

# Environmental Due Diligence Report

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October 2018

## India: Mumbai Metro Rail Systems Project

Prepared by Mumbai Metropolitan Region Development Authority for the Asian Development Bank.

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## **CURRENCY EQUIVALENTS**

(as of 14 August 2018)

Currency unit	–	rupee (₹)
₹ 1.00	=	\$0.0142908181
\$1.00	=	₹ 69.975000

## **LIST OF ABBREVIATIONS**

ADB	-	Asian Development Bank
DMRC	-	Delhi Metro Rail Corporation
EIA	-	Environment Impact Assessment
EMP	-	Environmental Management Plan
MoEFCC	-	Ministry of Environment, Forest and Climate Change
MMRDA	-	Mumbai Metropolitan Region Development Authority
SPS	-	Safeguard Policy Statement of ADB



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## EXECUTIVE SUMMARY

1. The Government of Maharashtra has approached Asian Development Bank for financial support to assist in the implementation of Mumbai Metro Rail Systems Project. ADB is financing (i) Line 2A from Dahisar (Charkhop) to DN Nagar; (ii) Line 2B from DN Nagar–Bandra–Mandale; and (iii) Line 7 from Dahisar (E) to Andheri (E). The aggregate length of these lines is about 58 km. Mumbai Metropolitan Region Development Authority (MMRDA) is presently implementing the civil works on these lines using state funds. ADB funding would be used to finance the rolling stock, signaling, and platform access systems, which are mainly plant supply and installation contracts.

2. The ongoing civil works for three elevated lines is considered an “associated facility” in accordance with the ADB Safeguard Policy Statement (2009) since it includes an existing structure, currently under construction, financed by the government. ADB requires having an environmental due diligence of associated facility as part of the environmental assessment study (as per paragraph 10 of Appendix 1 of the SPS 2009) to check compliance with the ADB SPS. Accordingly, this environmental due diligence has been carried out for the ongoing civil works for three lines. The due diligence identified several areas for improvement. Hence, a corrective action plan has been prepared to make the civil works component compliant with the ADB SPS.

3. According to the legislative provisions, rules, and regulations in India, the metro rail projects does not require to conduct an environment impact assessment (EIA) or seek environmental clearance from the government. However, Coastal Regulation Zone clearance is required for Lines 2A and 2B, which is obtained. Forest clearances for Line 2B are required, which is under process. Tree cutting permits have been processed and obtained for Line 2A and Line 7, and will be obtained for Line 2B before the start of construction works.

4. During detailed design, MMRDA has prepared EIAs for three lines during detailed project preparation. The EIAs have been disclosed on MMRDA website. The EIAs includes an environmental management plan (EMP) as well as environmental monitoring plan. The civil works for Line 7 and 2A have been awarded in 2016, whereas contract for line 2B was awarded in last quarter of 2017. MMRDA Safety, Health, and Environment (SHE) Manual and EMP have been included in the bidding documents and it formed integral part of contractors’ contract document. Contractors for Lines 7 and 2A have been mobilized in the second quarter of 2016 and in first quarter of 2018 for Line 2B. Each contractor has one environmental expert and one SHE Manager in its organization structure.

5. Contractors have prepared contract package-specific SHE Plan as well as site-specific EMPs. Contractors are preparing monthly environmental monitoring reports and monthly SHE monitoring reports. Monitoring of environmental quality (air, water, noise, and soil) is being done on a monthly basis in all the contract packages. General consultant is also submitting monthly monitoring reports to MMRDA.

6. Contractors have obtained requisite NOCs and statutory permits for contractor’s facilities (casting yard/batching plant). However, contractor’s facilities for Line 2B are yet to obtain consent to establish and consent to operate. Health, safety and hygiene conditions at all workers camps need immediate improvement as currently there is lack of adequate facilities in the workers camps. Occupational health and safety at construction sites also need improvement.

7. Contractor and General consultant has adequate environmental and safety personnel in their organization set-up. Trainings are being provided to workers on regular basis and it is being documented.

8. Overall implementation of environmental management measures during civil work activities is satisfactory. Some corrective measures such as mapping of sensitive receptor and detailed study on noise, vibrations, and privacy assessment along these three lines, improvement in health and safety of workers, good housekeeping, training of contractor personnel, and submission of semi-annual monitoring report have been recommended in the corrective action plan.



## **A. INTRODUCTION**

### **1. Purpose of this Report**

1. This environmental due diligence report has been prepared to fulfill ADB's Safeguard Policy Statement (SPS) 2009 requirements for associated facilities of an investment component. This due diligence exercise is part of environmental assessment and the due diligence report will be appended to the initial environmental examination (IEE) report being prepared for the ADB-financed components under Mumbai Metro Rail Systems Project in India. The scope of ADB financing for the Mumbai Metro Rail Systems Project includes rolling stock, signaling and telecommunication, and train access systems to make operational about 58 kilometers (km) of a section of the metro rail system in Mumbai city, covering Lines 2A, 2B, and 7. Since the civil works for these lines is under construction and considered as associated structures, it is required to have environmental due diligence of associated facility as part of the environmental assessment study (as per SPS 2009). Accordingly, this environmental due diligence report has been prepared.

2. Through environment due diligence, review, and supervision, ADB ensures that borrowers comply with the SPS requirements during project preparation and implementation. The process outlined in the SPS notes that, over time, ADB's safeguards may require updating of existing operations to enhance environmental effectiveness, respond to changing needs, and reflect evolving best practices.

### **2. Scope and Methodology Used for the due diligence**

3. The scope of this environmental due diligence includes review of environmental management practices associated with civil works construction for three lines, which are considered as an associated facility of proposed ADB financed project. The extent of due diligence is limited to the alignment of three lines where civil works in implemented and depot areas only.

4. Keeping in view the environmental specific due diligence requirements of the ADB's SPS 2009, this environmental due diligence has been carried out with the following broad objectives:

- (i.) to verify the compliance with environment specific regulatory requirements;
- (ii.) to evaluate the effectiveness of environmental management systems that are in place;
- (iii.) to assess potential environmental liabilities from regulated and unregulated materials and practices, and
- (iv.) to identify critical areas of concern and recommending corrective mitigation strategies.

5. The due diligence process was broadly divided into three phases i.e. pre-site visit activities, activities at the site, and post-site visit activities. The basic information on civil works for three lines was obtained by review of various documents including detailed project reports, EIAs prepared by MMRDA, progress reports and monitoring reports being submitted by supervision consultant. The information received about civil works were reviewed and main areas of the due diligence were identified. The resources required for due diligence process were finalized. This due diligence has been carried out by the environmental specialist (external expert engaged by ADB) with the assistance of MMRDA environmental officers. The due diligence process started by having a series of discussions with the management of MMRDA and local administration of Mumbai city including pollution control board, MCRZA, and Municipal Corporation of Greater Mumbai in month of May–June 2018. Relevant environmental and occupational, health and safety related issues were discussed, and scope

and methodology of due diligence was agreed upon. The general awareness and commitment of the management towards environmental protection was assessed during the discussions.

6. The on-site due diligence activities included discussions with MMRDA field staff, construction supervision consultant, and contractors' staff; inspection of sites, camps, casting yards; evaluation of performance of environmental management system and existing pollution control equipment/system at site, emission standards, compliance with various laws and regulations at the state and national level, review of existing monitoring facilities and assessment of environmental quality, review of in house capacity for environmental management, review of existing permits and approvals obtained and their applicability, waste management facilities, occupational health and safety facilities, and social aspects related with welfare of employees and nearby habitations.

7. The entire alignment of three lines, workers camps, construction camps, and casting yards were inspected thoroughly. The aspects of site layout, land use, material handling and storage, drainage system, safety aspects, and attitude of operators in process and waste management, etc. were observed. The attitude and technical capability of staff including senior management at the site were observed. The training and the institutional requirements were also assessed.

8. Post site visit activities involved synthesis of data collected during the site visit and the published data on the metro rail construction. The existing process was analyzed, and the adequacy of the existing environmental management measures was assessed. The adequacy of the existing facilities was also examined, and lapses were identified. Finally, to overcome the lapses and for compliance with the SPS standards, suitable corrective mitigation measures have been suggested in the Corrective Action Plan.

### **3. Structure of the Report**

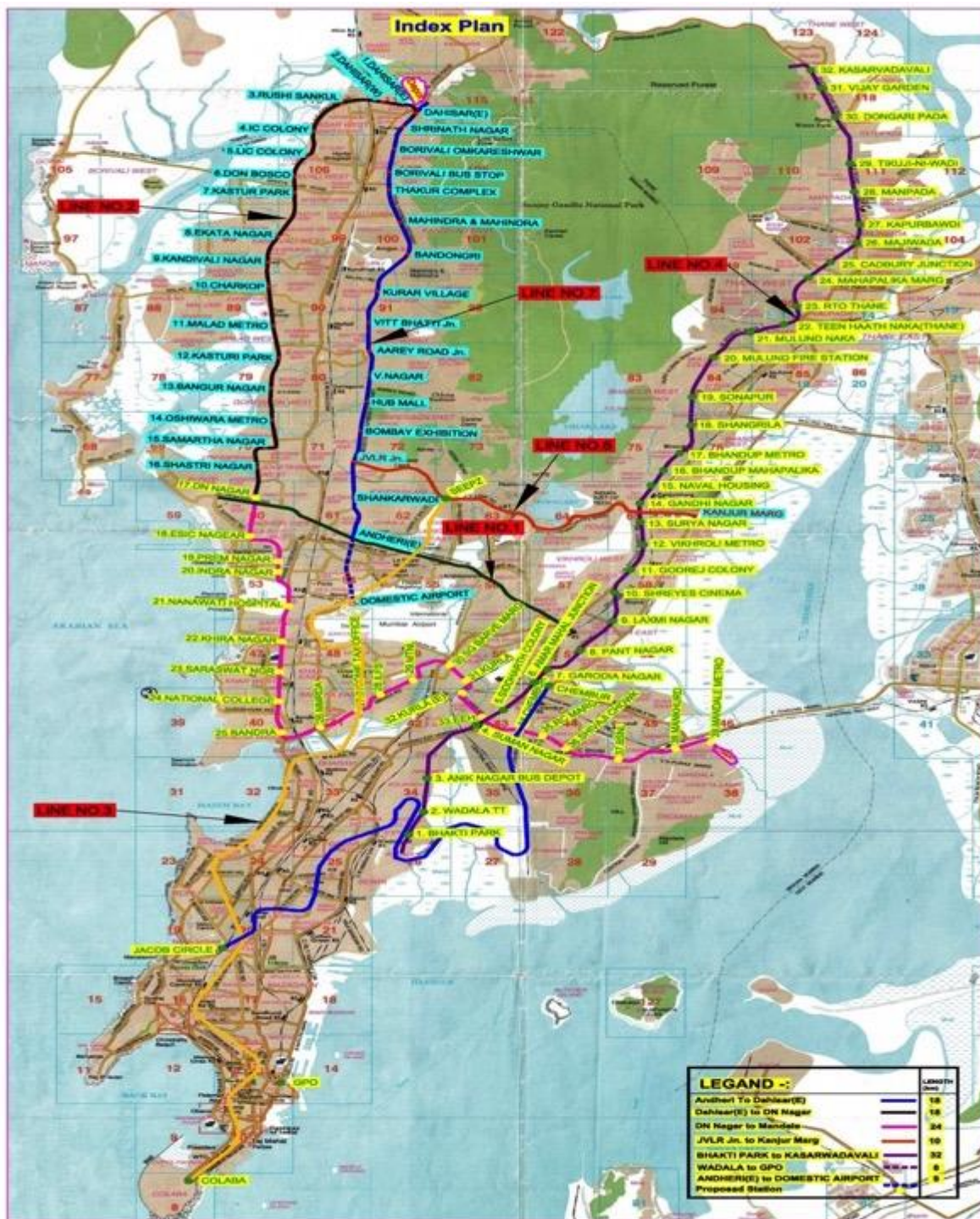
9. This due diligence report presents the findings of the due diligence process and structured to cover essential elements of an due diligence as stipulated in ADB SPS 2009. The report consists of main sections as follows: (i) executive summary; (ii) introduction section describing background, purpose and methodology of due diligence; (iii) facilities description, including both past and current activities; (iv) summary of national, local, and any other applicable environmental laws, regulations, and standards; (v) due diligence findings and areas of concern; and (vi) corrective action plan. This report is also supported with a series of annexures and supportive photographs (Annexure 1 to 5).

## **B. DESCRIPTION OF THE FACILITIES**

### **1. Project Location**

10. The proposed project is located in Mumbai city of Maharashtra State in India. Figure 1 show the layout of overall Mumbai Metro Rail Network and also the locations of the project lines. The black line corresponds to Line 2A, the pink line corresponds to Line 2B, and the blue line (north-south direction) corresponds to Line 7.

Figure 1: Index Map of Mumbai Metro Rail Project and Project Lines



## 2. Description of the Existing Facilities

11. The facilities considered for this environmental due diligence as part of environmental assessment for ADB-financed Mumbai Metro Rail Systems Project includes (i) civil works for the three metro lines (Lines 2A, 2B, and 7) with a total length of 58 km, and (ii) civil works for maintenance depots associated with these three lines. Salient features of the three lines are presented in following sections whereas maps showing alignment of each line is presented in Annexure 1.

### 2.1 Salient Features of Line 2A (Dahisar East – D.N. Nagar)

12. Dahisar (E)-D.N. Nagar corridor of Mumbai Metro start at western express highway with its station named as Dahisar (East) and platform located above the already proposed Dahisar (East) metro station for Andheri (E) – Dahisar corridor. The alignment stretches from Dahisar (E) to D.N. Nagar via Dahisar (W), Rushi Sankul, I.C. Colony, Don Bosco, Charkop, Kasturi Park, Oshiwara and runs on link road. The length of Dahisar (E)-D.N. Nagar Metro corridor is 18.589 km and it has 17 stations. The entire corridor and stations will be elevated.

### 2.2 Salient Features of Line 2B (D.N. Nagar - Mandala)

13. The alignment D.N. Nagar-Mandala line lies between the 19°07'48.70"N, 72°49'54.57"E and 19°02'53.71"N, 72°56'27.07"E. The alignment starts at Cosmopolitan Education Society Marg and then passes through Gulmohor road, S.V. road and enters into BKC from where it passes through Santacruz Chembur Link road, Mother dairy road, S.G Barve marg, V.N.Purav Marg, Sion-Panvel expressway and ends at the south of Sion Panvel Expressway (Yashwantrao Chavan Marg). Total length of the corridor from dead end to dead end is 23.643 km and it has 22 stations. The entire line corridor and stations proposed are elevated.

### 2.3 Salient Features of Line 7 (Andheri East – Dahisar East)

14. The alignment of Line 7 lies between the 19°06'57.43"N, 72°51'18.09"E and 19°15'10.30"N, 72°52'05.29"E. Andheri (East) – Dahisar (East) corridor of Mumbai Metro Project start at junction of Western Express Highway and MV Road in Andheri (East). The alignment stretches from Andheri (E) to Dahisar (E) via. Jogeshwari, Goregaon, Malad, Kandivali, Thakur Village, Poisar and Borivali parallel to western express highway (WEH). Total length of this corridor from dead end to dead end is 16.475 km and it has 13 stations. The entire line corridor and stations are elevated.

### 2.4 Viaduct–Elevated Structure

15. The proposed viaduct structure is fully elevated. Normally in metro elevated section, following two types of segmental superstructure are adopted:

- Pre-cast segmental box girder using external unbounded tendon.
- Pre-cast segmental U-Channel Superstructure with internal pre-stressing.
- Precast segment Twin U girders.

### 2.5 Track Design Criteria

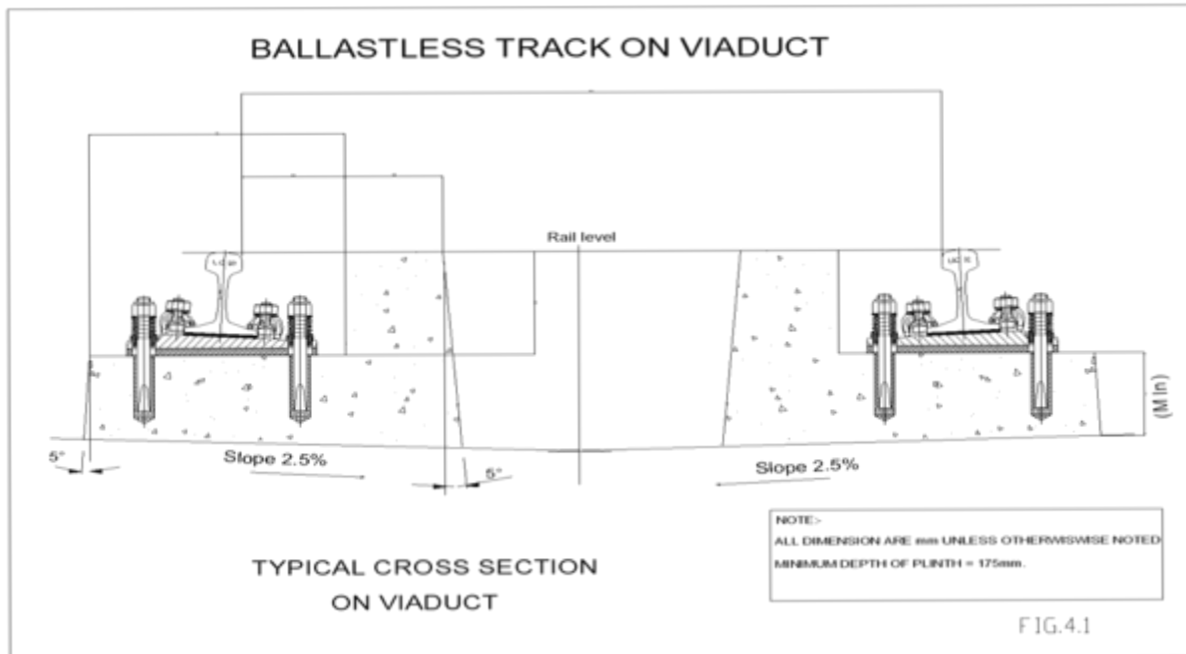
16. Standard gauge 1435 mm will be used to comply with India's no "right-of-way" reserved or metro system that often have sharp curves. Standard gauge permits adoption for sharper curves as compared to broad gauge that requires more land acquisition along alignments. Standard gauge also allows "off-the-shelf" rolling stock, subject to constant upgrades and promote India's export of technology to other countries that uses standard gauge.

17. Ballast-less track will be used, except in the depot to minimize regular maintenance and train downtime. The track will be joint-less to minimize vibration and noise level. Rails will

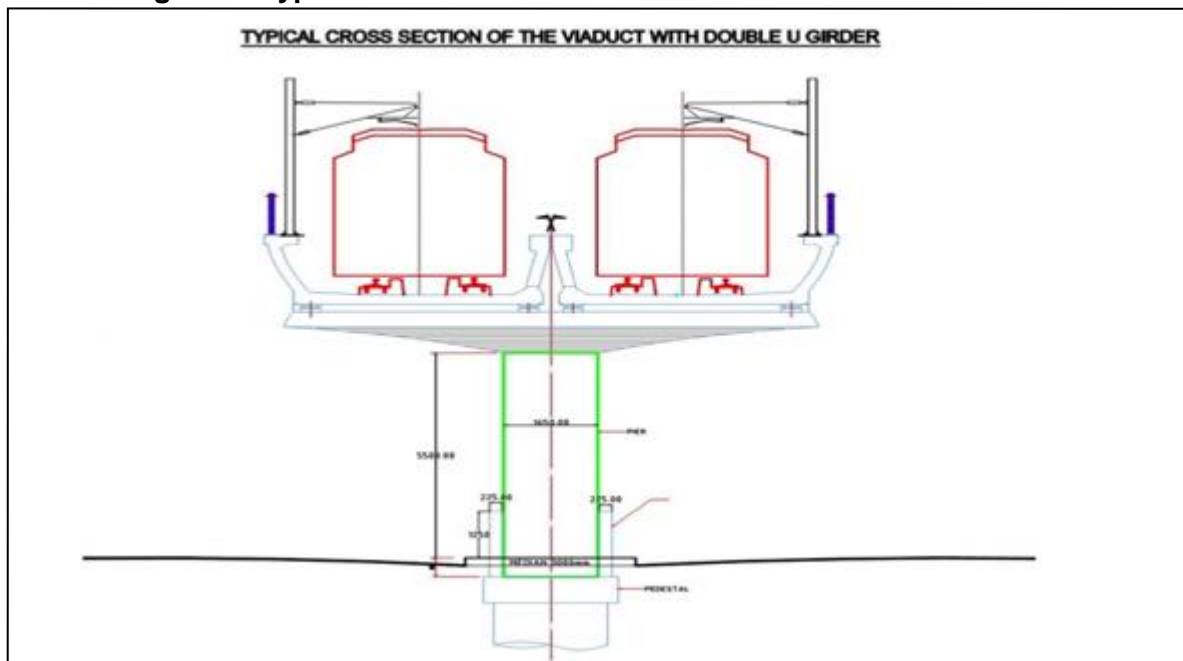
be made of 1080 Head Hardened material complying with India Rail Standard T-12-96 except in the depot which will be of 880 grade. The rail design also incorporates elastomeric pad and rail pads to control noise, vibration, and passenger riding comfort.

18. Figure 2 and Figure 3 shows the plans and cross sections of various project facilities and components.

**Figure 2: Typical Cross Section of the Ballast less Track on Viaduct**



**Figure 3: Typical Cross Section of the Viaduct with Double U Girder**



## 2.6 Maintenance Depots

19. It is proposed to provide the car maintenance depots for each line as detailed below.
- Line 7: Dahisar (15.5 ha) – AAI – Government Land
  - Line 2B: Mandale (22 ha) – Government Land
  - Line 2A: Charkop (16 ha) – Government Land
20. The depots will have following functions: (i) major overhauls of all the trains, (ii) all minor schedules and repairs; (iii) lifting for replacement of heavy equipment and testing thereafter; and (iv) repair of heavy equipment.

## C. SUMMARY OF APPLICABLE POLICY AND REGULATORY FRAMEWORK

21. The Government of India's environmental legal framework comprises a set of comprehensive acts and regulations aimed at conserving various components of the biological and physical environment including environmental assessment procedures and requirements for public consultation. The policies and requirements which are most relevant in the context of this project are provided in Table 1 below.

**Table 1: Summary of Relevant Environmental Legislation**

Act	Objective	Responsible Institution
Environment (Protection) Act (1986) and Rules (1986)	To protect and improve the overall environment	MoEFCC
Environmental Impact Assessment (EIA) Notification under Environmental Protection Rules (2006, 2009, 2011) and relevant Office Memorandums (OM)	To provide guidance on environmental clearance requirements and clarification on related specific technical issues	MoEFCC
Coastal Regulation Zone (CRZ) Notification, 2011	To ensure livelihood security to the fishing communities and other local communities living in the coastal areas; To conserve and protect coastal stretches and; To promote development in a sustainable manner based on scientific principles, taking into account the dangers of natural hazards in the coastal areas and sea level rise due to global warming.	MCZMA
The Wildlife Protection Act (1972 and amended in 1993)	To protect wild animals and birds through the creation of National Parks and Sanctuaries	MoEFCC
The Water (Prevention and Control of Pollution) Act 1972 (Amended 1988) and Rules 1974	To provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water.	CPCB
The Air (Prevention and Control of Pollution) Act, 1981(Amended 1987) and Rules 1982	To provide for the prevention, control and abatement of air pollution, and for the establishment of Boards to carry out these purposes.	CPCB and Road Authorities
Municipal Solid Waste (MSW) Rules, 2000	Provisions for collection, storage segregation, transportation, processing and disposal of municipal solid wastes.	State Pollution Control Board
Hazardous Waste (Management, Handling and Trans-boundary Movement) Rules 2008 (Amended 2009),	To protection the general public against improper handling, storage and disposal of hazardous wastes	State Pollution Control Board



<b>Act</b>	<b>Objective</b>	<b>Responsible Institution</b>
The Forest (Conservation) Act 1980 (Amended 1988) and Rules 1981 (Amended 2003)	To protect and manage forests	MoEFCC
Ancient Monuments and Archaeological Sites and Remains Act (1958)	Conservation of Cultural and historical remains found in India.	Archaeological Department, Government of India
Building and Other construction workers (Regulation and the Employment and conditions of service) Act, 1996	To regulate the employment and conditions of service of building and other construction workers and to provide for their safety, health and welfare measures	Ministry of Labour and Employment
Child labour (Prohibition and Regulation) Act, 1986	To regulate the employment of children including age limits, type of employment, timing of work, information disclosure and health and safety.	Ministry of Labour and Employment
Maharashtra (Urban Area) Protection of Trees Act, 1975	Establishment of Tree authority was taken place in this act to check further deforestation and conserve trees in urban areas.	Tree Authority, MCGM

CPCB = Central Pollution Control Board, MCGM = Municipal Corporation of Greater Mumbai, MoEFCC = Ministry of Environment, Forest and Climate Change, MZMCA = Maharashtra Coastal Zone Management Authority.

22. For implementation of metro rail projects in India, project proponents require to obtain clearances/permissions related to environment and forests.

23. As per Government of India EIA Notification 2006, all railways projects in India are exempted from requirements of preparing EIA, therefore environmental clearance for the lines proposed under the Project is not required. Letter issued by Ministry of Environment, Forest and Climate Change on this is provided in Appendix 2.

## **D. FINDINGS AND AREAS OF CONCERN**

### **1. Environmental Safeguards Documentation**

24. As part of detailed project preparation, MMRDA has prepared environmental impact assessment (EIA) reports for Line 7 and Line 2A in 2016. These EIAs have been updated in 2017 to address the changes made in the design as well as to meet policy requirements of international funding agencies. EIA for Line 2B has been prepared in March 2018. MMRDA has also prepared a Safety, Health and Environment (SHE) Manual for all metro projects. This MMRDA SHE Manual contains most of the items required in an EMP for construction projects.

25. During the bidding process, MMRDA has included this SHE Manual in the bidding documents and forms part of the contract documents of the contractors.

26. Each contractor has prepared a separate SHE Plan (based on MMRDA SHE Manual) for Line 7 and Line 2A, and submitted to MMRDA in August 2016. This SHE Plan is compatible with OHSAS 18001:2007, ISO 14001:2004 and MMRDA Conditions of Contract on SHE. For Line 2B, SHE Plans are being prepared by contractors.

27. In addition to SHE Plan, site specific EMPs are also prepared by each contractor and submitted to MMRDA in the months of July to September 2016. Site specific EMPs for Line 2B is being prepared. During implementation, each contractor is preparing monthly progress reports and quarterly EMPs. Annexure 3 show the sample monthly EMP submitted by contractor.

## 2. Compliance with Environmental Legal and Regulatory Requirements

28. Permits and clearances required include Coastal Regulation Zone clearance, Forest clearance, High Court NOC, permission from Tree Authority of Municipal Corporation of Greater Mumbai, and Consent to Establish (CTE) and Consent to Operate (CTO) for concrete batching plant. Some of these have been obtained while some are still under process. Table 2 shows the status of various clearances/permits. Since civil works is ongoing, MMRDA should expedite the process to get Hon. High Court NOC for mangroves and forest clearances for Line 2A and Line 2B.

**Table 2: Applicable Permits and Clearances Required for the Project**

Status of required clearances/permissions	Line 7	Line 2A	Line 2B
Environmental clearance	Not required	Not required	Not required
Coastal Regulation Zone clearance	Not required	Obtained in 113 <sup>th</sup> meeting of MCZMA	Obtained in 113 <sup>th</sup> meeting of MCZMA
Forest clearance	Not required	Applied for Forest clearance in September 2017	Applied for Forest clearance in April 2017
Hon. High Court permission	Not required	Will be taken after obtaining FC	Obtained in December 2016
Permission from Tree Authority of MCGM	Permission of 49 trees is awaited	Obtained	In process
Consent to Establish / Consent to Operate for ready mix concrete plant	Obtained	Obtained	In process

MCGM = Municipal Corporation of Greater Mumbai, MZMCA = Maharashtra Coastal Zone Management Authority.

## 3. Civil Works Contracts

29. The civil works has been divided in various civil works contract packages. Table 3 presents details of the civil works contracts and contractor awarded. Contractors for Line 7 have been mobilized in first half of 2016 and for Line 2A in 2017. However, award of contracts for Line 2B was delayed and awarded in the first quarter of 2018.

**Table 3: Present Status of Implementation (as of May 2018)**

Package No.	Name of Contractor	Length of Package	Date of Award
<b>Line 2A</b>			
AC-01	J. Kumar CRTG (JV)	(-) 414.53 m to -8283.501 m	June 2016
AC-02	J. Kumar CRTG (JV)	(-) 8292.17 to 18189.020	June 2016
<b>Line 2B</b>			
CA-04R	Simplex Infrastructures Limited	xx	2018
CA-06	M/s. MBZ, Ukraine-RCC. (JV)	xx	2018
CA-07	M/s. Guangdong-Neeraj Cement Structural Limited and PKHS Pvt. Limited. (JV)	xx	2018
CA-14	M/s. MBZ, Ukraine- RCC Infra Ventures Limited- (JV)	Mandala depot	2018
<b>Line 7</b>			
CA-1	Simplex Infrastructures Limited (SIL)	(-) 450 m to 5801.400 m	2016
CA-2	J. Kumar Infraprojects Limited	5801.400 m to 11664.600 m	2016
CA-3	NCC Limited	11664.600 m to 15440.000 m	June 2016



30. MMRDA has appointed a general consultant for construction work supervision. Delhi Metro Rail Corporation Limited (DMRC) is the general consultant for Mumbai Metro Rail Line 7 (Andheri-Dahisar corridor) and Line 2A, whereas general consultant for Line 2B is AICA consortium. The general consultant has a full time environmental specialist to supervise the implementation of EMP and SHE Plans by contractors.

#### 4. Status of Civil Works Implementation

31. Civil work in two packages (Line 7 and Line 2A) started in 2016 whereas civil works for Line 2B started in March 2018. Substantial progress has been made till date for Line 7 and 2A but civil works for Line 2B has just started. Soil investigations, utility works, and piling works is almost completed whereas 58% of work has been completed for pier cap works and U girder works. Work at station areas is also in progress. Tables 4, 5, and 6 shows the civil work status of three Lines as of July 2018.

**Table 4: Present Status of Line 2A Implementation (as of 10 July 2018)**

Sl. No.	Name of Work	Status
1	Soil Investigation Works	99% of the soil investigation work for Pier foundation is completed
2	Utility Works	94% work is completed
3	Piling Works	78% (3533 out of 4576 nos. completed)
4	Pile Cap Works	65% (593 out of 945 nos. completed)
5	Pier Works	58% completed (526 out of 908 nos. are cast)
6	Pier Cap Works	426 are cast (53%) and 376 (47%) are erected out of 799 nos.
7	U Girder Works	661 are cast (46%) and 510 are erected (36%) out of 1435 nos.
8	Station Work	Work in progress in all the 17 stations

Source: Mumbai Metropolitan Region Development Authority.

**Table 5: Present Status of Line 2B Implementation (as of 13 July 2018)**

Sl. No.	Name of Work	Status
1	Civil works	<p><b>Viaduct &amp; Stations</b></p> <ol style="list-style-type: none"> <li>1. CA-04R is awarded to M/s. Simplex Infrastructures Limited and the works commenced.</li> <li>2. CA-06 is awarded to M/s. MBZ, Ukraine-RCC. (JV) and the works commenced.</li> <li>3. CA-07 is awarded to M/s. Guangdong-Neeraj Cement Structural Limited and PKHS Pvt. Limited. (JV)</li> </ol> <p><b>Mandale Depot (Package-CA-14)</b></p> <ol style="list-style-type: none"> <li>1. CA-14 is awarded to M/s. MBZ, Ukraine- RCC Infra Ventures Limited- (JV) and Civil works commenced.</li> </ol>

Source: Mumbai Metropolitan Region Development Authority.

**Table 6: Present Status of Line 7 Implementation (as of 16 July 2018)**

Sl. No.	Name of Work	Status
1	Soil Investigation Works	98% of the soil investigation work for Pier foundation is completed
2	Utility Works	93% work is completed
3	Piling Works	89% (2867 out of 3204) of Piling work for 561 out of 709 no. of foundations completed
4	Pile Cap Works	69% completed (461 out of 709)
5	Pier Works	51% completed (308 out of 709)
6	Pier Cap Works	307 no. are cast (46%) and 262 nos. are erected (39%)
7	U Girder Works	478 no. are cast (40%) and 320 nos. are erected (27%)
8	Station Work	Work is in progress at all the 13 stations

Source: Mumbai Metropolitan Region Development Authority.

## **5. Status of Environmental Safeguards Implementation**

32. The contractors have appointed and mobilized the environmental, health and safety personnel as required under the contract. Contractors facilities such as casting yards, batching plant, construction and labor camps etc. have been established, and necessary statutory permissions / NOCs have been obtained in coordination with MMRDA.

33. The site-specific environmental management plan and SHE plans are being implemented by contractors in each package under the supervision of general consultant environmental specialist.

34. Environmental monitoring (air, water, and noise) is being carried out by contractors on monthly basis and monitoring results are reported in the monthly progress report as well as quarterly progress reports.

35. The monitoring of air, water, and noise is being carried out by contractors on monthly basis both onsite as well as offsite work place as per Central Pollution Control Board Guidelines. The monitoring results are being reported in a monthly progress report as well as quarterly progress reports.

36. Arrangements for proper collection and disposal of wastes such as food drop outs, combustible and other miscellaneous debris is being maintained in the working area. There is a continuous improvement and progress in implementation of Environment Management System and plan at site and outside workplace.

37. Environmental training on various topics is being conducted at site to the workmen by the Environment Manager.

38. Following pictures show the good environmental management practices being implemented by contractors.



Air quality monitoring station at Mahindra and Mahindra Station (Near P-167)



Noise Level monitoring at Pushpa Park Station (near Jagruthi Area)



Regular Water sprinkling on casting yard roads (Bandra)



Cleaning at Casting Yard



Sedimentation Tank construction at Batching Plant (Bandra)



Removal of muck/debris from Site





Biomedical Waste collection system



Inspection of Plantations



New Plantation at Aarey Colony



Environmental Awareness training to workers

## 6. Performance of Ongoing Construction Works

39. The ongoing construction work for two lines (Line 7 and Line 2A) is being implemented in compliance with EMP and SHE Manual prepared for these lines. There are no major accidents reported during the construction work except few site specific issues such as timely removal of construction and demolition waste, storage and handling of hazardous waste, access to structures, health and safety issues with workers etc. These issues are site specific and resolved by site engineers as and when reported.

40. Some social disturbance is reported during construction work particularly at station areas due to traffic diversion and restricted access to houses. Contractor together with MMRDA coordinated with traffic police to deal with traffic movement issues.

41. OHS aspects are being managed by contractor under the supervision of general consultants. Regular trainings is being provided to workers on OHS. Monitoring reports are being prepared by contractors and general consultant. Overall the environmental, health and safety performance of the ongoing construction work is satisfactory.

## 7. Area of Concern

42. While no major non-compliances were observed during the site visits, a number of observations were made which need improvements in the environment safeguards system. Observations and recommendations for improvement are provided below.

- (i.) Most of the permits are obtained. However, some of the permits are still under process. Forest clearance and permissions from Hon. High Court should be obtained on priority.

- (ii.) Air quality monitoring is conducted every fortnight or monthly at the construction site and casting yards. However, only PM10 data is collected.
- (iii.) First aid room at package 1 site for Line 7 was found to be in poor and unhygienic condition.
- (iv.) Safety barricading had been removed in some sections of Line 2A providing easy access for public to cross the road/construction site with overhead construction activities still going on. This could cause injuries to people.
- (v.) Workers working on the elevated girder were not wearing safety harness.
- (vi.) Cooking is being done in the sleeping quarters and domestic wastewater is being thrown near the entrance of each room creating a unhygienic and smelly environment.
- (vii.) Monthly reports are being submitted by contractors to the general consultant. However, the report does not include information on all environment, health and safety activities being implemented. e.g. information on list of health and safety training is not included.

### E. CORRECTIVE ACTION PLAN

43. Findings of the field visits and discussions with MMRDA, general consultant and contractor officials confirm that while no major non-compliances were observed in the implementation of civil works activities, a number of recommendations were made for improving the environment safeguards system. Corrective Action Plan for improvement of environment safeguards system is provided in Table 7.

**Table 7: Corrective Action Plan**

No.	Observation (July 2018)	Recommendation	Responsibility	Status as of 30 September 2018
1.	EIAs are prepared as per GOI policy requirements. Since this is a metro project and most of the impacts are associated with noise and vibrations (mainly due to operation of metro rail), assessment of noise and vibrations impacts are missing in the EIAs prepared by MMRDA.	Conduct the noise and vibration studies for project lines.	MMRDA	Partly completed.  Draft report for line 7 has been completed. Study is ongoing for line 2A and 2B. Expected to be completed by December 2018  EIA reports for line 2A and 7 are disclosed on MMRDA web site.
2.	Forest clearance, permissions from Hon. High Court, and tree cutting permits are pending.	Forest clearance and permissions from Hon. High Court should be obtained on priority.	MMRDA/ Contractor	Partly completed.  For Line 7 CRZ, Forest and High Court permission is not required. Tree authority permissions have already been obtained for most of the stretches. For Lines 2A and 2B MCZMA permission have already been obtained. Application for Forestry Clearance has been submitted and stage 1 Forestry Clearance is expected in three months.

				For Line 2A the Tree Authority permission has been obtained for most of the stretches. For Line 2B Tree Authority permissions is being processed.
3.	Air quality monitoring is conducted every fortnight or monthly at the construction site and casting yards. However, only PM10 data is collected.	Continue collecting PM10 data fortnightly/monthly. Also collect data on PM2.5, NOx, SOx and CO on a quarterly basis	Contractor	Partly completed.  Collection of PM2.5, NOx, Sox and CO data will be started in the last quarter of 2018
4.	First aid room at package 1 site for Line 7 was found to be in poor and in unhygienic condition	Clean the room and remove old shoes and other old materials. Have a proper and clean patient bed. First aider to be available on site full time. Well stocked medicines and basic medical appliances to be available on site.	Simplex, Contractor for package 1, Line 7	Completed.  The condition of the first aid room has been significantly improved with better supply of medicine and medical equipment. First aider is now regularly available on site.
5.	Safety barricading had been removed in some sections of Line 2A providing easy access for public to cross the road/construction site with overhead construction activities still going on. This could cause injuries to people.	Safety barricading to be maintained until all construction activities are fully completed.	J Kumar, Contractor for package C1, Line 2A	Completed.  Safety barricading is now being maintained till all works are fully completed in the respective section of the metro alignment
6.	Workers working on the elevated girder were not wearing safety harness	All workers working on elevated areas should wear safety harness all the time	J Kumar, Contractor for package C1, Line 2A	Completed.  Safety harnesses are provided to workers particularly in elevated areas
7.	Cooking is being done in the sleeping quarters and domestic waste water is being thrown near the entrance of each room creating an unhygienic and smelly environment.	No cooking to be allowed in sleeping quarters. Sleeping quarters to be made clean, neat and tidy. Oily sewage should be collected in septic tank with adequate treatment for removal and disposal of oily sewage. Workers camps sewage must be collected in separate septic tanks and disposed	J Kumar, Malwani casting yard	Partly completed.  Cooking in the sleeping quarters have mostly stopped. Most cooking is only done in the workers common kitchen.  Sewage from workers camp is being disposed in the septic tank. Domestic waste water is collected in a retention pond cleaned and released into the nearest storm drain.

		at Municipal disposal facility.		
8.	Monthly reports are being submitted by contractors to the GC. However, the report does not include information on all environment, health and safety activities being implemented. e.g. information on list of health and safety training is not included.	Monthly reports to include all activities related to environment, health and safety.	Contractor under guidance of general consultant	Completed.  Monthly reports with better coverage of environment activities being implemented is now being prepared and submitted to the GC

## F. CONCLUSIONS

44. As per the Government of India regulatory requirements, EIA for metro projects is not required. However, MMRDA has prepared EIAs for three Lines corridor including EMPs. MMRDA's SHE Manual and EMPs have been included in the bidding documents and it formed integral part of contractors' contract document. These EIAs, EMPs and SHE Manila are compatible with OHSAS 18001 and ISO 14001 and these documents also generally meet SPS criteria. Contractors have been mobilized in second quarter of 2016 (for Line 7 and Line 2A) and first quarter of 2018 (for Line 2B). Each contractor has one environmental expert and one SHE Manager in its organization structure. The civil works for Line 7 and Line 2A is at advance stage whereas civil works for Line 2B is at initial stage of contractor mobilization and ground clearing.

45. Contractors have prepared contract package-specific SHE Plan as well as site-specific EMPs. Contractors are preparing monthly environmental monitoring reports and monthly SHE monitoring reports. Monitoring of environmental quality (air, water, noise and soil) is being done on a monthly basis in all the contract packages. General consultant is also submitting monthly monitoring reports to MMRDA.

46. Contractors have obtained requisite NOCs and statutory permits for contractor's facilities (casting yard/batching plant). However, contractors for Line 2B are yet to receive consent to establish and consent to operate. Health, safety and hygiene conditions at all the workers camps need immediate improvement as currently there is lack of adequate facilities in the workers camps. Occupational health and safety at construction sites also need improvement.

47. Contractor and General consultant has adequate Environmental and Safety Personnel in their organization setup. Trainings are being provided to workers on regular basis and it is being documented.

48. Overall implementation of environmental management measures during civil work activities is satisfactory. Some corrective measures such as mapping of sensitive receptor and detailed study on noise, vibrations, and privacy assessment along these three lines, improvement in health and safety of workers, good housekeeping, training of contractor personnel, and submission of semi-annual monitoring report have been recommended in the corrective action plan.

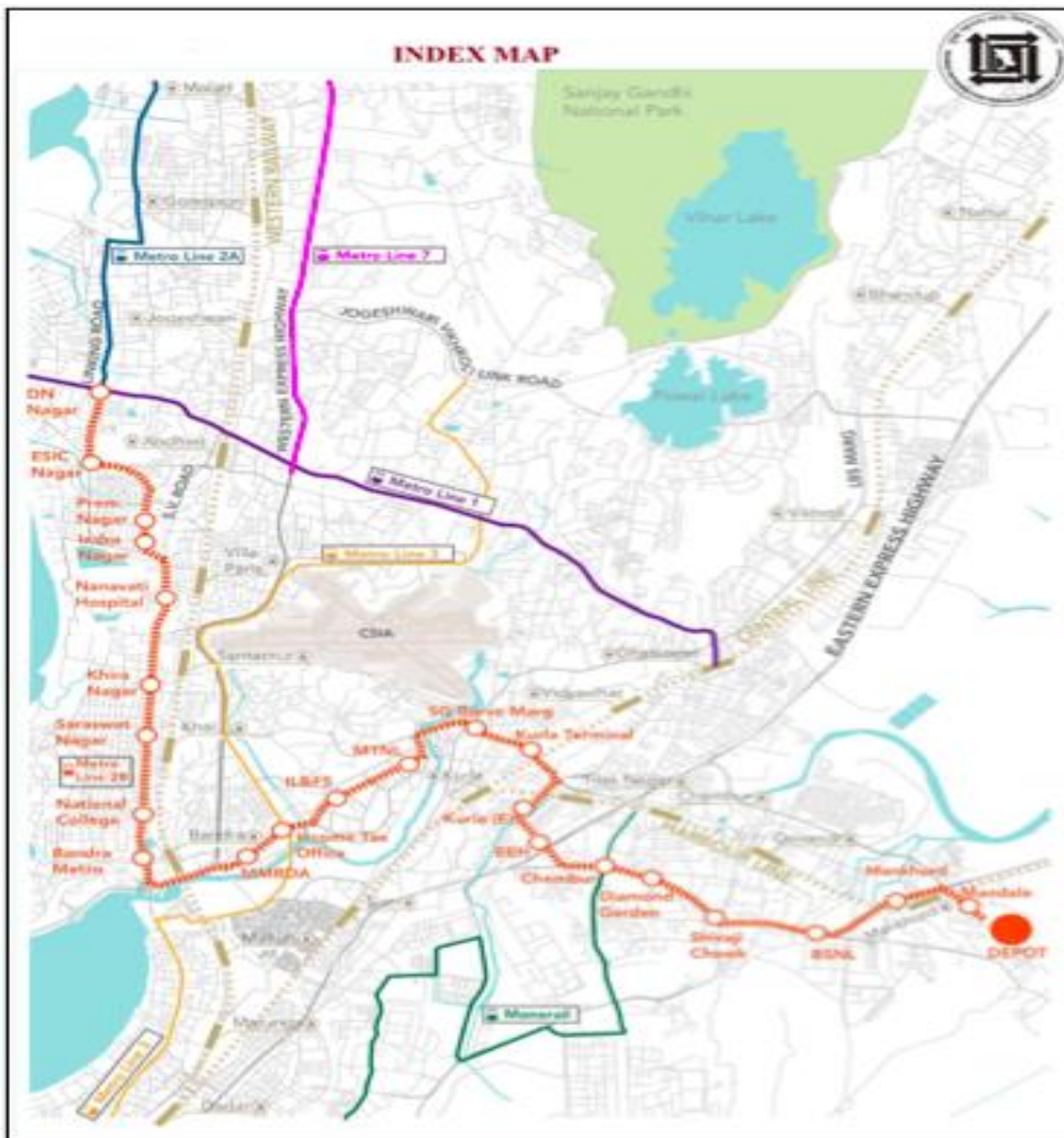
## Appendix 1: Location Map of Project Lines

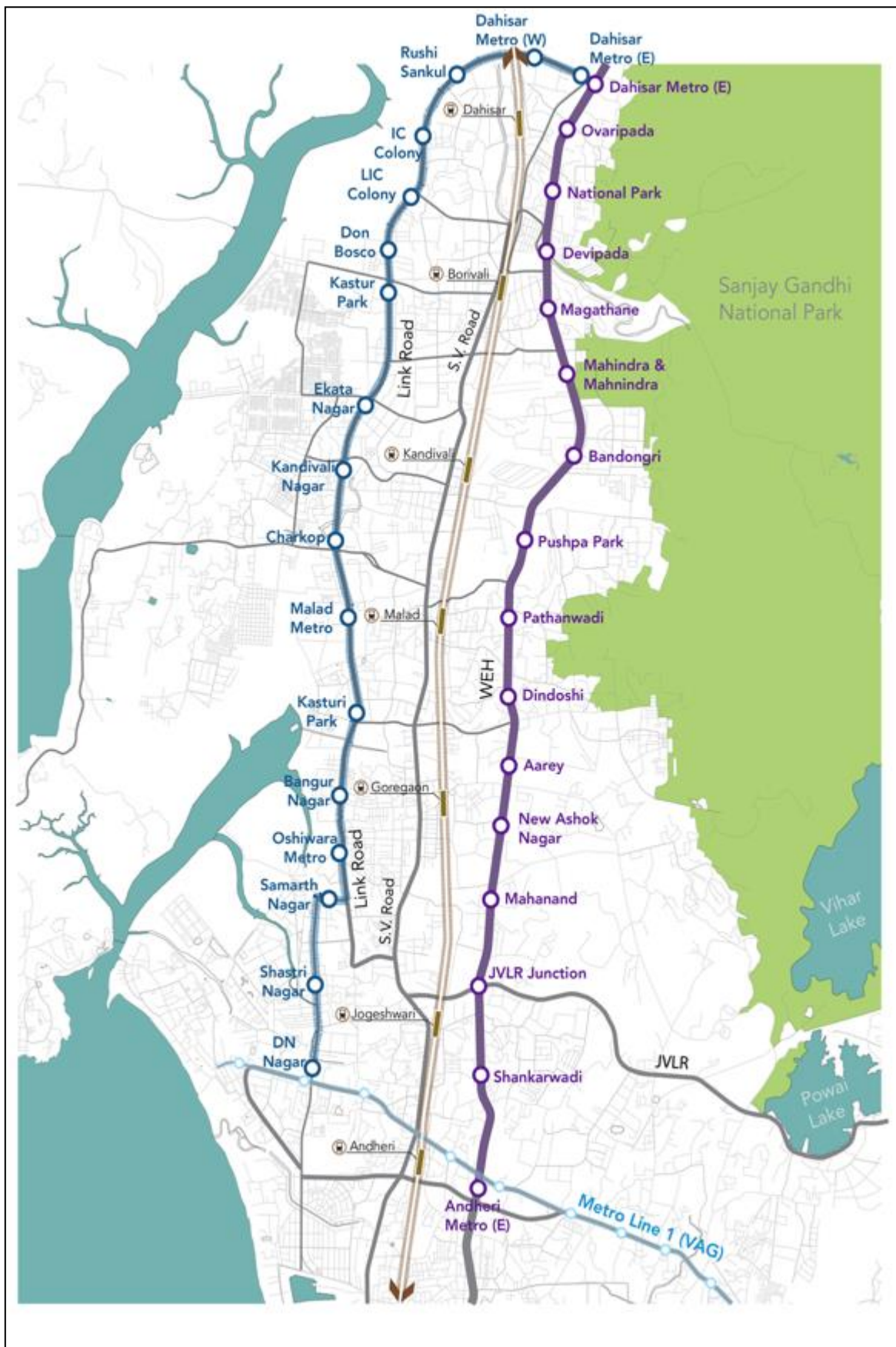
### Alignment Map of Line 2A Corridor





## Alignment Map of Line 2B Corridor



**Alignment Map of Line 7 Corridor**

## Appendix 2: Letter from MoEFCC on Exemption of Metro Projects for EC Requirements

F. No. 19-130/2015-IA III  
Government of India  
Ministry of Environment, Forest and Climate Change  
(I.A. Division)

Indira Paryavaran Bhawan  
Aliganj, Jorbagh Road,  
New Delhi -110003  
E-mail : [aditya.narayan@nic.in](mailto:aditya.narayan@nic.in)  
Telefax : 011: 24695398  
Dated 9<sup>th</sup> March, 2016

To  
Shri P R K Murthy  
Director (Projects)- Metro and Chief, Transport & Communications Div.  
Mumbai Metropolitan Region Development Authority,  
Bandra Kurla Complex,  
Bandra (East),  
Mumbai-400051

E-mail: [nainbhatia@hotmail.com](mailto:nainbhatia@hotmail.com); [prkmurthy1960@yahoo.com](mailto:prkmurthy1960@yahoo.com); [prkmurthy2008@gmail.com](mailto:prkmurthy2008@gmail.com);

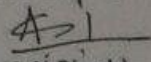
Sub: Exemption from Environmental Clearance for Mumbai Metro Rail Projects in respect of Construction of 118 Km of Metrorail Network in Mumbai covering 9 corridors regarding

Ref.: Your letter no. T &C/TP Unit/ Environmental Clearance/CH-1/371/2016 dated 8<sup>th</sup> February, 2016.

Sir,  
In the context of your letter dated 8<sup>th</sup> February, 2016 seeking exemption from Environmental Clearance for Mumbai Metro Rail Projects in respect of construction of 118 Km of Metrorail Network in Mumbai covering 9 corridors, I am directed to state that construction of Metro Rail is not covered under EIA Notification, 2006. However, project proponent may note as following for strict compliance:

- i. If any construction is proposed within CRZ area, clearance shall be obtained under the CRZ Notification, 2011. Any construction within CRZ-I shall be on stilts. Maintenance and repair activities (Industrial Activities) are not permissible within CRZ.
- ii. Proposed construction projects shall incorporate green building features, rain water harvesting system, energy efficiency, water conservation, sewage/effluent treatment/disposal, solid waste management, vehicle parking etc.
- iii. Statutory clearances under Forest (Conservation) Act, 1980, the Wildlife (Protection) Act, 1972, Air and Water Act as may be required in the case shall be obtained.
- iv. Construction of building within Metro rail project for commercial purposes such as mall, offices or residential buildings etc having built up area equal or more than 20,000 m<sup>2</sup> shall require prior environmental clearance from respective State Level Environmental Impact Assessment Authority.

This issues with the approval of the Competent Authority.


Yours faithfully  
  
(A N Singh)  
Joint Director (S)



### Appendix 3: Sample Environmental Monitoring Reports

**J. Kumar Infraprojects Ltd.**  
We dream ... So we achieve...

Regd. Off: 16-A, Andheri Industrial Estate, Veera Desai Road, Andheri (W), Mumbai - 400053, INDIA  
Ph.: +91-22-6774 3555. Fax+91-22-2673 0814. E-mail : info@jkumar.com Website : www.jkumar.com  
CIN No. : L74210MH1999PLC122886

  
**J. Kumar**  
ISO 9001:2015  
ISO 14001:2015  
OHSAS 18001:2007

EF: JKIL/MMRDA/Metro-7/site/919/2018

9<sup>th</sup> May 2018

To,

**The Project Director,**  
Consortium of Ayesa – ITALFER,  
AICA – Ayesa India (AICA),  
Unit No.3 And 4A, The Centrium,  
4<sup>th</sup> Floor, Phoenix Market City,  
BS Road, Kurla (West)  
Mumbai - 400070

**MUMBAI METRO Line 7 & 2B**  
**AICA Consortium (GC)**  
**RECEIVED**

Date: 11/5/2018  
Time: 04:20  
Received: ☒ Hard Copy ☐ Soft Copy (22/5)  
GC Number: 2018/2263  
Signature: [Signature]

**Subject:-** Part Design and Construction of elevated viaduct and 5 elevated stations viz. Aarey, Pathanwadi, Pushpa Park, Bandongri and Mahindra & Mahindra [Excluding Architectural Finishing & Pre-engineered steel roof structure of Stations] from Chainage 5801.400m to 11664.600m of Andheri (East)– Dahisar (East) Corridor of Mumbai Metro Rail Project of MMRDA.

- Submission of Environmental Report for the month of April - 2018 for Metro Line – 07 project (package 02).

Dear Sir,

With reference to above subject, we are submitting herewith Environmental Report for the month of April - 2018 for Metro Line – 07 Project (package 02).

This is for your kind information & record please.

Thanking and assuring you of our best services at all times.


Yours faithfully,  
For **J. Kumar Infraprojects Ltd.,**

[Signature]

Authorised Signatory

Encl: As above.

CC: - The Chief Engineer (Civil) MMRDA for information please.



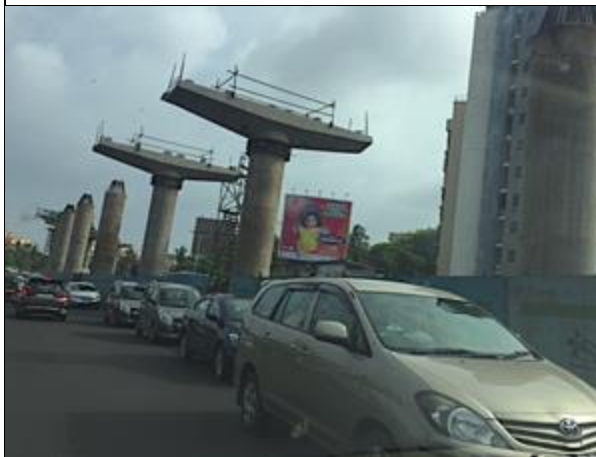
#### Appendix 4: Photographs (Field and Consultation)



Onsite Inspection and discussion with Contractor Staff



Inspection of Contractor Records at construction camp



Ongoing Civil work along Line 7



Completed viaduct section Line 2B



Ongoing Civil work along Line 7



Ongoing Civil work along Line 7





Work in progress on viaduct section along Line 7



Completed viaduct section along Line 2B



Ongoing work with unsafe conditions (safety hazard) with moving traffic on Road



EHS Training session at construction camp



Discussion with Contractor Team



Inspection of First Aid / Medical Facilities



Doctor showing medical facility and stock at Casting Yard /Camp



Injury / Accident Record at Medical Facility



Inspection of Workers Camp at Dahisar Casting Yard



Discussion with Contractor EHS Team and GC Team

## **Appendix 5: Outline of an Environmental Monitoring Report**

### **1. Introduction**

(Report Purpose, Brief project background including organizational set up, list of roads, planned project schedule etc., Details on Project Implementation Progress with details on current site works, location, earthworks, vegetation clearing, spoils disposal, establishment of construction camp and other construction related facilities (e.g., concrete mixing plant, asphalt batching plant, crushing plant, etc.), establishment and operation of quarry/borrow areas, etc., including locations, schedules, dates, etc., Schedule of construction activities for the subsequent months).

### **2. Compliance on Environment Safeguards Requirements**

(Status of compliance with ADB loan covenants: provide a list of environmental loan covenants and specify level of compliance).

Status of compliance with government environmental requirements: provide a list of government environmental requirements (permits, etc.) for the project as well as construction-related facilities/ activities and specify level of compliance, indicate any required environmental permit/license/consent obtained to date and to be obtained (including schedule) for the project and construction related facilities/activities).

### **3. Changes in project scope**

(Such as change in alignment or footprint in case of horizontal infrastructure, implementation of additional Project component/s, etc. (with reference to the Project scope identified in the ADB-cleared environmental assessment report, i.e., IEE or EIA) and corresponding safeguard measures undertaken, if applicable).

### **4. Implementation of Environmental Management Plan**

(Indicate the manner by which EMP requirements are incorporated into contractual arrangements, such as with contractors or other parties.

Summary of Environmental Mitigations and Compensation Measures Implemented.

Based on EMP; may include measures related to air quality, water quality, noise quality, pollution prevention, biodiversity and natural resources, health and safety, physical cultural resources, capacity building, and others. Provide a table/matrix showing a summary of each environmental mitigation measure specified in the EMP.

EMP Requirement (list all mitigation measures specified in the EMP)	Compliance Attained (Yes, No, Partial)	Comment on Reasons for Partial or Non-Compliance	Issues for Further Action and Target Dates
1.			
2.			
3.			
4.			
5.			
etc.			



## 5. Environmental Monitoring Activities

(Compliance Inspections, Summary of Inspection Activities, Mitigation Compliance<sup>1</sup> Mitigation Effectiveness 2. Findings of Environmental Monitoring Plan (EMOP) on quality of air, noise, water etc. and Results Assessment<sup>3</sup>)

## 6. Key Environmental Issues

(Key Issues Identified (e.g., non-compliance to loan covenants, EMP and/or government environmental requirements, insufficient mitigation measures to address Project impacts, incidents, accidents, etc.) Actions Taken and Corrective Action Plan (specify actions taken and corrective action plans to be implemented to address non-compliance and other identified issues. Such action plan should provide details of specific actions to be undertaken to resolve identified issues, responsible persons who will carry out such actions and timeframe/target date to carry out and complete required actions. The action plan could be presented in a tabular/matrix form (see below). Timeframe and responsibilities for reporting

---

<sup>1</sup> Overall compliance with mitigation implementation requirements could be described in qualitative terms or be evaluated based on a ranking system, such as the following:

1. Very Good (all required mitigations implemented)
2. Good (the majority of required mitigations implemented)
3. Fair (some mitigations implemented)
4. Poor (few mitigations implemented)
5. Very Poor (very few or no mitigations implemented)

Additional explanatory comments should be provided as necessary.

<sup>2</sup> Effectiveness of mitigation implementation could be described in qualitative terms or be evaluated based on a ranking system, such as the following:

1. Very Good (mitigations are fully effective)
2. Good (mitigations are generally effective)
3. Fair (mitigations are partially effective)
4. Poor (mitigations are generally ineffective)
5. Very Poor (mitigations are completely ineffective)

Additional explanatory comments should be provided as necessary.

<sup>3</sup> Discharge levels should be compared to the relevant discharge standards and/or performance indicators noted in the EMP. Any exceedences should be highlighted for attention and follow-up. In addition, discharge levels could be compared to baseline conditions (if baseline data is available) and described in qualitative terms or be evaluated based on a ranking system, such as the following:

1. Very Good (overall conditions are generally improved)
2. Good (conditions are maintained or slightly improved)
3. Fair (conditions are unchanged)
4. Poor (conditions are moderately degraded)
5. Very Poor (conditions are significantly degraded)

Additional explanatory comments should be provided as necessary.

to ADB on the progress of implementation of corrective action plan should also be specified under this section.)

Issue	Cause	Required Action	Responsibility	Timing (Target Dates)	Description of Resolution and Timing (Actual)
Old Issues from Previous Reports					
1.					
2.					
New Issues from this Report					
1.					
2.					

Complaints: Details of Complaint/s (Provide details of any complaints that have been raised by the local population and other stakeholders regarding environmental performance and environmental impacts (complainant, nature of complaint, date complaint was filed, which office received the complaint, etc.)

Action Taken (Document how the complaints were addressed or will be addressed by indicating the following:

- i. names and designation of specific staff or officials within the Grievance Redress Committee, executing agency, project management unit, local government, contractor and/or supervision consultant involved in receiving, documenting, and resolving the complaint (s).
- ii. specific actions taken to be taken to resolve the complaint and corresponding timeframe

## 7. Conclusion and Recommendation

Overall Progress of Implementation of Environmental Management Measures<sup>4</sup>

Problems Identified and Actions Recommended

Monitoring adjustment (recommended monitoring modifications based on monitoring experience/trends and stakeholders response)

## 8. Appendices

Site Inspection / Monitoring Reports

Source and Ambient Monitoring Results (Laboratory Analysis)

Photographs

Location Map of Sampling Stations

Copies of Environmental Permits/Approvals

Other relevant information/documents

<sup>4</sup>Overall sector environmental management progress could be described in qualitative terms or be evaluated based on a ranking system, such as the following:

1. Very Good
2. Good
3. Fair
4. Poor
5. Very Poor

Additional explanatory comments should be provided as necessary.