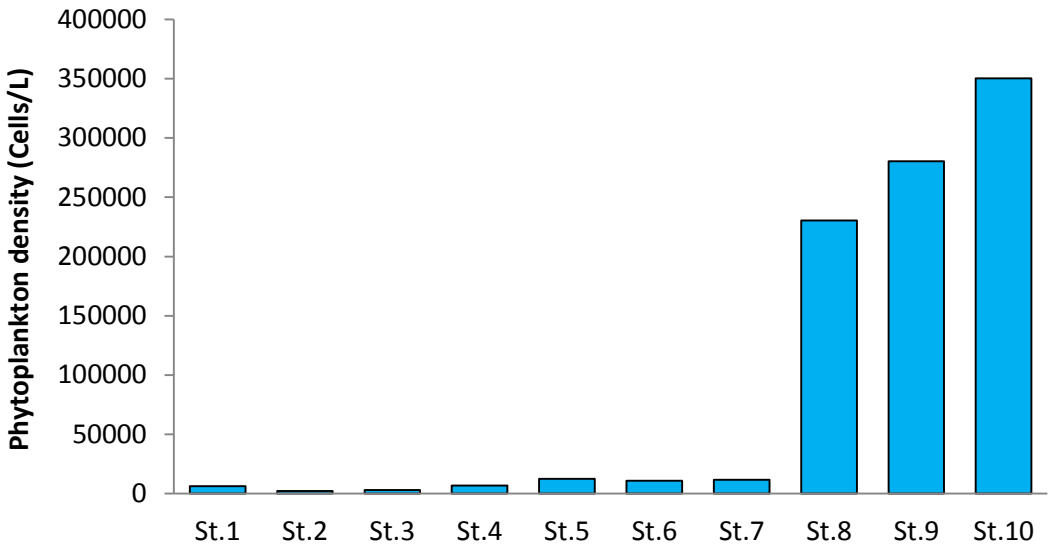

Fig. 10: Phytoplankton density along Dharamtar Port and Amba River

iii. Phytoplankton Bloom

During the survey in Amba River, *Coscinodiscus oculus-iridis was observed as the most dominant diatom* (99.9% based on Sedgewick-Rafter counting method). The data suggested C. *oculus-iridis* as a bloom forming species; with population density of ~ 350000 Cells/L. As diatom blooms are non-toxic, fish mortality was not observed during the survey. However, this species dominated over other phytoplankton species.

Nevertheless, some phytoplankton species were also observed regardless of bloom intensity e.g. *Amphora* sp., *Chaetoceros* sp., *Coscinodiscus* sp., *Pleurosigma* cf. *elongatum, Gonyaulax* sp. and *Protoperidinium* sp. (Table 6).

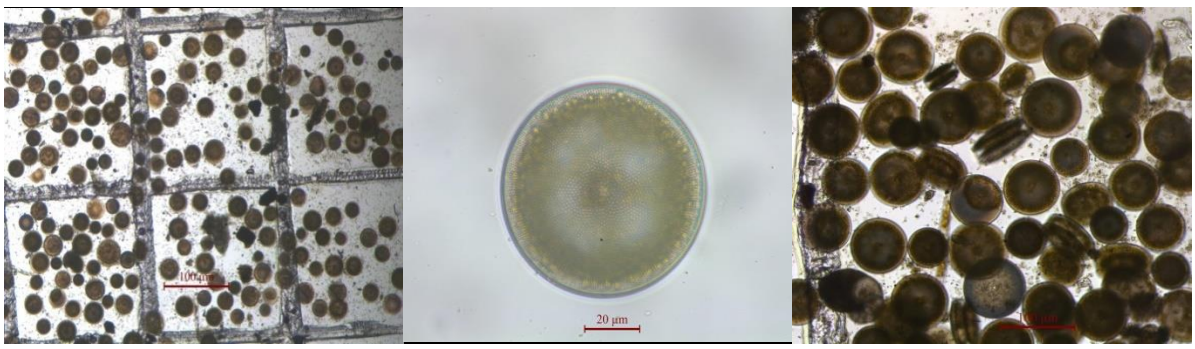

Fig.11: Microscopic view of the bloom-forming diatom Coscinodiscus oculus-iridis (a) 10x, (b) 20x & (c) 40x.Sedgewick Rafter Counting Chamber

iv. Species diversity and Cluster analysis

The number of species varied from 5 to 22 at each site in the Amba River. Low species diversity was observed at Amba River mouth with dominance of *Coscinodiscus oculus-iridis* (Table 7). Maximum values species diversity was observed at Station 1. Species richness ranged from (d=0.32-2.40). Maximum values were recorded *at* St.1 and minimum values were recorded at St.9. Evenness ranged from (J'=0.004-0.69). The diversity ranged from (H'=0.007-1.90).

Table 7: Diversity index of phytoplankton for Amba River

Stations	Salinity	S	N	d	J'	H'(loge)
St.1	11.06	22	6280	2.40	0.62	1.90
St.2	15.61	15	2340	1.81	0.62	1.67
St.3	26.77	16	3120	1.86	0.69	1.91
St.4	26.94	16	6751	1.70	0.42	1.17
St.5	28.37	15	12450	1.49	0.35	0.95
St.6	27.77	15	10982	1.51	0.30	0.80
St.7	30.02	12	11630	1.18	0.27	0.66
St.8	30.79	10	230400	0.73	0.01	0.02
St.9	31.20	5	280290	0.32	0.01	0.009
St.10	31.95	6	350280	0.39	0.00	0.007

Three separate assemblages of species were observed in the Amba River. The bloom forming species (of St.8, St.9 and St.10) formed first cluster with 90% similarity. Cluster-3 suggested the 63% similarity with the lowest phytoplankton density and influence of low salinity (Fig. 12).

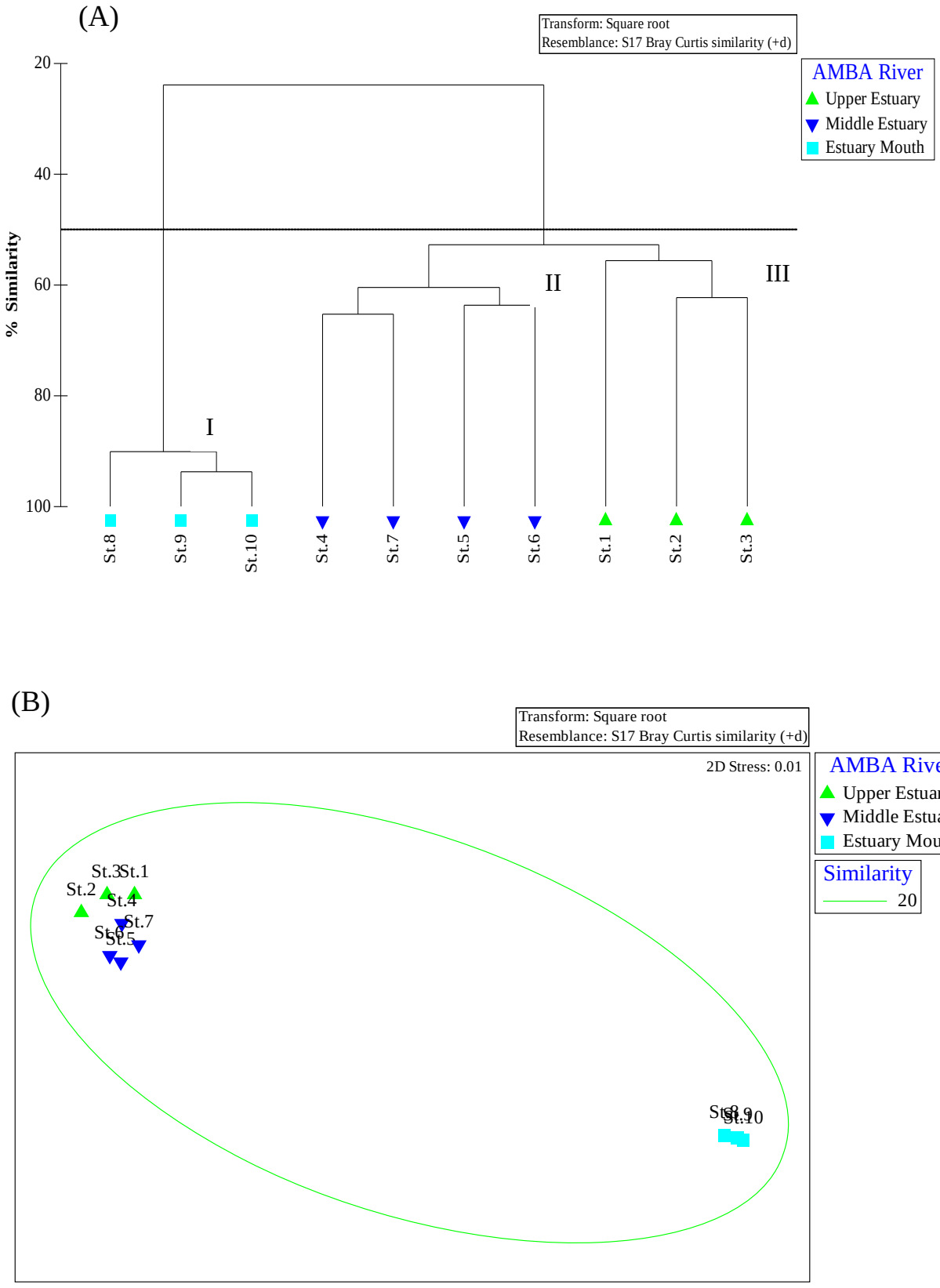

Fig. 12: Cluster Analysis of phytoplankton distribution in Amba River

Based on the similarity, the dendogram was grouped in three clusters. The first cluster comprises of diatoms and dinoflagellates with high population density of *Coscinodiscus oculus-iridis* species. In the second cluster, most of the pennate and centric diatoms were grouped whereas in the 3rd cluster low contribution of pennate and centric diatom population was observed (Fig.13).

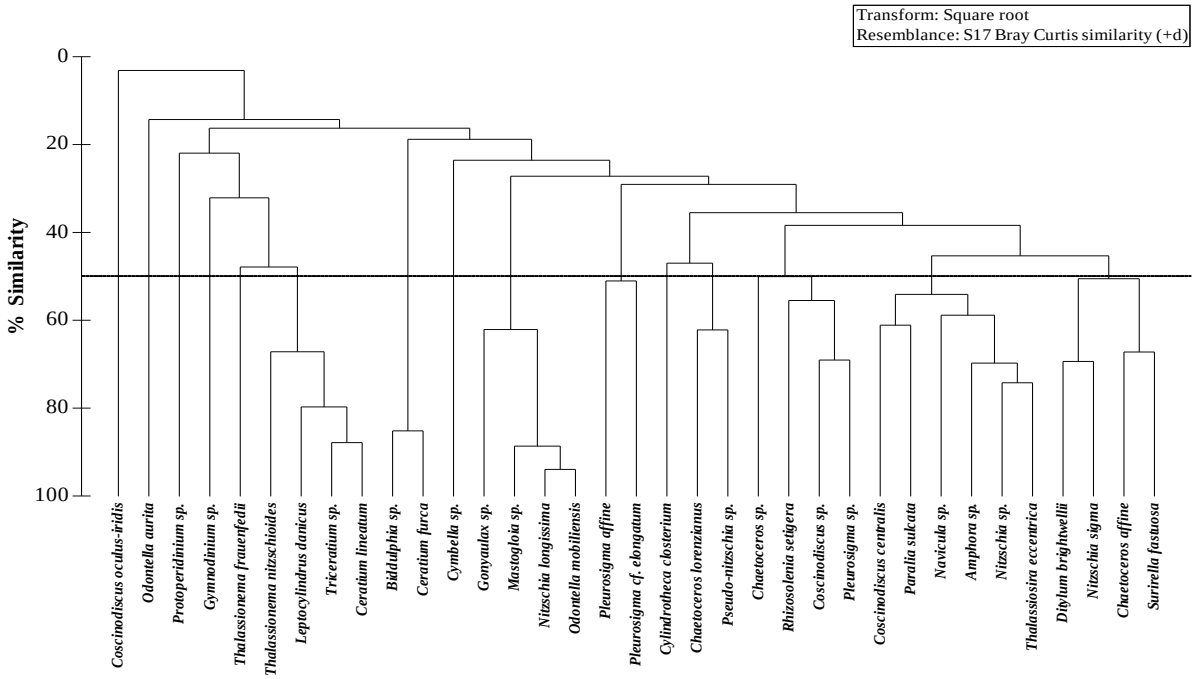

Fig.13: Cluster Analysis of family wise phytoplankton distribution in Amba River

(b) Zooplankton

Copepods (19 genera) dominated the meso-zooplankton diversity in Amba river comprising 78.2% of the total count. It was followed by nauplii (11.7%), gastropod veliger (5.4%) and decapod larva (1.6%). Other groups of zooplankton observed during sampling were appendicularians, chaetognaths, Lucifer sp., bivalve veliger, polychaete larva, cypris larva, cummaceans, fish larva, nematods, hydromedusa, foraminiferans, isopods, amphipods and mysids (Table 8).

Overall, the zooplankton abundance was segregated into four groups namely copepods, nauplii, gastropod veliger and decapod larva. The density of copepods increased with salinity (maximum at the river mouth). Similar trend was observed for nauplii, gastropod veliger and decapod larva (Fig. 14). Occurrence of demersal organisms (cummaceans) at the stations 9 and 10 suggested that shallow depth or mixing of water column might have caused mixing of surface water with bottom water.

Overall, 11 taxa of copepods and copepodids of different species were enumerated (Fig 15-17). Increased abundance of adult copepods was observed from the stations 7 to 10. Further, high density of demersal copepod *Pseudodiaptomus* sp. and occurrence of *Acartiella* sp. indicated the influence of brackish water.

Table 8: Zooplankton diversity and density in Amba River

Taxa (Indi/m³)	**St 1**	**St 2**	**St 3**	**St 4**	**St 5**	**St 6**	**St 7**	**St 8**	**St 9**	**St 10**	**Avg**	**(%)**
*Acartia*sp.	6.0	23.0	7.9	11.7	3.3	5.0	275		134	427	127	35
Acartiella sp.	-	-	-	-	-	-	-	-	-	8.4	0.8	0.23
Pseudodiaptomus sp.	-	9.5	3.9	1.7	2.4	-	12.3	9.9	38.8	58.6	13.7	3.75
Bestiolina sp.	-	-	-	1.7	2.8	-	9.8	-	8.1	23.0	4.5	1.24
*Parvocalanus*sp.	-	68.9	31.4	53.5	26	0.8	122	22.8	72.7	171	57.1	15.6
Acrocalanus sp.	-	-	-	-	-	-	-	1.0	-	-	0.1	0.03
Eucalanus sp.	-	-	-	-	-	-	-	-	1.6	-	0.2	0.04
*Tortanus*sp.	-	2.7	-	-	-	-	-	0.2	-	-	0.3	0.08
Oithona sp.	-	24.3	-	-	0.9	-	-	2.0	4.8	-	3.2	0.88
Tegastus sp.	-	-	-	-	-	-	-	-	0.5	4.2	0.5	0.13
Calaniod copepods	14.4	94.6	83.8	45.2	12.8	8.3	272.6	48.6	114.7	79.6	77.4	21.20
Harpacticoids	-	-	-	-	0.5	-	-	-	-	-	0.0	0.01
Chaetognaths	-	5.4	1.3	-	0.0	-	7.4	3.0	3.2	2.1	2.2	0.61
Gastropod veliger	-	4.1	1.3	5.0	0.5	-	68.8	31.7	54.9	29.3	19.6	5.35
Bivalve veliger	-	8.1	-	1.2	-	-	-	0.2	3.2	2.1	1.5	0.41
*Oikopleura*sp.	-	-	-	-	1.9	-	2.5	4.0	-	2.1	1.0	0.28
Nauplii	7.4	9.5	52.4	26.8	0.9	-	115	93.2	12.9	108	42.7	11.7
Decapod larva	4.6	12.2	-	3.3	1.9	-	7.4	2.0	21.0	4.2	5.7	1.55
Polychaetelarva	-	1.4	-	-	0.5	-	2.5	-	3.2	4.2	1.2	0.32
Cypris larva	-	-	-	-	-	-	-	-	-	0.4	0.0	0.01
Cummacea	-	-	-	-	-	-	-	-	0.5	1.3	0.2	0.05
Fish larva	-	-	-	-	0.5	-	2.5	0.2	1.1	-	0.4	0.12
Nematoda	-	-	-	-	-	-	-	0.2	-	-	0.0	0.01
Hydromedusa	-	-	1.3	1.2	-	-	7.4	-	1.6	-	1.1	0.31
Foraminifera	-	-	1.3	1.7	-	-	27.0	-	-	-	3.0	0.82
Isopoda	-	-	-	-	0.5	-	-	-	-	-	0.0	0.01
Insecta	-	-	-	1.7	0.5	-	2.5	-	-	-	0.5	0.13
Amphipoda	-	-	-	-	0.5	-	1.2	-	-	-	0.2	0.05
Lucifer sp.	-	-	-	-	0.5	-	-	-	0.5	-	0.1	0.03
Mysidacea	0.5	-	-	-	0.0	-	-	-	0.5	-	0.1	0.03
Total	**32.9**	**263.5**	**184.6**	**154.6**	**57.2**	**14.1**	**936.9**	**604.5**	**477.9**	**927.1**	**365.3**	**100.0**

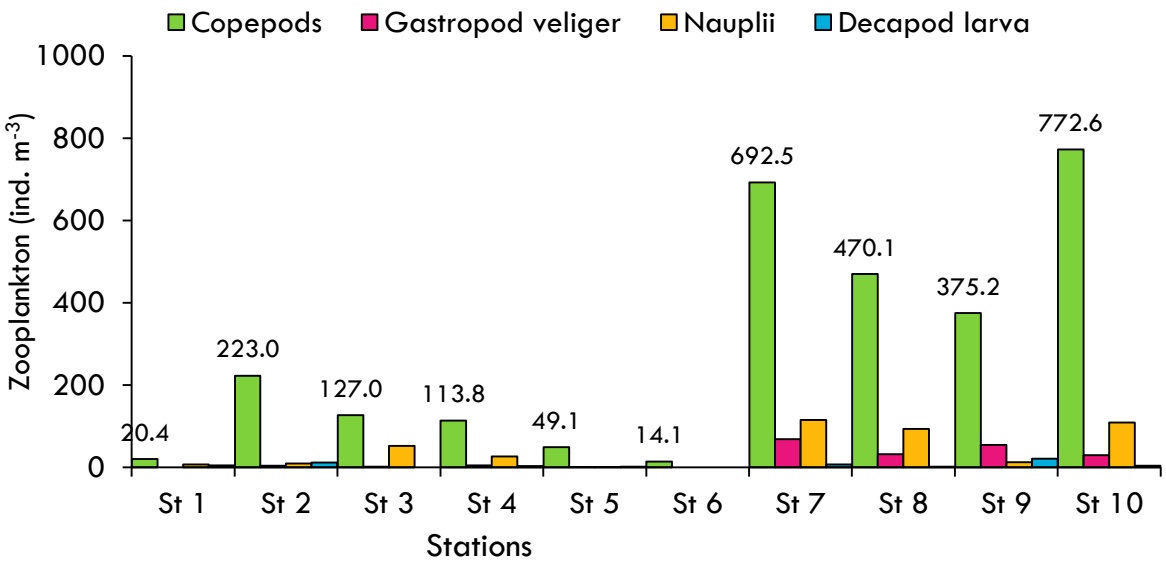

Fig.14: Abundance of zooplankton in the study area.

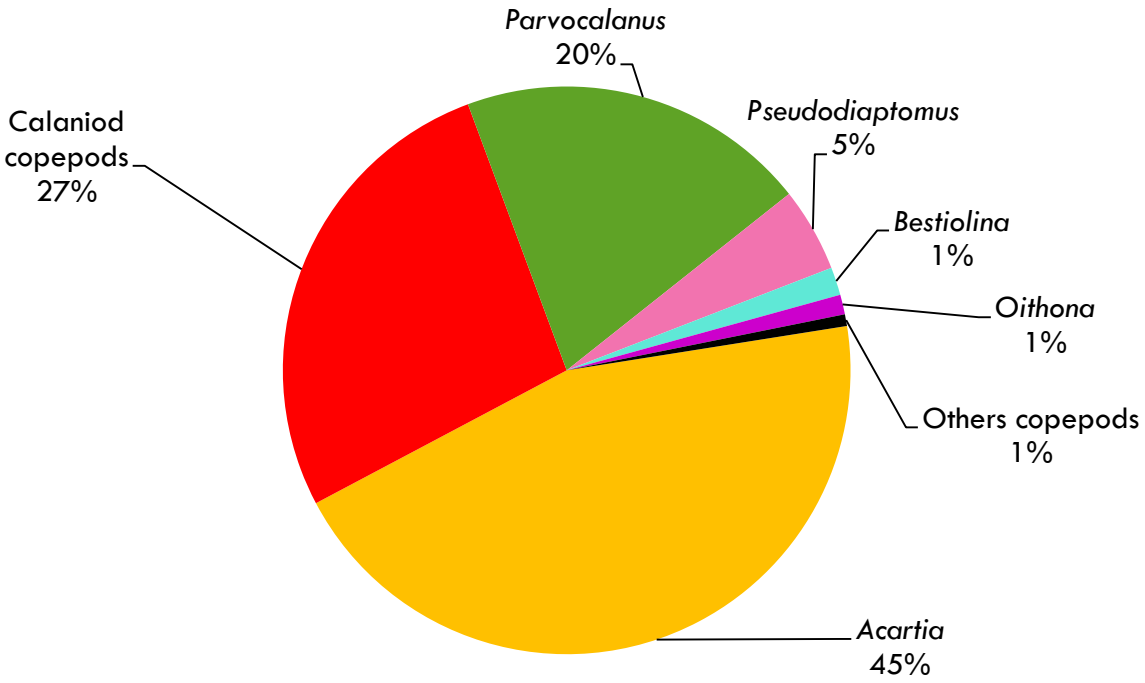

Fig.15: Relative abundance of copepod species in Amba River.

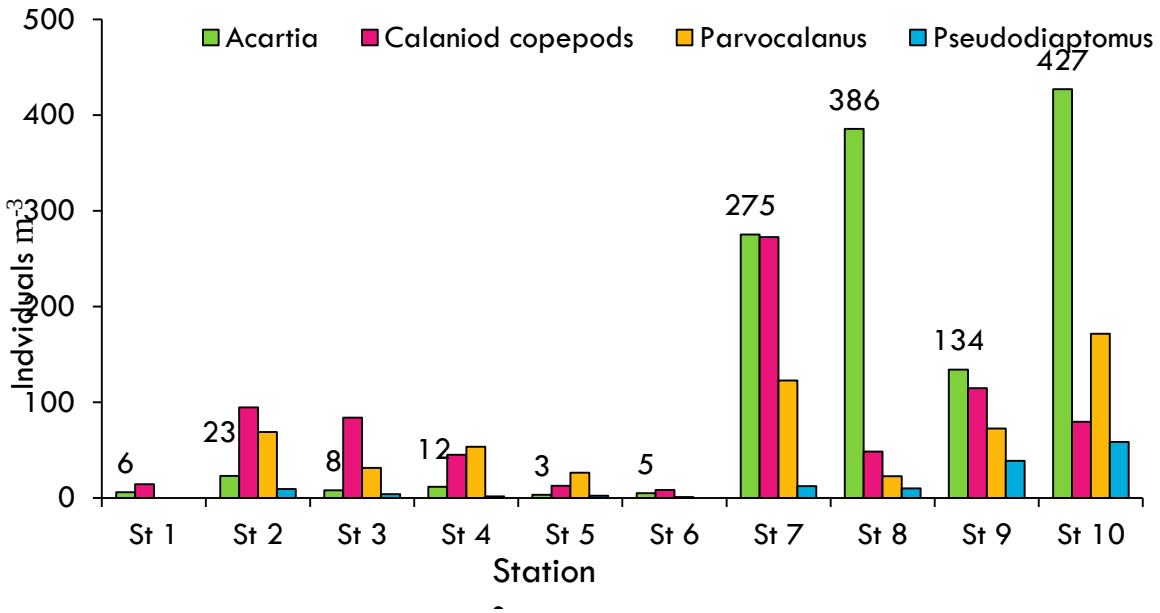

Fig. 16: Abundance of copepod in Amba River

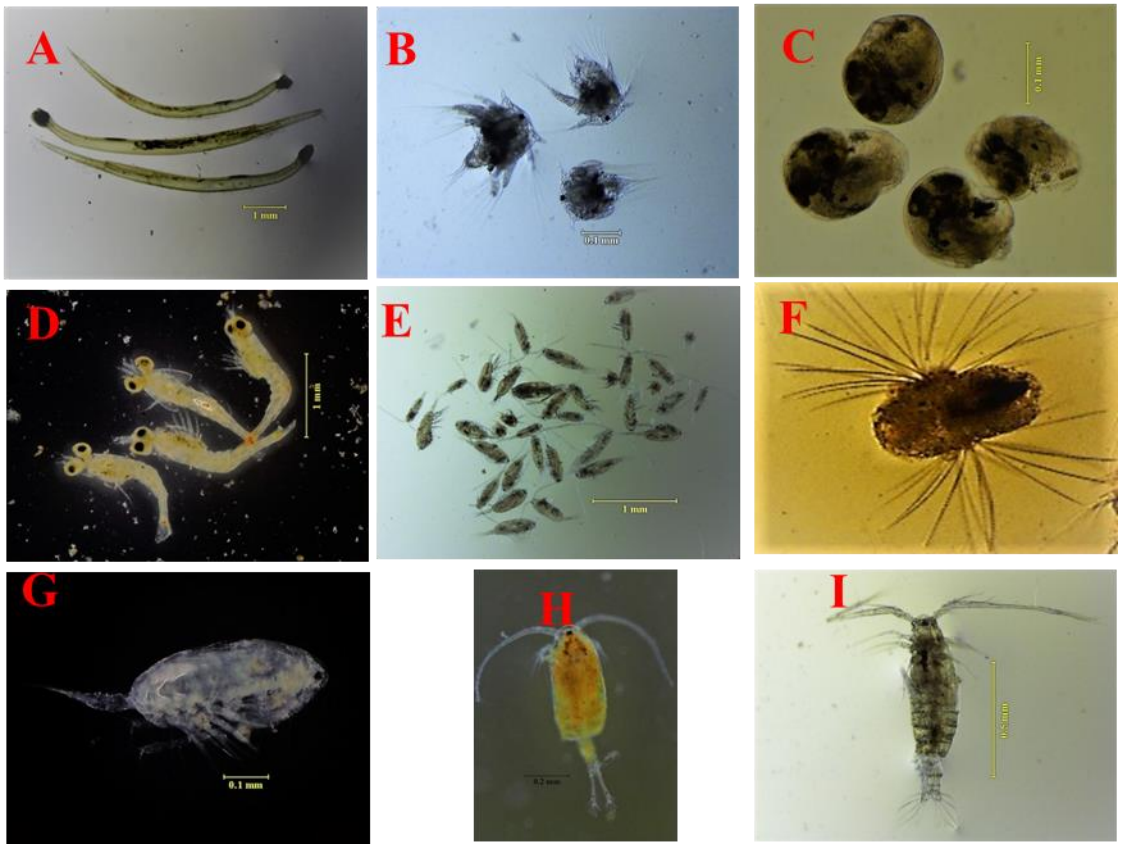

Fig.17: Zooplankton species observed in Amba River - A. Chaetognaths, B. Nauplii, C. Gastropod veliger, D. Decapod larvae, E.Copepods, F. Polychaete larva, G. Acartia sp., H. Pseudodiptomus sp. I. Acartia sp.

5. Mangroves of Amba River

The JSW industrial zone has expanded from 3.03 km^2 in 2005 to 4.82 km^2 in 2016 with an increase of 1.79 km^2 in the last decade (2005–2016). Subsequent increase in the Dharmatar Port area from 0.07 km^2 to 0.61 km^2 is witnessed during the period of comparison. Shrinkage in the river area from 41.68 km^2 in 2005 to 41.06 km^2 in 2016, a reduction by 0.62 km^2 is also recorded (Table.9).

Table. 9. Changes in land use pattern for the area under study

S. No.	Land Features	Area (Km^2)			Decadal Change (2005 to 2016) (%)
		2005	2010	2016	
1	Amba River	41.68	41.56	41.06	-1.49
2	Mudflat	15.64	12.85	12.81	-18.09
3	Mangrove	48.46	51.21	58.74	21.21
4	Industrial Zone	3.03	4.75	4.82	59.08

5.1 Changes in spatial extent of mangroves in the creek area

The total number of mangrove patches (including Dharmatar Port, Amba River, Bhogwati River and Patalganga River) recorded in the year 2005 was 625. This increased to 738 patches in 2010 and was reduced to 582 patches in the year 2016 based on geospatial assessment of the region. The reduction in the number of patches is directly attributed to the extensive growth of mangroves and the merging of two adjacent patches into a single patch. This is evident from the increase of mangrove area by 10.27 km^2 in the year 2016. The details of the patches are provided in Table10.

Table 10. Temporal variation in spatial extent of mangroves in the creek area

Year	2005		2010		2016	
	No. of patches	Area (Km^2)	No. of patches	Area (Km^2)	No. of patches	Area (Km^2)
Dharamtar Port	6	0.07	4	0.07	9	0.11
Ambariver (excluding Dharamtar port)	283	26.59	360	27.89	328	31.01
Bhogwati river	179	15.73	198	17.02	121	19.51
Patalganga river	157	6.08	176	6.23	124	8.11
Total	625	48.47	738	51.21	582	58.74

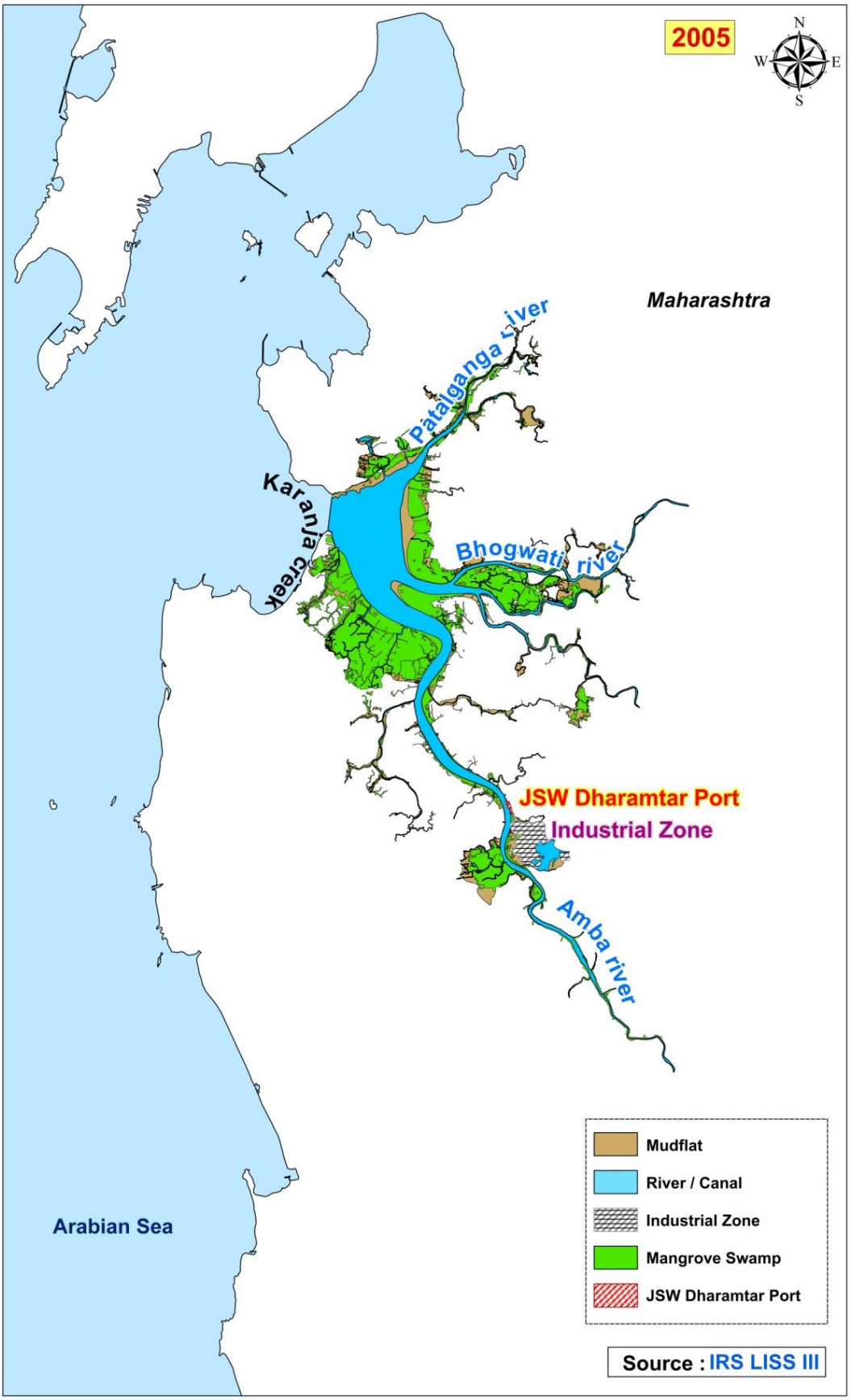

Fig.18: Distribution of mangroves(2005) along the Amba River and Karanja Creek

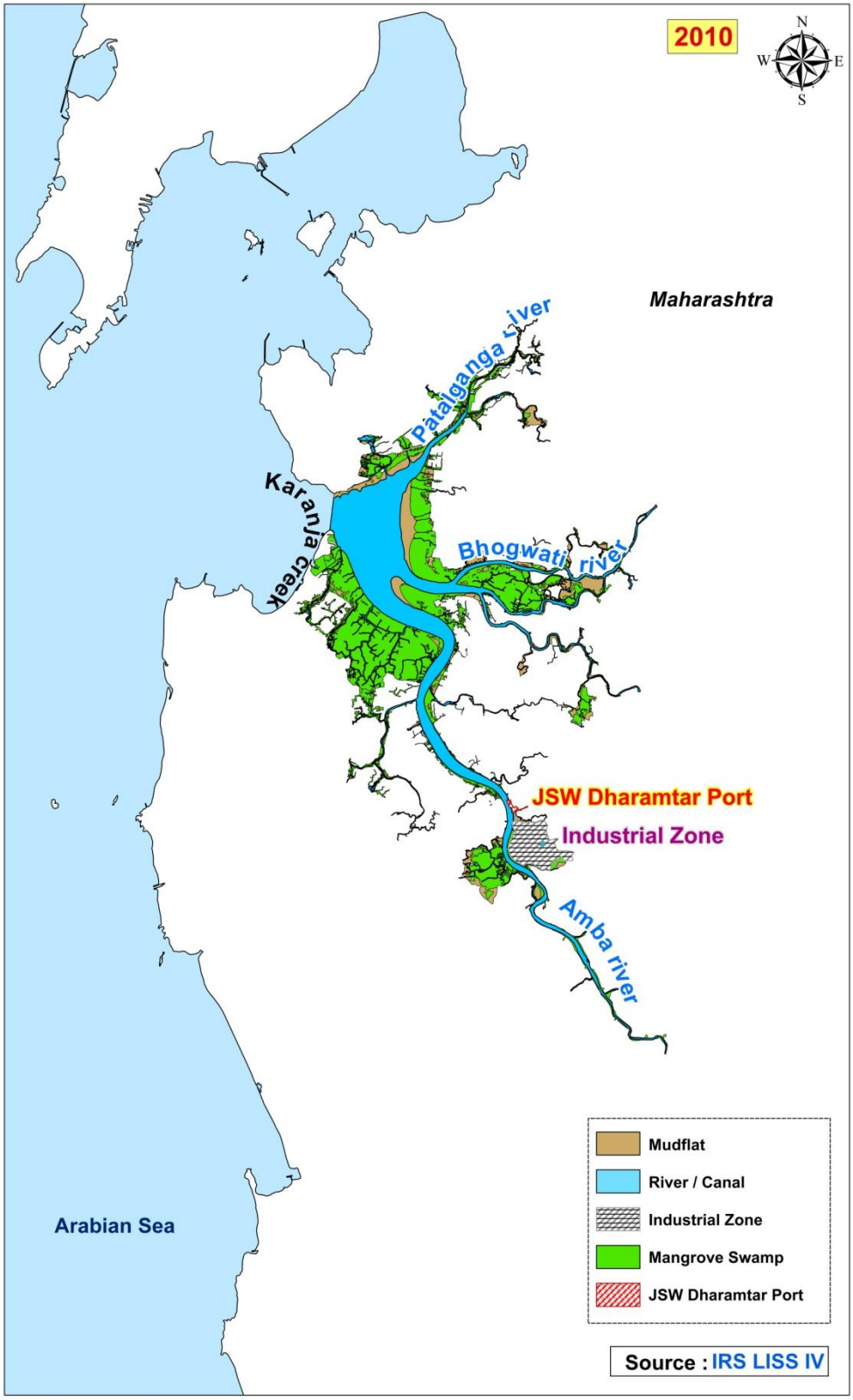

Fig.19: Distribution of mangroves (2010) along the Amba river and Karanja Creek

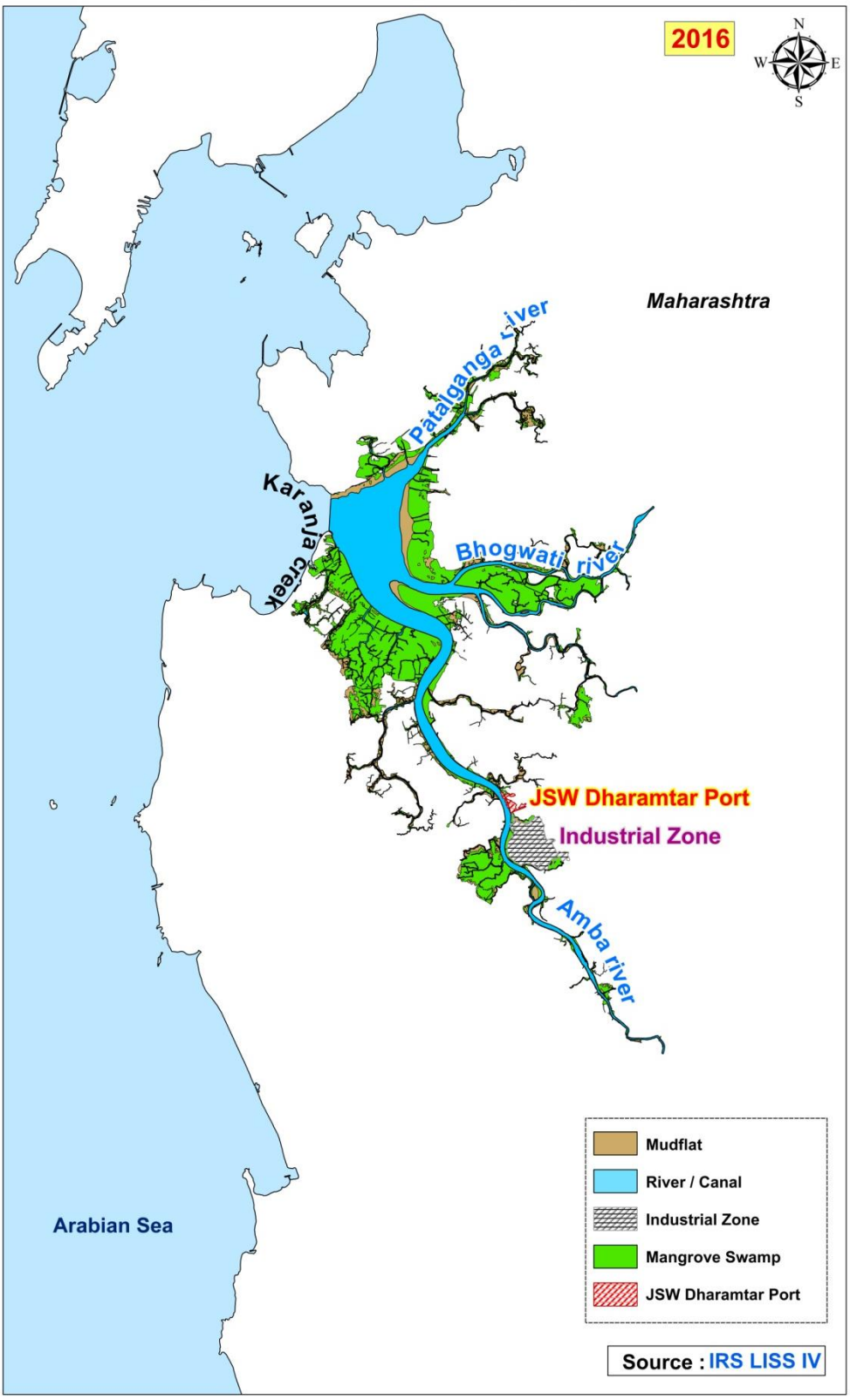

Fig.20. Distribution of mangroves (2016) along the Ambariver and Karanja Creek

5.2 Mangrove diversity

In the preliminary survey along the Amba River, 6 species of mangroves were identified from the banks of the estuary and the port extension area (Fig 21). The mangroves of Amba Rivers were healthy, and initial observation indicated that the construction work for the expansion of the berth is causing minimal hindrance of flow to the mangroves in vicinity of the Dharamtar port. However the mangrove leaves near the existing berth were covered with fine dust which may impinge their photosynthetic capacity (Fig 6).

Fig. 21: Mangroves of Amba River

In addition, on either side of the river bank downstream, erosion was observed along with dead and exposed mangroves (Fig. 22). There are several on-going activities such as river bed sand mining at upstream of Dharamtar port(Fig 23) which may alter the hydrology of the river causing the erosion. Detailed field studies and hydrodynamic modelling studies will be carried out for the mangrove management plan.

Fig. 22: Severe bank erosion leading to death of mangroves in downstream of Amba River

Fig. 23. Sand mining activity in Amba River, upstream of the JSW port

Further, the EIA report provided by JSW Port Authorities enlisted a total of 14 true mangrove species. Among these, *Sonneratia griffithii* is a species that is exclusively found in the west coast of India (West Bengal and Odisha) and the Andaman Islands. *Salvadora perisca* is typical coastal vegetation and is not a mangrove species. *Acanthus ilicifolius* listed along with mangrove associates but, this species is considered as a true mangrove. The revised list therefore comprises of 13 true mangrove species

(1) *Aegericascorniculatum*
(2) *Avicennia marina*
(3) *Avicenniaofficinalis*
(4) *Bruguieragymnorhiza*
(5) *Bruguieracaryophylloides*
(6) *Ceriopsdecandra*
(7) *Ceriopstagal*
(8) *Excoecaria agallocha*
(9) *Rhizophoraapiculata*
(10) *Rhizophoramucronata*
(11) *Sonneratia apetala*
(12) *Sonneratia alba*
(13) *Acanthus ilicifolius*

Detailed survey in the 10 km area of the project site covering the zonation pattern (along the creek and perpendicular to the creek) and the spatial distribution of mangrove species in relation to physico-chemical characteristics, hydrological and soil conditions will be undertaken in the forthcoming mission.

Avifaunal diversity

During the field survey, a total of 13 species of coastal birds were recorded. Of these, 4 were migratory (1) Eurasian curlew (*Numeniusarquata*) from Siberia, (2) Heuglins Gull (*Larusheuglini*) from Russia, (3) Pallas gull (*Larusichthyateus*) from central Asia and Tibet and (4) Terek sandpiper (*Xenuscinereus*) from Siberia (Fig 24). Future surveys will focus on species that are resident (breeding and foraging) in the survey area.

Other associated mangrove fauna

Molluscan forms namely the Horn snail *Telescopium telescopium* (Gastropoda) and the rock oyster *Saccostrea*sp (Bivalvia) were found in the estuarine regions. While the horn snail was found in the intertidal zones of the estuary amidst mangroves, the rock oysters were found attached to concrete structures and rocks (Fig 25)

Fig. 24: Migratory birds recorded in the Amba river estuary

Fig. 25: Horn snail Telescopium telescopium foraging in the intertidal area

6. Summary

A detailed survey was made at Dharamtar Jetty facility in Village Dolvi of District Raigad (Maharashtra) by the team of National Centre for Sustainable Coastal Management as per the recommendations of EAC, the Ministry of Environment, Forest& Climate Change vide MoEF&CC letter No. F. No. 11-79 / 2013-IA.III dated 26/11/2015. The objectives of the survey were to:

- Carry out a detailed field survey
- Fixing the sampling locations for continuous monitoring. These locations were chosen in addition to the locations mentioned in EIA.

6.1 Salient Observations

Following salient observations were made during the field survey

(a) Construction

- Construction of new berth as a part of on-going expansion is causing minimal disturbance to the existing river bank or sea bed since all necessary precautions are being observed by the Port.
- About 20m width strip of mangroves were observed all along the Amba estuary. Initial observations indicated that mangrove were intact near the construction.

(b) Air & Noise quality

- Mean PM_{10} and $PM_{2.5}$ concentrations were well within the permissible limits prescribed for the industrial areas defined by CPCB. However, the leaves of mangroves and other terrestrial vegetation near the jetty were covered with a layer of fine black dust which is considered to affect photosynthesis if exposed for prolonged period of time
- These results showed that the noise pollution level is satisfactory with respect to the CPCB standard.

(c) Water and Sediment Quality

- Water quality was as per Class D of CPCB norms for surface water indicating that water was suitable for propagation of Wild life and Fisheries. River bed sediment was mostly clay silt in nature.
- The bed sediment was poor in benthos as sand mining and dredging are continuous activities. Sediment depositions on dead shells were also observed.

(d) Flora & Fauna

- A total of 35 species under 24 genera of phytoplankton were recorded in the field stations. Mesozooplankton diversity composed of 19 taxa and was dominated by copepods (78.2%) followed by nauplii (11.7%).

(e) Mangroves

- 6 species of mangroves were identified from the banks of the Amba estuary and the port extension area during this survey
- The mangroves of Amba River were healthy, and initial observation indicated that the construction work for the expansion of the berth is causing minimal obstruction of flow to the mangroves in vicinity of the Dharamtar port.

6.2 Way forward

- In Amba River, 10 sampling locations have been identified for continuous environmental monitoring. The monitoring will include physico-chemical assessment of water and sediment quality, plankton studies, benthos assessment
- Air quality and noise will also be measured at the construction site for the expansion of berth.
- Proposed schedule for environmental monitoring is mentioned as follow:

S.No	Tasks	
1	First Quarterly sampling and analysis	March 2017
2	Second Quarterly sampling and analysis	June 2017
3	Third Quarterly sampling and analysis	September 2017
4	Fourth Quarterly sampling and analysis	December 2017

- Physical oceanographic survey such as bathymetry, flow dynamics including wave tides etc. will be carried out
- Modelling of the flow pattern assessing potential impacts on the mangroves due to potential changed flow regime will be undertaken
- Detailed survey will be made during first quarterly sampling to formulate a mangrove management plan.

Fig. 26: Site visit by scientists of NCSCM with officials of JSW Dharamtar was carried out for analysis and reporting.

Fig. 27: Collection of water samples for physico-chemical and biological analysis

Fig.28: In situ measurements during the field visit in Amba river

Fig.29: Collection of Plankton samples from Amba river.

Fig. 30: Mangroves of Amba River near the JSW Dharamtar Port

Fig. 31: On-going construction activities at JSW Dharamtar port. Mangroves are clearly visible behind the construction site.

Fig. 32: Dredger in downstream of Amba River

Fig. 33: Bank erosion (as observed at 18° 46.98'N, 73°0.052'E), downstream of Amba River

F. No. 11-79/2013 - IA III
Government of India
Ministry of Environment, Forest & Climate Change
(I.A. Division)

Indira ParyavaranBhawan
Aliganj, Jorbagh Road,
New Delhi -110003

E-mail :aditya.narayan@nic.in
Telefax:011: 24695398
Dated: 26th March, 2016

To,

The Vice President (Projects),
M/s JSW Dharamtar Port Pvt. Ltd.
JSW Centre, Bandra- Kurla Complex, Bandra (E),
Mumbai-51 (Maharashtra)

E-mail: rasmiranjan.patra@jsw.in; santosh.nair@jsw.in; Phone: 022-42861000;

Subject : Expansion of Dharamtar Jetty facility at Dolvi of District Raigad (Maharashtra) by M/s JSW Dharamtar Port Pvt Ltd – Amendment in Environmental and CRZ Clearance.

Ref.: (i) Ministry's letter of even no. dated 26th November, 2015.

(ii)Your online proposal no. IA/MH/MIS/34131/2015 dated 9th December, 2015.

Sir,

This is in continuation of this Ministry's letter dated 26th November, 2015 regarding the above mentioned subject, wherein following points are mentioned:

At S.N. (iii) of para 4.0 of the Environmental Clearance and CRZ Clearance dated 26th November, 2015: "*There will be no disposal of dredged material into the sea. But to be reused for reclamation, and for shore enrichment based on its characteristics, as committed.*""

2.0 It was noted that CWPRS, Pune has carried out mathematical model study to determine the impact of the waterfront development. As per study report, it is reported that dumping ground is suitable for disposal of excess soil from the dredging. The granular and rocky materials could be used for landfilling and grading. Dumping location of the dredge spoil indicating the location of the disposal ground in the geographical coordinates viz. Disposal Ground No. 1 : 18°52'29.96"N, 72°52'17.98" E and Disposal Ground No. 18°45'11.97"N, 72°48'24.0" E. In this regard, PP has submitted the copy of corrigendum no MMCE/2015 dated 22.12.2015 issued by CWPRS, Pune showing locations of dumping grounds alongwith geographical co-ordinate.

3.0 The proposal was considered by the Reconstituted Expert Appraisal Committee (Infrastructure-2) in its 1st meeting held during 21st – 22nd December, 2015 and the Committee recommended the proposal for the following amendment:

i) As proposed, the granular and rocky materials shall be used for landfilling and grading. Other dredge materials shall be disposed at designated disposal ground off Mumbai Port as suggested by Central Water and Power Research Station (CWPRS), Pune indicating

the location of the disposal grounds in the geographical coordinates viz. Disposal Ground No. 1 : 18°52'29.96"N, 72°52'17.98" E and Disposal Ground No. 18°45'11.97"N, 72°48'24.0" E".

4.0 The Ministry accepts the recommendation of the Expert Appraisal Committee (Infrastructure - 2) for amendment in the existing environmental clearance subject to compliance of specific conditions and general conditions.

5.0 All other conditions will remain unchanged.

6.0 In future, in case of change in the scope of the project, the company shall obtain fresh environmental clearance.

7.0 This issues with the prior approval of the Competent Authority.

(A N Singh)
Scientist D

Copy to:-

1.0 The Principal Secretary, Environment Department, Government of Maharashtra, 15th Floor, New Administrative Building, Mantralaya, Mumbai - 400 032
2.0 The Chief Conservator of Forests (Central), Kendriya Paryavaran Bhavan, Link Road No.3, Bhopal-462016.
3.0 The Chairman, Central Pollution Control Board Parivesh Bhavan, CBD-cum-Office Complex, East Arjun Nagar, New Delhi - 110 032.
4.0 The Chairman, Maharashtra Pollution Control Board, Kalpataru Point, 3rd and 4th floor, Opp. Cine Planet, Sion Circle, Mumbai-400 022.
5.0 Monitoring Cell, Ministry of Environment, Forest and Climate Change, Indira Paryavaran Bhavan, *Jorbagh Road*, New Delhi.
6.0 Guard File/Monitoring File/Record File.

(A N Singh)
Scientist D

ANNEXURE III

Final Report

On

Underwater noise monitoring at JSW Dharamtar Port Pvt. Ltd.

Submitted

To

JSW Dharamtar Port Pvt. Ltd., Raigad, Maharashtra

By

Department of Mechanical Engineering
Indian Institute of Technology Kharagpur
Kharagpur 721302, INDIA

July, 2017

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Introduction

This final report is made after executing two on-site measurements at JSW Dharamtar Port Pvt. Ltd. on the 3rd June, 2016 and 17th February 2017, as per the purchase order P.O. No. PO/JSWDPPL/16-17/03 dated 27-05-2016. The underwater noise measurements were made duirng the piling operation. Two underwater measurements were done at a distance of 100 m and 2 km from the piling site in the Amba River. The general area of measurement in the Amba river near the port where piling is being done is shown in the Google Map in Figure 1.

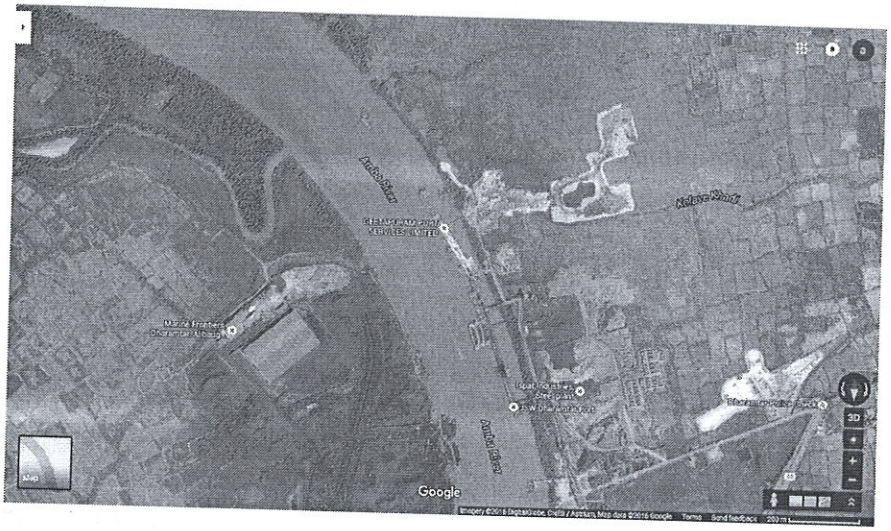

Figure 1: General area of measurement location

In this report the protocol of measurements as per established international maritime practices is adopted and for the sake of clarity, explicitly mentioned. This is followed by a description of the measurement equipment used and the analysis of the underwater noise.

The report concludes with a set of recommendations to be followed for underwater noise monitoring, which can be a guidance for the environmental health of the marine eco-system.

Measurement Protocol

1.) The general guidelines of measurements of underwater noise provided in ISO 17208.
2.) The hydrophone used for measurements must comply with IEC 60500 standard.
3.) The hydrophone must be calibrated both before and after measurements by a pistonphone calibrator.
4.) The ambient, temperature, local pressure and wind direction and speed condition must be reported. In general the weather condition be recorded.

5.) The locations of the hydrophone by a GPS system must be reported, along with the depth at which the hydrophone is placed.
6.) The hydrophone must have its appropriate battery powered signal conditioning amplifier.
7.) The hydrophone must be suspended in the water at the appropriate measurement height with a steel cable alongwith a weight at the bottom, so that the hydrophone doesn't sway sideways in the water.
8.) The analog signal from the hydrophone through the signal conditioning amplifier, be acquired by a computer aided data acquisition system with a minimum sampling frequency of 48 kHz. Adequate digital data points be captured so that the high frequency contents of the signal due to the piling impacts are captured.
9.) The data acquistion system must have adequate dynamic range to capture the signal, at a minimum it must be of 24 bit resolution with low pass anti-aliassing analog filters before the analog to digital conversion.
10.) The data acquistion system must have adequate on board memory to store the acquired digital data, and driven by a software with a GUI.
11.) The measurement report should contain the time history of the underwater measured noise by the hydrophones at all the locations.
12.) The peak level of the underwater noise at the measured locations be reported in dB (with reference of 10^{-6} Pa).
13.) The measurements should be made and reported in every quarter for a minimum of two years, to show the impact of piling on the marine environment eco-system.

Equipment Details

The details of the measuring equipment belonging to Indian Institute of Technology Kharagpur used in the measurements are given in Table 1.

Table 1. Equipment Details

Sl. No.	Equipment Name	Model No.	Serial No.
1.	Hydrophone with integrated 10 m cable	B&K 8104	2487076
2.	Charge Amplifier	B&K 2635	2744066
3.	Data Acquisition System	NI USB 4431	14287FB
4.	Hydrophone Calibrator	B&K 4229	2733820
5.	Laptop with NI LabVIEW Software	Dell Latitude E6430	3897281793

A view of the equipment on the boat used during measurement are shown in Figure 2. Figure 3. Shows the hydrophone cable along side the anchoring chain from the boat.

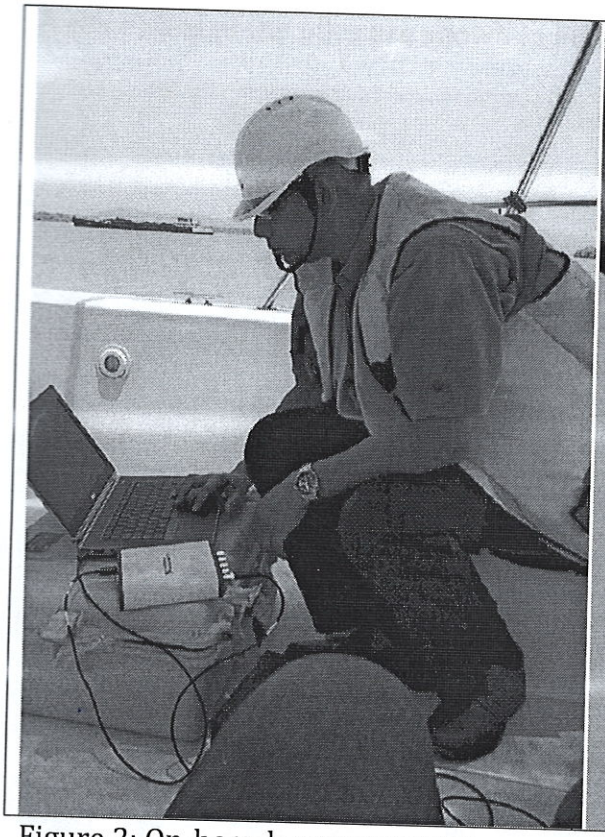

Figure 2: On-board measurement equipment

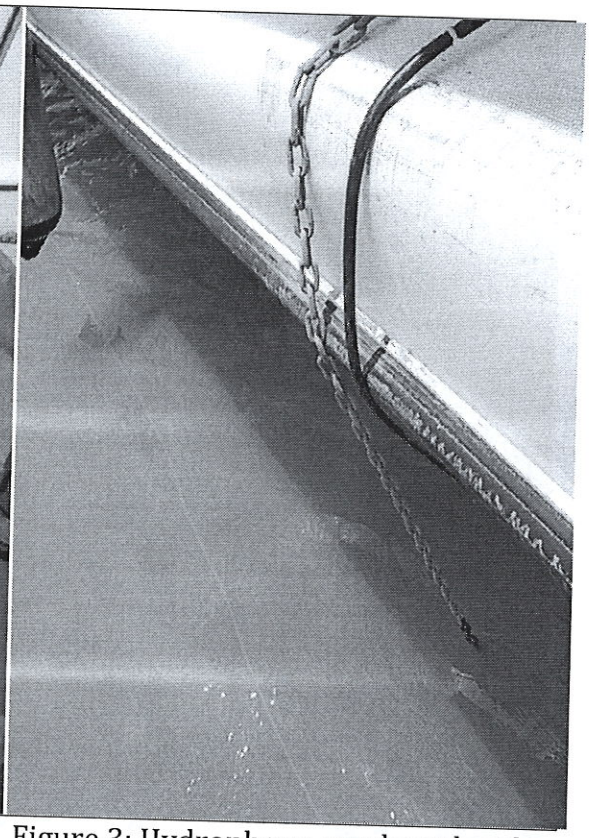

Figure 3: Hydrophone overboard with guide chain.

Piling Details

A view of the piling machine on the Amba river is shown in Figure 3. The pile had a weight of 1.5 tons, being dropped from a height of 1.5 m dropped by a pneumatic power source, which corresponds to a pile energy of 22 kJ. The pile diameter is of 0.5 m.

Figure 3. View of the pile in the background.

A close view of the piles are shown in Figure 4.

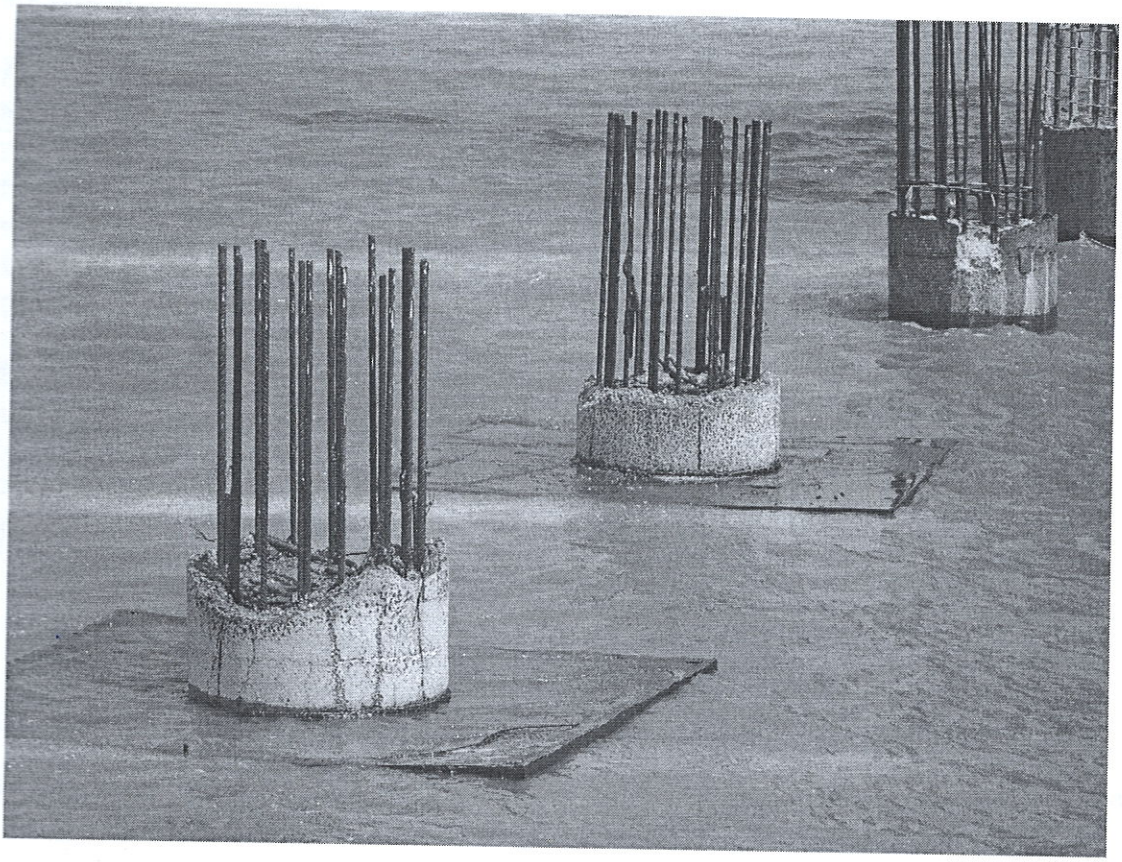

Figure 4: View of the 0.5 m diameter piles on the Amba river

Measurement Locations

A speedboat with outboard motors was used to traverse the site with the measuring equipment. During the measurements the speedboat outboard motors were switched off. It was noticed that at low tides the water waves splashed the boat hull and the boat drifted. However, care was taken to perform the measurements at the same location.

The GPS coordinates for measurement 1, 100 m away from the pile are 18^0 42'10"N $73^0$1'44"E. The GPS coordinates of measurement location 2, at a distance of 2 km away from the pile are 18^0 43'42"N 73^0 1'44"E for the measurements on the 3rd June, 2016.

Weather condition

During the measurements on 3rd June 2016 at Amba river, there were no rains, and the river was calm, with calm wind blowing. The ambient temperature was 33^0C.

Measured Time History

At each measurement location the underwater noise was measured using the hydrophone for a duration of 30 seconds at depths of every one meter from the river surface. The signal from the hydrophones were acquired at a sampling frequency of 50 kHz and for a 2 second time history, 100000 digital data points were stored, using a data logger software developed in LabVIEW at the Indian Institute of Technology Kharagpur. Measurements were done for the case of no piling and the case of piling. The average depth of the river was within 5 to 6 m in the entire measurement zone. The measurements close to the river bed would have reflections from the bed, thus for all the cases the measurement time history at a location of 3 m from the river surface are shown.

Figure 5. shows the background noise at 100 m location from the pile at 3 m depth.

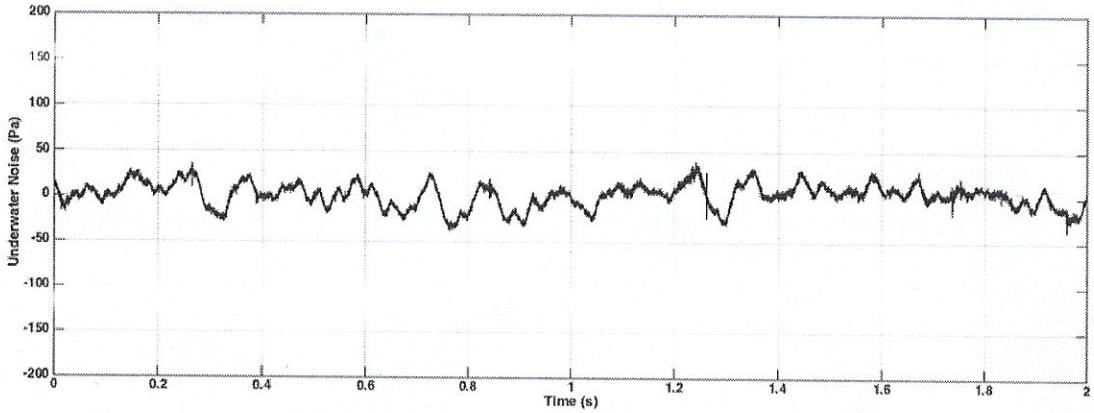

Figure 5: Measured underwater noise 100 m from piling location with no piling operation at a depth of 3 m.

Figure 6. shows the measured underwater noise at 100 m from the piling location while piling was being done.

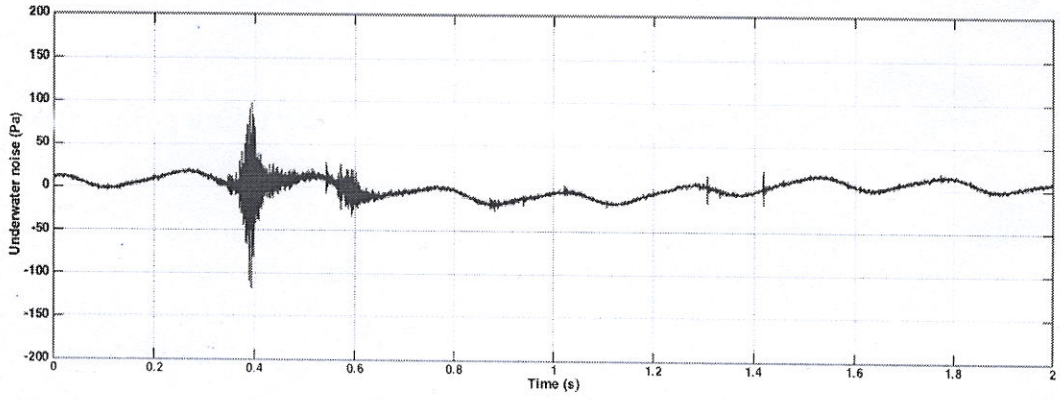

Figure 6: Measured underwater noise at 100 m from piling location during the piling at 3 m depth.

In figure 4m, the maximum impact noise of 100 m due to piling can be noticed at 400 ms.

Similar measurements were done at 2 km away from the pile, Figure 7 and 8 show the time history of the underwater noise without piling and with piling at 3 m depth.

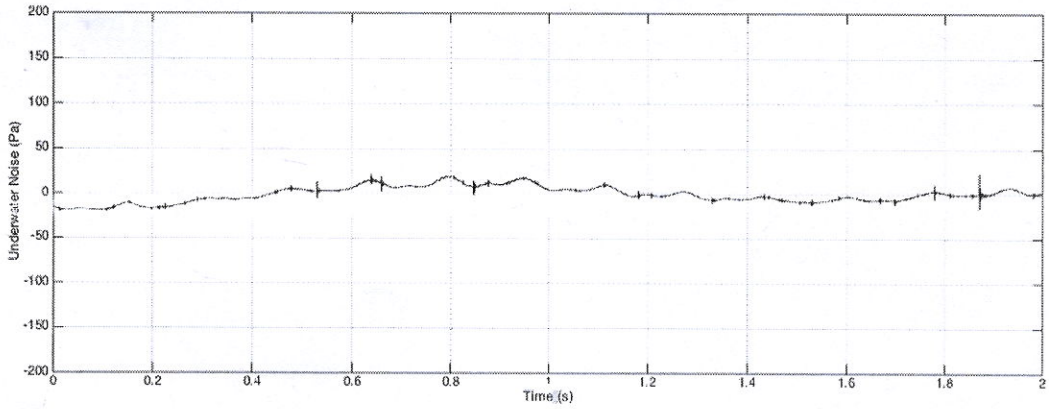

Figure 7: No piling underwater noise at 2 km from piling site at depth of 3 m

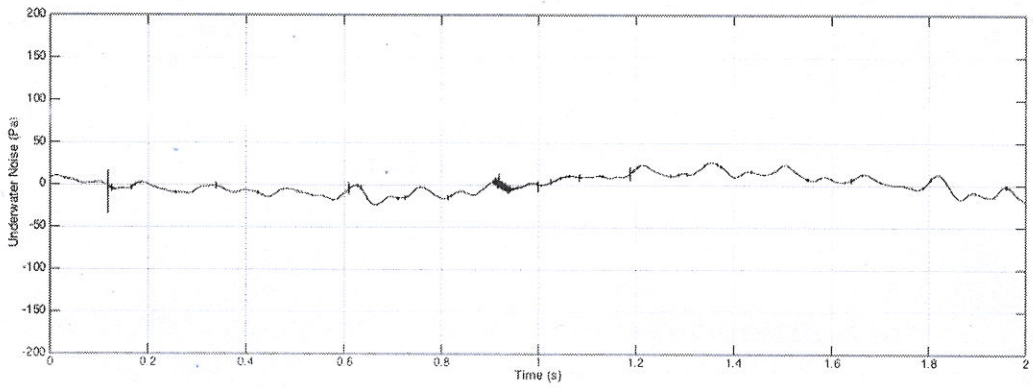

Figure 8: Piling underwater noise at 2 km away from pile at 3 m depth.

From Figures 7 and 8 it is observed that during the piling the underwater noise is almost equal to the case of no piling. And in Figure 6, around 900 ms the noise impact due to piling can be noticed.

Table 2 gives a summary of the underwater peak noise levels as measured at 3 m depth for the two locations. The underwater peak noise level given in Table 2 in decibel is with a reference of 10^{-6} Pa.

Table 2: Measured underwater peak noise levels at 3 m depth on 3rd June, 2016

Sl. No.	Distance from pile Location (m)	No piling	With Piling
1	100	25 Pa (147 dB)	100 Pa (160 dB)
2	2000	15 Pa (143 dB)	15 Pa (143 dB)

The underwater measurements were again done on the 17th February 2017 as per the previous protocol. Figure 9 shows the no piling noise at a distance of 100 m and a depth of 3 m from the piling source. And Figure 10 shows the measured noise for the case of piling.

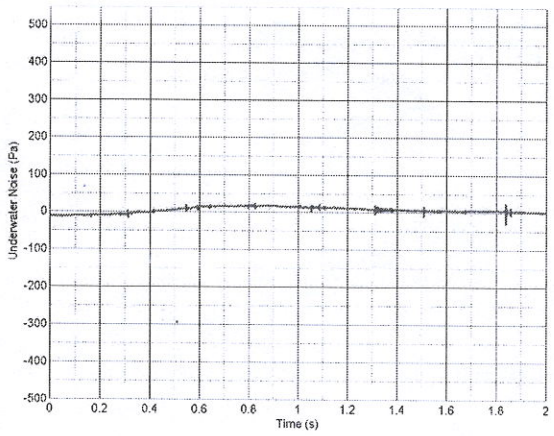

Figure 9: Measured underwater noise 100 m from piling location with no piling operation at a depth of 3 m on 17th Feb 2017.

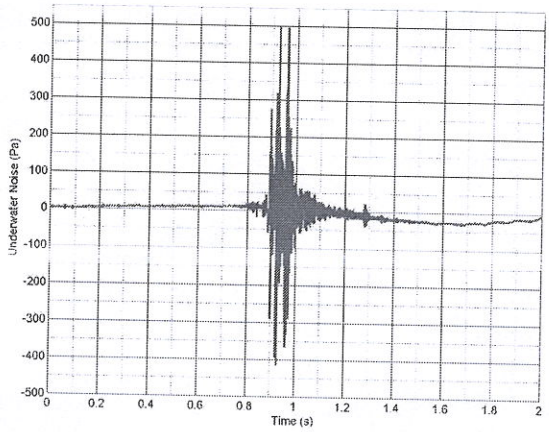

Figure 10: Measured underwater noise 100 m from piling location during piling operation at a depth of 3 m on 17th Feb 2017.

Similar measurements were done at a distance of 2 km from the piling source and are shown in Figures 11 and 12 for the no piling and piling case.

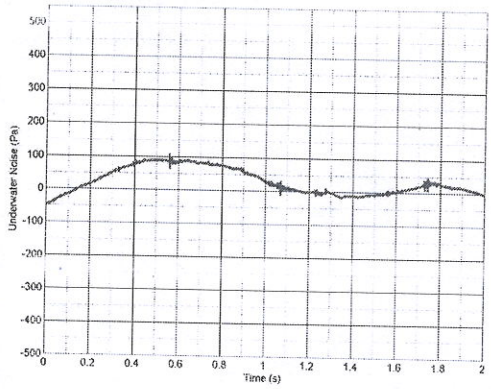

Figure 11: Measured underwater noise 2000 m from piling location with no piling operation at a depth of 3 m on 17th Feb 2017.

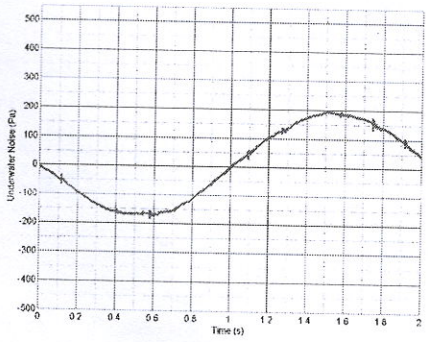

Figure 12: Measured underwater noise 2000 m from piling location during piling operation at a depth of 3 m on 17th Feb 2017.

Table 3 gives a summary of the underwater peak noise levels as measured at 3 m depth for the two locations on the 17th Feb 2017. The underwater peak noise level given in Table 3 in decibel is with a reference of 10^{-6} Pa.

Table 3: Measured underwater peak noise levels at 3 m depth on 17th Feb 2017

Sl. No.	Distance from pile Location (m)	No piling	With Piling
1	100	20 Pa (147 dB)	500 Pa (174 dB)
2	2000	15 Pa (143 dB)	15 Pa (143 dB)

Conclusions

From the measurements done at the site at two different times over a period of one year indicate that due to the year round piling activities being undertaken there is no significant change in the underwater noise levels at a distance of 2 km from the piling site.

For and behalf of Indian Institute of Technology Kharagpur.

Prof. A. R. Mohanty (Ph.D., University of Kentucky, USA)
Fellow Acoustical Society of India
Consultant-in-Charge
Professor of Mechanical Engineering
Indian Institute of Technology Kharagpur
Kharagpur 721302, INDIA

Tel: 03222-282944, Fax: 03222-255303
Mobile: +91-9434016966
Email: amohanty@mech.iitkgp.ernet.in
Web: www.iitnoise.com, www.iitkgp.ac.in

Dr. A. R. Mohanty
Professor
Mechanical Engineering Departmen
Indian Institute of Technology Kharagpur
KHARAGPUR 721 302, INDIA

Tel: (03222)-282944
Fax: (03222)-255303
Mobile: 94340-16966
Email: amohanty@mech.iitkgp.ernet.in
Web: www.iitnoise.com

Professor A. R. Mohanty is currently a professor in the department of mechanical engineering at the Indian Institute of Technology Kharagpur, where he has been a faculty since 1996. His specialization and research interests are in the areas of noise & vibration, condition monitoring, machine design, vehicle dynamics, underwater acoustics and instrumentation. At IIT Kharagpur he teaches Machinery Fault Diagnosis & Signal Processing, Noise and Vibration Control, Machine Design and Automobile Engineering. At IIT Kharagpur he has established a state-of-the-art research laboratory for Acoustics and Condition Monitoring. At IIT Kharagpur he is also a faculty adviser to the Formula SAE student's car project.

Dr. Mohanty obtained his B.Sc Engg (Hons) in Mechanical Engineering from the REC, Rourkela, (Now National Institute of Technology, Rourkela) in 1986. He holds an M. Tech Degree in Machine Design specialization from IIT Kharagpur. His Ph.D in the areas of noise control is from the University of Kentucky, USA and was a post-doctoral fellow at the Ray W. Herrick Labs of Purdue University, USA, in the areas of noise control. He has worked at Larsen & Toubro Limited, Mumbai and Ford Motor Company, Detroit, USA in their respective R&D divisions in the areas of noise and vibration.

Prof. Mohanty has been awarded the Chancellor's Award for Outstanding Teaching by the University of Kentucky, USA and the Rais Ahmed Memorial Award of the Acoustical Society of India, he is also a life fellow of the Acoustical Society of India. He has been awarded the overseas research fellowship of the National University of Singapore. He is a member of the national committee on noise pollution control of the Central Pollution Control Board of the Government of India. He is on the advisory and technical boards of many private and government organizations.

Prof. Mohanty has been a consultant to more than 50 companies in India in the areas of noise & vibration and machinery condition monitoring. Some such companies are Philips, Tata Steel, Larsen & Toubro Limited, Mahindra & Mahindra, Tata Motors, Tata Cummins, Escorts, Eicher Motors, John Deere, Whirlpool, Emami Paper Mills, Dhamra Port, Blue Star, SAIL Rourkela Steel Plant etc. He has more than 70 journal, one book chapter, one patent and over 100 conference publications to his credit in the areas of noise and vibration, condition monitoring and signal processing. Some of the path breaking researches of Prof. Mohanty are in the areas of Motor Current Signature Analysis for machinery condition monitoring and use of naturally occurring bio-degradable materials for industrial and automotive noise control.

Prof. Mohanty has several of his research projects sponsored by the Ministry of Human Resources Development, Ministry of Ocean and Earth Sciences, Ministry of Information Technology, Defense Research Development Organization of the Govt. of India, and many public & private sector industries in the areas of noise and vibration and machinery condition monitoring.

JSW DHARAMTAR PORT PVT LTD

DHARAMTAR, DOLVI-402107, TALUKA-PEN, DIST-RAIGAD

JETTY AMBIENT AIR QUALITY MONITORING

MONTH : FROM DEC-2018 TO MAY-2019

Date	PM-10- µg/m3	PM-2.5-µg/m3	SO2-µg/m3	NO2-µg/m3
03.12.2018	52.36	24.71	16.59	24.11
07.12.2018	48.63	22.16	14.92	24.11
10.12.2018	40.99	24.57	14.63	28.81
14.12.2018	44.30	12.19	16.27	24.97
17.12.2018	52.30	22.51	18.96	22.58
21.12.2018	54.28	16.09	14.71	20.22
24.12.2018	48.69	16.27	18.44	24.10
28.12.2018	44.12	14.50	16.92	22.09
31.12.2018	52.38	16.97	18.72	22.09
01.01.2019	48.63	22.87	20.19	24.77
04.01.2019	40.15	26.95	18.24	24.88
07.01.2019	44.50	24.33	19.42	24.86
11.01.2019	40.17	22.98	18.64	24.81
14.01.2019	54.64	26.18	22.13	28.94
18.01.2019	48.55	16.49	14.09	18.41
21.01.2019	52.50	20.39	20.77	26.07
25.01.2019	48.75	19.58	18.41	24.17
28.01.2019	46.29	29.88	20.71	24.99
04.02.2019	40.15	20.81	10.69	22.47
08.02.2019	38.66	22.14	10.69	22.75
11.02.2019	40.66	28.98	10.92	22.18
15.02.2019	44.78	20.51	10.45	22.36
18.02.2019	56.68	20.41	11.05	20.17
20.02.2019	38.59	22.15	10.71	16.02
22.02.2019	50.18	22.69	10.98	24.75
25.02.2019	42.61	25.73	10.94	22.30
28.02.2019	48.17	24.97	10.61	22.47
05.03.2019	38.91	22.84	11.52	24.66
08.03.2019	40.18	24.64	11.88	24.70
11.03.2019	42.31	24.77	11.62	24.87
15.03.2019	45.08	22.51	11.69	20.37
18.03.2019	54.29	22.57	10.24	24.11
22.03.2019	36.50	24.63	11.52	23.91
25.03.2019	52.08	24.66	11.52	22.61
27.03.2019	48.71	22.61	11.52	24.80
29.03.2019	44.39	22.84	11.62	23.96
01.04.2019	36.84	20.54	10.22	22.69
05.04.2019	42.64	22.84	10.44	22.6

08.04.2019	40.32	22.54	10.66	22.87
12.04.2019	42.95	20.55	11.98	24.65
15.04.2019	52.88	20.95	11.54	24.78
19.04.2019	35.98	20.47	10.65	22.94
22.04.2019	50.44	22.95	10.84	24.98
26.04.2019	44.18	20.54	10.34	22.89
29.04.2019	40.87	22.92	10.29	20.82
03.05.2019	34.12	22.84	10.66	24.28
06.05.2019	44.66	24.78	10.38	24.49
10.05.2019	44.2	24.87	10.76	24.15
13.05.2019	40.18	22.67	10.98	22.41
17.05.2019	54.66	22.57	12.01	22.91
20.05.2019	32.72	22.19	11.23	22.72
24.05.2019	52.14	24.73	11.87	25.93
27.05.2019	42.18	22.57	11.69	23.8
31.05.2019	42.86	24.51	10.76	24.62

JSW DHARAMTAR PORT PVT LTD

DHARAMTAR, DOLVI-402107, TALUKA-PEN, DIST-RAIGAD

JETTY CREEK WATER ANALYSIS REPORT

MONTH : FROM DEC-2018 TO MAY-2019

WATER SAMPLES DETAILS

PARAMETERS	Turbidity	pH	TDS	Chloride	Nitrate	Hexavalent Chromium	Conductivity	Oil & Grease	Sulphate	Lead	Mercury	COD	Tempurature	Salinity	BOD	Phosphate
UNIT	NTU		mg / l	mg / l	mg / l	mg / l	µmhos/cm	mg / l	mg / l	mg / l	mg / l	mg / l	0C	PSU/PPT	mg / l	mg / l
Date																
01.12.2018	0.1	7.9	35850	15032	3.7	<0.02	60000	<0.1	1468	0.568	<0.001	262	28	40.21	88	<0.01
05.12.2018	0.1	7.8	37156	16884	3.7	<0.02	62000	<0.1	1198	0.698	0.001	318	28	41.73	109	<0.01
08.12.2018	0.1	7.8	34234	14448	4.0	<0.02	57000	<0.1	1426	0.912	<0.001	322	28	37.94	103	<0.01
12.12.2018	0.1	7.9	34188	11142	3.7	<0.02	57000	<0.1	1378	0.678	<0.001	288	28	37.94	94	<0.01
12.12.2018	0.1	7.5	35812	13844	3.8	<0.02	60000	<0.1	1322	0.568	<0.001	340	28	37.94	112	<0.01
15.12.2018	0.1	7.4	33468	13860	3.9	<0.02	56000	<0.1	1380	0.638	<0.001	312	28	37.19	106	<0.01
19.12.2018	0.1	7.5	33640	14680	3.8	<0.02	56000	<0.1	1282	0.812	<0.001	351	28	37.19	112	<0.01
22.12.2018	0.1	7.6	3860	15288	3.8	<0.02	58000	<0.1	1280	0.811	<0.001	343	28	38.69	117	<0.01
26.12.2018	0.1	7.8	31864	15264	3.9	<0.02	53000	<0.1	1280	0.768	<0.001	298	28	34.95	97	<0.01
29.12.2018	0.1	7.8	35288	16288	3.6	<0.02	59000	<0.1	1410	0.911	<0.001	358	28	39.45	119	<0.01
01.01.2019	0.1	8.1	34098	15323	3.2	<0.02	57000	<0.1	1420	0.592	<0.001	242	28	37.94	85	<0.01
05.01.2019	0.1	7.6	36238	16266	3.0	<0.02	61000	<0.1	1660	0.612	<0.001	302	28	40.97	106	<0.01
08.01.2019	0.1	7.6	32864	14264	2.7	<0.02	55000	<0.1	1468	0.762	<0.001	342	28	36.40	111	<0.01
12.01.2019	0.1	7.6	34068	13964	2.7	<0.02	57000	<0.1	1280	0.52	<0.001	298	28	37.94	100	<0.01
12.01.2019	0.1	7.6	31880	14608	3.1	<0.02	53000	<0.1	1190	0.798	<0.001	340	28	34.95	110	<0.01
15.01.2019	0.1	7.6	35672	15795	3.1	<0.02	60000	<0.1	1580	0.698	<0.001	280	28	40.21	91	<0.01
19.01.2019	0.1	7.4	36786	16031	3.0	<0.02	61000	<0.1	1378	0.702	<0.001	342	28	40.97	119	<0.01

22.01.2019	0.1	7.6	32566	14145	3.0	<0.02	54000	<0.1	1662	0.968	<0.001	362	28	35.70	124	<0.01
28.01.2019	0.1	7.6	33860	16973	3.1	<0.02	57000	<0.1	1580	0.74	<0.001	374	28	37.94	129	<0.01
29.01.2019	0.1	7.8	34281	14852	2.7	<0.02	57000	<0.1	1420	1.028	<0.001	340	28	37.94	115	<0.01
01.02.2019	0.1	8.5	32468	13390	4.9	<0.02	54000	<0.1	1390	0.612	<0.001	262	28	35.70	89	<0.01
05.02.2019	0.1	7.9	35148	13107	5.0	<0.02	59000	<0.1	1480	0.408	<0.001	288	28	39.45	93	<0.01
08.02.2019	0.1	7.9	33084	12164	4.9	<0.02	55000	<0.1	1220	0.302	<0.001	308	28	36.44	106	<0.01
12.02.2019	0.1	7.7	35678	12353	4.5	<0.02	59000	<0.1	1162	0.21	<0.001	302	28	39.45	99	<0.01
12.02.2019	0.1	7.9	32661	11787	4.3	<0.02	54000	<0.1	1132	0.212	<0.001	296	28	35.70	97	<0.01
15.02.2019	0.1	8.4	32675	13296	4.9	<0.02	55000	<0.1	1288	0.341	<0.001	280	28	36.44	93	<0.01
19.02.2019	0.1	7.9	35442	12919	5.0	<0.02	59000	<0.1	1372	0.398	<0.001	292	28	39.45	91	<0.01
22.02.2019	0.1	7.9	32861	11787	4.7	<0.02	55000	<0.1	1212	0.22	<0.001	296	28	36.44	87	<0.01
26.02.2019	0.1	7.7	35130	11976	5.0	<0.02	59000	<0.1	1180	0.228	<0.001	314	28	39.45	109	<0.01
26.02.2019	0.1	7.9	33068	11976	4.7	<0.02	55000	<0.1	1180	0.23	<0.001	288	28	36.44	93	<0.01
01.03.2019	0.1	8.5	34988	14224	4.0	<0.02	58000	<0.1	1420	0.308	<0.001	280	29	38.69	93	<0.01
05.03.2019	0.1	7.9	34988	13240	4.0	<0.02	58000	<0.1	12864	0.312	<0.001	284	29	38.09	95	<0.01
08.03.2019	0.1	7.9	33168	12034	4.0	<0.02	55280	<0.1	11840	0.282	<0.001	302	29	36.44	100	<0.01
12.03.2019	0.1	7.7	35214	12288	4.0	<0.02	58690	<0.1	11622	0.304	<0.001	310	29	39.21	103	<0.01
12.03.2019	0.1	7.8	32882	13264	4.5	<0.02	54800	<0.1	12134	0.278	<0.001	292	29	36.29	100	<0.01
15.03.2019	0.1	8.5	35068	14068	4.0	<0.02	58000	<0.1	1418	0.262	<0.001	272	29	38.69	91	<0.01
15.03.2019	0.1	7.9	34780	13180	4.0	<0.02	58000	<0.1	12812	0.301	<0.001	282	29	38.69	95	<0.01
22.03.2019	0.1	7.7	33263	12280	4.1	<0.02	55500	<0.1	11680	0.28	<0.001	298	29	36.82	97	<0.01
26.03.2019	0.1	7.7	34994	12162	4.0	<0.02	58000	<0.1	11782	0.342	<0.001	304	29	38.69	102	<0.01
26.03.2019	0.1	7.8	32692	12684	4.4	<0.02	54487	<0.1	11962	0.304	<0.001	290	29	36.06	97	<0.01
05.04.2019	0.1	7.4	35482	14632	3.5	<0.02	59000	<0.1	1312	0.612	<0.001	278	30	39.45	89	<0.01
08.04.2019	0.1	7.4	34564	12440	3.4	<0.02	58000	<0.1	1180	0.53	<0.001	270	30	38.69	75	<0.01
12.04.2019	0.1	7.5	34682	12470	3.4	<0.02	58000	<0.1	1180	0.53	<0.001	272	30	38.69	75	<0.01
12.04.2019	0.1	7.8	32472	13988	3.4	<0.02	54000	<0.1	1180	0.628	<0.001	298	30	35.70	85	<0.01
15.04.2019	0.1	8.1	33184	11362	3.3	<0.02	55000	<0.1	1218	0.558	<0.001	230	30	36.44	77	<0.01
19.04.2019	0.1	7.4	35118	14251	3.5	<0.02	59000	<0.1	1328	0.588	<0.001	252	30	39.45	86	<0.01

22.04.2019	0.1	7.4	34780	12390	3.4	<0.02	58000	<0.1	1198	0.54	<0.001	272	30	38.69	75	<0.01
26.04.2019	0.1	7.5	34680	12310	3.3	<0.02	58000	<0.1	1092	0.54	<0.001	280	30	38.69	76	<0.01
26.04.2019	0.1	7.8	32280	14012	3.4	<0.02	54000	<0.1	1172	0.621	<0.001	290	30	35.70	84	<0.01
02.05.2019	0.1	8.1	34672	10872	5.7	<0.02	58000	<0.1	878	0.532	<0.001	236	30	38.69	78	<0.01
06.05.2019	0.1	7.5	35290	12410	5.4	<0.02	59000	<0.1	810	0.622	<0.001	270	30	39.45	88	<0.01
08.05.2019	0.1	7.5	35462	10862	4.3	<0.02	59000	<0.1	912	0.611	<0.001	272	30	39.45	89	<0.01
12.05.2019	0.1	7.5	35472	11480	4.9	<0.02	59000	<0.1	910	0.608	<0.001	301	30	39.45	95	<0.01
12.05.2019	0.1	7.6	33470	12460	5.7	<0.02	56000	<0.1	902	0.598	<0.001	288	30	37.19	92	<0.01
15.05.2019	0.1	7.9	34280	10284	4.9	<0.02	57000	<0.1	792	0.608	<0.001	268	30	37.94	88	<0.01
19.05.2019	0.1	7.7	35290	11478	4.2	<0.02	59000	<0.1	910	0.612	<0.001	280	30	39.45	93	<0.01
22.05.2019	0.1	7.6	34168	9862	4.3	<0.02	57000	<0.1	932	0.61	<0.001	288	30	37.94	92	<0.01
26.05.2019	0.1	7.6	34280	11068	4.7	<0.02	57000	<0.1	958	0.612	<0.001	292	30	37.94	95	<0.01
26.05.2019	0.1	7.7	32680	11542	4.3	<0.02	55000	<0.1	968	0.602	<0.001	286	30	36.44	92	<0.01