

Draft Initial Environmental Examination

April 2016

IND: Kolkata Environmental Improvement
Investment Program (KEIIP) Tranche 2 – Water
Supply in Joka & Adjoining Area, Kolkata

Prepared by the Kolkata Municipal Corporation for Asian Development Bank. This is a revised version of the draft originally posted in May 2012 available on <http://www.adb.org/sites/default/files/project-document/73266/42266-023-ind-rp-draft-02.pdf>

CURRENCY EQUIVALENTS

(as of 22 April 2016)

Currency unit	–	Indian rupee (Rs)
Rs1.00	=	\$0.0150
\$1.00	=	INR66.4983

ABBREVIATIONS

ADB	- Asian Development Bank
BOD	- Biochemical Oxygen Demand
BPS	- Booster Pumping Stations
CI	- Cast Iron
COD	- Chemical Oxygen Demand
CPHEEO	- Central Public Health and Environmental Engineering Organisation
DI	- Ductile Iron
DO	- Dissolved Oxygen
DSC	- Design and Supervision Consultants
DWF	- Dry Weather Flows
KMC	- Executing Agency
EKW	- East Kolkata Wetlands
GOI	- Government of India
GRC	- Grievance Redressal Committee
GRM	- Grievance Redress Mechanism
HDPE	- High-Density Polyethylene
INR	- Indian National Rupee
KEIP	- Kolkata Environment Improvement Project
KEIP	- Kolkata Environment Improvement Investment Program
KMA	- Kolkata Metropolitan Area
KMC	- Kolkata Municipal Corporation
KMDA	- Kolkata Metropolitan Development Authority
KMWSA	- Kolkata Metropolitan Water and Sanitation Authority
MOUD	- Ministry of Urban Development
MS	- Mild Steel
NRW	- Non Revenue Water
O and M	- Operation and Maintenance
PMU	- Project Management Unit
PST	- Pre-Settling Tanks
PWD	- Public Works Department
SAR	- Subproject Appraisal Reports
SMU	- Safeguard Monitoring Unit
ST	- Schedule Tribe
STP	- Sewage Treatment Plant
SWF	- Storm Water Flow
SWM	- Solid Waste Management
TDS	- Total Dissolved Solids
TFS	- Total Fixed Solids
TKN	- Total Kjeldahl Nitrogen
TOR	- Terms of Reference
TSS	- Total Suspended Solids
USD	- US Dollar

WBPCB	- West Bengal Pollution Control Board
WTP	- Water Treatment Plant
WBSETCL	- West Bengal State Electricity Transmission Company Limited

WEIGHTS AND MEASURES

CFU	- Colony Forming Unit
cum/hr	- cubic meter per hour
cum/m ³	- cubic meter
dB(A)	- Decibal in A network
Ft	- feet
Ha	- hectare
Km	- kilometer
km ² or sq km	- square kilometer
KVA	- Kilovolt ampere
lpcd	- liter per capita per day
M	- meter
m/yr	- meter per year
mg/l	- milligram per liter
MGD	- million gallon per day
MGH	- million gallon per hour
MPN	- Most Probable Number
MT	- Metric Ton
ML	- million liter
MLD	- million liter per day
mm	- Millimeter
NTU	- Nephelometric turbidity Unit

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EXECUTIVE SUMMARY

1. The Kolkata Environmental Improvement Investment Program (KEIIP) is a key urban infrastructure initiative of the KMC, and aims to improve the environment and quality of life in parts of Kolkata Municipal Area mainly through improved water supply, sewerage, drainage and sanitation. The Project will be implemented over a 5-year period from 2014 to 2019. The Program is proposed to be implemented using a multi-tranche financing facility (MFF) of ADB. The first loan under the MFF, Tranche 1 or Loan 3053-IND, amounting to \$100 million, was made effective on 30 May 2014. Project 1, supported by Tranche1, included subprojects for improvement of infrastructure, operations and sustainability in sewerage, drainage and water supply in KMC. Project 2, supported by the Tranche 2, will include physical and non-physical investments in water supply and sanitation improvement in KMC. Project 2 is aligned with improved access to water supply and sanitation in KMC as defined by KEIIP. At present KEIIP Tranche 1 project is under implementation.

2. ADB requires consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. The SPS *inter alia* mandates that ADB ensures environmental assessment of all project loans, program loans, sector loans, sector development program loans, and loans involving financial intermediaries, and private sector loans.

3. This IEE has been prepared as a part of Tranche 2 loan for the proposed water supply sub project "Water Supply in Joka & Adjoining Area, Kolkata" and water loss management of KMC water supply area.. The work includes, (i) Demarcation DMAs and allied works including hydraulic modeling, (ii) Construction of 2 Under Ground Reservoir (UGR) cum Pumping Station (PS) at Prantik Phase III and KMC land on Julpia Road, Construction of 6 Elevated Service Reservoirs (ESRs) at Prantik Ph III, N-E of SSE STP, N-W of SSE STP, KMC land on Julpia Road, WBSETCL (West Bengal State Electricity Transmission Company Limited) and 22 Bigha, (iii) Laying of Transmission Main from existing Daspara PS to UGRs at Pratik Phase III and KMC land on Julpia Road; and transmission main from UGRs to 8 ESRs (6 proposed + 2 existing), (iv) Laying of distribution system and house connection within the command area of 8 ESRs (6 proposed + 2 existing), (v) Construction of Elevated Service Reservoir (ESR) at Ramkantapur, Malpara, Charaktala; Laying of Transmission main from UGR at KMC land on Julpia Road from to 3 ESRs; Laying of Distribution system and house connection within command area of 3 ESRs, and (vi) Dedicated Water Supply Transmission Main from Junction of James Long Sarani to Daspara near existing Pumping Station along James Long Sarani and (vii) Water Loss Management under Jay Hind WTP Area (Eastern Kolkata) including rehabilitation, expansion of 100 km Distribution network and connection to around 20000 Households.

4. Construction work is likely to commence in 2016 and will be completed in 27 months.

5. This IEE aims to (i) provide critical facts, significant finding, and recommended actions; (ii) present the national and local legal and institutional framework within which the environmental assessment has been carried out; (iii) provide information on existing geographic, ecological, social and temporal context including associated facilities within the subproject's area of influence; (iv) assess the subproject's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic, and physical cultural resources in the subproject's area of influence; (v) identify mitigation measures and any residual negative impacts that cannot be mitigated; (vi) describe the process undertaken during project design to engage stakeholders and the planned information disclosure measures and the process for

carrying out consultation with affected people and facilitating their participation during project implementation; (vii) describe the subproject's grievance redress mechanism for resolving complaints about environmental performance; (viii) present the set of mitigation measures to be undertaken to avoid, reduce, mitigate, or compensate for adverse environmental impacts; (ix) describe the monitoring measures and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures; and (x) identify who is responsible for carrying out the mitigation and monitoring measures.

6. Potential negative impacts were identified in relation to pre- construction, construction and operation stages of the improved infrastructure, but no permanent environmental impacts were identified as being due to either the subproject design or location. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the designs for the infrastructure. This means that the number of impacts and their significance have already been reduced by amending the design.

7. The public participation processes to be undertaken during project detailed design will ensure that stakeholders are engaged during the preparation/finalization of detailed design and the IEE. The planned information disclosure measures and process for carrying out consultation with affected people will facilitate their participation during project implementation.

8. The subproject's Grievance Redress Mechanism (GRM) will provide the citizens with a platform for redress of their grievances and describes the informal and formal channels, time frame and mechanisms for resolving complaints about environmental performance.

9. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between KMC, PMU, DSC and the contractors. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (ii) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (iii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iv) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (v) ensure that safety recommendations are complied with.

10. The contractor for the package will be required to submit to KMC/PMU, for review and approval, site environmental plan (SEP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following **Tables 24 to 28** of the EMP to ensure no significant environmental impacts; (iii) monitoring program as per SEP; and (iv) budget for SEP implementation. No works are allowed to commence prior to approval of SEP.

11. A copy of the EMP/approved SEP will be kept on site during the construction period at all times. The EMP has been made binding on all contractors operating on the site and included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

12. The subproject is unlikely to cause significant adverse impacts because: (i) most of the individual components involve straightforward construction and operation, so impacts will be mainly localized; (ii) in most cases the predicted impacts are localized and likely to be associated with the construction process at isolated locations and are produced because the process is invasive, involving excavation, obstruction at specific construction locations, and

earth movements. The potential adverse impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

13. Therefore as per ADB SPS, the subproject is classified as environmental Category B and does not require further Environmental Impact Assessment.

I. INTRODUCTION

1. The city of Kolkata is the seventh largest metropolis in India, and had 4.5 million residents in 2011. It is the largest city in the state of West Bengal, and has been the biggest contributor to West Bengal's gross state domestic product. The continuous improvement in the city's urban environment is necessary to increase labor productivity through better health status of the urban population, especially when it has been experiencing lower population growth. There have been, however, geographical disparities in access and quality of the water supply and sewerage services, because the Kolkata Municipal Corporation (KMC), an urban local body with a mandate to provide these services under the KMC Act of 1980, has an aging water supply system, and has inadequate sewer coverage in the city's peripheral areas.¹ The Asian Development Bank (ADB) loans have assisted KMC in the expansion of the sewerage coverage through the Kolkata Environmental Improvement Project² (KEIP) since 2000. The Kolkata Environmental Improvement Investment Program³ (KEIIP) will help KMC not only continue sewer network expansion on a larger scale, but also gradually improve efficiency in water supply operations, which will enable KMC to generate operating surplus for capital investment in water supply and sewerage.

2. On 26 September 2013, ADB approved the provision of loans under a multi-tranche financing facility (MFF) for KEIIP for an aggregate amount not exceeding \$400 million. The impact of KEIIP will be improved access to water supply and sanitation in KMC. The outcome will be improved water supply, sewerage and drainage service quality and operational sustainability in selected areas of KMC. Thus KEIIP has three outputs: (i) inefficient water supply assets rehabilitated; (ii) sewerage extension to peripheral areas continued; and (iii) financial and project management capacity further developed.

3. KMC is KEIIP's executing agency. A project management unit (PMU) created under KMC is implementing KEIIP.

4. The first loan under the MFF, Tranche 1 or Loan 3053-IND, amounting to \$100 million, was approved by ADB on 22 October 2013, signed on 3 March 2014 and made effective on 30 May 2014. Project 1, supported by Tranche 1, included subprojects for improvement of infrastructure, operations and sustainability in sewerage, drainage and water supply in KMC. While Project 2, supported by the Tranche 2, will include physical and non-physical investments in water supply and sanitation improvement in KMC. Project 2 is aligned with improved access to water supply and sanitation in KMC as defined by KEIIP.

¹ The 1899 Calcutta Municipal Act defined the administrative domain of the municipal authority as covering 25 wards and 48.5 km². Many boundary changes followed, the latest one in January 1984, when Boroughs XI, XII, XIII, XIV, and XV were annexed to KMC. These boroughs are popularly known as the "added areas." Recently The KMC has been further expanded by including Joka area in the southern part of the city creating 3 additional wards under a new Borough XVI..

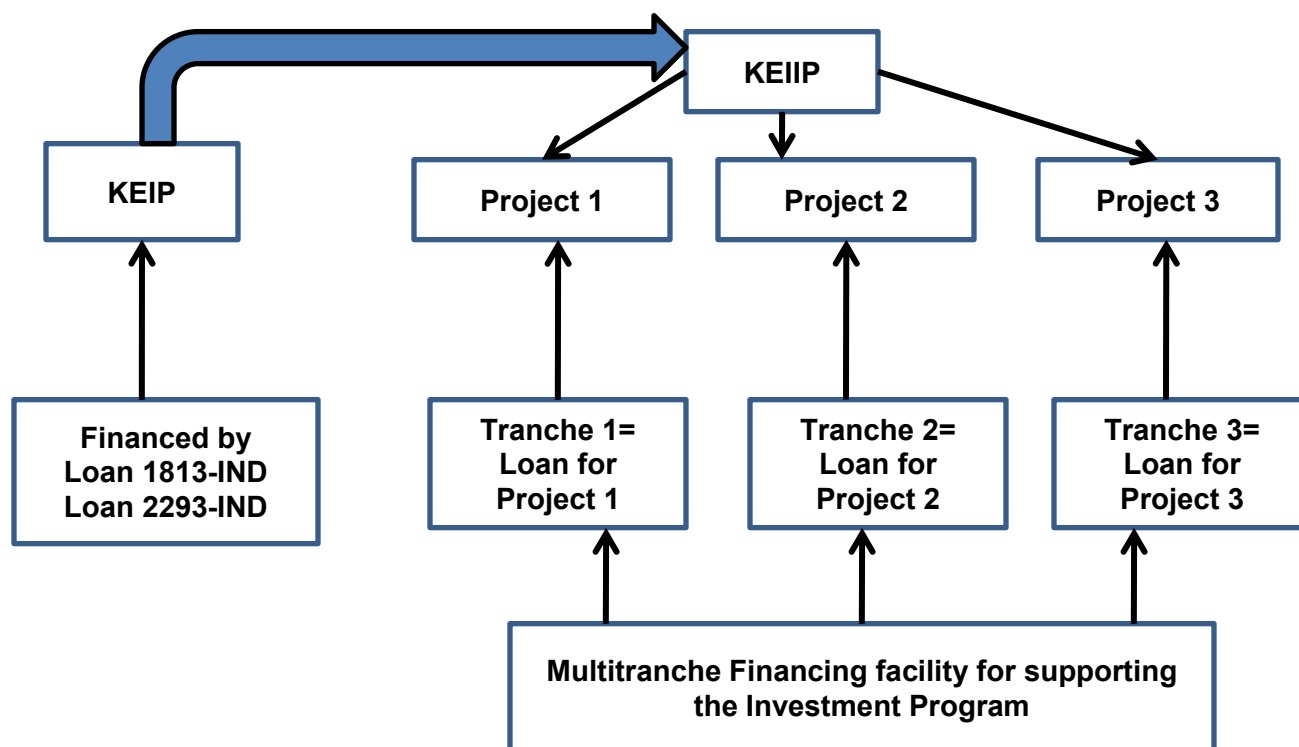
² ADB. 2000. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to India for the Calcutta Environmental Improvement Project*. Manila (Loan 1813-IND, \$250 million, approved on 15 November 2000). The project completion date is 30 June 2012.

ADB 2006. *Report and Recommendation of the President to the Board of Directors: Proposed Supplementary Loan to India for the Kolkata Environmental Improvement Project*. Manila (Loan 2293-IND: \$80 million, approved on 20 November 2006). The project completion date is 30 June 2012.

³ ADB provided project preparatory technical assistance. ADB. 2009. *Technical Assistance to India for Preparing for Kolkata Environmental Improvement Project II*. Manila.

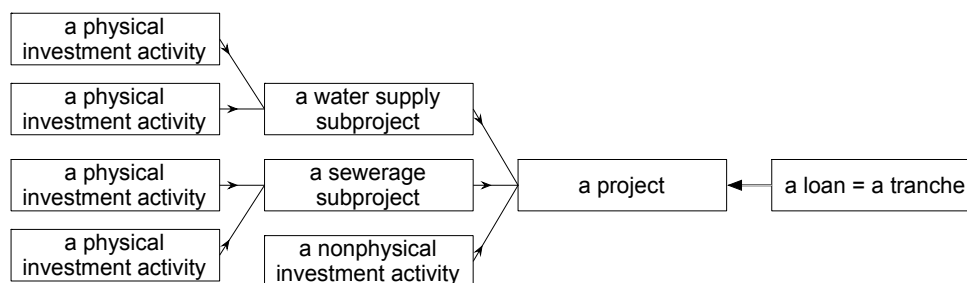
5. The Tranche 2 project will be implemented over a 3-year period from 2016 to 2019. At present KEIP Tranche 1 is under implementation.

Figure 1: Relationship between the KEIP and the KEIIP



6. KEIIP Project 2 will include: (i) water supply, including pumping and transmission system, and (ii) sewerage and drainage (S&D) including dry weather flow (DWF) and storm water flow (SWF) pumping stations and sewage treatment plants (STPs).

Figure 2: Structure of a Project, Subprojects, and KEIIP Activities



7. A detailed description and outputs are given in the following paragraphs.

Output 1. Inefficient water supply assets rehabilitated. Project 2, under this output, will assist KMC to:

- (i) Demarcate and hydraulically district metering areas (DMAs) and hydraulically isolate the DMAs, through installation of bulk water meters, procurement of NRW

reduction equipment and upgrading of the SCADA, to ensure equitable distribution and reduction in NRW across the overall water supply service area of KMC.

- (ii) Upgrade water supply services in Joka and adjoining areas -peripheral areas recently merged into KMC - to deliver a continuous, pressurized supply of safe water to the population. It will include rehabilitation of the existing works; rehabilitation and construction of new transmission mains; construction of new overhead storage tanks and ground level storage reservoirs; renovation and construction of distribution mains and pipelines; and providing all customers with water connection meters; and
- (iii) Implementation of performance based water loss/ NRW reduction measures in East Kolkata to provide continuous pressurized supply of safe water, including 20,000 consumer connections and metering, for a population of 200,000 population.

Output 2: Sewerage and drainage extension to peripheral areas continued. The overall objective of the subprojects is to rehabilitate and expand services in peripheral areas of KMC in South and South Eastern fringes such as Behala, Kasba to upgrade the sanitation status of the areas by collecting and transporting the domestic sewage, to be finally treated and disposed to the existing water bodies as also reducing the water logging problems in the target areas thereby reducing the loss in man hours, loss in properties and improvement in general sanitation of the areas by reduction of the level and duration of the water logging. Construction of a new pumping station in Lalababu Nikashi is expected to provide substantial relief to population in Cossipur area by reduction of chronic water logging problem in the areas.

Output 3: Financial and Project Management Capacity Further Developed. Under this output, Project 2 will continue to support KMC and the newly established Utility Finance Improvement Unit and Water Loss Management Unit in implementing the policies on NRW reduction, water metering, user charges, and in achieving institutional reforms and full cost recovery of services, and implementing Project 2.Outputs will include (i) training and capacity building of PMU, and (ii) consulting services to engage project management, supervision and design consultants.

8. All subprojects and their components are to comply with relevant safeguard requirements in each loan agreement for the Government of India, the state government of West Bengal, and the Safeguards Policy Statement (SPS), 2009 of ADB as applicable.

9. The provision for the use of frameworks is required for implementation of the investment program under the MFF to guide safeguard assessments in all tranches, as well as in non-sensitive components of each project under the investment program where detailed design takes place.

10. This IEE has been prepared as a part of Tranche 2 loan for the proposed water supply sub project "Water Supply in Joka & Adjoining Area, Kolkata" and water loss management of KMC water supply area. The work includes, (i) Demarcation DMAs and allied works including hydraulic modeling, (ii) Construction of 2 Under Ground Reservoir (UGR) cum Pumping Station (PS) at Prantik Phase III and KMC land on Julpia Road, Construction of 6 Elevated Service Reservoirs (ESRs) at Prantik Ph III, N-E of SSE STP, N-W of SSE STP, KMC land on Julpia Road, WBSETCL (West Bengal State Electricity Transmission Company Limited) and 22 Bigha, (iii) Laying of Transmission Main from existing Daspara PS to UGRs at Pratik Phase III and

KMC land on Julpia Road; and transmission main from UGRs to 8 ESRs (6 proposed + 2 existing), (iv) Laying of distribution system and house connection within the command area of 8 ESRs (6 proposed + 2 existing), (v) Construction of Elevated Service Reservoir (ESR) at Ramkantapur, Malpara, Charaktala; Laying of Transmission main from UGR at KMC land on Julpia Road from to 3 ESRs; Laying of Distribution system and house connection within command area of 3 ESRs, and (vi) Dedicated Water Supply Transmission Main from Junction of James Long Sarani to Daspara near existing Pumping Station along James Long Sarani and (vii) Water Loss Management under Jay Hind WTP Area (Eastern Kolkata) including rehabilitation, expansion of 100 km Distribution network and connection to around 20000 Households.

11. Construction work is likely to commence in 2016 and will be completed in 27 months.

12. This IEE aims to (i) provide critical facts, significant finding, and recommended actions; (ii) present the national and local legal and institutional framework within which the environmental assessment has been carried out; (iii) provide information on existing geographic, ecological, social and temporal context including associated facilities within the subproject's area of influence; (iv) assess the subproject's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic, and physical cultural resources in the subproject's area of influence; (v) identify mitigation measures and any residual negative impacts that cannot be mitigated; (vi) describe the process undertaken during project design to engage stakeholders and the planned information disclosure measures and the process for carrying out consultation with affected people and facilitating their participation during project implementation; (vii) describe the subproject's grievance redress mechanism for resolving complaints about environmental performance; (viii) present the set of mitigation measures to be undertaken to avoid, reduce, mitigate, or compensate for adverse environmental impacts; (ix) describe the monitoring measures and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures; and (x) identify who is responsible for carrying out the mitigation and monitoring measures.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

13. ADB requires the consideration of environmental issues in ADB's all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB SPS, 2009. SPS mandates environmental assessment of all ADB's project loans, program loans, sector loans, sector development program loans, and loans involving financial intermediaries, and private sector loans.

14. **Screening and Categorization.** The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project, the sensitivity, scale, nature and magnitude of its potential impacts, and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impact and are assigned to one of the following four categories:

- (i) **Category A.** Projects could have significant adverse environmental impacts. An EIA is required to address significant impacts.
- (ii) **Category B.** Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely.

If an EIA is not needed, the IEE is regarded as the final environmental assessment report.

- (iii) **Category C.** Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.
- (iv) **Category FI.** Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all Projects will result in insignificant impacts.

15. **Environmental Management Plan.** An EMP which addresses the potential impacts and risks identified by the environmental assessment shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the Project's impact and risks.

16. **Public Disclosure.** The IEE will be put in an accessible place (e.g., local government offices, libraries, community centers, etc.), and a summary translated into local language for the project affected people and other stakeholders. The following safeguard documents will be put up in ADB's website so that the affected people, other stakeholders, and the general public can provide meaningful inputs into the project design and implementation:

- (i). For environmental category A projects, a draft EIA report at least 120 days before Board consideration;
- (ii). Final or updated EIA and/or IEE upon receipt; and
- (iii). Environmental monitoring reports submitted by the Project Management Unit (PMU) during project implementation upon receipt.

B. National and State Laws

17. Implementation of the subproject will be governed by the national and State of West Bengal environmental acts, rules, regulations, and standards. These regulations impose restrictions on activities to minimize/mitigate likely impacts on the environment. It is the responsibility of the project executing and implementing agencies to ensure subprojects are consistent with the legal framework, whether national, state or municipal/ local. Compliance is required in all stages of the subproject including design, construction, and operation and maintenance.

18. The following legislations are applicable to any project:

- (i) Environmental (Protection) Act of 1986, its rules and amendments;
- (ii) Environmental Impact Assessment (EIA) Notification of 2006 and 2009;
- (iii) Water (Prevention and Control of Pollution) Act of 1974, its Rules, and amendments;
- (iv) Air (Prevention and Control of Pollution) Act of 1981, its Rules and amendments;
- (v) Central Pollution Control Board (CPCB) Environmental Standards;
- (vi) Ancient Monuments and Archaeological Sites and Remains Rules of 1959;
- (vii) Land Acquisition Act of 1894 and as amended in 1985;
- (viii) Wetlands (Conservation and Management) Rules, 2010;
- (ix) Hazardous Wastes (Management, Handling and Trans-boundary Movement) Rules 2008
- (x) Noise Pollution (Regulation and Control) Rules of 2000 as amended up to 2011.
- (xi) National Institute of Occupational Safety and Health Criteria for a recommended standard: occupational noise exposure, NIOSH Publication No. 98-126

- (xii) West Bengal Trees (Protection and Conservation in Non-Forest Areas) Act, 2006;
- (xiii) East Kolkata Wetlands (Conservation and Management) Act, 2006
- (xiv) The Child Labour (Prohibition and Regulation) Act, 1986

19. The summary of environmental regulations and screening of mandatory requirements for the subproject is shown in **Table 1**. During the design, construction, and operation of the project the PMU and PIUs will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of India regulations differ from these levels and measures, the contractor shall achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU and PIUs will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

Table 1: Applicable Environmental Regulations for Water supply subproject

Law	Description	Requirement
EIA Notification	The EIA Notification of 2006 and 2009 (replacing the EIA Notification of 1994), set out the requirement for environmental assessment in India. This states that Environmental Clearance is required for certain defined activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts. Category A projects requires Environmental Clearance from the National Ministry of Environment, Forest and Climate Change (MoEFCC). Category B projects require Environmental Clearance from the State Environmental Impact Assessment Authority (SEIAA).	The proposed components of this water supply subproject are not listed in the EIA Notification's "Schedule of Projects Requiring Prior Environmental Clearance" and thus Environmental Clearance is not required.
Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments	Control of water pollution is achieved through administering conditions imposed in consent issued under provision of the Water (Prevention and Control of Pollution) Act of 1974. These conditions regulate the quality and quantity of effluent, the location of discharge and the frequency of monitoring of effluents. Any component of the Project having the potential to generate sewage or trade effluent will come under the purview of this Act, its rules and amendments. Such projects have to obtain Consent to Establish (CTE) under Section 25 of the Act from West Bengal Pollution Control Board (WBPCB) before starting implementation and Consent to Operate (CTO) before commissioning. The Water Act also requires the occupier of such subprojects to take measures	No work components of the water supply subproject under will require CTE and CTO from WBPCB. The construction of the water reservoir and pumping stations does not come under purview of Act

Law	Description	Requirement
	for abating the possible pollution of receiving water bodies.	
Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.	The subprojects having potential to emit air pollutants into the atmosphere have to obtain CTE under Section 21 of the Air (Prevention and Control of Pollution) Act of 1981 from WBPCB before starting implementation and CTO before commissioning the project. The occupier of the project/facility has the responsibility to adopt necessary air pollution control measures for abating air pollution.	For the subproject, the following will require CTE and CTO from WBPCB: (i) diesel generators; and (ii) hot mix plants, wet mix plants, stone crushers, etc. if installed for construction. All relevant forms, prescribed fees and procedures to obtain the CTE and CTO can be found in the WBPCB website (www.wbpcb.gov.in). CTE to be obtained by KMC prior to award of contract. CTO to be obtained prior to commissioning. CTO renewal to be undertaken by KMC during operations stage.
Environment (Protection) Act, 1986 and CPCB Environmental Standards.	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards notified.	Appendix 1 provides applicable standards for ambient air, air emission, effluents, receiving water bodies, and drinking water at the consumer end. Contractors are required to ensure all emissions and discharges during civil works conform to all applicable standards
Noise Pollution (Regulation and Control) Rules, 2002 amended up to 2010.	Rule 3 of the Act specifies ambient air quality standards in respect of noise for different areas/zones.	Appendix 2 provides applicable noise standards. Contractors are required to ensure all noise-producing activities during civil works conform to applicable standards
National Institute of Occupational Safety and Health (NIOSH) Publication No. 98-126	NIOSH has laid down criteria for a recommended standard: occupational noise exposure. The standard is a combination of noise exposure levels and duration that no worker exposure shall equal or exceed.	Appendix 3 provides applicable NIOSH occupational noise standards. Contractors are required to provide hearing-protection equipment and ensure exposures of workers to noise-generating activities are within allowed NIOSH standards.
Hazardous Wastes (Management, Handling and Trans-boundary Movement) Rules, 2008.	According to the Rules, hazardous wastes are wastes having constituents specified in Schedule II of the Rules if their concentration is equal to or more than the limit indicated in the said schedule (Appendix 4).	If during excavation works, the excavated material is analyzed to be hazardous, they are to be stored and disposed of only in such facilities as may be authorized by the WBPCB for the purpose
Forest (Conservation) Act, 1980 and Forest Conservation Rules, 2003 as amended	As per Rule 6, every user agency, who wants to use any forest land for non-forest purposes shall seek approval of the Central Government.	No notified forest land within the subproject area.

Law	Description	Requirement
Wetlands (Conservation and Management) Rules, 2010	The Rules specify activities which are harmful and prohibited in the wetlands such as industrialization, construction, dumping of untreated waste and effluents, and reclamation. The Central Government may permit any of the prohibited activities on the recommendation of Central Wetlands Regulatory Authority.	The subproject is not within the East Kolkata Wetlands thus no permission from the Central Government is required.
Ancient Monuments and Archaeological Sites and Remains Rules of 1959	The Rules designate areas within a radius of 100 meters (m) and 300 m from the "protected property" as "protected area" and "controlled area" respectively. No development activity (including mining operations and construction) is permitted in the "protected area" and all development activities likely to damage the protected property are not permitted in the "controlled area" without prior permission of the Archaeological Survey of India (ASI). Protected property includes the site, remains, and monuments protected by ASI or the State Department of Archaeology.	There are no protected properties in the subproject area. However, in case of chance finds, the contractors will be required to follow a protocol as defined in the Environmental Management Plan (EMP).
Land Acquisition, Rehabilitation and Resettlement Act, 2013 (The Act shall come into force once passed by the Parliament and notified by the Central Government. The Act will replace the Land Acquisition Act, 1894, a nearly 120-year-old law enacted during British rule and lays emphasis on Rehabilitation & Resettlement in cases of land acquisition)	Private land acquisition is guided by the provisions and procedures under this Act. Before the acquisition of any land, the Government is required to consult the concerned Panchayat or Municipal Corporation and carry out a Social Impact Assessment in consultation with them. The Act provides a transparent process for land acquisition for industrialization, development of essential infrastructural facilities and urbanization by giving adequate financial compensation to the affected people.	All project locations are within the Govt. land, no acquisition of land is required. Resettlement Plan has been prepared in accordance with the ADB SPS, 2009.
West Bengal Trees (Protection and Conservation in Non-Forest Areas) Act, 2006	The Act states that those who want to fell trees will have to obtain permission from the Forest Directorate, Government of West Bengal. Violators (means whoever fells or causes to be felled any tree or cuts, uproots or otherwise disposes of any fallen tree or contravenes the permission granted) shall be punished with imprisonment up to one year or with fine of Rs.5000/- or both. Also, until plantation of requisite number of trees is undertaken, the violators will be fined for each day of default of Rs.50/-. In case the development agency or entrepreneur fails to implement the plantation plan, the defaulter might have to face an	Permission from the Divisional Forest Officer (Utilization Division), Forest Directorate, Government of West Bengal will be required if trees, particularly those looked upon as sacred groves, identifies as belonging to an endangered species, or given the status of heritage, will be cut/felled. Promoters/developers will have to submit a 'Tree Plantation Plan' while they seek approval for a residential/ commercial/ industrial project.

Law	Description	Requirement
	imprisonment up to two years or fine that may extend to Rs.10,000/- or with both.	
East Kolkata Wetlands (Conservation and Management) Act, 2006	In August 2002, 12,500 hectares (ha) of the East Kolkata Wetland area was included in the 'Ramsar List' making it a 'wetland of International Importance'. The Ramsar convention is playing a vital role by providing certain basic guidelines to draw up suitable plans for the maintenance and sustenance of the wetlands. Among these, the three most important guiding principles are: (i) maintenance of the special characteristics of the ecosystem; (ii) wise use of its resources with an eye towards sustainability; and (iii) economic development for the wetland community. The East Kolkata Wetlands Management Authority (EKWMA) has the power to enforce land use control in the substantially water body-oriented areas and other areas in the East Kolkata wetlands.	The subproject is not within the East Kolkata Wetlands thus no permission from the Central Government is required.
The Child Labour (Prohibition and Regulation) Act, 1986	No child below 14 years of age will be employed or permitted to work in any of the occupations set forth in the Act's Part A of the Schedule or in any workshop wherein any of the processes set forth in Part B of the Schedule.	No children between the age of 14 to 18 years will be engaged in hazardous working conditions.

III. DESCRIPTION OF THE SUBPROJECT

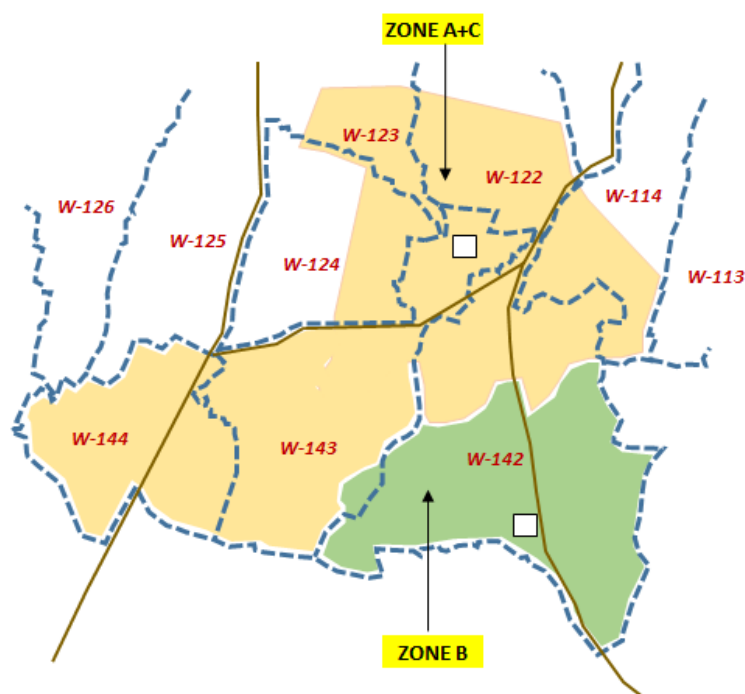
A. Existing Situation

20. The specific objective of the subproject under Tranche 2 is to develop water supply facilities on priority basis which in turn helps to improve social, environmental and economic condition of the population.

21. This is an IEE Report on Water Supply for Joka and adjoining areas.. The proposed work addresses the need and rationale of the requirement for the proposed infrastructure in the target area. The proposals considered in this report have been framed for the work of Underground Reservoirs, Overhead Reservoirs, Pumping Stations, Transmission Mains and water Distribution Network in Joka & adjoining areas.

22. KMC area has recently (2015) been enlarged by addition of Joka area in its southern part with the creation of 3 new Wards (nos. 142, 143 and 144). A new Borough XVI has also created within KMC with the new Wards (142 to 144).

23. The Project area includes Wards 142, 143, 144 and adjoining areas of Wards 122, 123, 124 and 114 (Refer Figure below and **Figure 3** - Project location map). Total project area is about 1685 Ha.

Figure 3: Project Location Map

24. The area is relatively less populated. There are some primary roads extending in north south direction. In general, width of many of these roads are narrow.

B. Water Source

25. Potable water in this area is now supplied by PHED supply system. River Hooghly is the source for surface water. Treated water comes from Raipur WTP, situated in South 24 Parganas district, about 25 km from the project area. Total supply to the project area is 1.36 MGD (6.2 mld).

26. There are some private and public shallow tube wells. 124 nos. hand tube wells were existing before handover from Gram panchyat to KMC. Most of them (about 50% average) are non-functional at present. KMC sank 116 tube wells 700 ft depth, each discharging 20KL per day. Total discharge from shallow tube well comes to 3.56 mld.⁴

27. In addition, KMC is operating 4 nos. small dia. deep tube well, each having discharging capacity of 8000 Gallon/hr operating 4 hours per day⁵. Total discharge from these deep tube wells comes to 0.58 mld. The supply is intermittent. As per local inquiry the ground water quality is not good.

⁴ $\{124 \times 50 / 100 + 116\} \times 20 / 1000 = 3.56$

⁵ Source of information for the relevant paragraphs under the sub-chapter – KMC official.

Surface Water	6.18 mld
Shallow tubewell	3.56 mld
Deep tubewell	0.58 mld
Total	10.32 mld

C. Reservoir

28. There are three overhead reservoirs (or Elevated Service Reservoirs) from where water is being supplied. In the study area, two reservoirs are located within the municipal boundary, one at Diamond park having a capacity of 1500 cum and the other at Prantik with 900 cum capacity. The third one is 700 cum, located near Pailan which is outside the municipal boundary and serving outside study area.

D. Existing Network

29. In Joka area, the existing distribution system is from two ESRs. Pipe are predominantly of DI and uPVC, supplemented by CI in few stretches. Total length of existing pipe network is about 30 km for Ward 142 to 144, diameter ranging from 350mm to 90mm.

30. Number of existing connection for surface water source supply is 3490. But in most parts of the area public stand post are the main point of water supply. There is no organized house connection system in the region. In few cases, one connection is being shared by multiple household. Water is being supplied intermittently, maximum supply of 3 hours in a day. Water supply is insufficient in quantity. Availability of water at consumers' end is grossly inadequate. There is no defined pressure zoning in the existing system. Pressure at the consumer end is low, being 2-3m of water head during supply hours.

31. **Figure 4** shows existing water supply system of Joka.

E. Need of the sub project

32. PHED supplies water to about 60% of the project area. The water supply system of Joka and adjoining area is not very old, but infrastructures are inadequate to meet up urban demand. The present average per capita supply is 49 lpcd⁶, which is far beyond the desired supply of 150 lpcd (for metropolitan cities). Unaccounted for water is not assessed. 30% system loss is assumed, same as for KMC⁷. The average supply period is 3-4 hours a day. Residual pressure is very low to about 2-3m. Even in some pocket pressure is less than 1m, where stand post supply point is kept at lower level than ground level by making stand post chambers below the ground. In rest 40% project area there is provision for ground water supply, maintained by KMC. But due to poor quality it is not widely used. From quality and public health point of view groundwater needs to be replaced.

33. The water supply service level in Joka and adjoining area of KMC is far from adequate service level. So there is a need for the project on water supply in this area.

34. From the above assessment it is clear that investment is needed to improve the water supply system in Joka and adjoining area under Kolkata Municipal Corporation. The objective of

⁶ $10.32\text{mld} * (100\% - 30\% \text{ water loss}) / 146357 \text{ pop. as on 2015} * 10^6 = 49 \text{ lpcd}$

⁷ Source : SAR WS KEIP, June 2012

the subproject, within the overall objectives of KEIP, is to enhance the service levels in a phased approach to arrive at the target service levels.

35. The water supply service level in Joka and adjoining area of KMC is far from adequate service level. At present WTP of Public Health Engineering Department (PHED) contributes 6.2 MLD of water in the subproject area. So there is a need for the project on water supply in this area. Based on the service level in the current situation for the year 2015, a summary of the demand-supply gap is given below. 'Demand' figures are based on the theoretical demand target as per service level indicator of the national standard and CPHEEO. Services to other municipalities are not considered in this analysis.

Sl. No.	Parameter	Demand	Supply	Gap (as on 2015)	Remarks/ Target
1	Surface water source quality after treatment	As per CPHEEO permissible limits	As per CPHEEO permissible limits	-	From treated water quality point of view there is no gap
2	Groundwater source quality	As per CPHEEO permissible limits	Poor quality (as per local complain).	Replace groundwater by surface water	Replace groundwater by surface water
3	Surface water source quantity (river flow)	With 15 % System loss + 5% treatment loss = 40mld ⁸	98000 mld ⁹	-	There is no shortage of surface water.
4	Groundwater source quantity	-	-	-	Groundwater source is to be discarded.
5	UFW	15%	-	-	Data not available
7	Water production	With 15 % System loss = 38 mld ¹⁰	10.3mld	27.7mld	There is shortage of production.
9	Per capita demand	150 lpcd	49lpcd	101lpcd	Water production and transmission system to be increased and augmented
10	Supply hours	24 hours	3.5 hours (average)	21.5 hours	Increase in supply hours
11	Coverage of area (by surface water)	100%	60%	40%	Extent of surface water supply to be increased.
12	Distribution lines	300 km	30 km	270 km	Increase of piped water supply coverage.
13	Reservoir capacity	21.2 ML	2.4 ML	18.8 ML	Additional reservoirs required
14	Residual Pressure	12 m minimum. Cause for	2-3 m water head (In some area it is	9.5 m water head	Rezoning of system network is

⁸ $\{146357 \times 150 \times (1 + 0.15 + 0.3 + 0.01)\} / 0.2$

⁹ Rough assessment of lean flow in surface water source, i.e. River Hooghly

¹⁰ $\{146357 \times 150 \times (1 + 0.15 + 0.3 + 0.01)\} / 0.15$

Sl. No.	Parameter	Demand	Supply	Gap (as on 2015)	Remarks/ Target
		rejection below 7m	1.0m)		required with proper districting.
15	Extent of metering	90%	0.0%	90.0%	
16	Efficiency of redressal of complaints	80%	-	-	
17	Efficiency of collection of user charges	90%	-	-	

F. Components of the Subproject

36. Water demand for subproject in design horizon 2050 is 84.5 MLD. The proposed system has been conceptualized to be divided in 3 service zones A, B & C. Zones A & C will be served from one PS and Zone B from other. Total 11 ESRs have been proposed, including 2 existing.

37. The proposed project work includes (i) Demarcation DMAs and allied works including hydraulic modeling, (ii) Construction of 2 Under Ground Reservoir (UGR) cum Pumping Station (PS) at Prantik Phase III and KMC land on Julpia Road, Construction of 6 Elevated Service Reservoirs (ESRs) at Prantik Ph III, N-E of SSE STP, N-W of SSE STP, KMC land on Julpia Road, WBSETCL (West Bengal State Electricity Transmission Company Limited) and 22 Bigha, (iii) Laying of Transmission Main from existing Daspara PS to UGRs at Pratik Phase III and KMC land on Julpia Road; and transmission main from UGRs to 8 ESRs (6 proposed + 2 existing), (iv) Laying of distribution system and house connection within the command area of 8 ESRs (6 proposed + 2 existing), (v) Construction of Elevated Service Reservoir (ESR) at Ramkantapur, Malpara, Charaktala; Laying of Transmission main from UGR at KMC land on Julpia Road from to 3 ESRs; Laying of Distribution system and house connection within command area of 3 ESRs, and (vi) Dedicated Water Supply Transmission Main from Junction of James Long Sarani to Daspara near existing Pumping Station along James Long Sarani and (vii) Water Loss Management under Jay Hind WTP Area (Eastern Kolkata) including rehabilitation, expansion of 100 km Distribution network and connection to around 20000 Households.

38. **Table 2** shows the work components under the project.

Table 2: Sub project components- Joka water supply

Sub project	Package	S. No.	Components	Nos.	Details area covered by project components	Capacity (ML /cum/hr)
1		1	Demarcation DMAs and allied works including hydraulic modeling of KMC water supply area			
2	Tr 2/WS 15	1	Under Ground Reservoir at Prantik Ph III	1	70 m x 50 m x 5 m WD	17500 cum
			PS & E&M works at Prantik Ph III	1	PS - 30 m x 10 m Pumps for Zone A – 600 cum/hr & 37 m head (3 W + 2 S) & Pumps for Zone C– 476.11 cum/hr & 42 m head (3 W + 2 S)	
		2	Under Ground Reservoir at KMC land on Julpia Road	1	45 m x 20 m x 5 m WD	4500 cum
			PS & E&M works at KMC land on Julpia Road	1	PS - 15 m x 10 m Pumps for Zone B– 297.41 cum/hr & 40 m head (3 W + 2 S)	
		3	ESR at Prantik Ph III	1	32 m x 20 m x 5 m WD	3100 cum
		4	ESR at KMC land on Julpia Road	1	26 m x 16 m x 5 m WD	2000 cum
		5	ESR at N-E SSESTP	1	19 x 19 m x 5 m WD	2000 cum
		6	ESR at N-W SSESTP	1	21 m x 21 m x 5 m WD	1750 cum
		7	ESR at 22 Bigha	1	26 m x 16 m x 5 m WD	3400 cum

Sub project	Package	S. No.	Components	Nos.	Details area covered by project components	Capacity (ML /cum/hr)
		8	ESR at WBSETCL near Joka Tram Depot.	1	35 x 20 m x 5 m WD	2050 cum
	Tr 2/WS 16	1	Laying of Transmission Main from existing Daspara PS to UGRs at Prantik Phase III and KMC land on Julpia Road		Length= approx 6.5 km	
		2	Transmission main from UGRs to 8 ESRs (6 proposed + 2 existing).		Length= approx 11.9 km	
	Tr 2/WS 17	1	Laying of distribution system and house connection within the command area of 8 ESRs (6 proposed + 2 existing).		Length=approx. 245 km	
	Tr 2/WS 18	1 to 3	Construction of Elevated Service Reservoir (ESR): <ul style="list-style-type: none"> Ramkantapur, Malpara, Charaktala 	3 nos.	Ramkantapur -27M dia, 3.5 M SWD Malpara - 22M dia, 3.5 M SWD Charaktala- 22M dia, 3.5 M SWD	Ramkantapur,- 2000 cum Malpara,- 1250 cum Charaktala- 1250 cum

Sub project	Package	S. No.	Components	Nos.	Details area covered by project components	Capacity (ML /cum/hr)
		4	Laying of Transmission main from UGR at KMC land on Julpia Road from to 3 ESRs		Length= approx. 4.050 km	
		5	Laying of Distribution system and house connection within command area of 3 ESRs.		Length= approx. 55 km	
	Tr-2/WS 24	1	Dedicated Water Supply Transmission Main from Junction of James Long Sarani to Daspara near existing Pumping Station along James Long Sarani		Approx. length 6.0 km, 1200 mm dia by micro-tunneling	
3	TR-2 / WS 25	1	Water Loss Management under Jay Hind WTP Area (Eastern Kolkata) including rehabilitation, expansion of 100 km Distribution network and connection to around 20000		Length of distribution pipeline= 100 km 20000 household connection	

Sub project	Package	S. No.	Components	Nos.	Details area covered by project components	Capacity (ML /cum/hr)
			House holds			

ESR: Elevated storage reservoir, E & M: Electrical & Mechanical, PS: Pumping station, SSE STP: South Suburban East sewage treatment plant, WD: water depth,

Note: All length and capacity are tentative, will be finalized after designing of the sub project

39. Details of Land area available for combined UGR, ESR and pumping house at the identified locations are as :

Table 3: Details of Land Area

Land	Area available ¹¹	Owner	Present Status
Prantik Ph III	8 bigha (10600 sqm approx.)	Land belongs to Govt. department.	<ul style="list-style-type: none"> • Land within prantik ph II housing • Unfenced. • Covered with small trees and shrubs.
KMC land on Julpia Road	8 bigha (10600 sqm approx.) [4 bigha will be available for water supply purpose]	Land belongs to Govt. department.	<ul style="list-style-type: none"> • Fenced by masonry boundary wall. • Presently under the possession of KMC. • Deep tubewell with pump house (for local supply) at north east corner of the plot. • Part will be available for water supply purpose. • Pond located nearby

40. Pumping system has been designed for year 2035. For Zone A+C (i.e. Prantik PS), 2 sets of pumping system has been proposed – one for ESRs of zone A and the other for zone C.

41. All ESRs under Water supply package WS-15 will be constructed in the government land. Land for construction of ESRs (package WS-18) at Ramakantapur, Malpara and Charaktala are private land. Investigation of land ownership and direct purchase of land is under process.

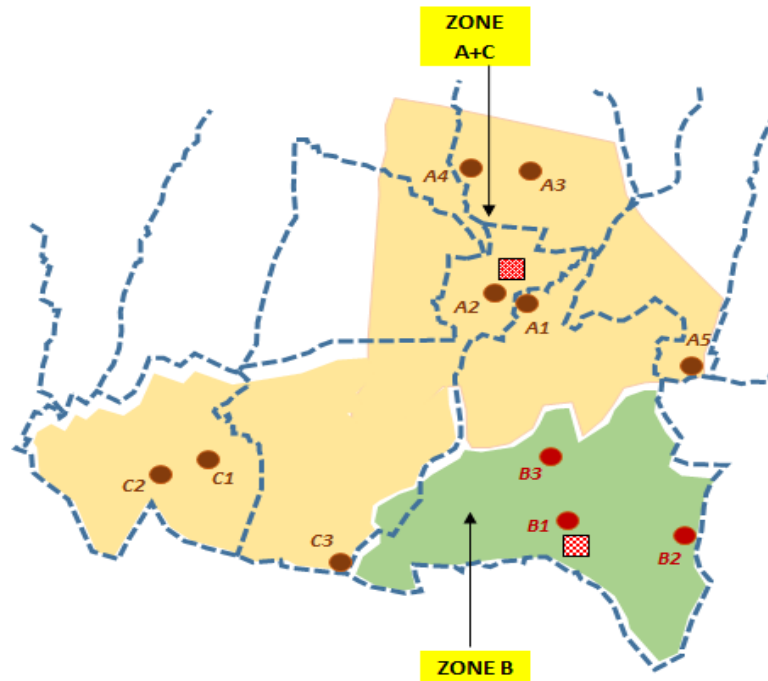
42. **Command area zoning.** Land of UGR cum PS has been identified at Prantik Phase III, KMC land at Julpia Road and near Joka Tram depot respectively for Zone A, Zone B and Zone C. Site visits and meetings were done with KMC officials. As an outcome of the meeting, availability of Joka Tram depot land, i.e. UGR for Zone C is doubtful. No other alternative land is available for the desired purpose. Accordingly, near Joka Tram deport land is presumed to be unavailable for construction of UGR cum PS, but land for ESR will be available.

43. The concept has been reframed as per the availability of land. Finally zoning has been adopted. The proposal has been developed with 2 zones –

- (i) Zone B, and
- (ii) Zone A+C (Zone C being integrated with Zone A).

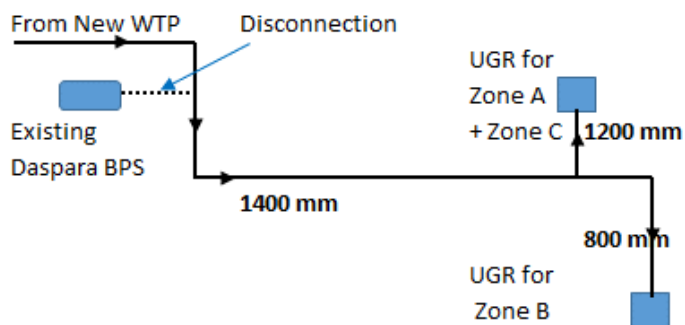
¹¹ Source of information – KMC official

Figure 4: Command Area Zoning



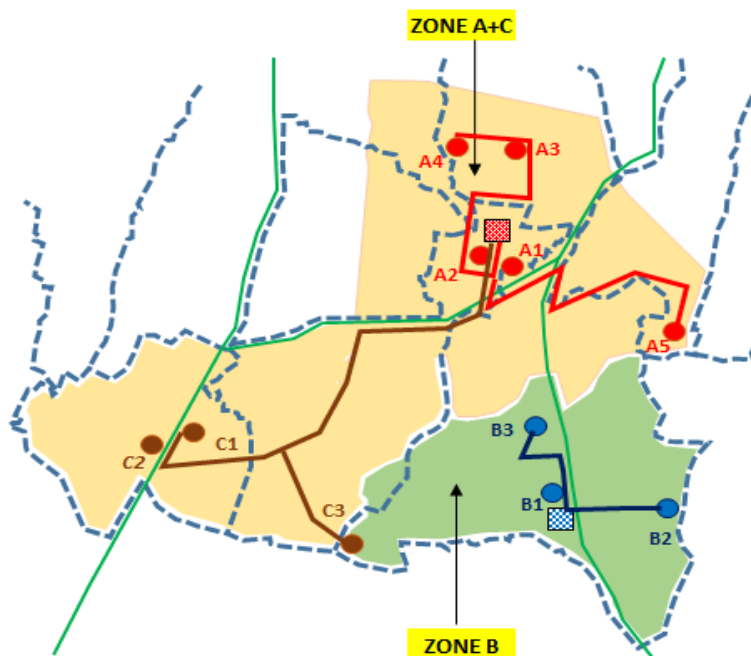
44. **Transmission System to UGR.** For immediate Demand - From existing Daspara PS water will be pumped to propose UGR at Prantik Ph-III and KMC land in Julpia Road in 8 hours. Available water of 0.75 MG/hr will be distributed to these 2 UGRs. This will continue till 2025, till New WTP come under commissioning. It has been assumed that the distribution of water to proposed UGRs will be in proportion to zonal demand

Figure 5: Transmission System to UGR



45. **Transmission Main.** Transmission main has been designed for the year 2050. Transmission system has been considered to be operative for 18 hrs a day. In Zone A+C, 2 dedicated transmission main has been proposed from Prantik PS: one for near ESRs within 3km under zone 'A' and the other for ESRs above 3km under zone 'C'. For Zone B, separate transmission main has been proposed from KMC land at Julpia Road. Pipe sizes has been suitably selected to keep velocity at maximum flow at around 1.0 m.sec.

Figure 6: Zones (Command area) with UGR, ESR and transmission main (to ESR)



46. **Elevated Service Reservoirs.** ESRs will be fed from PS. 8 ESRs in Zone (A+C) and 3 ESRs in Zone B have been proposed. Location of ESRs are selected as per the availability of land. Two existing reservoirs of capacity 900 cum and 1500 cum (marked as A1 and C1 in the figure) would be utilized to integrate in the proposed system. Capacity of each ESR has been adopted as 0.25 times daily demand, i.e. 6 hours storage capacity. Salient details of the ESRs are given below.

I. No.	ESR Designation	Location Name	Remarks
1	A1	Prantik	Existing
2	A2	Prantik phase III	
3	A3	N-E of SSE STP	
4	A4	N-W of SSE STP	
5	A5	Ramkantapur	
6	B1	KMC land at Julpia Road	
7	B2	Malpara	
8	B3	Charaktala	
9	C1	Diamond Park	Existing
10	C2	WBSETCL	
11	C3	22 igha	

47. **Distribution Pipes.** Maximum diameter in distribution system has been recommended as 600mm. In case, the starting distribution pipe, i.e. outlet from ESR, requires bigger pipe size, multi-outlet piping system would be provided to accommodate design requirement. Minimum diameter has been kept as 100mm.

Sl. No.	Distribution Pipe diameter (mm)	Proportion of distribution	Length (km)
1	600	0.2	0.6
2	500	0.5	1.5
3	400	0.8	2.4
4	350	1.5	4.5
5	300	2.0	6
6	250	5.0	15
7	200	10.0	30
8	150	20.0	60
9	100	60.0	180
	Total	100	300

48. ESR location wise distribution pipelines as follows,

Under command of ESR A-1 (Existing) – 21km
 Under command of ESR A2 – 48km
 Under command of ESR A3 – 38km
 Under command of ESR A4 – 27km
 Under command of ESR A5 – 25 km
 Under command of ESR B1 – 24km
 Under command of ESR B2 – 14 km
 Under command of ESR B3 – 16km
 Under command of ESR C1(Existing) – 30km
 Under command of ESR C2 – 28km
 Under command of ESR C3 – 29km

49. **House Connection.** It is assumed that after completion of project in 2020, house connection will be provided by KMC.

Population as on 2020	191385
Assume, household size	4.8 (Source : Source – SAR for Water Supply KEIP)
Household Premises	39872

G. Phasing of Water Supply

50. It has been conceptualized that dedicated water supply system would be required for Joka and adjoining area. KMC has undertaken construction of a New WTP at Garden Reach of capacity 50MGD (227 mld), i.e. 2.1 MG/hr considering 24 hrs supply. As per KMC Water Supply Department, the proposed transmission main from the New WTP would fill up different PS under KMC area. So for immediate phase this WTP would deliver water to different PS before entering to Joka area, for the immediate phase upto year 2025.

51. Daspara PS is an existing pumping station and falls en route to the proposed transmission main alignment. Its command area is adjacent to project area, but feeding to the localities outside of the project area. In the discussion with KMC officials it was known that this proposed transmission main will also feed Daspara PS in the immediate phase. To meet up the demand of Joka and adjoining area for immediate phase, water can be pumped from existing Daspara Pumping Station.

H. Under Ground Reservoir

52. From existing Daspara Pumping station, water will be pumped to the proposed UGRs at PrantikPh-III and KMC land on Julpia Road for 8 hours. Available water of 0.75 MG/hr will be distributed to these 2 UGRs. This will continue up to 2025, i.e., till the new WTP at Garden Reach is commissioned. After the commissioning of the new WTP, water will be pumped to supply the proposed UGRs from the WTP. From UGRs, water will be separately distributed to the ESRs by pumping for 18 hrs a day.

53. Thus, adequate water supply system including treated water production and dedicated transmission, for Joka and adjoining area, is expected to be in operation from the year 2025.

54. It is to be noted that right now, Daspara PS is supplying water to the adjacent region (other than project area) on the northern part of the project boundary. Water is being fed to consumer for 4-5 hrs a day. In the remaining hours it has the pumping capacity to supply to proposed UGRs for 8 hours. Thus, existing Daspara PS could be utilised as the water source for immediate phase, i.e. up to year 2025.

55. Daspara pumping station has 2 nos. 2273 m³/hr pumps of 42m head and 4 nos. 1136 m³/hr pumps of 42m head each. During the non-supply hours (i.e. the period when direct pumping to distribution system of Daspara's own command area is off) water can be pumped to the proposed UGRs for 8 hours a day. After feeding to Daspara from New WTP in future, the maximum rate at which Daspara pumping station can feed is 0.75 MG/hr¹² for 8 hours, i.e. at a rate of 27.24 mld with 8 hours pumping.

56. After 2025, water will be transmitted directly to proposed PS at Prantik PH-III and KMC land on Julpai Road, avoiding Daspara PS. ESRs will be fed from these 2 proposed PS.

57. Figures below show proposed water supply zone, transmission line and water reservoir service zone.

58. During construction phase, excess earth will be generated that will be utilized for filling up of low lying area of different sites of the Subproject. Estimation of volume of excess earth will be done at detail design stage and site specific disposal will be drawn up. Any earth remaining after such disposal will be carried away by the contractors for disposal in pre-approved sites.

I. Salient features of the Subproject

59. The design norms adopted for preparation of various components of project are generally in line with CPHEEO Manual (2013), KMC practices, KEIP practices & standard practices. Whenever felt necessary guide lines laid down in other internationally accepted manuals are followed.

Components	Design Period (Years)	Remarks
Underground Reservoir	30	
Pumping Station - Civil	30	
Pumping Station –	15	

¹² Source – KMC Officials

Components	Design Period (Years)	Remarks
Mechanical and Electrical		
Elevated Service Reservoir	15	In KMC area it is very difficult to get required land area that would be required as additional for future demand, which is for next 15 years. So, ESR has been considered for 30 years design period.
Transmission main from PS to ESR	30	
Distribution System	30	

60. **Figure 8** shows layout map for UGRs cum PS and ESRs. Google map for project components are shown in **Figure 9**.

J. Implementation Schedule

61. Construction work is likely to commence in 2016 and will be completed in 27 months.

62. This is Sub project appraisal report stage. Implementation schedule will be finalized after finalization of DPR. Tentative schedule is given below.

Table 4: Package Implementation Schedule

Activity	Project – Joka Water supply
Submission by contractor of Site Environmental Plan (SEP) by Contractor	Within 28 days after receiving notice under commencement of work
Review and approval by KMC of contractor's SEP, proposed locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes if any.	Within 21 days
Construction period	27 months (Sept 2016 to Nov 2018)
Commissioning period	

Figure 7: Project Location map

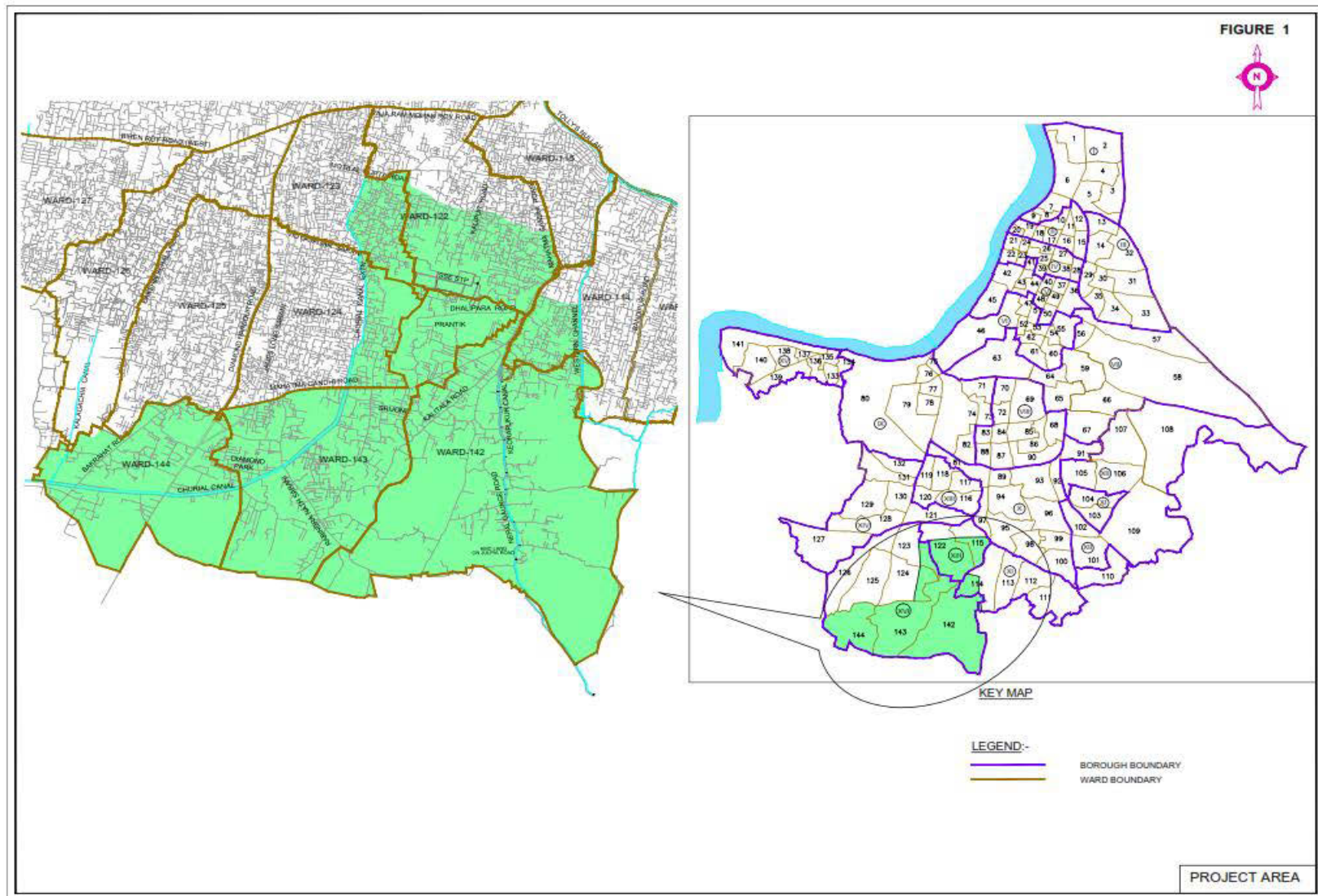


Figure 8: Existing water supply distribution system at Joka area

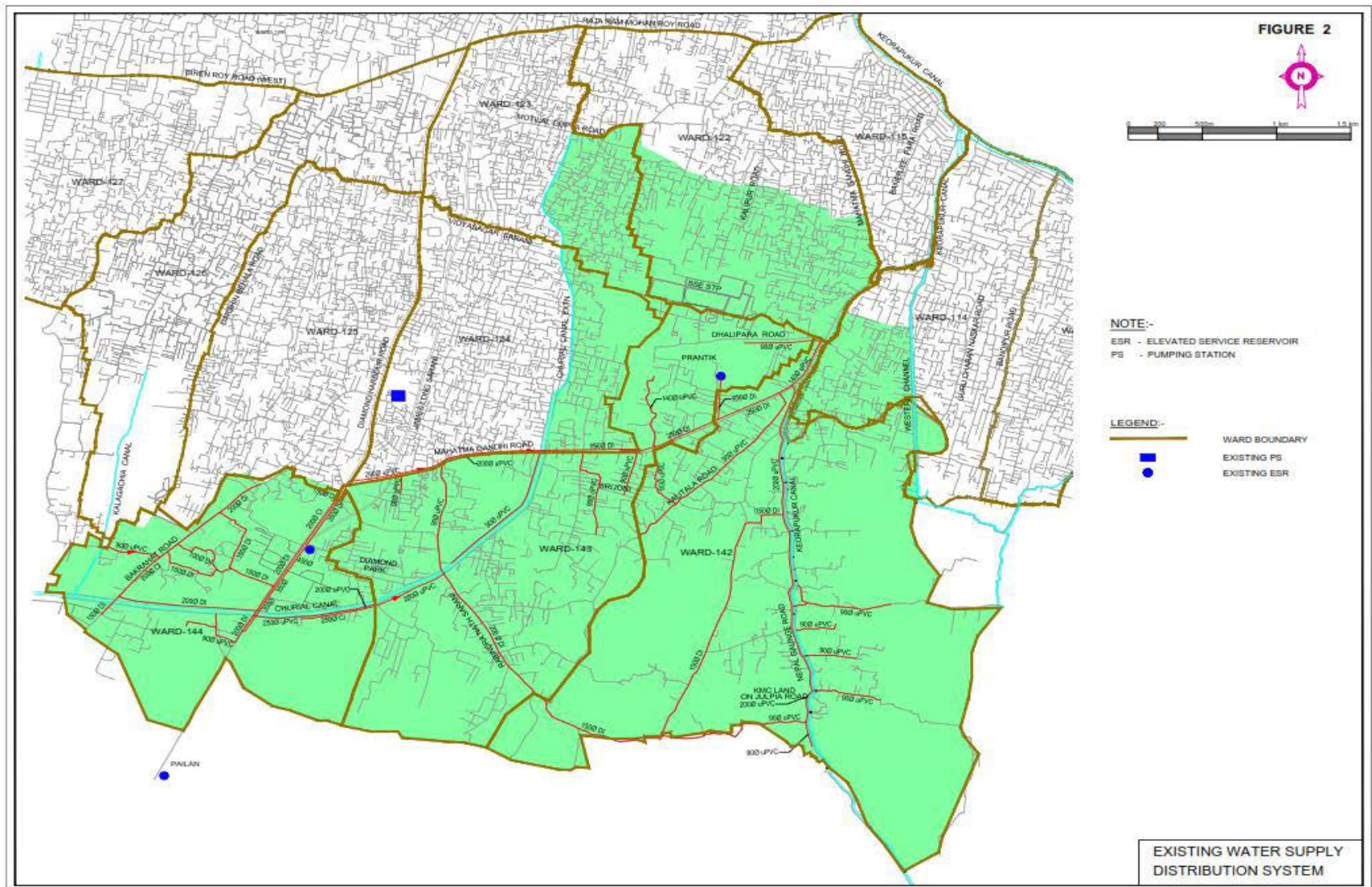


Figure 9: Proposed Preliminary Zoning

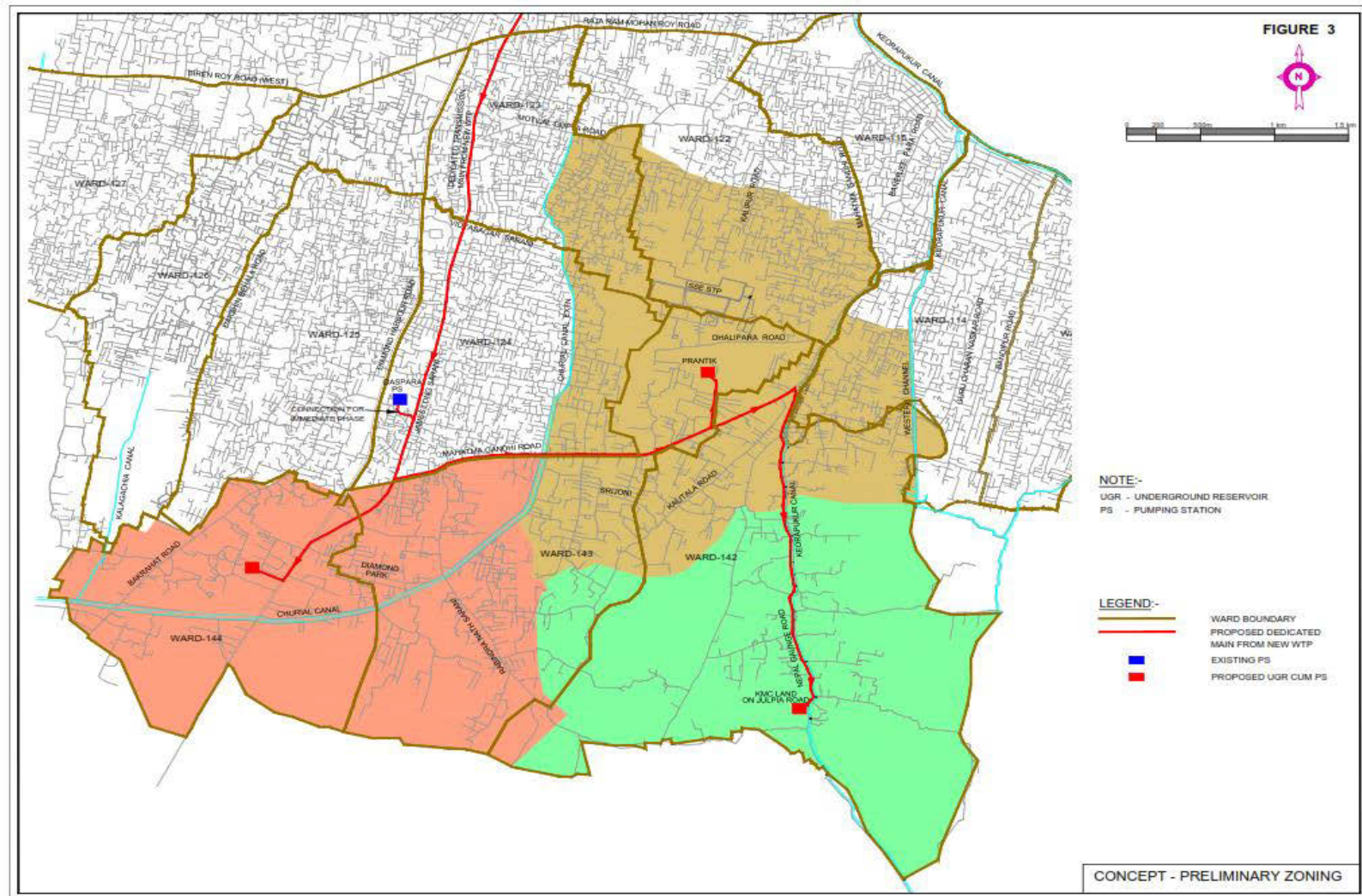


Figure 10: Proposed Transmission system

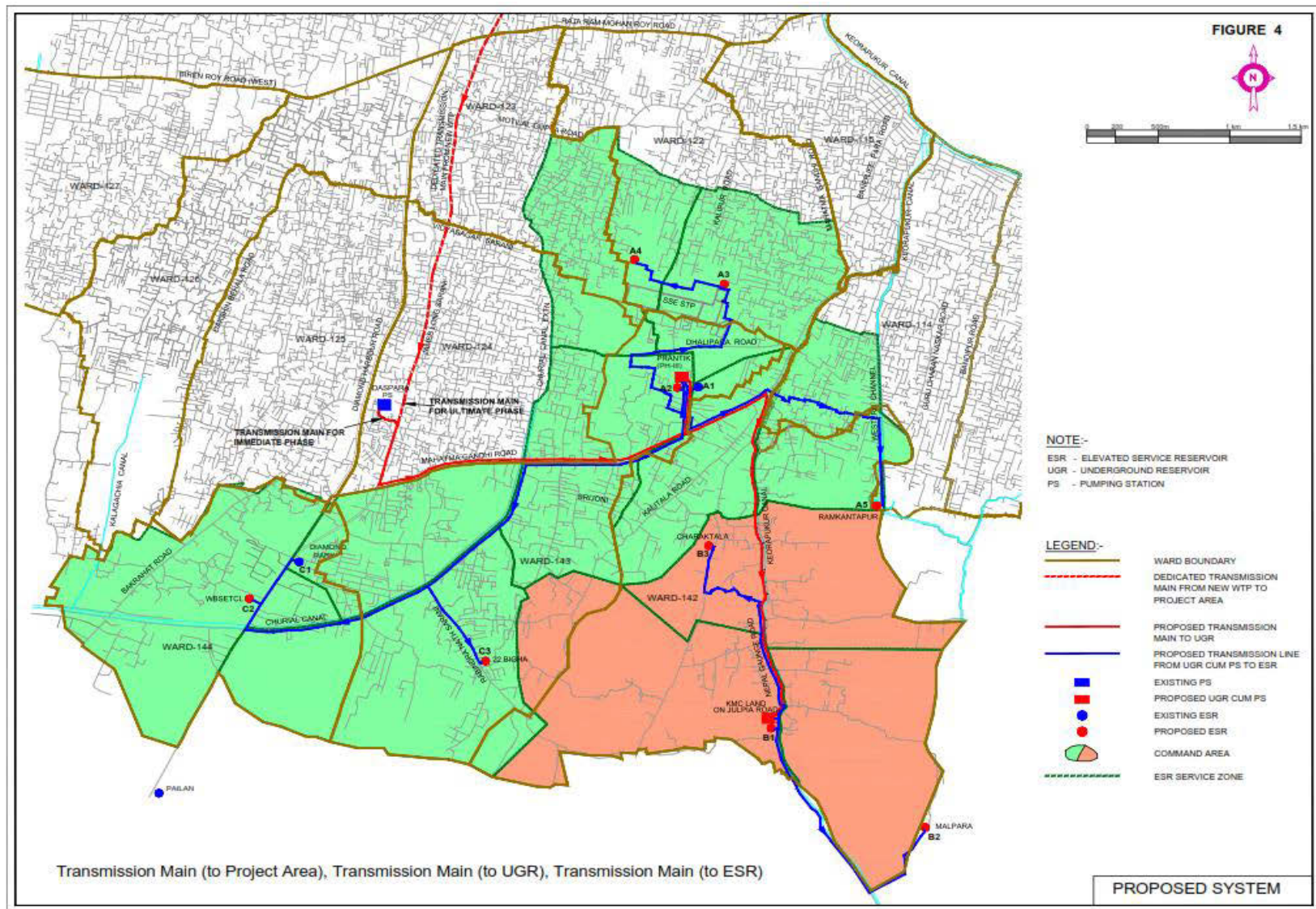


Figure 11: Proposed ESR service zone

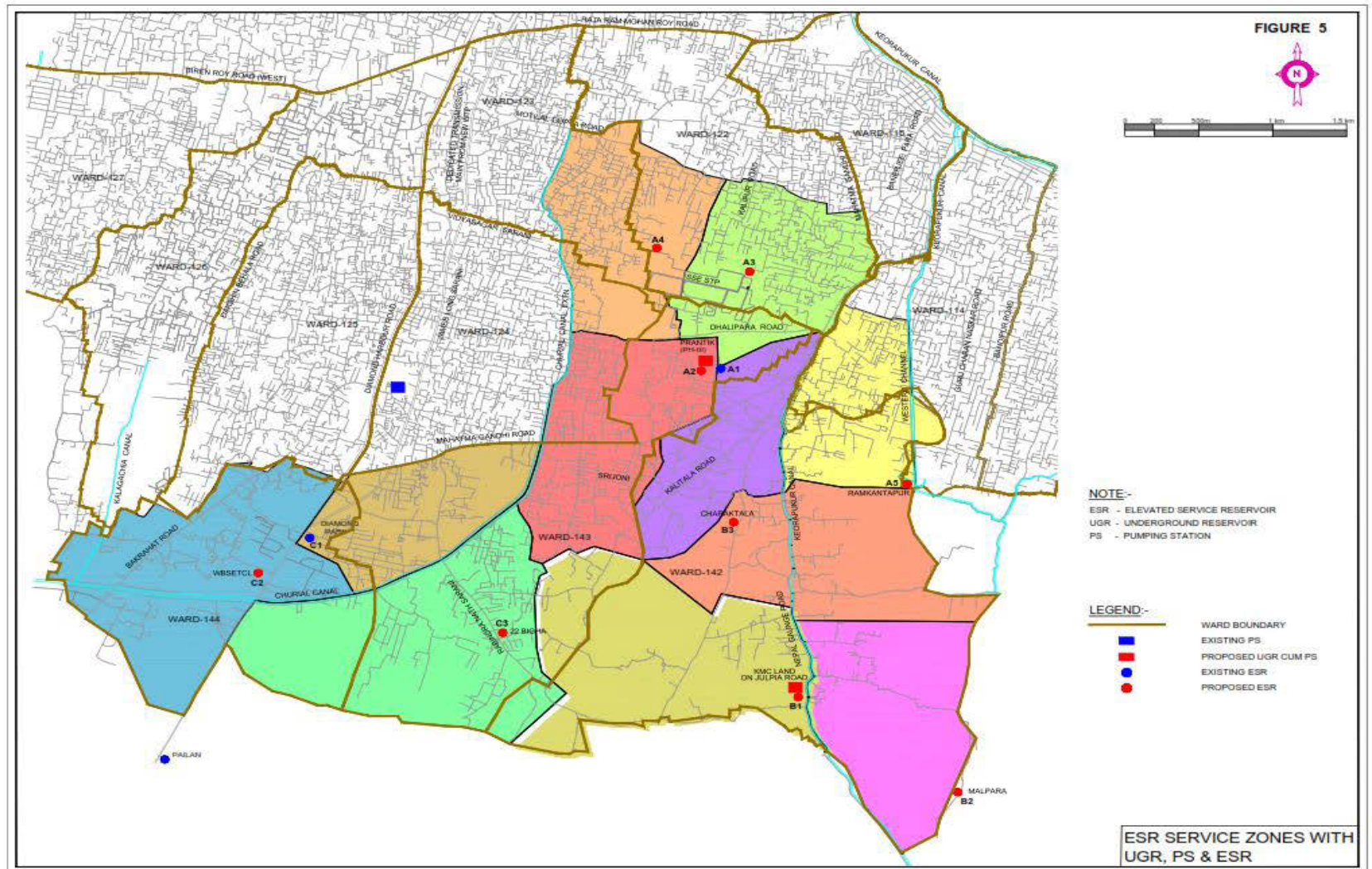
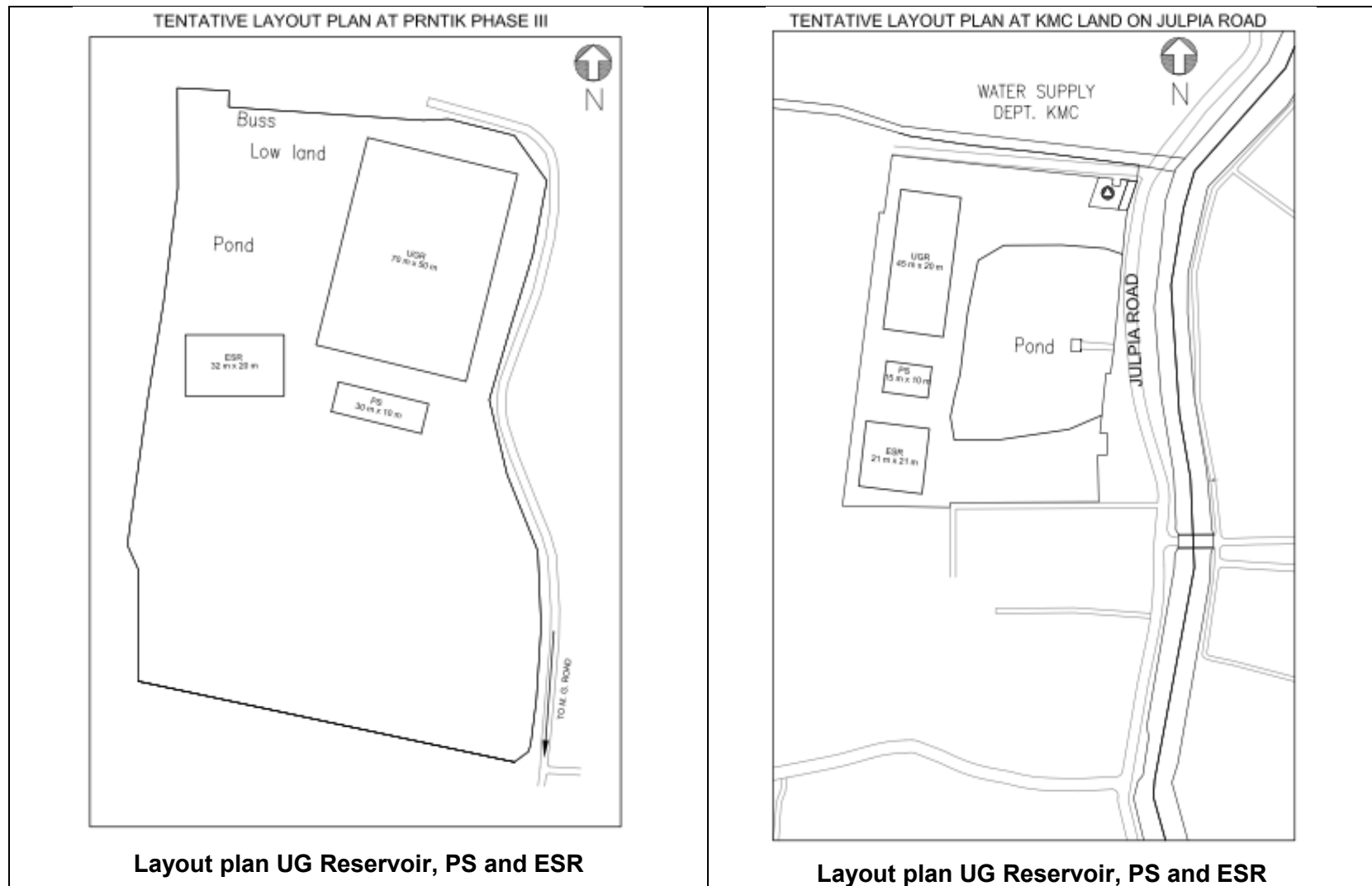
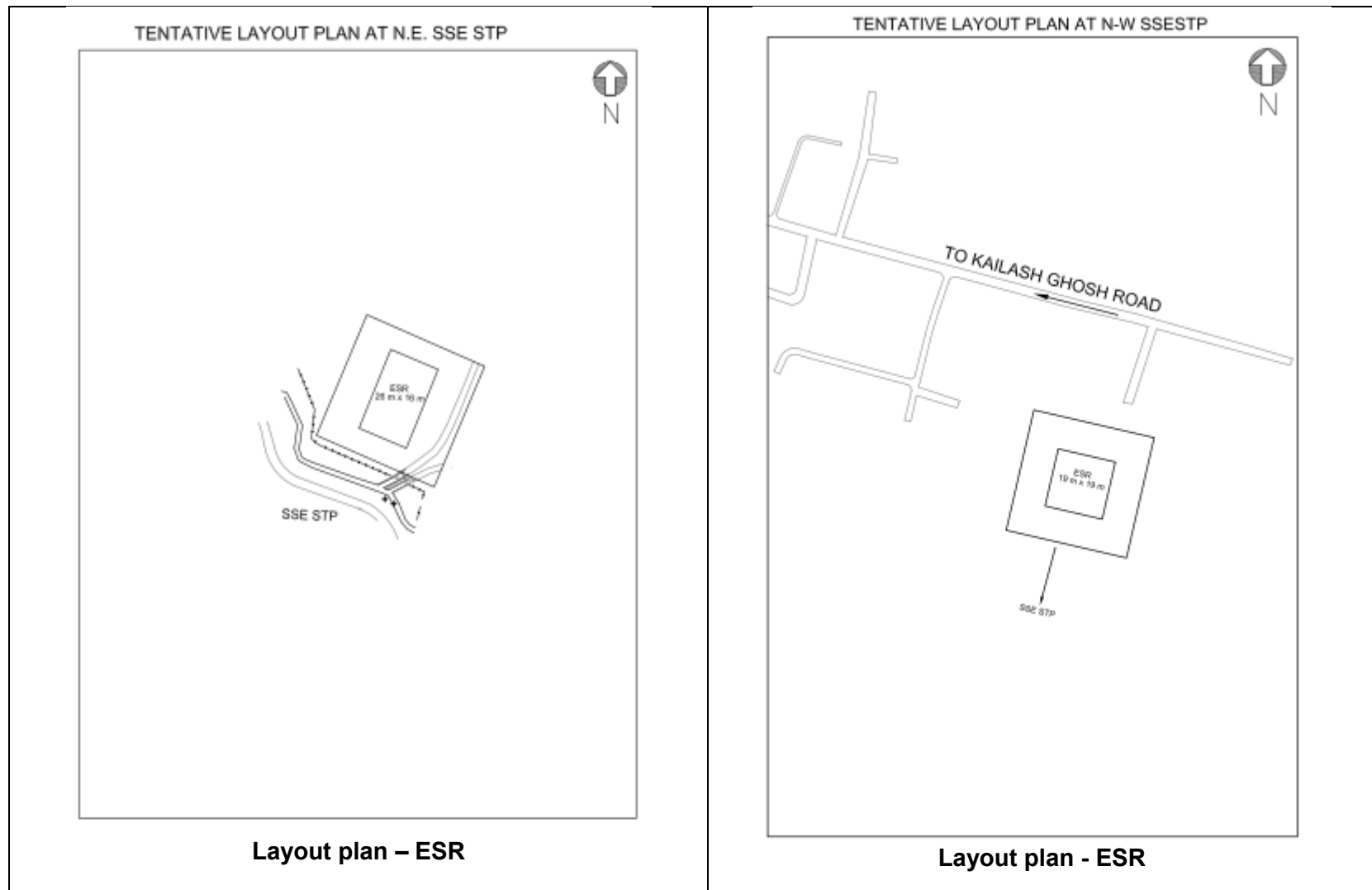


Figure 12: Layout plan of project components at different locations





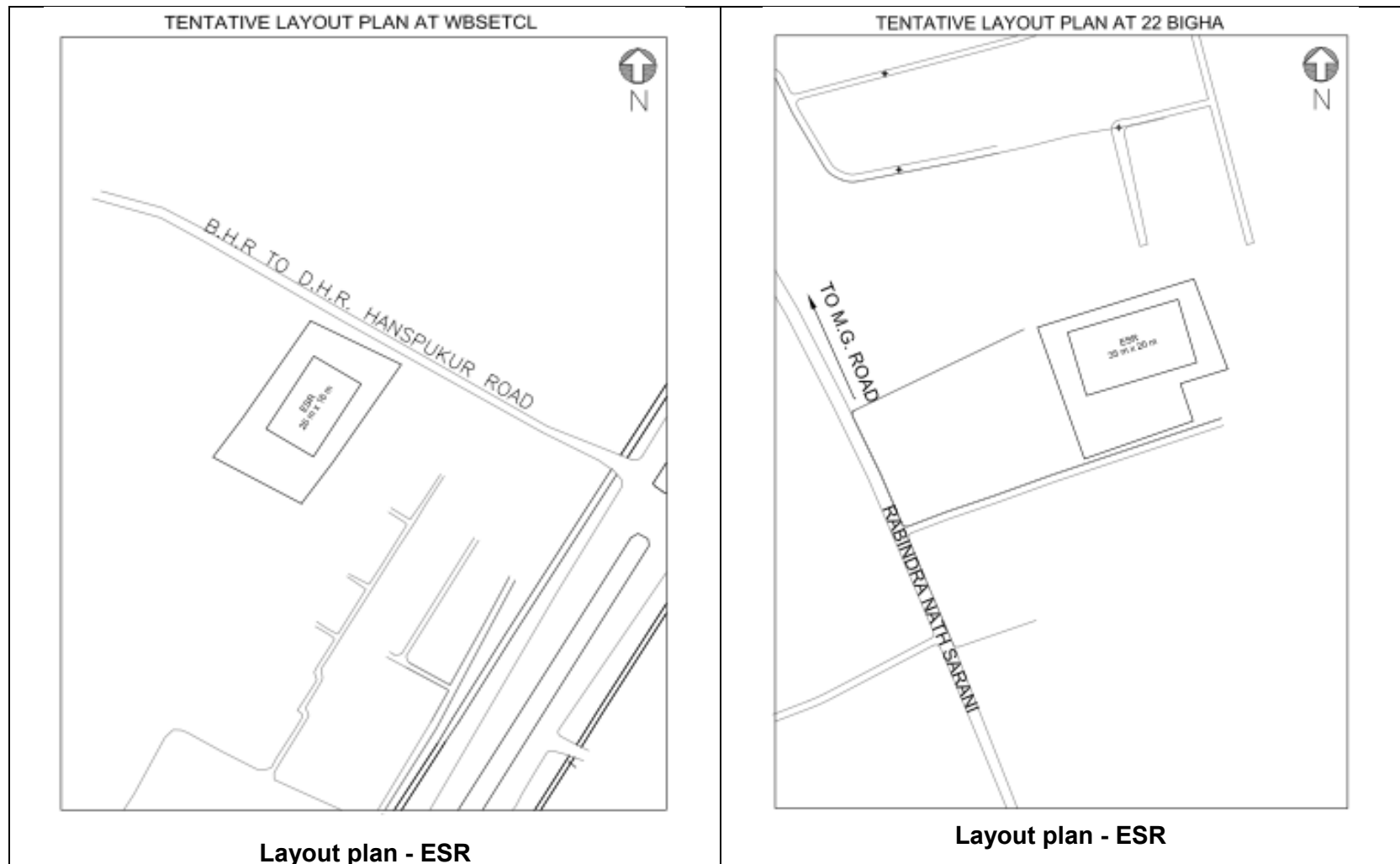


Figure 13: Google map of project locations



IV. DESCRIPTION OF THE ENVIRONMENT (BASELINE DATA)

A. Physical Resources

63. **Topography, drainage, and natural hazards.** Regionally KMC area is mostly flat and sloping in general from north to south and from west to east. The southern portion of the Boroughs XI, XIII, XIV and XVI are low lying and marshy. Similarly, the southwestern part of Borough XV and different parts of Borough XII are low lying. The broad topographical features of the subproject area are given in **Table 5**.

Table 5: Topographical information of Borough XVI in KMC

Basin	Ground level	General slope
XVI	Elevations range from 2.5 to 4.5 m. from MSL	General topography is flat and low laying

64. The primary surface water resource for Kolkata is the Hooghly River. Rough assessment of lean flow in Hooghly River is 90,000 MLD. In addition, the city has a large number of water bodies and canals that are heavily used for everything from water supply, bathing, washing, aquaculture, and recreation to waste disposal. Hooghly river forms the western boundary of the KMC area. Bidyadhari and Kulti rivers meander along the eastern boundaries of KMC and discharge directly in to the Bay of Bengal. These rivers, along with an elaborate network of canal systems connected to these rivers are the recipients of entire drainage from KMC and its adjacent areas. Drainage of KMC area is generally divided in to the following drainage basins according to the topography and land use: Kolkata Basin; Bagjola Basin; Tollys Nullah Basin; Manicktala Basin; Tollygunge – Panchanagram (T-P) Basin; Keorapukur Basin; Monikhali Basin; and Churial Basin.

65. The KMC area, with its generally flat terrain condition, receives more than 1,582 mm of rainfall yearly mainly spread over a 4 months period and comprised of mainly medium density – high frequency long duration storms. Due to the absence of an efficient drainage system to cater such an adverse condition, large areas of KMC suffer from prolonged inundation during monsoon causing severe health and economic hazards to the inhabitants.

66. The waste and storm water of the KMC area is carried by a system of natural and man-made canal system as follows:

- (i). Bagjola Canal system – flowing in easterly direction
- (ii). Kestopur Canal system – flowing in southerly direction
- (iii). Beliaghata (Circular) Canal system
- (iv). Storm Water Flow (SWF) – Dry Weather Flow (DWF) canal system flowing in easterly direction towards East Kolkata Wetlands carrying the pumped storm and sewage water of Kolkata
- (v). Tolly's *nala* system
- (vi). T-P system
- (vii). Monikhali system
- (viii). Churial system

67. Natural hazards in southern part of Kolkata (project influence area in general) include water logging and flooding during monsoon months. In areas like Behala, Tollygunge, Joka and

Garden Reach even a small shower causes water logging in many localities which takes considerable period to evacuate. Some pockets remain inundated for even 3 to 4 months in a year. All these result due to poor and inadequate drainage facility in the areas. However, with the completion of KEIP I S & D subprojects situations have improved to a great extent. Duration of flooding varies from hours to days, depending on the facility available, nature of topography and outfall conditions in and around different localities. However, July is the worst month, followed by June and August. Some part of sub project areas of Joka is low laying.

68. In revised seismic zones map of India (IS 1893; Part 1, 2002) eastern part of Kolkata falls in Zone IV while the area to the west falls in Zone III. No seismic micro-zonation map has yet been prepared for the KMC area.

69. **Geology and Mineral Resources.** The subproject area is underlain by Quaternary sediments consisting of clay, silt, and various grades of sand, gravel, and pebbles. Lithological logs show the presence of a clay bed at the top, with a thickness of 10 to 40m. There is a further clay bed 250 to 650 m below ground level. There is a group of granular aquifers between these layers, and these are being tapped as a ground water resource. Regional subsoil data covering a large area in subproject area reveal six levels of strata up to a depth of about 50 m below ground level. Near surface stratigraphy of Kolkata Region is given in **Table 6**.

Table 6: Near Surface Stratigraphy of Kolkata Region

Horizon I	Stratum I	Brownish grey/ light brown, silty clay/ clayey silt/ sandy silt with occasional lenses of silty fine sand; encountered from the top ground surface to a depth of about 3 to 4 m; occasionally only fill material of widely varying characteristics (about 4 m).
	Stratum II	Grey/ dark gray silty clay with semi-decomposed timber pieces, having lenses of silt and peaty clay; encountered between depths 3-4m and approximately 15m below ground level (about 10m).
Horizon II	Stratum III	Bluish grey and mottled brown/ grey, silty clay with kankar nodules and minute pockets of silt and sand (about 5.5m).
	Stratum IV	Brown/ yellowish brown, sandy silt/ silty fine sand/ clayey silt with lenses and pockets of brown/ grey silty clay (about 6m).
	Stratum V	Mottled brown/ grey, grey silty clay and brown silty clay frequently showing laminar character (about 18m).
	Stratum VI	Brown/ light brown, silty fine to medium sand (9m +).

70. The Horizon I comprising Strata I and II represents generally soft sediments. The second horizon comprising Strata III to VI have two clay layers (Stratum III and V) separated by a predominantly cohesionless layer (Stratum IV). Stratum VI is definitely water bearing and shallow tube wells in Kolkata region draw water from this stratum. The sediments of the second horizon are oxidized and are consolidated. The sequence is intercepted at several locations by deposits of the recent river system, parts of which are now dry.

71. There no mineral occurrence in the area.

72. **Soil.** The Kolkata area may be divided into two groups based on the soil types : Entisols and Alfisols. The Entisols are present at the western part of the area and the other part is represented by Alfisols. These soils are typically deltaic alluvial soils. The agro-climatic zone characterization of the area is Gangetic alluvium group of soils rich in calcium. Free calcium carbonate occurs in surface soils and the soil profile shows low to medium levels of organic matter and medium levels of available phosphate and potash. Kolkata and the neighboring

areas are represented predominantly by clayey soils. **Table 7** lists the physical and chemical characteristics of soil sampled and analyzed from the five selected Boroughs of KMC in the southern part of the city.

Table 7: Soil Quality in Five Boroughs of Kolkata Municipal Council

Sl. No.	Parameters	Sample (S1)	Sample (S2)	Sample (S3)	Sample (S4)	Sample (S5)
1	Sand (%)	14.0	15	20	22.0	24.0
2	Silt (%)	32.0	30	40	44.0	30.0
3	Clay (%)	54.0	65.0	60.0	34.0	46.0
4	pH	8.5	9.3	6.9	9.7	9.47
5	Available nitrogen (mg/kg)	1250	1428.0	1071.0	2356.2	904.4
6	Available phosphorus (mg./kg)	180	230	190	280	210
7	Available potassium (mg./kg)	58	80	62.5	90	52.0
8	Iron (mg/kg)	326.0	266.9	250.0	5433.57	3125.87
9	Zinc (mg/kg)	29.1	25.0	28.5	31.1	31.48
10	Copper (mg/kg)	5.81	7.69	8.5	21.94	<0.4
11	Hexavalent chromium (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
12	Trivalent chromium (mg/kg)	11.67	8.33	5	28.33	25.0
13	Nickel (mg/kg)	10.0	13.2	8	14.8	14.0
14	Arsenic (mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1
15	Lead (mg./kg)	12.35	12.8	8.5	25.19	13.33
16	Cadmium (mg./kg)	<0.4	<0.4	<0.4	<0.4	<0.4

Notes: S1 - HL Sarkar Road, Borough XI, Ward 113; S2 - Near Chowbagha, Borough XII, Ward 108; S3 - Motilal Gupta Road, Borough XIII, Ward 122; S4 - Near Kalitala Market, Borough XIV, Ward 125; and S5 - Near Badartala, Borough XV, Ward 141

73. **Climate.** The climate is hot and humid from March to October. It is somewhat cool from November to February. Rains are received principally from June to September with frequent pre-monsoon showers and nor'westers during April and May. The winter season begins in November and continues to February, followed by the summer season which continues until mid-June. The monsoon starts in mid-June and goes up to mid-September, sometimes extending up to October.

74. April and May are the hottest months with monthly mean maximum temperature above 35 degree Celcius (deg C). Mean maximum temperature is above 30 deg C from March to October. Relatively low monthly mean minimum temperatures occur during December (15.2 deg C), January (14.1 deg C) and February (18.1 deg C). Mean monthly minimum temperature is relatively high and is between 26 deg C and 27 deg C during the months of May, June, July and August.

75. The average annual rainfall is about 1919 mm with the four monsoon months (June to September). Rainfall peaks in July. Average number of rainy days is about 146 days per annum. During monsoon months it is not uncommon to receive 75 mm to 100 mm of rainfall in a 24 hour period. Such heavy rainfall may occur from 4 to 10 times in a year.

76. Wind is light to gentle with maximum monthly average speed 7.22 kilometer per hour (km/hr). The post-monsoon and winter months (October-February) experience very light wind. The average monthly wind speed during pre-monsoon and monsoon are 6.10 and 5.03 km/hr respectively. The mean annual wind speed is 4.28 km/hr. The prevalent wind direction was from southwest during most of the time in the year, except during winter when the northerly wind became significant. However, during cyclonic storms and depressions especially those

occurring in September to October, high wind speed reaching around 100 km/hour is not uncommon.

77. **Air Quality.** The concentrations of air pollutants in Kolkata are highly variable over the seasons. They are at their highest during winter months (November to February) and at their lowest during monsoon months (June to September). 24-hourly suspended particulate matter (SPM) concentration in the winter months generally ranges between 300 and 400 microgram per cubic meter ($\mu\text{g}/\text{m}^3$), sometimes reaching values in excess of $500 \mu\text{g}/\text{m}^3$. 24-hourly respirable particulate matter (RPM) concentration in those months is mostly in the range of 150 to $200 \mu\text{g}/\text{m}^3$ but often exceeds $200 \mu\text{g}/\text{m}^3$. During monsoon months, the 24-hourly SPM and RPM concentrations come down to around $100 \mu\text{g}/\text{m}^3$ and around $50 \mu\text{g}/\text{m}^3$ respectively. Similarly, 24-hourly nitrogen oxides (NO_x) concentrations are around $50 \mu\text{g}/\text{m}^3$ during the monsoon months but rises to around $90 \mu\text{g}/\text{m}^3$, sometime exceeding $100 \mu\text{g}/\text{m}^3$, during the winter months. Except for a slight build-up during the winter months, 24-hourly sulphur dioxide (SO_2) concentrations are mostly around 5 to $7 \mu\text{g}/\text{m}^3$ during most months of the year. The month of October generally shows a rapid transition from low concentrations of all pollutants to the succeeding high concentration months. But the transition from high concentration in winter months to that of low in monsoon months is rather gradual through the months of March, April and May. Seasonal variations in temperature, wind, rainfall, and other factors account for this.

78. Ambient air quality at Behala Chowrasta (near project site) and overall Kolkata average close to the subproject sites showed the same pattern from April, 2011 to March, 2012 as given in **Table 8**. Concentration of PM_{10} is above the standard.

Table 8: Month-Wise Average Ambient Air Quality at Behala Chowrasta

April, 2011 to March, 2012 (Arithmetic Mean Concentration in $\mu\text{g}/\text{m}^3$ from 24-Hourly Data)

Months	Behala Chowrasta			Kolkata Average		
	NO_2	PM_{10}	SO_2	NO_2	PM_{10}	SO_2
March'12	NA	NA	NA	24.5	152.0	2.5
February'12	NA	NA	NA	48.0	237.0	5.7
January'12	NA	NA	NA	34.6	188.0	5.0
December'11	88.0	250	10.0	75.2	207.0	8.2
November'11	67.7	165	8.9	58.0	161.0	7.3
October'11	65.3	125	9.4	57.1	107.0	8.1
September' 11	47.1	52	7.2	37.3	42.0	5.7
August'11	37.8	40	6.4	31.9	31.0	5.3
July' 11	40.0	40	5.8	31.0	33.0	4.9
June' 11	42.7	45	5.5	36.2	39.0	4.7
May' 11	44.8	50	6.0	40.4	45.0	5.3
April' 11	48.7	70	6.0	43.7	67.0	5.4
Yearly Mean	53.6	93.0	7.2	43.2	109.0	5.7

NA: Not Available

{Standard = 1. PM_{10} for industrial, Residential and Rural and other areas: $60 \mu\text{g}/\text{m}^3$ (Annual); $100 \mu\text{g}/\text{m}^3$ (24 Hour); 2. NO_2 for industrial, Residential and Rural and other areas: $40 \mu\text{g}/\text{m}^3$ (Annual); $80 \mu\text{g}/\text{m}^3$ (24 Hour); 3. SO_2 for industrial, Residential and Rural and other areas: $50 \mu\text{g}/\text{m}^3$ (Annual); $80 \mu\text{g}/\text{m}^3$ (24 Hour)}

Source: WBPCB Annual Report 2011-2012- Latest report disclosed by WBPCB, www.wbpcb.gov.in

Notes: NO_2 = Nitrogen oxides; PM_{10} = Particulate Matter with diameter of 10 micron or less; SO_2 = Sulphur dioxide

79. Results of limited time air quality monitoring carried out by KEIIP near Joka tram depot are reproduced in **Table 9**. The values are comparable with the general air quality level of Kolkata and surrounding areas.

Table 9: Ambient Air Quality at Diamond Park Club, near Joka Tram depot nearby the project location

Date	Shift wise sample no.	Pollutants level in $\mu\text{g}/\text{m}^3$				
		PM ₁₀	SPM	SO ₂	NO ₂	CO
21.10.2011 to 22.10.2011	1/1 1/2 1/3	139.2 126.0 137.2	268.5 237.2 241.8	6.8 5.2 5.8	38.5 26.5 30.0	<125 <125 <125
24.10.2011 to 25.10.2011	2/1 2/2 2/3	143.8 130.8 136.8	278.2 236.5 247.2	7.2 5.6 6.5	40.0 26.5 35.0	<125 <125 <125
31.10.2011 to 01.11.2011	3/1 3/2 3/3	136.8 120.8 128.3	260.1 228.5 237.2	6.7 5.8 6.1	36.5 28.7 32.8	<125 <125 <125
03.11.2011 to 04.11.2011	4/1 4/2 4/3	130.8 112.9 120.5	256.2 218.5 224.8	6.5 5.6 5.8	35.0 25.0 31.6	<125 <125 <125
07.11.2011 to 08.11.2011	5/1 5/2 5/3	143.8 132.5 123.7	280.5 256.7 238.2	7.2 6.2 6.0	42.5 32.5 31.2	<125 <125 <125
10.11.2011 to 11.11.2011	6/1 6/2 6/3	123.5 116.3 126.5	237.2 210.5 228.1	5.9 5.6 5.6	32.8 25.0 31.5	<125 <125 <125
14.11.2011 to 15.11.2011	7/1 7/2 7/3	168.2 130.8 162.5	273.5 236.2 258.7	7.8 7.0 7.0	45.0 35.0 38.2	<125 <125 <125
18.11.2011 to 19.11.2011	8/1 8/2 8/3	162.5 123.8 138.5	261.8 232.5 248.2	6.8 5.8 6.2	38.2 26.5 32.8	<125 <125 <125

Source: Primary data generated under KEIIP preparation

Notes: NO₂ = Nitrogen oxides; PM₁₀ = Particulate Matter with diameter of 10 micron or less; SO₂ = Sulphur dioxide, SPM = Suspended Particulate Matter, CO = Carbon Monoxide

80. Air quality monitoring has been carried out recently for packages under implementation (KEIIP Tranche 1) near project locations. Results are shown in **Table 10** below. Like other locations concentration of PM₁₀ is above the standard.

Table 10: Ambient Air Quality monitoring data under KEIIP- near sub project location

Location	Date	Parameters- level in $\mu\text{g}/\text{m}^3$			
		PM ₁₀	PM _{2.5}	SO ₂	NOx
Joka (near Metro station)	09.06.2015	139.96	59.85	27.34	59.84

(Source: KEIIP Tranche 1 monitoring, 2015)

81. **Surface Water Quality.** The primary surface water resource for Kolkata is the Hooghly River that skirts the western margin of Kolkata. In addition, the project area has a large number of water bodies and canals that are heavily used for everything : from bathing, washing, aquaculture and waste disposal. A large quantity of water is drawn from the Hooghly River for various uses and returns as wastewater to the river without little treatment. Industrial and domestic pollution along with runoff from adjoining areas has led to deterioration in river water quality. Summary chemical analysis Hooghly river water at Garden reach are given below in **Table 11.**

Table 11: Water quality of Hooghly river at Garden Reach

SI No.	Parameter	Unit	Test result (dated 11.01.11)	Test result (dated 07.04.11)	Test result (dated 08.07.10)
1	Conductivity	µs/cm	336	371	214
2	Dissolved O ₂ (DO)	mg/l	12.2	4.4	5.7
3	pH	Unit	8.27	8.03	7.4
4	Temperature	°C	16	29	27
5	BOD	mg/l	5.55	3.8	5.9
6	Nitrate-N	mg/l	0.04	1	0.31
7	Fecal Coliform	MPN/100ml	250000	8000	22000
8	Total Coliform	MPN/100ml	350000	11000	33000
9	Ammonia-N	mg/l	BDL	0.164	0.225
10	Phosphate - P	mg/l		0.25	0.04
11	Chloride	mg/l		29.14	14.56
12	Lead	microgram/l		7.48	

Source: WBPCB, www.wbpcb.gov.in

Notes: us/cm = micro siemen per centimetr; mg/l = milligram per litre; MPN/100 mL = Most Probable Number per one hundred millilitre; BDL = Below Detection Limit; ug/l = Microgram per litre; There are no government standards for (tidal) river water

82. Treated water quality which presently supply in and around project area is given below.

Table 12: Treated Water Quality

DAKSHIN RAIPUR WATER TREATMENT PLANT LABORATORY
 South 24 Parganas Water Supply Division – I, Public Health Engineering Dte.
 Government of West Bengal

TEST REPORT OF CLEAR WATER

SI No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Report Of CWR
1	Colour, hazen units,Max	5	15	5.15
2	pH Value	6.5 - 8.5	6.5 - 8.5	7.68
3	Taste	Agreeable	Agreeable	Agreeable
4	Total Dissolved Solid, mg/l,Max	500	2000	164.00
5	Turbidity,NTU,Max	1	5	0.50
6	Free Residual Chlorine,Mg/l,Min,	0.2	1	1.50
7	Total Alkalinity,Mg/l,Max	200	600	106.32
8	Salinity	-	-	0.00
9	Conductivity,Mg/l,Max	222	385	280.00

Source: KMC

83. **Groundwater.** The aquifers that are tapped for ground water in Kolkata are under confined condition because of the presence of a thick clay layer near the surface. Such aquifers occur at various depths separated by other clay layers. Generally the first aquifer is encountered at a depth of about 15 m followed by other aquifers with a principal one at about 90 m depth. The shallow aquifer is not used for bulk water tapping purposes, and is generally only tapped for spot supply of through hand pumps. A further deep aquifer occurs at depths approximately

between 150 and 200m, and majority of deep tube wells for organized supply of drinking water tap this aquifer. The earliest geohydrological data for the configuration of the piezometric surface beneath Kolkata are available for the post-monsoon period of 1956. It shows that in the northern part of the city, the piezometric surface was about 0.5-1.0 m above sea level and progressively declined below mean sea level towards the south. There was a drastic change in the pattern in the pre-monsoon of 1958 when a small depression in the piezometric surface was created with the center near Park Street lying at 5 m below mean sea level. The piezometric surface contour plan therefore defined a centripetal ground water flow pattern changing from an open north to south to a closed one. This ovoid ground water trough with long axis trending northwest-southeast persisted since then progressively going down with the central part having piezometric surface lying at (-) 13 m below the mean sea level in the pre-monsoon of 1998. The fall in elevation of the piezometric surface over a period of 40 years is of the order of at least 5 m at the extreme eastern part of Kolkata. The fall of piezometric surface in Command Hospital (Alipore), Kudghat and Tiljala area are 2.08, 3.06 and 3.24 m respectively. The area of depression is roughly bounded by the triangle formed by Narkeldanga, Park Circus and Alipore National Library.

84. As part of KEIP DPR preparation for added area geohydrological investigations were carried out in January, 2009 in seventeen Wards distributed in Borough XI to XV. In these areas, ground water occurs mainly under confined to semi-confined conditions in 13 Wards (108, 109, 111, 115, 122, 123, 124, 125, 126, 127, 139, 140 & 141). Depths of piezometric surface from ground level in these Wards varied between 9.3m and 14.11m. In Wards 110, 112, 113 & 114, due to presence of near surface aquifers under water table conditions the depths to water level in the tube wells in these wards are between 1.3m and 2.9m. An aquitard occurs near surface over the entire studied area and ground water from this aquitard is tapped by dug wells. The depths to water table varied between 0.50m and 7.95m in these dug wells. With most areas reporting water levels within 1 to 2 m from the ground surface.

85. The relevant ground water level data are given in the following **Table 13**.

Table 13: Ground water level data as measured during December, 2011 (near project locations)

Sl. No.	Location	Type of Structure	Sector	SWL (m bgl)
1	57/6/2, Santosh Roy Road, Kolkata-8	Dug Well	Behala	0.85
2	210, James Long Sarani, Opposite to Fire Brigade Depo, Kolkata-63	Dug Well	Behala	0.6
3	P-21, J. L. Sarani, Majher Para, Thakurpukur, Kolkata-63	Dug Well	Behala	1.0
4	Diamond Park, behind Vaishnawi Garden, 444, J. L. Sarani, Kolkata-104	Dug Well	Behala	0.5
5	12/1A, Roy Bahadur Roy, Kolkata-34	Tube Well	Behala	13.85
6	N/214, Biren Roy Road (E), Kolkata-8	Tube Well	Behala	14.85
7	Primary School, Barisha Purba Para, Kolkata-63	Tube Well	Behala	13.32
8	Thakurpukur, Maheshtola, J. L. Sarani, Kolkata-108	Tube Well	Behala	12.07

Notes: SWL = Static Water Level, m bgl = Meter Below Ground Level

86. Ground water in KMC area under two principal types, viz. a) Bicarbonate type and b) Chloride type. Ground Water in the area west of a line connecting BBD Bag, Park Street and

Jadavpur is of Biocarbonate type whereas in the area east of this line ground water is of Chloride type. The two anionic types were further subdivided each into two types on the basis of predominance of cation concentration. These are (i) Calcium – magnesium bicarbonate, (ii) Sodium bicarbonate; (iii) Calcium –Magnesium chloride; and (iv) Sodium chloride.

Table 14: Ground water facies at project area of KMC

Type	Facies	Distribution and characteristics of ground water facies	Borough
Bicarbonate	Ca-Mg- HCO₃	Occurrence in the entire western and south-central part of the city, south of Taltala- Kasba-Santoshpur tract in the NNW- SSE direction concentration of chloride low, in some places around New Alipore, Khidirpur, Elgin Road and Harish Park etc., chloride concentration as low as 11mg/l to 67 mg/l. Sodium concentration from 14 to 32 mg/l and average total dissolved solid 500mg/l	IX, XI, XII, XIII, XIV, and XV
	Na- HCO₃	Occurrence in the southern part of the city and particularly Behala, Tollygunge, Joka, Jadavpur and Putiari Soft with total hardness less than 150 mg/l; softening of ground water probably due to base exchange of calcium- magnesium ion with sodium ion from sodium montmorillonite clay	X, XII, XVI

87. Ground water quality was monitored around the project sites during November, 2011 -12 and the results are reproduced in **Table 15** below. Water quality is rather high in TDS but within acceptable limit. Fe concentration is also high. No heavy metal pollution especially that of arsenic has been detected.

Table 15: Ground water quality around water supply subproject sites

Parameters	GW – 1 Diamond Park, Joka (Tube Well)	GW – 2 Krishnayan Cooperative Housing, Behala (Tube Well)	GW – 3 Thakurpukur, James Long Sarani (Tube Well)	National drinking water standard Permissible limit
Temperature(^o C)	19.50	18.0	18.5	-
Colour unit	1.0	1.0	1.0	5
Turbidity(NTU)	2.65	4.8	6.8	1
Odour	No odour observed	No odour observed	No odour observed	Agreeable
pH	7.78	7.71	7.8	6.5-8.5
TSS (mg./l)	<10	<10	<10	-
TDS(mg./l)	556.0	879.0	580.0	500
Total hardness(mg./l)	228.0	232.0	240.0	200
Chloride(mg./l)	79.12	219.79	76.93	250
Sulphate(mg./l)	5.0	9.75	3.5	200
Nitrate(mg./l)	12.5	35.80	25.0	45
Sodium(mg./l)	138.5	212.0	180.0	-
Potassium(mg./l)	30.0	42.10	25.0	-
Calcium(mg./l)	56.11	72.14	60.92	75
Magnesium(mg./l)	21.12	12.48	21.12	30

Parameters	GW – 1 Diamond Park, Joka (Tube Well)	GW – 2 Krishnayan Cooperative Housing, Behala (Tube Well)	GW – 3 Thakurpukur, James Long Sarani (Tube Well)	National drinking water standard Permissible limit
Iron(mg./l)	0.64	1.61	2.34	0.3
Zinc(mg./l)	0.65	0.65	0.28	5.0
Phosphorus(mg./l)	0.14	0.04	0.06	-
Fluoride(mg./l)	<0.02	<0.02	<0.02	1.0
Lead(mg./l)	<0.03	<0.03	<0.03	0.01
Cadmium(mg./l)	<0.01	<0.01	<0.01	0.003
Arsenic(mg./l)	<0.01	<0.01	<0.01	0.01
Chromium (III) (mg./l)	<0.20	<0.20	<0.20	-
Chromium(VI) (mg./l)	<0.01	<0.01	<0.01	0.05
Phenolic compound(mg./l)	<0.001	<0.001	<0.001	0.001
Cyanide(mg./l)	<0.05	<0.05	<0.05	0.05
Mercury(mg./l)	<0.0001	<0.0001	<0.0001	0.001
Total coliform (MPN/100 ml)	<2	<2	<2	Not detectable

Source: Primary data generated under KEIIP

Notes: NTU = Nephelometric Turbidity Units; TON = Threshold Odor Number; mg/l = milligram/litre;
MPN/100 ml = Most Probable Number per one hundred millilitre;
TSS = Total Suspended Solid TDS = Total Dissolved Solid

88. **Noise.** Noise level in Kolkata high and exceeds the national standard.

89. Ambient noise level monitoring was carried out in the subproject area and the results are reproduced in **Table 16**. The day and night Leq level is generally above 70 dBA (maximum value above 80 in most of the cases) due to heavy traffic movement.

Table 16: Noise along Diamond Harbour Road & James Long Sarani

Station No.	Location	Date & time	Minimum dB(A)	Maximum dB(A)	L _{eq} dB(A)
N1	Diamond Park	24.10.2011 (day time)	55.3	61.5	58.79
		24.10.2011 (Night time)	51.2	60.8	56.18
N2	ESIC Hospital	24.10.2011 (day time)	79.8	85.3	82.56
		24.10.2011 (Night time)	64.2	69.8	67.20
N3	Kolkata Model School. James Long Sarani	24.10.2011 (day time)	74.2	83.5	77.87
		24.10.2011 (Night time)	62.8	71.5	67.89
N4	Thakurpukur Police Station	24.10.2011 (day time)	80.9	89.5	83.69
		24.10.2011 (Night time)	64.8	72.5	70.67
N5	Birsha High School (Sakher Bazar)	24.10.2011 (day time)	79.2	88.9	82.45

Station No.	Location	Date & time	Minimum dB(A)	Maximum dB(A)	L _{eq} dB(A)
		24.10.2011 (Night time)	63.8	72.5	70.67
N6	Joka Tram Depot	24.10.2011 (day time)	78.3	85.2	82.47
		24.10.2011 (Night time)	67.2	74.8	72.50

Source: Primary data generated ,Notes: dBA = decibal in A network; Leq = Equivalent noise level

B. Ecological Resources

90. **East Kolkata Wetlands.** The East Kolkata Wetlands (EKW), located on the eastern fringes of Kolkata city, is a part of the extensive inter-distributory wetland regimes formed by the Gangetic delta. The total area is 12,500 ha. The subproject is not within EKW area. Only a small part of KMC area falls within the limits of EKW. The EKW area includes one of the largest assemblages of sewage fed fish ponds. The importance of this wetland lies in the fact that these sustain the world's largest and oldest integrated resource recovery practice based on a combination of agriculture and aquaculture, and provide livelihood support to a large, economically underprivileged population of around 27,000 families which depend upon various wetland products, primarily fish and vegetables for sustenance. Based on its immense ecological and socio cultural importance, the Government of India, declared East Kolkata Wetlands as Wetland of International Importance under Ramsar Convention in 2002. EKW is a classical example of harnessing natural resources of the wetland system for fisheries and agriculture through ingenuity of local communities with their traditional knowledge. The wetland has been included by the Ramsar Convention as one of the 17 case studies on wise use of wetlands at the global level. The wetland provides strong arguments for integration of traditional knowledge of local communities into conservation and management practices. More than 1000 MLD of untreated sewage from Kolkata are discharged in to the fisheries of EKW for natural treatment in the fish ponds.

91. The ecology of the EKW area has undergone a dramatic change since the beginning of the 19th century due to cessation of tidal (brackish water) influx from Bidyadhari and Matla rivers in to the then saline marshy area with brackish water fisheries. The change is not only due to natural causes like siltation but also due to developmental activities and hydrological interventions. The brackish water fisheries of earlier years were converted in to sewage fed fisheries bringing in a changed ecosystem and establishing a new biodiversity in the EKW areas.

92. There is no forest patch within EKW. There are no endangered species but there are a number of rare mammals, reptiles, fish and bird species. According to the Ramsar information database, there are rare mammals such as Marsh mongoose, small Indian mongoose, Palm civet and small Indian civet which are significant in and around the EKW.

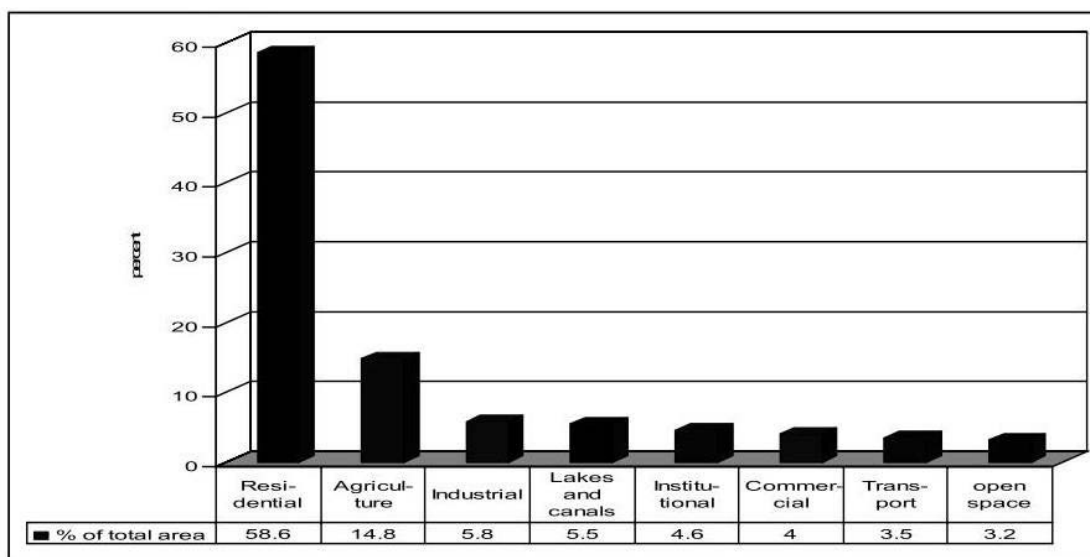
93. **Vegetation.** The Kolkata region, except a small part that is falling in East Kolkata Wetlands to the east is in a region of moist tropical deciduous vegetation with fresh water aquatic plants. Because of the continuous expansion of human habitation and heavy population pressure, the nature of the vegetation is rapidly changing and there are fewer herbaceous plants in some parts of the area. The few undisturbed areas along canal banks, road sides and small orchards within the residential area offer more varied vegetation. There is no demarcated forest.

94. **Wildlife.** Common jungle cats, foxes (*Vulpes bengalensis*), house rats (*Rattus rattus*), and mice (*Mus muscatus*), kingfisher (*Alcedo* sp.) are present. Of the reptiles, garden lizards (*Calotes versicolor*), snakes (*Natrix* sp., *Viper* sp.), and kraits (*Bungarus caeruleus*) are common. The bird life includes house crows (*Acridotheres tristis*), house sparrows (*Paser domesticus*), and pigeons (*Coluamba livia*). Amphibians such as Indian bullfrogs (*Rana tigrina*), annelids such as earthworms (*Eisenia foetida*), and arthropods such as cockroaches (*Periplanata americana*), butterflies and ants (*Tapinoma sessile*) are common. There are no endangered faunal species in the subproject area.

95. **Aquatic Flora and Fauna.** Anchored and free floating and submerged hydrophytes like Kachuri pana (*Eichhornia crassipes*), Azolla (*Azolla pinnata*), Sagittaria (*Sagittaria* sp.), Hogla (*Typha angustifolia*) etc can be seen in the many open water bodies other than Hooghly river. Such water bodies often contain fishes such as Rohu (*Labeo rohita*), Catla (*Catla catla*), and Bata (*Labeo bata*). Phytoplankton like Spirogyra sp., Zygnema sp., Navicula sp., Nostoc sp., Hydrodistyom sp., etc and zooplankton like Cyclops sp., Paramecium sp., Euglena sp., Diaptomus sp., larvae of culex sp. etc are ubiquitous.

C. Economic Development

96. **Land use.** The metropolitan area of Kolkata has grown from a few small villages to its present status as India's most populous city. The predominant land use in the KMC is residential, as shown in Figure below. However, for most residential areas a more exact description will be mixed use. There are industrial sites throughout the city, in all 16 Boroughs and in 71 of the 144 Wards. Urban planning is one of the responsibilities of the KMC. The KMDA also has a role in land planning, with a broader geographic scope than KMC.

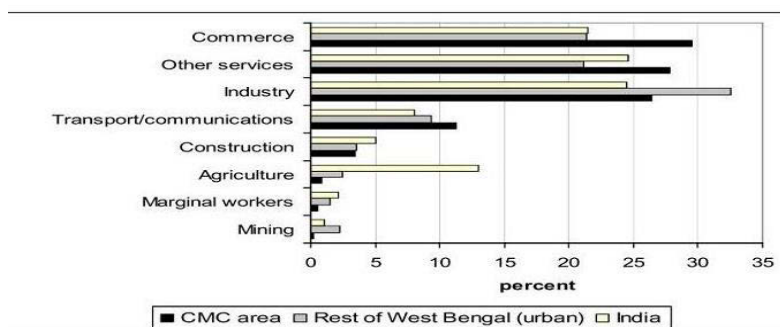


97. The land use pattern in the subproject area is predominantly semi urban with scattered residential colonies. However, very little commercial activities are also observed in some parts. Joka Cancer Hospital and IIM Kolkata are the major health and educational facilities present within the project area respectively. One important sewage treatment plant (SSE STP) is located in the northern part of the project area. There is no approved landuse map of this area.

98. The new extension of the metro railway line, under construction, terminates in Joka. The Diamond Harbour Road, being the trunk road to Sager island (religious spot) and Kulpi (developing area for future harbor access) passes through the heart of the project area. Joka is the doorway from south of West Bengal to Kolkata. Institutional, commercial and industrial activities will definitely enhance and expand. Construction of residential towers are already at place. It is expected that there will be boom in this area.

99. **Commerce and industry.** Kolkata is a service center rather than an industrial center. As shown on Figure below, the proportion of the population working in industry is similar to the India urban average, but below that of the rest of urban West Bengal.

100. Industrial growth has been accelerating in West Bengal with the introduction of the New Economic Policy (1992), the average annual growth of industrial production has moved up to 5.05%. While the organized industries are located in Cossipore area (Borough I), small scale industries as lead recycling, tanneries etc. are located in the Tiljala/Topsia area (Borough VII). It may be noted that all the tanneries are being relocated to a specially designated site at Karaidanga about 25 km away with all environmental safeguards. Only green i.e. non-polluting industries are permitted to be set up in KMC area. Permission from WBPCB is mandatory for discharging of waste in to municipal sewer or land or inland surface water body. For discharge to municipal sewer, industries must treat the effluent to the acceptable discharge limit as prescribed. Port related industries such as oil handling facilities etc. are found in the Garden Reach area viz Borough XV.



101. **Water supply.** The water supply system of Kolkata is very old, operated from 1865. Present average per capita supply is 134 lpcd, which is very near to desired supply of 150 lpcd (for metropolitan cities). But the supply is very uneven, ranging from 310 lpcd to 40 lpcd. Unaccounted for water (UFW) is 40%. Average supply period is 8 hours a day. Residual pressure is very low. The average terminal pressure at consumer end is around 2.5 m of water head. In some areas it ranges around 0.5 m-1.0 m of water head. About 10% of supply in Kolkata is from ground water. The source is affected by arsenic in some locations and TDS and Fe values are often above permissible values. From quality and health point of view the ground water source needs to be replaced. Coverage by piped water supply is 92% which is nearing 100%. But the rest 8% is near the periphery of the study area and far from surface water source. The two main water works are Palta and Garden Reach.

102. **Transportation.** The Kolkata's transportation system is multi-modal and highly heterogeneous. Public transportation comprises everything from human-powered rickshaws to a subway system. Main thoroughfares in Kolkata are crowded with taxis, buses, two-wheelers, three-wheelers, hawkers, and a myriad of pedestrians all vying for limited space on the streets.

103. **Electrical Power.** Power supply in Kolkata dates back to 1898, when Calcutta Electric Supply Corporation was formed for generation, transmission and distribution of electrical energy in and around the city of Kolkata. From about 100 kw demand in 1898, the system has grown to about 1200 MW in 1998. Apart from its own generation, CESC Limited, presently a licensee of WBSEB, purchases power from the latter and also from Damodar Valley Corporation (DVC). The generating stations that operate in Kolkata area are: Mulajore, capacity 150 MW, New Cossipore 160 MW, Titagarh 240 MW, Southern 135 MW, and Budge-budge 250 MW. In addition, 300-400 MW of power is supplied by West Bengal State Power Development Corporation and Damodar Valley Corporation. All these power plants are coal-based.

104. **Sanitation and Sewerage.** In the core city area all properties, except the slums, are directly connected to the underground sewer network, meaning a total number of 358,750 households directly connected which is equivalent to 75% of all households in the core city area. The slum areas are in general served by communal toilets connected to septic tanks. In the outer areas served by KEIP a total number of 70,000 house connections would be constructed once the project is finalized in June 2012. This means a coverage of 22% of the total population in the KEIP areas. In the outer areas not yet served house connections to underground sewers don't exist by lack of any underground sewer system, meaning 0% coverage. This brings the average total for the entire KMC area at 44% as compared to the national target level of 100% but nevertheless it is way above the national average of 28%.

105. According to the 2001 Census 96% of the KMC population has access to individual or community toilets within walking distance in the service area. This compares favorably with the national average of 82% and is near the national benchmark of 100%. Most of the KMC slum areas are provided with communal toilet facilities within walking distance. Only 4% of the KMC population has no sanitation facilities and uses gutters, open drains, channels or vacant land for sanitation. This is mostly in the urban fringe areas where population densities are still relatively low.

106. The collection efficiency of sewage is 71%, which is higher than the percentage of people with direct sewer connections because it also includes sewage collected through the interceptor sewer system. The collection efficiency is around 90% in the core city area as well as in the KEIP areas. The remaining outer areas have no formal sewer system yet and collection is zero.

107. The treatment capacity of the existing treatment plants and the East Kolkata Wetlands (EKW) is sufficient to serve the entire central city (100%) and the KEIP areas (100%). The total average for KMC is 88% because the outer areas not yet served by KEIP generate 12% of the waste water for the entire KMC. The effluent quality at the outlets of the East Kolkata Wetlands and the existing treatment plants fully comply with national norms.

108. The extent of re-use is very high because 90% of all sewage from KMC ends up in the fisheries of the EKW where it serves as quality food for the fisheries. Effluent from other treatment facilities is partially re-used for agricultural purposes before it finally discharges into the Hooghly River. On average 93% of waste water generated in KMC is re-used, comparing very favourable to the national target of 20%.

109. **Solid Waste Management.** The solid waste management system consists of three main components: Collection, Transportation and Disposal.

110. The majority (90%) of collection is done by KMC and 10% is contracted out to private contractors. House-to-house (doorstep) collection has been introduced in 80% of the KMC area. Other areas are served by street sweepers who operate manually. Many roads are too narrow to allow access for motorized collection vehicles. Primary collection is mostly by open hand carts and delivery at secondary collection sites (vats). There are 694 such collection points – 392 open vats and 302 bulk containers or direct loading. Open vats are generally poorly managed with spillage of disposed waste from the bulk containers or from open vat boundaries creating in most cases an unhygienic environment. In 2011 source segregation has been introduced as a pilot project in 7 Wards.

111. 80% of the KMC area is served by a door-to-door collection system and 25% by street sweeping. This compares favorably to the national average of 51% but is still far below the 100% benchmark target. The central city and most of the surrounding outer areas are served daily collection, but some of the lower density fringe areas are only served once or twice per week.

112. Presently, mixed waste (biodegradable and recyclable) is collected from residential, commercial and market areas and brought to collection points, which may be small bins or large bulk containers (dumpers) that are painted yellow (42%) or open storage enclosures (58%). Waste is directly loaded from these containers into trucks or trailers manually or using pay loaders. This step is known as secondary collection. Pay loaders cannot collect all the waste from the storage enclosures, since some manual cleaning is required. They tend to break the edge of the storage enclosures and that spills waste when loading. Pay loaders also often find it difficult to operate in the narrow cramped streets of Kolkata metropolitan area. Currently, pay loaders are used to collect waste from only 5% of the total collection points, while the remaining collection is done either manually or by private agencies (mostly manual operations).

113. KMC has two waste disposal sites. The Garden Reach dumping ground is a small facility with little remaining capacity. It receives currently about 10 MT/day of waste mainly from nearby Borough XV. The main dumping ground is at Dhapa in the east of KMC at approximately 8 km from the city centre. This dump site is nearing its maximum capacity and has been authorized by West Bengal Pollution Control Board to operate for one more year only. It received an average of 4286 MT/day solid waste in 2011 out of which 300 MT/day was diverted to the privately operated Dhapa composting plant.

114. The extent of scientific disposal of solid waste is currently zero and should become 100% in accordance with the national benchmark target. Both the Dhapa and the Garden Reach dump site are not operated as sanitary landfill in accordance with national standards. There is no formal leachate treatment, no proper soil cover and informal, unorganized rag pickers operate at the sites. KMC has an interim permit from WBPCB to operate the Dhapa landfill facility for one year.

115. West Bengal has one Common Hazardous Waste Treatment, Storage and Disposal Facility (CHWTSDF) at Haldia (about 100 km south of Kolkata) that commenced operations in 2005. The facility was jointly developed by the Haldia Development Authority and the Hyderabad based private company, M/s Ramky Enviro Engineers Ltd. who formed a joint venture company named M/s West Bengal Waste Management limited (WBWML) for the development and operation of the facility. The CHWTSDF at Haldia operated by M/s WBWML has completed almost four years of successful operation. The facility caters to units in the entire state of West Bengal.

D. Social and Cultural Resources

116. **Communities and Population.** The population of the KMC area is 4.45 million with a growth rate -1.93% (2001 to 2011). Approximately one third (32%) of the KMC population lives in bustees and substandard housing. The Project team prepared population projections to 2022 based on the using previous census data of 2001, 1991 and 1981. These projections show a declining population trend for the KMC area, increasing from 4.38 million in 1991 to 4.56 million in 2022. This hike will indicate a general growth of population in the south and south-eastern part of Kolkata which has a tremendous growth potential. The average household no. for the total KMC area is 972,264 and the average household size of Kolkata Municipal Corporation is 4.61 in 2011. Population density of KMC is very high 24,783 persons/sq.km. in 2011. Household numbers are 972,264 and average household size is 4.61 in 2011.

117. **Institutions.** A number of institutions are present in the KMC area and may have a role in the Project's development. These can be classified in to several categories, as follows: government administration and services, police and security, urban development, and environmental protection.

118. **Government administration and services.** . The agency with the most important role in the Project is KMC. Municipal administration in Kolkata dates from 1727. The functions of the first Corporation were then limited to provision of local roads and drainage and conservancy service. The present system of municipal government has come through an evolutionary process over a long period, resulting in KMC being assigned the responsibility for the following services: regulation of land use; regulation of construction of buildings; planning for economic and social development; roads and bridges; water supply; public health, sanitation, conservancy and solid waste management; urban forestry, protection of the environment and promotion of ecological aspects; safeguarding interests of weaker sections of society, including the handicapped; slum improvement; urban poverty alleviation; provision of urban amenities such as parks gardens, playgrounds; promotion of cultural, educational and aesthetic aspects; burials and burial grounds, cremation and cremation grounds; cattle grounds, prevention of cruelty to animals; vital statistics including registration of births and deaths; public amenities including street lighting, parking lots, bus stops and public conveyance; and regulation of slaughterhouses and tanneries.

119. **Environmental protection.** The WBPCB has the overall responsibility to set policy and standards for the protection of the environment, following the lead of the Central Pollution Control Board. This includes air, noise, hazardous waste, and water quality standards, and the requirement for the preparation of EIAs. The WBPCB also carries out water and air quality monitoring, and might be involved in the environmental quality monitoring program that will be a part of this project. No designated protected area lies within 10 km radius of the water supply subproject sites. Kolkata does not fall under the Coastal Regulation Zone (CRZ).

120. **Education.** The population of is fairly literate, around 90% of males and females being literate. School enrollment is moderately for all segments of the population. 85% of males and 80% of females report at least a primary school education. 27% of the population has completed secondary school and 9% have graduated from college.

121. **Religion.** About 80% of the residents of KMC are Hindus. Most belong to general castes (84%), with the balance belonging to scheduled caste or scheduled tribes. There are significant concentrations of Muslims in the bustees.

122. **Languages.** The mother tongue reported by 74% of the population is Bengali, with Hindi and Urdu represented by 14% and 12% of the population respectively. Interestingly, those living in standard residential housing report 91% Bengali, while those in sub-standard housing reporting only 58% Bengali and 25% Hindi.

123. **Occupation.** About 6% of households report unemployment: 5% for those living in standard residential areas and 7% for those in bustees and refugee colonies. Of those employed, there is a broad variety of employment types, with no single category predominating over others.

124. **Education, Health and Health Care Facilities.** A listing for Boroughs XI-XVI indicated that there are more than 180 government and private educational institutes within the Boroughs. The list includes primary, secondary and higher secondary schools, degree colleges, technical and professional institutes. Public health varies according to socio-economic level and location. There are more than fifty health centers, government hospitals/dispensaries, private hospitals and nursing homes within the study area. Mention may be made of Ruby General Hospital (Ward 108), Manovikash Kendra (Ward 108), R N Tagore International Institute for Cardiac Sciences (Ward 109), Peerless Hospital and B K Roy Research Centre (Ward 109) and Thakurpukur Cancer Hospital (Ward 124). Health care facilities appear to be on the low side in Wards 112, 113 and 122. Malaria is seasonally prevalent. Cardio-vascular diseases are increasingly prevalent among people over 40, while waterborne diseases such as gastrointestinal diseases are common among children less than 15 years of age.

125. **Aesthetic Resources.** The main aesthetic resources of Kolkata as a whole consist of historic buildings and many small lakes and other water bodies. Both of these resources are recognized as being in need of restoration, and a number of efforts are under way to accomplish this. Foreign tourism is not yet a well-developed industry in Kolkata, and there are opportunities for making tourism a profitable industry while still conserving the urban beauty of the area.

126. **Cultural Resources.** The buildings of north Kolkata reflect the traditional culture of the zamindar and rajas, whereas the structures in central Kolkata reflect the British colonial style. The buildings and churches in this area are around 50 to 100 years old. Most of the archaeological monuments are maintained either by the Department of Archaeology or by private concerns like Rama Krishna Mission or Trusts. Some of the valuable monuments are: Metcalfe Hall, Gwalior Monument, Victoria Memorial, Shahid Minar, Indian Museum, Cossipore, Club, Town Hall, Tagore's Baitak Khana, Fort William, Vivekananda's house, and Roy's Naroial – Cossipore. There are also a few monuments at Tollygunge and Kalighat areas.

127. As the subproject is concentrated primarily in the added areas of KMC, the project will not hamper any precincts of cultural or historical significance.

128. **Recreational and other facilities.** More than twenty five large play grounds are present in Boroughs XI to XVI area. There are innumerable temples, maths, mosques and a few churches scattered over the area. Housing complexes with their own recreational areas have come up especially in Wards, 108, 109 and 110.

V. ANTICIPATED IMPACTS AND MITIGATION MEASURES

129. **Methodology.** Issues for consideration have been raised by the following means: (i) input from interested and affected people; (ii) desktop research of information relevant to the proposed subproject; (iii) site visit, limited measurements by specialized agency and

professional assessment by Environment Specialist engaged by the implementing agency; and (iv) evaluation of proposed design scope and potential impacts based on the environment specialist's past experience.

130. The methodology used to rate the impacts was qualitative. Each category was divided into a number of different levels. These levels were then assigned various criteria as indicated in **Table 17**.

Table 17: Summary of Quantifiers and Qualifiers Used for Assessment Purposes

Duration (time-scale)	Short-term	Impact restricted to construction (0-27 months).
	Medium-term	Impact will continue throughout operation (after construction-30 years).
	Long-term	Impacts will exist beyond the life of the project components (>30 years)
	Permanent	Impacts will have permanent potential
Geographic spatial scale	Site	The impact will be limited to within the site boundaries.
	Local	The impact will affect surrounding areas.
	Regional	The impact will affect areas far beyond the site boundary but limited to the State of West Bengal.
Significance rating before mitigation (positive / negative)	Low	The impact will have a minimal effect on the environment.
	Medium	The impact will result in a measurable deterioration in the environment.
	High	The impact will cause a significant deterioration in the environment.
Mitigation	n/a	No mitigation necessary.
	Full	Full mitigation/reversal of the impact is possible.
	Partial	Only partial mitigation/reversal of the impact is possible
	None	No mitigation or reversal of the impact is possible
Degree of Certainty	Definite	(>90%)
	Possible	(50%)
	Unsure	(<40%)

131. Categorization of the subproject has been undertaken using ADB's REA Checklist for Water supply (**Appendix 6**).

A. Planning and Design Phase

132. The lean flow rate of Hooghly river is assessed at 90,000 MLD. The water demand for subproject in design horizon 2050 of 84.5 MLD will not have significant impact on water availability of Hoogly River. Except 3 proposed ESR locations all other subproject components will be located in properties held by KMC. Purchase of land will be required only for Charaktala, Malpara and Ramakantapur ESR locations.

133. The plan and technical design of the subproject are based on the specifications of the Manual on Water Supply and Treatment developed by the Ministry of Urban Development's Central Public Health and Environmental Engineering Organization. Engineering decisions considered the results of the demand-supply gap analysis, area and population to be served, design period, the per capita rate of water supply, other water needs in the area, the nature and location of facilities to be provided, the optimum utilization of the existing WTPs, points of water supply intake and wastewater disposal. The salient design features are presented in **Table 18**.

Table 18: Design Consideration

Parameter	Design Consideration
Design Period	The subproject is designed to meet the requirements over a 30-year period after completion.
Design Population	The forecasted population of 325882 is estimated with due regard to all the factors governing the future growth and development of KMC until year 2050
Per capita supply	150 lpcd for 100% of population
Pressure requirements	The subproject is designed on continuous 24 hours basis to distribute water to consumers at adequate pressure at all points. The minimum residual pressure is 12 m in general (7m in some specific location).
Water storage	Capacity of reservoirs considering 24 hours consumer supply and 10 to 18 hours pumping at different years. Volume of reservoir (in ML) = 0.25 times Demand (mld), i.e 1/4th of Daily demand or 6 hrs storage. Maximum 18 hours supply from UGR to ESR, and 8 to 12 hours pumping to UGR
Alignment of transmission mains and distribution network	Alignment of the transmission mains and distribution pipeline is guided by public ROWs and existing road alignment.
Design of the transmission mains	The design velocity considered will eliminate any possibility of siltation and abrasion inside the pipe and will ensure the stipulated discharge capacity.
Pipe materials	The pipe materials considered in the design will ensure durability, life and overall cost which include pipe cost, installation and maintenance costs necessary to ensure the required function and performance of the pipeline throughout its designed life time.
Pipe laying	The transmission mains will be laid using open trenching. Everyday's work will be done in short length
Sanitation systems	Improvements on sewerage of the area will be considered separately
Ecological diversity	The subproject is situated within an existing built up area and no areas of ecological diversity occur within the subproject. Due to the nature and locality of the subproject there is unlikely to any impacts on biodiversity within the area. Any landscaping to be undertaken will be done with locally indigenous species and low maintenance requirements.
Land use and livelihoods	The key efforts undertaken to minimize impacts: before the preparation of engineering design, a detailed survey of the properties nearby the project components was conducted with regard to their ownership with the objective that minimum proprietary land is utilized for the subproject
Traffic flow and access	A traffic Management Plan will be developed to provide vehicle and pedestrian access and maintain community linkages. Local communities along the alignment will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction. The road closure together with the proposed detours will be communicated via advertising, pamphlets, radio broadcasts, road signages, etc. The implementation of the road detours will also be dependent on advance road signages indicating the road detour and alternative routes. KMC will coordinate with the traffic police for the implementation of the Traffic Management Plan. At ESR and UGR sites, due to isolated locations no impact on traffic flow is expected Template for Traffic Management plan is shown as Appendix 7
Infrastructure and services	There are a number of existing infrastructure (roads, telecommunication lines, power lines and various pipelines along the alignment of the transmission mains. To mitigate the adverse impacts due to relocation of the utilities, PMU will (i) identify and include locations and operators of these utilities in the detailed

Parameter	Design Consideration
	design documents to prevent unnecessary disruption of services during construction phase; and (ii) require construction contractors to prepare a contingency plan
Noise and vibrations	During construction phase, some noise and vibration will be generated from the various construction activities like construction works, operation of construction equipment and vehicles engaged in transportation of construction materials. However, these will be confined to the work sites only and will be temporary in nature occurring mostly during daytime.
Aesthetics, landscape character, and sense of place	The subproject is considered to be compatible with the surrounding landscape and is not expected to negatively impact the existing visual quality or landscape character of the area. Construction waste, spoil materials will be disposed as per Spoil Management Plan (Template shown in Appendix 8)
Environmental Monitoring	Monitoring will be done in respect to supply water from reservoirs as per Environment Management Plan

134. The design considerations were discussed with the specialists responsible for the engineering aspects, and as a result measures have already been included in the subproject design for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design.

135. For the package “Dedicated Water Supply Transmission Main from Junction of James Long Sarani to Daspara near existing Pumping Station along James Long Sarani” micro tunneling will be utilized for pipe laying. Existing road is busy traffic route and accordingly micro tunneling technology is planned to minimize impact. Design consideration including benefit of pipe laying through micro tunneling is given below.

Table 19: Design Considerations for the Pipe laying Methodology

	Parameters	Micro-Tunneling	Open Trenching
1	Construction methodology	Modern; boring with pipe jacking technique	Primitive; manual
2	Accidental damage to utilities	Below utility lines	Invasive through or avoiding the utility lines; often utility lines are required to be shifted
3	Waste (solid and liquid) handling and disposal during construction	Solid waste handling volume is less; disposal of waste is somewhat complicated	Handling volume is more; some part of the excavated material need to be put back again to fill up the trench after pipe is placed; construction method is hazardous
4	Pollution potential (air, noise, vibration, surface water, etc) during construction	Less severe as operation is below the ground without disturbing the surface	Open trenching gives rise air, water and noise pollution
5	Relative hazards during construction	Same degree	Same degree
6	Relative loss of business due to construction	Loss of business is minimal	Loss of business is likely to be more if the roads are narrow and traffic is heavy
7	Inconvenience to people using ROW	Less likely	More likely
8	Cost	More compared to	Much less

	Parameters	Micro-Tunneling	Open Trenching
		trenching	
9	Construction time	Less	More
10	Maintenance	Same effort is required	Same effort is required
	Recommendation	Micro-tunneling	

B. Construction Phase

136. **Construction method water storage reservoir.** Excavation will be done as per the execution drawing for excavation by adopting standard procedures by using Excavators. The Excavation will be carried out in methodical manner by providing proper approach roads with adequate slopes for machinery movement. Wherever the excavation is not possible by machines – manual excavation by workmen will be carried out.

137. Consolidation will be carried out by knowing the exact geo-technical characteristics of the site. Compaction and consolidation of earth will be carried out upto the desired level of consolidation by adopting standard procedures. The necessary compaction test will be conducted.

138. Before carrying out any concreting works necessary approval of client/consultant in the pour card will be obtained. Bill of materials and Bar bending schedules as per the approved drawings will be prepared and kept ready.

139. The shuttering plates of proper sizes with proper finish or new plywood (waterproof) of adequate thickness will be used along with scaffolding pipes and clamps.

140. All concreting works will be carried out as per the Mix design hence required materials such as course sand, stone aggregates and cement will be sent to the design laboratories. After receipt of design mix from approved labs, all concrete works will be taken up accordingly. Only one type of cement will be used in one mix. The quality of cement will generally confirm the required IS specification.

141. At the time of placing concrete at every stage required test cubes will be taken and it will be kept under proper curing. These cubes will be tested in the Site laboratory in the presence of client/consultant on 7/14/28 days sampling and testing shall be as per respective specification under the supervision of client/consultant.

142. After completing concrete work required curing arrangements are kept ready. Curing will be carried out as per the IS. The de-shuttering of formwork of concrete surface will be as per IS 456 without any deviations.

143. After the completion of the super structure the required finishes viz. plastering, water proof plastering & other amenity works as per the specifications. Finally the entire building will be white washed besides application of necessary approved color shade.

144. At construction phase for quality control project site will have a laboratory which will be equipped with various testing machines including cube testing machines, sieve analysis unit, measuring jars, weighing balance etc.

145. **Transmission mains and Distribution network.** Distribution mains and transmission mains will be buried in trenches adjacent to roads un-used RoWs. In some areas occupied by drains or edges of shops and houses, trenches may be dug into the edge of the road to avoid damage to utilities and properties.

146. Trenches will be dug using a backhoe/manual, supplemented by manual digging where necessary. Excavated soil will be placed alongside, and the pipes (brought to site on trucks and stored on unused land nearby) will be placed in the trench by hand or using ropes for the Ductile Iron (DI) pipes. Pipes will be joined by hand, after which filling will be done with the excavated soil manually upto the ground level and compacted by a vibrating compressor. Where trenches are dug into an existing roadway, the bitumen or concrete surface will be broken by hand-held pneumatic drills, after which the trench will be excavated by backhoe, and the appropriate surface will be reapplied on completion.

147. Pipes are normally placed by approx 1 m below the existing ground level/road level and a clearance of 200 mm is left between the pipe and each side of the trench to allow backfilling. Trenches will be smaller for the distribution main (minimum of 1m deep and 1 m wide).

148. New pipes and connections to the distribution main will be provided to house connections, and these will run to individual dwellings in small hand-dug trenches, or on the surface. New consumer meters will be located outside houses, attached to a wall or set onto the ground. Pathways and other local infrastructure will be reinstated to at least their pre-project condition upon completion of construction.

149. **Transmission main by micro-tunneling.** Micro tunneling technology will be applied for laying of 6.0 km pipeline within busy road. Intermittent shafts of access will be dug using a backhoe digger, supplemented by manual digging where necessary. Excavated soil will be placed alongside the shafts and the pipes will be brought to shaft sites on trucks and stored on unused land nearby. Excess spoils will be loaded into trucks for disposal. Slurry will be collected, stored in a container and disposed of to permitted low laying area. Pathways and other local infrastructure will be reinstated to at least their pre-project condition upon completion of construction.

150. **Table 20** presents an indication of what activities and facilities are likely to be undertaken during construction of the subproject, including the associated inputs and outputs.

Table 20: Summary of activities and facilities, resource use, and produced outputs during Construction Phase

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
Construction camp and its associated facilities (including lay-down areas)	Cement	Waste concrete and other construction rubble
Storage camps and lay-down areas	Chemical additives used in concrete (i.e. retarders)	Used fuels, lubricants, solvents and other hazardous waste
Materials and equipment stockpiles	Paving blocks/bricks	General waste
Handling and storage of hazardous materials including chemicals additives, gravel, cement, concrete and lubricants	Aggregate (sand and stone)	Contaminated soil
Source of water	Gravel	Soil contaminated with petrochemicals (i.e. oils and lubricants) and other chemicals
Vegetation clearance (as per requirement)	Water	Sewage and grey water (temporary construction camp sanitation)
Earthworks, grading and contouring.	Drinking, cooking and sanitation at construction camps	Spoil material (excess soil)
Movement of construction staff, equipment and materials	Water for dust suppression	
	Water applied to base and sub-base layers during compaction	
	Water for application to sub-	

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
Importation of selected materials Noise and vibrations Dust suppression Waste production and temporary storage/disposal i.e. used fuels, waste concrete and bitumen, spoil materials and general waste Use of asphalt/bitumen (and associated storage and mixing areas, chemicals) Concrete batching plant (and associated storage and mixing areas, chemicals) Rehabilitation of disturbed areas Interaction between construction workforce and local communities Reminders to affected people (if any) of construction with time frames	base and base layers prior to compaction Petrochemicals Other Chemicals/lubricants/paints Construction vehicles, machinery and equipment Temporary energy supply to construction camps Topsoil used during re-vegetation and rehabilitation Plant material for re-vegetation (seeds, sods, plant specimens) Labor Recruitment of construction work force Skills training Control of movement of public needs barriers (not just danger tape) to prevent people from falling in trenches/ excavated area for underground reservoirs during construction	removed during excavations) Noise and vibrations (construction vehicles and machinery) Lighting at construction camps, equipment yards and lay-down areas Plant material removed from servitude/right-of-way during vegetation clearance Smoke and fumes Burning of waste Burning of vegetation cover Fires used for cooking and space heating (construction camps) Vehicle exhaust emissions

151. The following table (**Table 21**) outlines potential impacts during the construction phase gathered from a process that included a review of available documentation, verified during the site visit, i.e. how, where and when the proposed development can interact and affect the environment significantly, and details what mitigation measures may be taken to counteract these impacts.

Table 21: Summary of anticipated potential environmental impacts during Construction Phase

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
Climate	The nature and intensity of rainfall events in an area, has implications for storm water management. Smoke from burning activities could have wider spread on windy days especially when dust could be blown off site.	Consider seasonal climatic variations during scheduling of construction activities in the area. Do excavations and other clearing activities only during agreed working times and permitted weather conditions. Implement storm water control as per method approved by PMU. No open fires permitted on site	Low (negative)	Site	Short-term	Full Mitigation Possible
Air Quality	Sensitive receptors (e.g. hospitals, schools, religious places) may be affected temporarily by increased traffic and related impacts during the construction phase Fugitive dust can also impact on roadside air quality during construction. Exhaust fumes from construction machinery, and potential smoke from cooking fires. Burning of waste and cleared vegetation Odors from use of toilet 'facilities' other than provided facilities.	Guidelines that deal with the control of air pollution and dusts on site have been outlined in the Environmental Management Plan (EMP) Ensure compliance with the Air Act. Ensure compliance with emission standards Undertake monitoring of air pollution levels in potential problem areas. Manage (including storage, transport, handling and disposal) hazardous substances used. Avoid dust generating construction activities during strong winds. Cover soil loads in transit. Cover stockpiles of soil or apply suitable dust palliative such as water or commercial dust suppressants. Regularly service vehicles off-site in order to limit gaseous emissions. No open fires permitted on site Place atleast portable toilets on-site and maintain on a daily basis.	Medium (negative)	Local	Short-term	Partial Mitigation Possible
Geology and	Strong water flows into open	The design of the site drainage system	Low	Site	Short-	Full

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
soil	excavated area Layers of mixed fill cover natural ground surface in many places. Contamination from spillage of petroleum products, spent engine oil and oil leaks from construction vehicle maintenance taking place on site.	is adequate to control runoff from the excavated and open areas in line with topographical features of the site. Rehabilitate all sites during construction including construction camps, stockpile area, temporary access and hauling routes, as soon as possible after the disturbance has ceased. Contractor to exercise strict care in the disposal of construction waste Contain contaminated water and dispose off site at an approved disposal site in consultation with WBPCB. Mix cement, concrete and chemicals on a concrete plinth and contain spillages or overflows into the soil. Do not allow vehicle maintenance on site. If oil spills occur, dispose contaminated soil at a disposal site in consultation with WBPCB. Stockpile subsoil and overburden in all construction and lay down areas. Utilization of overburden/ excavated earth for project site development or disposal at designated areas	(negative)		term	Mitigation Possible
Drainage and hydrology	The proposed development is situated within an existing built up area. Due to the nature and locality of the subproject there is unlikely any significant impacts on water resources within the immediate area.	The site surface has been engineered and shaped in such a way that rapid and efficient evacuation of runoff is achieved. No contamination of water body nearby Provide containment areas for potential pollutants at construction camps, refueling, depots and concrete batching plants.	Medium (negative)	Site	Short-term	Full Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
		Implement waste management practices. Control and manage transport, storage, handling and disposal of hazardous substances.				
Biodiversity Fauna and Flora	The proposed development is situated within an existing built up area. No areas of ecological diversity occur within the subproject location. Due to the nature and locality of the subproject, the proposed development is unlikely to cause any significant impact on biodiversity within the area As per preliminary design there will be no requirement for tree felling. This will be further assessed during detail design stage	Permission will be obtained (if required) from the KMC for the cutting/felling of trees prior to start of civil works. Ensure any landscaping to be undertaken will be done with locally indigenous species and low maintenance requirements.	Low (negative)	Site	Short-term	Full Mitigation Possible
Land Uses	Due to the location and nature of the subproject, there will be limited interference with access. There will be no as such road closure. There will be no as such disruptions to health services, education services, local businesses, transport services, pedestrian movements, due to traffic and construction	KMC has consulted with various organizations, departments, etc within the area and will be continued during the construction phase. Consult with local departments, organizations, etc regarding location of construction camps, access and hauling routes, and other likely disturbances during construction. Make use of local labor, materials, goods and services as far as possible Provide sign boards for pedestrians/ locality nearby to inform nature and duration of construction works and contact numbers for	Low (negative)	Local	Short-term	Partial Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
		concerns/complaints. Reinstate pathways and other local infrastructure immediately to at least their pre-project condition upon completion of construction.				
Infrastructure and Services	There is likely to have temporary disruption of infrastructure and services during the pipe laying of the transmission mains. There are a number of existing infrastructure and services (roads, telecommunication lines, power lines and various pipelines within the vicinity of the subproject).	Undertake utility shifting prior to commencing pipe laying Keep construction-related disturbances to a minimum. Consult with affected service providers regarding impacts on access to infrastructure and services and alternatives. Consult with affected communities or businesses prior to foreseeable disruptions, for example notifying residents of a temporary severance of water supply. Provide backup or alternative services during construction-related disruptions, for example by providing generators for power supply. Provide access points to infrastructure and services. Monitor complaints by the public. Reinstate pathways and other local infrastructure immediately to at least their pre-project condition upon completion of construction.	Low (negative)	Local	Short-term	Full Mitigation Possible
Traffic	Increased volume of construction vehicles on the roads may lead to increased wear and tear of roads in the vicinity of the subproject site. Road safety concerns due to slow moving construction	Reroute traffic and close roads according the Traffic Management Plan (TMP). The objective of the TMP is to ensure safety of all the road-users along the work zone and to address: (i) protection of work crews from hazards associated with moving traffic; (ii)	Medium (negative)	Regional	Short-term	Partial Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
	<p>vehicles.</p> <p>Traffic flow within the vicinity will be affected.</p> <p>The temporary road closure will result in a decrease in overall network performance in terms of queuing delay, travel times/speeds.</p> <p>The road closure will impact on a public transport operations and routing.</p> <p>On street parking and loading bays will be affected by the proposed road closure.</p> <p>Pedestrian movements will be affected by the road closure.</p>	<p>mitigation of the adverse impact to the road capacity and delays to the road-users; (iii) maintenance of access to adjoining properties; and (iv) issues that may delay the subproject works.</p> <p>Negotiate with privately-owned public transport operators regarding the affected public transport facilities and routing.</p> <p>Negotiate with business owners and social service operations regarding the loss of parking and loading bays.</p> <p>Clear roads signs will be erected for the full length of the construction period.</p> <p>Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.</p> <p>Ensure the City Traffic Police will be available on site.</p> <p>Communicate road closure together with the proposed detour via advertising, pamphlets, radio broadcasts, road signage, etc. The implementation of the road detour is also dependent on advance road signage indicating the road detour and alternative routes.</p> <p>Define clearly construction routes.</p> <p>Strictly control access of all construction and material delivery vehicles.</p> <p>Enforce speed limits.</p> <p>Do not allow deliveries during peak traffic hours</p>				
Health and	Construction related activities	Implement good housekeeping	High	Site and	Short-	Partial

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
Safety	<p>may lead to injuries.</p> <p>Open fires in construction camp can result in accidents</p> <p>Safety of workers and general public may be compromised due to difficult site conditions.</p> <p>Poor waste management practices and unhygienic conditions at temporary ablution facilities can breed diseases.</p> <p>Standing water due to inadequate storm water drainage systems, inadequate waste management practices, pose a health hazard to providing breeding grounds for disease vectors such as mosquitoes, flies and snails.</p>	<p>practices at the construction camp.</p> <p>Strictly implement health and safety measures and audit on a regular basis.</p> <p>Secure enclosed construction site.</p> <p>Use reputable contractors.</p> <p>Provide warning signs of hazardous working areas.</p> <p>Clearly demarcate excavations and provide barriers (not just danger tape) to protect pedestrians from open trenches.</p> <p>Thoroughly train workers assigned to dangerous equipment.</p> <p>Workers have the right to refuse work in unsafe conditions.</p> <p>Control speed and movement of construction vehicles</p> <p>Exclude public from the site</p> <p>Ensure all workers are provided with and use Personal Protective Equipment.</p> <p>Ensure the visibility of workers through their use of high visibility vests when working at night</p> <p>Ensure that qualified first-aid can be provided at all times. Ensure equipped first-aid stations are easily accessible throughout the site;</p> <p>Provide medical insurance coverage for workers.</p> <p>Provide clean eating areas where workers are not exposed to hazardous or noxious substances;</p> <p>Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances</p>	(negative)	Local	term	Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
		may be present. Ensure also that visitor/s do not enter hazard areas unescorted; Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate. Health and Safety Plan is attached as Appendix 9				
Noise and Vibrations	Sensitive receptors (hospitals, schools, religious places) may be affected temporarily by increased traffic and related impacts Disturbance from afterhours work.	Locate concrete batching, lay down areas and construction camps away from sensitive receptors. Restrict construction activities to reasonable working hours Keep adjacent landowners informed of unusually noisy activities planned. Regulate roadworthiness of vehicles. Ensure that machinery in a good state of maintenance. Monitor noise levels in potential problem areas.	High (negative)	Local	Short-term	Partial Mitigation Possible
Aesthetics, Landscape Character, and Sense of Place	The presence of heavy duty vehicles and equipment, temporary structures at construction camps, stockpiles, may result in impacts on aesthetics and landscape character	Properly fence off storage areas. Collect all domestic solid waste central point of disposal and feed into the city waste collection system. Contractor to exercise strict care in disposing construction waste. Identify suitable waste disposal site to hold additional waste to be generated by the construction activities.	Medium (negative)	Local	Short-term	Partial Mitigation Definite

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
		Remove unwanted material and litter on a frequent basis. Reinstate pathways and other local infrastructure immediately to at least their pre-project condition upon completion of construction.				
Workers Conduct	Construction workers on site disrupting adjacent land uses by creating noise, generating litter, and possible loitering.	Ensure strict control of laborers Minimize working hours to normal working times Control littering Ensure no overnight accommodation is provided.	Low (negative)	Local	Short-term	Full Mitigation Definite
Employment Generation	The subproject will provide employment opportunities for local people during construction. Expectations regarding new employment will be high especially among the unemployed individuals in the area. Labor gathering at the site for work can be a safety and security issue, and must be avoided. The training of unskilled or previously unemployed persons will add to the skills base of the area.	Employ local (unskilled) labor if possible Training of labor to benefit individuals beyond completion of the subproject. Ensure recruitment of labors will take place offsite. Ensure at least 50% of all labor is from surrounding communities in the contractual documentation.	Medium (positive)	Local	Short-term	Partial Mitigation Possible
Archaeological and Cultural Characteristics	The proposed development will not require demolition of ASI- or state-protected monuments and buildings	Ensure that construction staff members are aware of the likelihood of heritage resources being unearthed and of the scientific importance of such discoveries. Contact ASI or the State Department of Archaeology if any graves be	Low (negative)	Local	Short-term	Full Mitigation Definite

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
		<p>discovered and all activities will be ceased until further notice.</p> <p>Contact ASI or the State Department of Archaeology if any heritage resources or objects, defined in the Act, be discovered and all activities will be ceased until further notice.</p> <p>Cease all activities immediately and do not move any heritage object found without prior consultation with ASI or the State Department of Archaeology</p>				

C. Operation and Maintenance phase

152. The system have a design life of 30 years, during which shall not require major repairs or refurbishments and shall operate with little maintenance beyond routine actions required to keep the pumps and other equipment in working order. No process effluent is to be discharged back to the source (Hoogly River). The stability and integrity of the system will be monitored periodically to detect problems and allow remedial action if required. Repairs will be small-scale involving manual, temporary, and short-term works involving regular checking and recording of performance for signs of deterioration, servicing and replacement of parts.

153. The main requirement for maintenance of the transmission main and distribution system will be for the detection and repair of leaks. The generally flat topography and the usage of good quality pipes shall mean that pipeline breaks are very rare, and that leaks are mainly limited to joints between pipes.

154. **Table 22** presents an indication of what activities and facilities are likely to be undertaken during operation and maintenance of the subproject, including the associated inputs and outputs.

Table 22: Summary of Activities and Facilities, Resource Use, and Produced Outputs during Operation and Maintenance Phase

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
Operation activities Wastewater generation if any Maintenance activities Upkeep and repair of pumps, painting of ESR	Labor Vehicles and equipment used for inspections and maintenance Fuels and lubricants for pumps	Wastewater Spent chemicals and containers Vehicle exhaust emissions

155. The following **Table 23** outlines potential impacts during the operation and maintenance phase gathered from a process that included a review of available documentation, verified during the site visit, i.e. how, where and when the proposed development can interact and affect the environment significantly, and details what mitigation measures may be taken to counteract these impacts.

Table 23: Summary of Anticipated Potential Environmental Impacts During Operation and Maintenance (including defect liability) Phase

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
Air Quality	Sensitive receptors (e.g. hospitals, schools, religious places) may be affected temporarily by increased	Ensure compliance with the Air Act. Ensure compliance with emission standards Regularly service vehicles off-site in order to limit gaseous emissions.	Low (negative)	Local	Short-term	Partial Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
	traffic and related impacts during water storage reservoir maintenance.					
Biodiversity Fauna and Flora	The proposed development is situated within an existing built up locality. No areas of ecological diversity occur within the subproject location. Due to the nature and locality of the subproject, the proposed development is unlikely to have any significant impact on biodiversity within the area during maintenance works	Ensure no accidental damage to local flora and fauna.	Low (negative)	Site	Short-term	Full Mitigation Possible
Land Uses	Due to the location and nature of the subproject, there will be interference with access during maintenance works Existing public transport facilities and operations	Put a sign of “Keep Clear” near critical roads (e.g. in front of fire and police stations, school and hospitals). Consult with local departments, organizations, etc regarding location of construction camps, access and hauling routes, and other likely disturbances. Provide clear and	Low (negative)	Local	Short-term	Partial Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
	will be affected by the road closure and detours. There will be disruptions to health services, education services, local businesses, transport services, pedestrian movements, due to traffic and maintenance-related noise, visual, and air pollution.	realistic information regarding detours and alternative accesses for local communities and businesses in order to prevent unrealistic expectations. Provide walkways and metal sheets where required to maintain access across for people and vehicles. Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools. Consult businesses and institutions regarding operating hours and factoring this in work schedules. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints. Reinstate pathways and other local infrastructure immediately to at least their pre-project condition upon completion of construction.				
Health and Safety	Danger of operations and maintenance-related injuries. Safety of	Implement good housekeeping practices at pumping stations. Strictly implement health and safety measures and audit	Low (negative)	Site and Local	Short-term	Partial Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
	workers and general public must be ensured. Standing water due to inadequate storm water drainage systems, inadequate waste management practices, pose a health hazard to providing breeding grounds for disease vectors such as mosquitoes, flies and snails. Fire and electrocution hazards in the pumping stations.	<p>on a regular basis. Provide warning signs of hazardous working areas. Clearly demarcate excavations and provide barriers (not just danger tape) to protect pedestrians from open trenches. Thoroughly train workers assigned to dangerous equipment. Workers have the right to refuse work in unsafe conditions. Ensure all workers are provided with Personal Protective Equipment. Ensure the visibility of workers through their use of high visibility vests when working at night. Ensure that qualified first-aid can be provided at all times. Ensure equipped first-aid stations are easily accessible throughout the site; Provide medical insurance coverage for workers. Provide clean eating areas where workers are not exposed to hazardous or noxious substances; Ensure moving equipment is outfitted with audible back-up alarms; Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service</p>				

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
		rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate. Health and Safety Plan is attached as Appendix 9				
Noise and Vibrations	Sensitive receptors (hospitals, schools, religious places) may be affected temporarily by increased traffic and related impacts Disturbance from afterhours work.	Restrict maintenance activities to reasonable working hours where near sensitive receptors. Keep adjacent landowners informed of unusually noisy activities planned. Fit and maintain silencers to all machinery on site. Monitor noise levels in potential problem areas.	Low (negative)	Local	Short-term	Partial Mitigation Possible
Workers Conduct	Maintenance workers on site disrupting adjacent land uses by creating noise, generating litter, and possible loitering.	Ensure strict control of laborers Minimize working hours to normal working times Control littering	Low (negative)	Local	Short-term	Full Mitigation Definite

D. Summary of Site Specific Mitigation Measures

156. Site specific mitigation/safeguard measures for below mentioned project sites are summarized as in table (**Table 24**) below. It will be revised again after.

Table 24: Site Specific Mitigation Measures for the water supply project

Work Component	Mitigation measures
Construction of Underground reservoir, pumping station and Elevated water storage reservoir – at Prantik phase III	<ol style="list-style-type: none"> 1. Location within housing complex – safety arrangement (use of caution tape/ barricade) is needed 2. Removal of scrub required. No as such tree felling 3. Excavated earth will be utilized for filling up low laying area 4. Material storage will be planned within designated area without impacting movement of people 5. Camp site with toilet and drinking water facility will be selected at vacant location of housing complex without impacting local residents and movement of vehicles 6. Noise generation from construction activity will be regulated and activity should be planned during day time only
Construction of Underground reservoir, pumping station and Elevated water storage reservoir at KMC land of Julpia road	<ol style="list-style-type: none"> 1. Sufficient road width available for transportation of materials at site 2. Pond near the site will be protected and its present use will not be disturbed. No construction materials will be disposed in pond water. Water of the pond will not be polluted with construction waste water 3. Camp site with toilet and drinking water facility will be selected at vacant location 4. Excavated earth will be utilized locally
Construction of Elevated water storage reservoir – at 22 Bigha, WBSETCL near Joka Tram Depot, at SSE STP North west and North East, Ramkantapur, Malpara, Charaktala	<ol style="list-style-type: none"> 1. There are few residence nearby the ESR 2. Caution tape and barricade will be utilized for public safety 3. Material storage will be planned within designated area without impacting movement of people 4. Camp site with toilet and drinking water facility will be selected at vacant location without impacting local residents and movement of vehicles 5. Noise generation from construction activity will be regulated and activity should be planned during day time only 6. Excavated earth will be utilized locally 7. Road available for accessing the site 8. KMC land nearby SSE STP complex – scrub need to be removed 9. Haul road will be constructed for transportation of materials at SSE STP North west and North East
<ul style="list-style-type: none"> • Laying of Transmission Main from existing Daspara PS to UGRs at Pratik Ph III and KMC land of Julpia road; and Transmission Main from UGRs to 8 ESRs • Transmission Main from UGR at KMC land of Julpia road to 3 ESRs 	<ol style="list-style-type: none"> 1. Residential area nearby the pipe laying location 2. Caution tape and barricade will be utilized for public safety 3. Temporary impact on business/ shop 4. Material storage will be planned within designated area without impacting movement of people 5. Safety arrangement near school 6. Mostly narrow road 7. Traffic diversion and road closure as per requirement 8. Camp site with toilet and drinking water facility will be selected at vacant location without impacting local residents and movement of vehicles 9. Noise generation from construction activity will be regulated and activity should be planned during day time only 10. Excavated earth will be utilized locally or disposed as per spoil management plan 11. Reinstate pathways and other local infrastructure immediately to at least their pre-project condition upon completion of

Work Component	Mitigation measures
	construction.
<ul style="list-style-type: none"> • Laying of distribution system and house connection within the command area of 8 ESRs (6 proposed + 2 existing). • Distribution system and house connection within command area of 3 ESRs 	<ol style="list-style-type: none"> 1. Residential area nearby the pipe laying location 2. Caution tape and barricade will be utilized for public safety 3. Mostly narrow road 4. Traffic diversion and road closure as per requirement 5. Material storage will be planned within designated area without impacting movement of people 6. Safety arrangement near school, religious place 7. Camp site with toilet and drinking water facility will be selected at vacant location without impacting local residents and movement of vehicles 8. Noise generation from construction activity will be regulated and activity should be planned during day time only 9. Excavated earth will be utilized locally or disposed as per spoil management plan 10. Reinstate pathways and other local infrastructure immediately to at least their pre-project condition upon completion of construction.
<ul style="list-style-type: none"> • Dedicated Water Supply Transmission Main from Junction of James Long Sarani to Daspara near existing Pumping Station along James Long Sarani 	<ol style="list-style-type: none"> 1. Entry shafts for the micro-tunnels are to be located at places on the road where there are least encroachment on the ROW and least chances of inconveniences to pedestrians and people living in the neighborhood. 2. A traffic management plan as approved by the DSC and PMU is to be in place before construction work commences 3. Suitable bill boards are to be put up at strategic points on the James Long Sarani giving salient information on the work component, time schedule and name & contact numbers of responsible persons of PMU and Contractor 4. Security fencing is to be provided throughout the construction period around the shafts 5. Excess solid waste is to be disposed at sites pre-approved by PMU 6. Slurry is to be stored in container and needs to be disposed of at sites with due permission 7. Reinstate pathways and other local infrastructure immediately to at least their pre-project condition upon completion of construction.
<ul style="list-style-type: none"> • Water Loss Management under Jay Hind WTP Area (Eastern Kolkata) including rehabilitation, expansion of 100 km Distribution network and connection to around 20000 House holds 	<ol style="list-style-type: none"> 1. Few residential areas nearby 2. Caution tape and barricade will be utilized for public safety 3. Mostly narrow road 4. Traffic diversion and road closure as per requirement 5. Material storage will be planned within designated area without impacting movement of people 6. Excess solid waste is to be disposed at sites pre-approved by PMU 7. Reinstate pathways and other local infrastructure immediately to at least their pre-project condition upon completion of construction.

VI. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Public participation during the preparation of the IEE

157. The public participation process included identifying interested and affected people (stakeholders); informing and providing the stakeholders with sufficient background and

technical information regarding the proposed development; creating opportunities and mechanisms whereby they can participate and raise their viewpoints (issues, comments and concerns) with regard to the proposed development; giving the stakeholders feedback on process findings and recommendations; and ensuring compliance to process requirements with regards to the environmental and related legislation.

158. The primary stakeholders are: (i) local residents, shopkeepers and business people who live and work alongside the roads where pipeline will be laid and facilities will be provided; and (ii) custodians and users of socially- and culturally-important buildings in affected areas.

159. The secondary stakeholders are: (i) KMC as the executing agency; (ii) KEIIP officials as implementation agency; (iii) WBPCB, government department (like Environment department, Government of West Bengal, Forest Directorate, Government of West Bengal, Ministry of Environment, Forests and Climate Change, Government of India) and relevant government agencies (like CPCB, NEERI), including state and local authorities responsible for land acquisition, (iv) non-government organizations, university professors, and community-based organizations (CBOs) working in the affected communities; (v) other community representatives (prominent citizens, religious leaders, elders, women's groups); (vi) beneficiary community in general; and (vii) ADB, the government, and Ministry of Finance.

160. The following methodologies will be used for carrying out public consultation:

- Local communities, Individuals affected, traders and local shopkeepers who may be directly affected to be given priority while conducting public consultation.
- Walk-through informal group consultations along the proposed water supply pipe laying stretch.
- The local communities to be informed through public consultation with briefing on project interventions including its benefits.
- The environmental concerns and suggestions made by the participants to be listed out, discussed and suggestions to be noted for consideration during implementation.

161. There are series of informal discussions by the DSC & PMC engineering Consultants with Chief Engineers of KMC and Director General (Projects), PMU mainly on understanding current situation and optimum design to be adopted in order to attain the objectives of taking up the work items. On environmental issues of KEIIP a meeting at the WBPCB office was held on 1st December 2015 in which Chairman, Member Secretary, Chief Engineer and other engineers of WBPCB were present. The officials of WBPCB were appraised about the proposed work program of Tranche 1 and 2 of KEIIP. **Appendix 10** shows Minutes of the Meeting.

162. Also discussion has been carried out with Chief Engineer West Bengal Pollution Control Board on different safeguard issues on 10.04.2015, 29.06.2015 and 17.08.2015. WBPCB opined that,

- Consent to operate for sub projects under Tranche 1 and 2 should be taken in single composite manner along with other facilities with KMC requiring consent to operate authorization
- Public liability insurance as per MoEFCC notification should be taken for all KMC facilities including tranche 1 and 2 sub projects requiring consent to operate authorization
- Consent to establish (NOC) authorization for relevant subprojects should be taken under orange category in serial titled infrastructure facility development

- WBPCB wanted presentation from KEIIP for the benefit of its engineers and officers covering all sub projects under Tranche 1 and 2 so that the engineers of WBPCB are appraised about details of the work plan of the sub projects in Tranche 1 and 2 of KEIIP.

163. Official community consultation has been carried out at 41 Pally, KMC Ward Office, Ward No. 122 on 16th December 2015, Office of Borough XVI, Ward No. 144 on 19th December 2015 and Prantik Abasan, Phase-III, (Community Hall) Ward No. 143 on 21st December. They informed that present availability of water at the project area is absolutely inadequate. Issues related to consultation and design consideration is shown in Table below and detail of the consultation and participation enclosed as **Appendix 11**.

Table 25: Issues related to consultation and design consideration

Issues raised by the participants	Consideration in design
<ul style="list-style-type: none"> ➤ The commencement of the project work and duration. ➤ Water logging during heavy monsoon is a big challenge for the local people. ➤ Absence of drainage network and Scarcity of drinking water in the project area ➤ Quality of the water that is being supplied at present by PHE (Public Health Engineering Dept) is not up to the mark for drinking (quantity of iron is above than normal range and salinity is also present). ➤ Application of protection measures including safety during construction ➤ Quantity of water supply is inadequate to cater the present demand. ➤ Replacement of poor PVC pipe by new one. ➤ Policy of house connection in case of joint property recorded in Kolkata Municipal Corporation (erstwhile Joka gram panchayet). ➤ Policy regarding connection fees in case of house connection. ➤ Network coverage in remote part of the ward. 	<ul style="list-style-type: none"> ▪ Work will be started very soon, within 6 months ▪ Sewerage and drainage package needs to be considered separately to tackle water logging ▪ Sufficient water will be provided as per demand and completely treated water will be supplied after treatment ▪ New distribution pipelines will be laid under different packages in the KEIIP program ▪ Design is developed with the consideration of 100% coverage and 24 hrs supply ▪ Application of Environment Management Plan during project implementation

B. Future Consultation and Disclosure

164. The public consultation and disclosure program will remain a continuous process throughout the subproject implementation and shall include the following:

1. Consultation during detailed design

165. Focus-group discussions with affected persons and other stakeholders to hear their views and concerns, so that these can be addressed in subproject design wherever necessary. Regular updates on the environmental component of the subproject will kept available at the PMU office of KMC.

166. KMC will conduct information dissemination sessions at major intersections and solicit the help of the local community leaders/prominent citizens to encourage the participation of the people to discuss various environmental issues.

167. The PMU, with assistance of DSC will conduct information dissemination sessions in the subproject area. During EMP implementation PMU and DSC will organize public meetings and will apprise the communities about the progress on the implementation of EMP in the subproject works.

2. Consultation during construction:

168. Public meetings with affected communities (if any) to discuss and plan work programs and allow issues to be raised and addressed once construction has started; and

169. Smaller-scale meetings to discuss and plan construction work with local communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation;

3. Project disclosure

170. A communications strategy is of vital importance in terms of accommodating traffic during road closure. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction.

171. One public information campaigns via newspaper/radio/TV is proposed to explain the subproject details to a wider population. Public disclosure meetings at key project stages will be organized to inform the public of progress and future plans.

172. For the benefit of the community a summary of the IEE will be translated in the local language and made available at the offices of KMC, PMU and DSC. Hard copies of the English version of the IEE will be accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE will be placed in the official website of the KEIIP and the official website of ADB after approval of the IEE by Government and ADB. The PMU will issue Notification on the start date of implementation of the S & D subproject in KEIIP web site ahead of the implementation works.

VII. GRIEVANCE REDRESS MECHANISM

173. Common Grievance Redress Mechanism: A common grievance redress mechanism (GRM) has been established during Project 1 implementation for social, environmental or any other subproject related grievances.

174. Grievance Redress Process. PMU will maintain a Complaint Cell at KEIIP office located in 206 A J C Bose Road Kolkata 700017 headed by a designated Grievance Officer (currently the Administrative Officer) under Project Director. The Complaint Cell will also serve as Public Information Centers, where, apart from grievance registration, information on the Project, subprojects, social and environmental safeguards, etc can be provided.

175. At every Borough of KMC under which works are in progress, a Public Relations & Grievance Redressal Unit is to be established for information disclosure on request from public and for receipt of complaints.

176. At Contractors' site offices, complaint and suggestion books will be available for lodging any complaint. The concerned Executive Engineers of KEIIP will monitor these books and if possible take necessary actions for redressal of minor complaints with intimation to the complainant.

177. The Grievance Registration/Suggestion Form will be available at the Complaints Cell and in Borough Offices and will also be downloadable from the KEIIP/KMC websites. Grievances/ suggestions of affected persons can be dropped in suggestion boxes or conveyed through phone or mail. Affected Persons will also be able to register grievances - social, environmental or other, personally at the Complaint Cell and at Borough offices of KMC. The Grievance Officer and designated official at the Boroughs will be able to correctly interpret/record verbal grievances of non-literate persons and those received over telephone.

178. All complaints (unresolved at local site/Borough level) relating to KEIIP will be sent to the Project Director, KEIIP including those received in the KMC/KEIIP website for redressal. The Grievance Officer will resolve simple unresolved issues and in case of complicated issues, consult/seek the assistance of the Environment/Social Specialist of the DSC/PMU. Grievances not redressed through this process within one month of registration will be brought to the notice of the Project Director, KEIIP. Action taken in respect of all complains will be communicated to the complainant by letter, over phone or e-mail or whatsapp as the case may be.

179. Periodic community meetings with affected communities to understand their concerns and help them through the process of grievance redress (including translation from local dialect/language, recording and registering grievances of non-literate affected persons and explaining the process of grievance redress) will be conducted if required. The above Grievance Redress Process will be discussed with the stakeholders at the proposed disclosure workshop.

180. Grievance Redressal Committee (GRC): A PMU level GRC has already been constituted by the Project Director to address grievances. Grievances not resolved at borough level are referred to PMU level. However grievances that cannot be resolved at PMU level will be referred to an apex grievance redress committee (GRC).¹³ Still unresolved issues will be referred to an appropriate court of law.

181. The time limit for grievance redressal will be as follows,

- Site level – 7 days
- Borough level – 7 days
- GRC – PMU level – 15 days
- Apex GRC- 15 days

182. **Appendix 12** shows office order related to setting up of GRC at PMU level.

¹³ The apex GRC will have the following members: KMC Commissioner as Chairperson, KEIIP Project Director, Director General (P), KEIIP, Environment/Social Safeguard Officer, Administrative Officer as the convener, representatives of APs, Community Based Organizations (CBOs), and eminent citizens. The GRC must have at least two women members.

183. **Consultation Arrangements.** This will include group meetings and discussions with affected persons, to be announced in advance and conducted at the time of day agreed on with affected persons and conducted to address general/common grievances; and if required with the Environment/Social Specialist of PMU/DSC for one-to-one consultations. Non-literate affected persons/ vulnerable affected persons will be assisted to understand the grievance redress process, to register complaints and with follow-up actions at different stages in the process.

184. **Record-keeping.** Records will be kept by PMU/Borough Office/Contractors' site office of all grievances received including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were in effect, and final outcome.

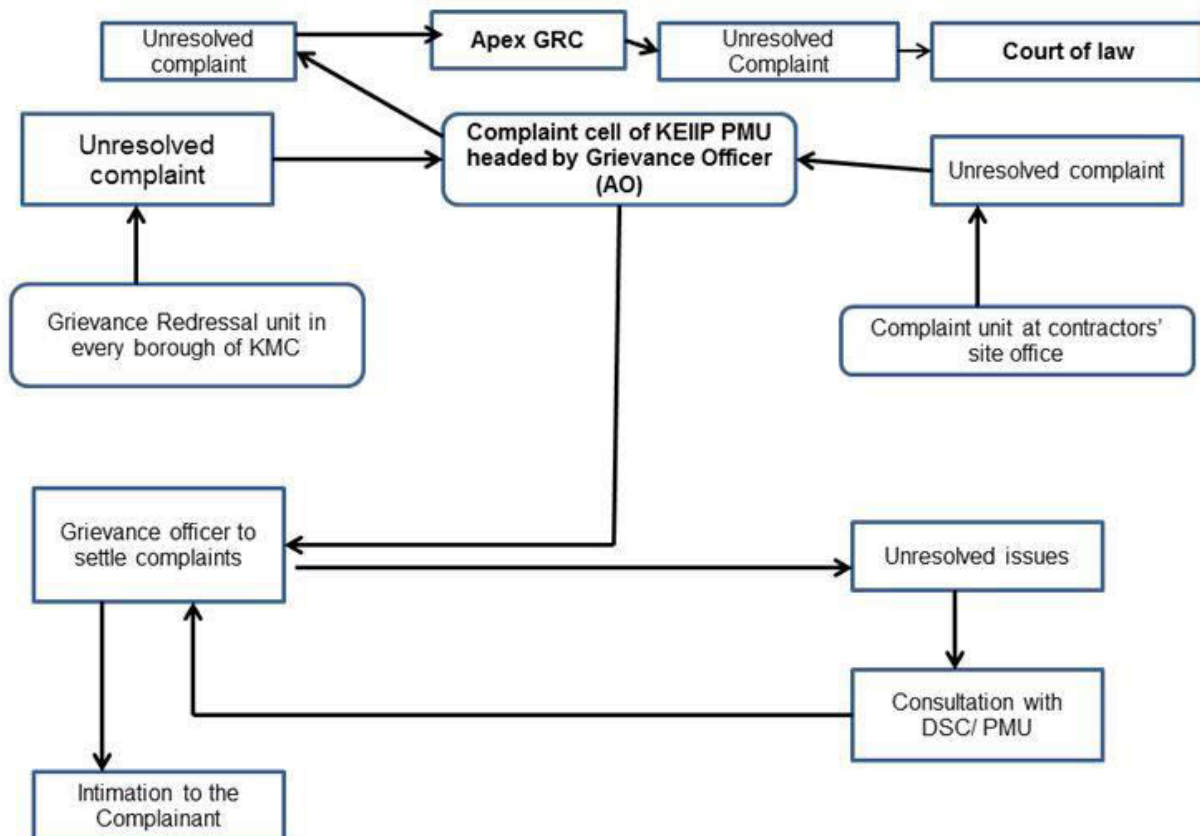
185. **Information Dissemination Methods of the GRM.** Grievances received and responses provided will be documented and reported back to the affected persons. (**Appendix 13** -Sample Grievance Registration Form). The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the offices of the different Boroughs of KMC and web. The phone number where grievances are to be recorded will be prominently displayed at the construction sites.

186. **Periodic Review and Documentation of Lessons Learned.** PMU will periodically review the functioning of the GRM and effectiveness of the mechanism, especially on the Project's ability to prevent and address grievances.

187. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication and reporting / information dissemination) will be borne by PMU.

188. **Figure 10** shows GRM flow chart.

Figure 14: GRM system in KEIIP



VIII. ENVIRONMENTAL MANAGEMENT PLAN

189. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between the PMU, DSC, and the contractors. The EMP identifies activities according to the following three phases of development: (i) Site Establishment and Preliminary Activities (Pre construction Phase); (ii) Construction Phase; and (iii) Post Construction/Operational Phase.

190. The purpose of the EMP is to ensure that the activities are undertaken in a responsible non-detrimental manner with the objectives of: (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensure that safety recommendations are complied with. The contractor will be required to submit to PMU for review and approval site environmental plan (SEP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following **Tables 26 to 30** of the EMP to ensure no significant environmental impacts; (iii) monitoring program as per SEP; and (iv) budget for SEP implementation. No physical works are allowed to commence prior to approval of SEP.

191. A copy of the EMP/ approved SEP must be kept on site during the construction period at all times. The EMP will be made binding on all contractors operating on the site and will be included within the Contractual Clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance. It shall be noted that the Supreme Court of India¹⁴ mandates those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage. (The polluter pays principle).

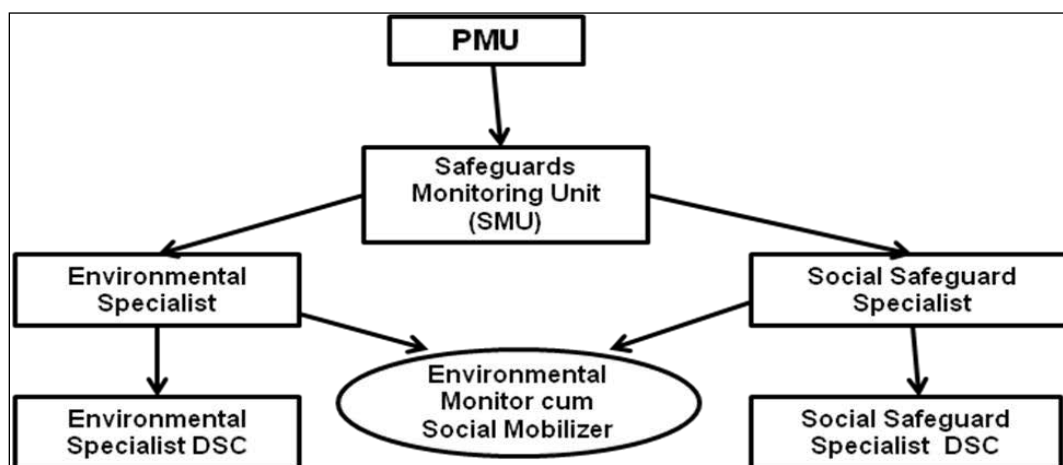
192. The Contractor is deemed not to have complied with the EMP/approved SEP if:
- (i). Within the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention of clauses.
 - (ii). If environmental damage ensues due to negligence.
 - (iii). The contractor fails to comply with corrective or other instructions issued by the PMU/DSC within a specified time.
 - (iv). The Contractor fails to respond adequately to complaints from the public.

A. Institutional Arrangement

193. The institutional arrangement will follow KEIP's organizational structure and functions established in Project 1. The subproject will be implemented and monitored by the Project Management Unit (PMU). The KEIP's PMU Environment Specialist is overall in-charge on Environmental safeguard of the program. The responsibilities of the Environmental Specialist will ensure that (i) environmental safeguard issues are addressed; (ii) EMP/approved SEP is implemented; (iii) physical and non-physical activities under the subproject are monitored; and (iv) monitoring reports are prepared on time and submitted to ADB.

194. PMU- SMU will be supported by the Design and Supervision Consultants (DSC). An Environment Specialist is engaged to ensure: (i) EMP/ approved SEP is implemented; (ii) surveys and measurements are undertaken; (iii) inspections and observations throughout the construction period are recorded to ensure that safeguards and mitigation measures are provided as intended; and (iv) statutory clearances and permits from government agencies/other entities are obtained prior to start of civil works.

¹⁴ Writ Petition No. 657 of 1995. The Supreme Court, in its order dated Feb.4, 2005, that "The Polluter Pays Principle means that absolute liability of harm to the environment extends not only to compensate the victims of pollution, but also to the cost of restoring environmental degradation. Remediation of damaged environment is part of the process of sustainable development."

Figure 15: Institutional Arrangement – Safeguards

Notes: PMU = Project Management Unit; DSC = Design and Supervision Consultants; R & R = Relocation and Rehabilitation

195. **Table 26** gives the institutional roles and responsibilities in all phases of the subproject.

Table 26: Institutional Roles and Responsibilities: Environmental Safeguard

Phase	PMU/ SMU	DSC	ADB
Subproject identification stage		<ul style="list-style-type: none"> DSC to screen subprojects with inputs based on the EARF subproject selection guidelines 	
Subproject appraisal stage	<ul style="list-style-type: none"> PMU to review the REA checklists and draft IEE. PMU to disclose on its website the approved IEE. PMU to ensure disclosure of information throughout the duration of the subproject. 	<ul style="list-style-type: none"> DSC to conduct REA for each subproject using checklists and to prepare IEE 	<ul style="list-style-type: none"> ADB to review the REA checklists and reconfirm the categorization. ADB will review and approve EIA reports (Category A) and IEE reports (Category B) subprojects. ADB to disclose on its website the submitted EIA/IEE report.
Detailed Design Phase	<ul style="list-style-type: none"> SMU of PMU with the assistance of DSC to incorporate the EMP, environmental mitigation and monitoring measures into contract documents. 	<ul style="list-style-type: none"> DSC to revise the IEE and EMP in accordance with detailed design changes if warranted. DSC to ensure incorporation of EMP in bid documents and contracts. DSC to prepare inventory of utilities to be affected by the subproject. DSC to conduct baseline environmental 	<ul style="list-style-type: none"> ADB will review and approve updated EIA reports (Category A) and IEE reports (Category B) subprojects. ADB to disclose on its website updated EIA/IEE report.

Phase	PMU/ SMU	DSC	ADB
		conditions and inventory of affected trees	
Pre-construction Phase	<ul style="list-style-type: none"> • DSC to conduct public consultation and disclosure during IEE process and comments will be reflected in the IEE report. • PMU to monitor the disclosure and public consultation. • PMU and DSC to approve contractor's proposed locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes 	<ul style="list-style-type: none"> • DSC to ensure statutory clearances and permits from government agencies/other entities are obtained prior to start of civil works. • DSC to consult affected people and ensure RP is implemented prior to start of civil works. • DSC to ensure disclosure of information prior to start of civil works and throughout the duration of the construction period. • DSC to approve contractor's site-specific environmental plan (such as traffic management plan, waste management plan, locations for camp sites, storage areas, lay down areas, and other sites/plans specified in the EMP). 	
Construction Phase	<ul style="list-style-type: none"> • SMU will review 6-monthly monitoring and EMP implementation report including the status of Project compliance with statutory clearances and with relevant loan covenants and submit the 6-monthly report to ADB and seek permission to disclose the same in the Project web site. 	<ul style="list-style-type: none"> • DSC to monitor the implementation of mitigation measures by Contractor. • DSC to prepare monthly progress reports including a section on implementation of the mitigation measures (application of EMP and monitoring plan) • DSC (as per EMP) will conduct environmental quality monitoring during construction stage (ambient air and noise, and water quality). • DSC to prepare the 6 monthly (semi-annual) monitoring report on environment by focusing on the progress in implementation of the EMP and issues encountered and measures adopted, follow-up actions required, if any. 	<p>ADB to review the 6 monthly report, provide necessary advice if needed to the PMU and approve the same.</p> <ul style="list-style-type: none"> • ADB to disclose on its website environmental monitoring reports.
Pre-operation Phase (Commissioning)	PMU to review monitoring report of DSC on post-construction activities by the	<ul style="list-style-type: none"> • DSC to monitor post-construction activities by the contractors as 	

Phase	PMU/ SMU	DSC	ADB
and Defect Liability Period)	contractors as specified in the EMP	specified in the EMP.	
Operation Phase	<ul style="list-style-type: none"> • KMC to conduct monitoring, as specified in the environmental monitoring plan. • WBPCB to monitor the compliance of the standards regarding drinking water quality, ground water, ambient air, effluent quality from treatment plant, as applicable. 		

Notes: WBPCB = West Bengal State Pollution Control Board, KMC = Kolkata Municipal Corporation, CTE = Consent to Establish, CTO = Consent to Operate, DSC = Design and Supervision Consultant, EIA = Environmental Impact Assessment, EMP = Environmental Management Plan, IEE = Initial Environmental Examination, PMU = Project Management Unit; REA = Rapid Environmental Assessment, SMU= Safeguard Monitoring Unit.

196. The Safeguards Monitoring Unit will:

- (i) prepare the REA checklist, to draft the EIA/IEE and to disclose the approved EIA/IEE in the website
- (ii) ensure that Environmental Clearance (EC), Consent to Establishment and Consent to Operate and other certificates, as required, are obtained in time from appropriate authorities and to ensure compliances with conditions imposed.
- (iii) ensure incorporation of the EMP, environmental mitigation and monitoring measures into the contract documents
- (iv) monitor disclosure and public consultation arranged by DSC during IEE process and to ensure that comments are reflected in the IEE report
- (v) ensure disclosure of information throughout the duration of the subproject through suitable visual means and publications
- (vi) provide necessary input for grievance redress
- (vii) approve contractor's proposed locations for construction work camps, storage areas, hauling roads, lay-down areas, and disposal areas for solid and hazardous wastes on recommendations of DSC
- (viii) guide the Contractor for drawing up of Site Environmental Management Plan and to approve the same
- (ix) induct the Contractor for taking up the construction following environmental and social safeguards
- (x) facilitate scheduled monitoring during implementation of the project.
- (xi) carry out regular onsite monitoring and guide the Contractor to adopt the required site management standard.
- (xii) ensure the required health and safety measures at work sites
- (xiii) obtain in time and to review the monthly monitoring report of the Contractors
- (xiv) prepare 6-monthly monitoring and EMP implementation report, including the status of project compliance, statutory clearances and relevant loan covenants, and submit the approved 6-monthly report to ADB and seek permission to disclose the same in the investment program website
- (xv) prepare monitoring report on post-construction activities by the contractors as specified in the EMP

197. The Contractor will be required to:

- (i). Submit Site environmental plan (SEP) covering proposed sites / locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes
- (ii). Comply with all applicable legislation, is conversant with the requirements of the EMP/ approved SEP;
- (iii). Brief his staff, employees, and laborer about the requirements of the EMP/ approved SEP;
- (iv). Ensure any sub-contractors/ suppliers who are utilized within the context of the contract comply with the environmental requirements of the EMP/ approved SEP. The Contractor will be held responsible for non-compliance on their behalf;
- (v). Supply method statements for all activities requiring special attention as specified and/or requested by the DSC Environment Specialist during the duration of the Contract;
- (vi). Provide environmental awareness training to staff, employees, and laborers;
- (vii). Bear the costs of any damages/compensation resulting from non-adherence to the EMP/ approved SEP or written site instructions;
- (viii). Conduct all activities in a manner that minimizes disturbance to directly affected residents and the public in general, and foreseeable impacts on the environment.
- (ix). Ensure that the PMU Environment Specialist is timely informed of any foreseeable activities that will require input from the DSC Environment Specialist.

B. Environmental Management and Mitigation Measures

198. **Table 27** outlines the site establishment and preliminary activities.

Table 27: Site Establishment and Preliminary Activities (to be revised by contractors during preparation of SEP)

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
1.	Legislation, Permits and Agreements	In all instances, KMC, service providers, contractors and consultants must remain in compliance with relevant local and national legislation.	PMU and DSC	Prior to moving onto site and during construction
		DSC to obtain statutory clearances and permits from government agencies/other entities	PMU	Prior to start of civil works
		Contractor to submit proof of compliance to Air Act (in relation to hot mixing, stone crushers, diesel generators)	DSC Environment Specialist	Prior to moving onto site and during construction
		A copy of the EMP/approved SEP must be kept on site during the construction period	PMU Environment Specialist and DSC Environment Specialist	At all times
2.	Access to Site	Access to site will be via existing roads. The Contractor will need to ascertain the existing condition of the roads and repair damage shall not occur due to construction. For accessing reservoir sites within SSE STP haul road to be constructed	DSC Environment Specialist	Prior to moving onto site and during construction
		The Local Traffic Department shall be	DSC Environment	Prior to moving

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		involved in the planning stages of the road closure and detour and available on site in the monitoring of traffic in the early stages of the operations during road closure	Specialist	onto site
		The Local Traffic Department must be informed at least a week in advance if the traffic in the area will be affected.	DSC Environment Specialist	Prior to moving onto site
		The location of all affected services and servitudes must be identified and confirmed.	DSC Environment Specialist	Prior to moving onto site
		All roads for construction access must be planned and approved ahead of construction activities. They shall not be created on an ad-hoc basis.	PMU Environment Specialist and DSC Environment Specialist	Prior to moving onto site and during construction.
		No trees/shrubs/groundcover may be removed or vegetation stripped without the prior permission.	PMU Environment Specialist and DSC Environment Specialist	Before and during construction.
		Contractors shall construct formal drainage on all temporary haulage roads in the form of side drains and miter drains to prevent erosion and point source discharge of run-off.	DSC Environment Specialist	Prior to moving onto site.
3.	Setting up of Construction Camp ¹⁵	Choice of site for the contractor's camp requires the DSC Environment Specialist's permission and must take into account location of local residents, businesses and existing land uses, including flood zones and slip / unstable zones. A site plan must be submitted to the DSC Environment Specialist for approval.	DSC Environment Specialist and PMU Environment Specialist	During surveys and preliminary investigations and prior to moving onto the site
		If the Contractor chooses to locate the camp site on private land, he must get prior permission from both the DSC Environment Specialist and the landowner.	PMU Environment Specialist and DSC Environment Specialist	During site establishment and ongoing – weekly inspections
		In most cases, on-site accommodation will not be required. The construction camp can thus be comprised of: <ul style="list-style-type: none"> • site office • toilet facilities • designated first aid area • eating areas • staff lockers and showers (where water and waterborne sewers are available) • storage areas • batching plant (if required) 	DSC Environment Specialist	During set-up

¹⁵ Careful planning of the construction camp can ensure that time and costs associated with environmental management and rehabilitation are reduced.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		<ul style="list-style-type: none"> re-fuelling areas (if required) maintenance areas (if required) crushers (if required) 		
		Cut and fill must be avoided where possible during the set up of the construction camp.	DSC Environment Specialist	During site set-up
		The contractor shall make adequate provision for temporary toilets for the use of their employees during the construction phase. Such facilities, which shall comply with local authority regulations, shall be maintained in a clean and hygienic condition. Their use shall be strictly enforced.	DSC Environment Specialist	During site establishment and ongoing – weekly inspections
		Under no circumstances may open areas or the surrounding bush be used as a toilet facility.	DSC Environment Specialist	Ongoing
		Bins and/or skips shall be provided at convenient intervals for disposal of waste within the construction camp.	DSC Environment Specialist	During site set-up and ongoing
		Bins shall have liner bags for efficient control and safe disposal of waste	DSC Environment Specialist	Ongoing
		Recycling and the provision of separate waste receptacles for different types of waste shall be encouraged.	DSC Environment Specialist	During site set-up and ongoing
4.	Establishing Equipment Lay-down and Storage Area ¹⁶	Choice of location for equipment lay-down and storage areas must take into account prevailing winds, distances to adjacent land uses, general on – site topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary	PMU Environment Specialist and DSC Environment Specialist	During site set-up
		Storage areas shall be secure so as to minimize the risk of crime. They shall also be safe from access by children	DSC Environment Specialist	During site set-up
		It is very important that the proximity of resident is taken into account when deciding on storage areas for hazardous substances or materials. Residents living adjacent to the construction site must be notified of the existence of the hazardous storage are	PMU Environment Specialist and DSC Environment Specialist	During site set-up
		Equipment lay-down and storage areas must be designated, demarcated and fenced if necessary.	DSC Environment Specialist	During site set-up
		Fire prevention facilities must be present at all storage facilities	DSC Environment Specialist	During site set-up
		Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must	DSC Environment Specialist	During site set-up and ongoing

¹⁶ Storage areas can be hazardous, unsightly and can cause environmental pollution if not designed and managed carefully

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s). These pollution prevention measures for storage shall include a bund wall high enough to contain at least 110% of any stored volume. The contractor shall submit a method statement for approval		
		These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources	DSC Environment Specialist	During site set-up and ongoing
		Fuel tanks must meet relevant specifications and be elevated so that leaks may be easily detected.	DSC Environment Specialist	During site setup and monitored
		Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances to be used on site.	DSC Environment Specialist and Contractor	Ongoing
		Staff dealing with these materials/substances must be aware of their potential impacts and follow the appropriate safety measures.	DSC Environment Specialist and Contractor	Ongoing
		Contractors shall submit a method statement and plans for the storage of hazardous materials and emergency procedures.	DSC Environment Specialist	Prior to establishment of storage area
5.	Materials Management – Sourcing ¹⁷	Contractors shall prepare a source statement indicating the sources of all materials (including sands, natural gravels, crushed stone, asphalt, clay liners etc), and submit these to the DSC Environment Specialist for approval prior to commencement of any work.	PMU Environment Specialist and DSC Environment Specialist	On award of contract
		Where possible, a signed document from the supplier of natural materials shall be obtained confirming that they have been obtained in a sustainable manner and in compliance with relevant legislation	PMU Environment Specialist and DSC Environment Specialist	On receipt of natural materials
		Where materials are borrowed (mined), proof must be provided of authorization to utilize these materials from the landowner/material rights owner and the Department of Minerals	DSC Environment Specialist	On receipt of borrowed (mined) materials
6.	Education of site staff on general and	Ensure that all site personnel have a basic level of environmental awareness training	PMU Environment Specialist, DSC Environment	During staff induction and ongoing

¹⁷ Materials must be sourced in a legal and sustainable way to prevent offsite environmental degradation.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
	Environmental Conduct ¹⁸		Specialist and Contractor	
		Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitized to any potential hazards associated with their task	DSC Environment Specialist and Contractor	During staff induction, followed by ongoing monitoring
		No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by DSC	DSC Environment Specialist and Contractor	During staff induction, followed by ongoing monitoring
		All employees must undergo safety training and wear the necessary protective clothing	DSC Environment Specialist and Contractor	During staff induction, followed by ongoing monitoring
		<p>A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules:</p> <ul style="list-style-type: none"> • No alcohol / drugs to be present on site; • Prevent excessive noise • Construction staff are to make use of the facilities provided for them, as opposed to ad-hoc alternatives (e.g. fires for cooking, the use of surrounding bus as a toilet facility are forbidden) • No fires to be permitted on site • Trespassing on private / commercial properties adjoining the site is forbidden • Other than pre-approved security staff, no workers shall be permitted to live on the construction site • No worker may be forced to do work that is potentially dangerous or for what he / she is not trained to do 	DSC Environment Specialist and Contractor	During staff induction, followed by ongoing monitoring
6.	Social Impacts ¹⁹	Open liaison channels shall be established between the site owner, the developer, operator, the contractors and interested and affected people such that any queries, complaints or suggestions can be dealt with quickly and by the appropriate person(s).	PMU Environment Coordinator and DSC Environment Specialist	Prior to moving onto site and ongoing
		A communications strategy is of vital	PMU Environment	Prior to moving

¹⁸ These points need to be made clear to all staff on site before the subproject begin.

¹⁹ It is important to take notice of the needs and wishes of those living or working adjacent to the site. Failure to do so can cause disruption to work.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		importance in terms of accommodating traffic during road closure. The road closure together with the proposed detour needs to be communicated via advertising, pamphlets, radio broadcasts, road signage, etc	Coordinator	onto site and ongoing
		Advance road signage indicating the road detour and alternative routes. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	PMU Environment Specialist	Prior to moving onto site and ongoing
		Storage facilities, elevated tanks and other temporary structures on site shall be located such that they have as little visual impact on local residents as possible.	DSC Environment Specialist and PMU Environment Specialist	During surveys and preliminary investigations and site set-up.
		In areas where the visual environment is particularly important or privacy concerns for surrounding buildings exist, the site may require screening. This could be in the form of shade cloth, temporary walls, or other suitable materials prior to the beginning of construction.	DSC Environment Specialist and PMU Environment Specialist	During surveys and preliminary investigations and site set-up.
7.	Noise Impacts	Construction vehicles/ equipments are to be fitted with standard silencers prior to the beginning of construction	DSC Environment Specialist and PMU Environment Specialist	During site set-up
		Equipment that is fitted with noise reduction facilities (e.g. side flaps, silencers, etc) will be used as per operating instructions and maintained properly during site operations	DSC Environment Specialist and PMU Environment Specialist	During site set-up
8.	Dust/Air Pollution ²⁰	Vehicles travelling along the access roads must adhere to speed limits to avoid creating excessive dust.	PMU Environment Specialist	Ongoing.
		Camp construction / haulage road construction – areas that have been stripped of vegetation must be dampened periodically to avoid excessive dust.	PMU Environment Specialist	Ongoing – more frequently during dry and windy conditions
		The Contractor must make alternative arrangements (other than fires) for cooking and / or heating requirements. LPG gas cookers may be used provided that all safety regulations are followed.	DSC Environment Specialist	Ongoing.
9.	Soil Erosion	The time that stripped areas are left open to exposure shall be minimized wherever possible. Care shall be taken to ensure that lead times are not excessive.	DSC Environment Specialist and PMU Environment Specialist	Throughout the duration of the subproject.
		Wind screening and storm water control shall be undertaken to prevent soil loss	DSC Environment Specialist and PMU	During site set-up

²⁰ Establishment of the camp site, and related temporary works can reduce air quality.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		from the site.	Environment Specialist	
10.	Storm water ²¹	To prevent storm water damage, the increase in storm water run-off resulting from construction activities must be estimated and the drainage system assessed accordingly. A drainage plan must be submitted to the DSC Environment Specialist for approval and must include the location and design criteria of any temporary stream crossings (siting and return period etc).	DSC Environment Specialist	During surveys and preliminary Investigations.
		During site establishment, storm water culverts and drains are to be located and covered with metal grids to prevent blockages if deemed necessary by the DSC Environment Specialist. (e.g. due to demolition work).	DSC Environment Specialist	During site setup.
		Temporary cut off drains and berms may be required to capture storm water and promote infiltration.	PMU Environment Specialist	During site setup.
11.	Water Quality ²² .	Storage areas that contain hazardous substances must be bunded with an approved impermeable liner	DSC Environment Specialist	During site setup.
		Spills in bunded areas must be cleaned up, removed and disposed of safely from the bunded area as soon after detection as possible to minimise pollution risk and reduced bunding capacity.	DSC Environment Specialist and PMU Environment Specialist	During site setup.
		Provision shall be made during set up for all polluted runoff to be treated to the DSC Environment Specialist's approval before being discharged into the storm water system. (This will be required for the duration of the project.)	DSC Environment Specialist and PMU Environment Specialist	During site setup and to be monitored weekly
12.	Conservation of the Natural Environment ²³	No vegetation will be cleared without prior permission from the DSC Environment Specialist.	DSC Environment Specialist and PMU Environment Specialist	During site setup and ongoing.
		Trees that are not to be cleared shall be marked beforehand with danger tape. The PMU Environment Specialist must be given a chance to mark vegetation that is to be conserved before the Contractor begins clearing the site	DSC Environment Specialist and PMU Environment Specialist	During site set-up
		Care must be taken to avoid the introduction of alien plant species to the	PMU Environment Specialist	Ongoing in camp Site, haulage

²¹ Serious financial and environmental impacts can be caused by unmanaged stormwater.

²² Incorrect disposal of substances and materials and polluted run-off can have serious negative effects on groundwater quality

²³ Alien plant encroachment is particularly damaging to natural habitats and is often associated with disturbance to the soil during construction activities. Care must be taken to conserve existing plant and animal life on and surrounding the site.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		site and surrounding areas. (Particular attention must be paid to imported material)		Areas
13.	Set-up of Waste Management Procedure	The excavation and use of rubbish pits on site is forbidden	PMU Environment Specialist	Ongoing
		Burning of waste is forbidden.	PMU Environment Specialist	Ongoing
14.	Cultural Environment	Prior to the commencement of construction, all staff need to know what possible archaeological or historical objects of value may look like, and to notify the DSC Environment Specialist/Contractor shall such an item be uncovered.	PMU Environment Specialist	During site set-up and ongoing.
15.	Security and Safety	Lighting on site is to be set out to provide maximum security and to enable easier policing of the site, without creating a visual nuisance to local residents or businesses.	DSC Environment Specialist	During site set-up
		Material stockpiles or stacks must be stable and well secured to avoid collapse and possible injury to site workers / local residents.	PMU Environment Specialist	Ongoing
		Flammable materials shall be stored as far as possible from adjacent residents / businesses.	PMU Environment Specialist	Ongoing
		All interested and affected persons shall be notified in advance of any known potential risks associated with the construction site and the activities on it. Examples are: <ul style="list-style-type: none"> • stringing of power lines • excavation • earthworks/earthmoving machinery on beside houses/infrastructure/sensitive receptors • risk to residences/sensitive receptors along haulage roads / access routes 	PMU Environment Specialist and DSC Environment	24 hours prior to activity in question

199. **Table 28** outlines management of construction activities and workforce.

Table 28: Management of Construction and Workforce Activities (to be revised by contractors during preparation of SEP)

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
1.	Access to Site	Contractor shall ensure that all side and miter drains and scour check walls on access and haul roads are functioning properly and are well maintained.	DSC Environment Specialist	Weekly and after heavy rains.
		Contractor shall ensure that access roads	DSC Environment	Weekly inspection.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		are maintained in good condition by attending to potholes, corrugations and storm water damage as soon as these develop.	Specialist	
		If necessary, contractor to employ a staff to clean surface roads adjacent to construction sites where materials have been spilt.	DSC Environment Specialist	When necessary
		Contractor to avoid unnecessary compaction of soils by heavy vehicles.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to restrict construction vehicles to demarcated access, haulage routes and turning areas.	DSC Environment Specialist	Ongoing monitoring.
2.	Maintenance of Construction Camp	Contractor to monitor and manage drainage of the camp site to avoid standing water and soil erosion.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure run-off from the camp site must not discharge into neighbors' properties.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to maintain toilets in a clean state and shall be moved to ensure that they adequately service the work areas	DSC Environment Specialist	Weekly inspection
		Contractor to ensure that open areas or the surrounding bush are not being used as a toilet facility.	DSC Environment Specialist	Weekly inspection
		Contractor to ensure all litter is collected from the work and camp areas daily.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to empty bins and/or skips regularly, dispose wastes at the pre-approved sites, keep all disposal waybills for review.	DSC Environment Specialist	Weekly inspection
		Contractor to ensure eating areas are regularly serviced and cleaned to the highest possible standards of hygiene and cleanliness.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure that his camp and working areas are kept clean and tidy at all times.	DSC Environment Specialist	Weekly monitoring
3.	Staff Conduct	Contractor to monitor performance of construction workers, ensure points relayed during their induction have been properly understood and are being followed. If necessary, the DSC Environment Specialist and/or a translator shall be called to the site to further explain aspects of environmental or social behavior that are unclear.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure rules that are explained in the worker conduct section, ²⁴ must be followed at all times	DSC Environment Specialist	Ongoing monitoring.

²⁴ (i) no alcohol / drugs to be present on site; (ii) prevent excessive noise; (iii) construction staff are to make use of the facilities provided for them, as opposed to ad-hoc alternatives (e.g. fires for cooking, the use of surrounding bus as a toilet facility are forbidden); (iv) no fires to be permitted on site; (v) trespassing on private / commercial properties adjoining the site is forbidden; (vi) other than pre-approved security staff, no workers shall be permitted to live on the construction site; (vii) no worker may be forced to do work that is potentially dangerous or for what he / she is not trained to do.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
4.	Dust and Air Pollution ²⁵	Contractor to ensure vehicles travelling to and from the construction site adhere to speed limits so as to avoid producing excessive dust.	DSC Environment Specialist	Ongoing monitoring.
		A speed limit of 30km/hr must be adhered to on all dirt roads.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to dampen access and other cleared surfaces whenever possible and especially in dry and windy conditions to avoid excessive dust.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to keep vehicles and machinery in good working order and meet manufacturers specifications for safety, fuel consumption etc.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to check and repair equipment as soon as possible if excessive emissions are observed.	DSC Environment Specialist	As directed by the DSC Environment Specialist.
		No fires are allowed on site except for the burning of firebreaks.	DSC Environment Specialist	Ongoing monitoring.
		Undertake monitoring of air pollution levels in potential problem areas	DSC Environment Specialist	Ongoing monitoring.
		Cover stockpiles of soil or apply suitable dust palliative such as water or commercial dust suppressants.	DSC Environment Specialist	Ongoing monitoring.
5.	Soil Erosion	Once an area has been cleared of vegetation, the top layer (nominally 150mm) of soil shall be removed and contractor to stockpile in the designated area.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure storm water control and wind screening to prevent soil loss from the site.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to dispose unusable soils and spoils to pre-approved disposal sites. Volume will be estimated during detail design	DSC Environment Specialist	Ongoing monitoring.
6	Noise & vibration	Locate concrete batching, lay down areas and construction camps away from residential houses.	DSC Environment Specialist	Ongoing monitoring.
		Restrict construction activities to reasonable working hours	DSC Environment Specialist	Ongoing monitoring.
		Keep adjacent landowners informed of unusually noisy activities planned	DSC Environment Specialist	Ongoing monitoring.
		Regulate roadworthiness of vehicles.	DSC Environment Specialist	Ongoing monitoring.
		Ensure that machinery in a good state of maintenance.	DSC Environment Specialist	Ongoing monitoring.
		Monitor noise levels in potential problem areas.	DSC Environment Specialist	Ongoing monitoring.
7	Storm water drainage and hydrology	Contractor to dispose earth, stones, and rubbles and prevent obstruction of natural water pathway, i.e.: these materials must not	PMU Environment Specialist and DSC Environment	Monitoring throughout the duration of the

²⁵ Main causes of air pollution during construction are dust from vehicle movements and stockpiles, vehicle emissions and fires.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		be placed in storm water channels, drainage lines or ponds	Specialist	subproject.
		The site surface has been engineered and shaped in such a way that rapid and efficient evacuation of runoff is achieved	DSC Environment Specialist	Ongoing monitoring.
		Provide containment areas for potential pollutants at construction camps, refueling, depots and concrete batching plants.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to check periodically sites' drainage system to ensure that the water flow is unobstructed.	DSC Environment Specialist	Monthly inspection.
		Contractor to control un-channeled flows. Where large areas of soil are left exposed, rows of straw/ hay or bundles of cut vegetation shall be dug into the soil in contours to slow surface wash and capture eroded soil.	DSC Environment Specialist	As surfaces become exposed.
		Control and manage transport, storage, handling and disposal of hazardous substances.	DSC Environment Specialist	Ongoing monitoring.
8	Water Quality ²⁶	Contractor to ensure mixing/decanting of all chemicals and hazardous substances take place either on a tray or on an impermeable surface and dispose waste from these to pre-approved disposal sites.	DSC Environment Specialist	Regular monitoring (refer to the environmental monitoring program)
		Contractor to ensure every effort is made that any chemicals or hazardous substances do not contaminate the soil	DSC Environment Specialist	Regular monitoring (refer to the environmental monitoring program)
		Contractor to prohibit site staff in using any stream, other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any construction or related activities. Municipal water (or another source approved by the DSC Environment Specialist) shall instead be used for all activities such as washing of equipment or disposal of any type of waste, dust suppression, concrete mixing, compacting etc.	DSC Environment Specialist	Regular monitoring (refer to the environmental monitoring program)
		Contractor shall refer to emergency contact numbers of WBPCB in order to deal with spillages and contamination of aquatic environments.	PMU Environment Specialist and DSC Environment Specialist	As necessary
9	Conservation of Natural Environment	Contractor is to check vegetation clearing and tree-felling have prior permission as the work front progresses.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure only trees that have	DSC Environment	Ongoing monitoring.

²⁶ Water quality is affected by the incorrect handling of substances and materials. Soil erosion and sediment is also detrimental to water quality. Mismanagement of polluted run-off from vehicle and plant washing and wind dispersal of dry materials into rivers and watercourses are detrimental to water quality.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		been marked beforehand are to be removed.	Specialist	
		Contractor to prohibit site staff from gathering firewood, fruits, plants, crops or any other natural material on-site or in areas adjacent to the sites.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to immediately re-vegetate stripped areas and remove aliens species by weeding. This significantly reduces the amount of time and money that must be spent on alien plant management during rehabilitation.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure, where possible, cleared indigenous vegetation is kept in a nursery for use at a later stage (such as site rehabilitation process).	DSC Environment Specialist	As the work front progresses.
10.	Materials Management	Contractor to ensure stockpiles do not obstruct natural water pathways.	DSC Environment Specialist.	As necessary.
		Contractor to ensure stockpiles do not exceed 2m in height unless otherwise permitted by the DSC Environment Specialist.	DSC Environment Specialist	As necessary.
		Contractor to cover stockpiles exposed to windy conditions or heavy rain with vegetation, cloth, or tarps.	DSC Environment Specialist	As necessary.
		Contractor to ensure stockpiles are kept clear of weeds and alien vegetation growth by regular weeding	DSC Environment Specialist	Monthly monitoring
		Contractor to ensure all concrete mixing take place on a designated, impermeable surface.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure vehicles transporting concrete to the site are not washed on-site.	Contractor	Ongoing monitoring.
		Contractor to prohibit mixing of lime and other powders during excessively windy conditions.	DSC Environment Specialist	As necessary
		Contractor to store all substances required for vehicle maintenance and repair in sealed containers until they can be disposed of/removed from the sites.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure hazardous substances/materials are transported in sealed containers or bags	DSC Environment Specialist	Ongoing monitoring
11	Land uses	KMC has consulted with various organizations, departments, etc within the area and will be continued during the construction phase.	DSC Environment Specialist	Ongoing monitoring.
		Consult with local departments, organizations, etc regarding location of construction camps, access and hauling routes, and other likely disturbances during construction.	DSC Environment Specialist	Ongoing monitoring.
		Make use of local labor, materials, goods and services as far as possible	DSC Environment Specialist	Ongoing monitoring.
		Provide sign boards for locality nearby to	DSC Environment	Ongoing monitoring.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		inform nature and duration of construction works and contact numbers for concerns/complaints.	Specialist	
		Contractor to reinstate pathways and other local infrastructure immediately to at least their pre-project condition upon completion of construction.	DSC Environment Specialist	Ongoing monitoring.
12	Waste Management	Contractor to place refuse in designated skips/bins, rubbles in demarcated areas, remove from the site, and transport to the pre-approved disposal sites.	DSC Environment Specialist	Checked at each site meeting.
		Contractor to prohibit littering on-site and clear the site of litter at the end of each working day.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to encourage recycling by providing separate receptacles for different types of waste and make sure that staffs are aware of their uses.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to clean toilets regularly; and avoid contamination of soils, water, pollution and nuisance to adjoining areas.	DSC Environment Specialist	Weekly monitoring.
13	Health & safety	<ul style="list-style-type: none"> • Implement good housekeeping practices at the construction camp. • Strictly implement health and safety measures and audit on a regular basis. • Secure enclosed construction site. • Use reputable contractors. • Provide warning signs of hazardous working areas. • Clearly demarcate excavations and provide barriers (not just danger tape) to protect pedestrians from open trenches. • Thoroughly train workers assigned to dangerous equipment. • Workers have the right to refuse work in unsafe conditions. • Control speed and movement of construction vehicles • Exclude public from the site • Ensure all workers are provided with and use Personal Protective Equipment. • Ensure the visibility of workers through their use of high visibility vests when working at night • Ensure that qualified first-aid can be provided at all times. Ensure equipped first-aid stations are easily accessible throughout the site; • Provide medical insurance coverage for workers. • Provide clean eating areas where workers are not exposed to hazardous or noxious substances; 	DSC Environment Specialist	Weekly monitoring.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		<ul style="list-style-type: none"> Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate. Health and Safety Plan is attached as Appendix 9 		
14.	Social Impacts ²⁷	Contractor to restrict activities and movement of staff to designated construction areas.	DSC Environment Specialist	Ongoing.
		Contractor to assist in locating DSC Environment Specialist and/or PMU Environment Specialist in the event a construction staff is approached by members of the public or other stakeholders.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure conduct of construction staff, when dealing with the public or other stakeholders, shall be in a manner that is polite and courteous at all times. Failure to adhere to this requirement may result in the removal of staff from the site.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure disruption of access for local residents is minimized and approved by the DSC Environment Specialist.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to provide walkways and metal sheets where required to maintain access across for people and vehicles.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to consult businesses and institutions regarding operating hours and factoring this in work schedules.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	DSC Environment Specialist	At least 1 week prior to the activity taking place.
		Contractors to ensure lighting on the construction site is be pointed downwards and away from oncoming traffic and nearby	DSC Environment Specialist	Ongoing monitoring.

²⁷ Regular communication between the Contractor and the interested and affected parties is important for the duration of the contract.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		houses.		
		Contractor to ensure machinery and vehicles are in good working order to minimize noise nuisance.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to restrict noisy activities to the daytime.	DSC Environment Specialist	Ongoing monitoring.
		A complaints register (refer to the Grievance Redress Mechanism) shall be housed at the site office. This shall be in carbon copy format, with numbered pages. Any missing pages must be accounted for by the Contractor. This register is to be tabled during monthly site meetings.	DSC Environment Specialist	Monthly monitoring.
		Interested and affected people' need to be made aware of the existence of the complaints book and the methods of communication available to them.	PMU Environment Specialist and DSC Environment Specialist	Ongoing monitoring.
		Contractor to initially handle and document queries and complaints; submit these for inclusion in complaints register; bring issues to DSC Environment Specialist's attention immediately; and take remedial action as per DSC Environment Specialist's instruction	PMU Environment Specialist and DSC Environment Specialist	As necessary.
		Contractor to assign staff for formal consultation with the interested and affected people in order to explain and answer questions on the construction process.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to reinstate pathways and other local infrastructure immediately to at least their pre-project condition upon completion of construction.	DSC Environment Specialist	Ongoing monitoring.
15.	Archaeological and Cultural Characteristics	Contractor to note possible items of historical or archaeological value include old stone foundations, tools, clayware, jewellery, remains, fossils etc. If something of this nature be uncovered, contractor to stop work immediately and notify the DSC Environment Specialist which in turn inform the PMU and coordinate with ASI or State Department of Archaeology.	DSC Environment Specialist	As required.

Table 29: Site Specific EMP for Water supply package

Work Component	Mitigation measures
Construction of Underground reservoir, pumping station and Elevated water storage reservoir – at Prantik phase III	<ol style="list-style-type: none"> 1. Location within housing complex – safety arrangement (use of caution tape/ barricade) is needed 2. Removal of scrub required. No as such tree felling 3. Excavated earth will be utilized for filling up low laying area 4. Material storage will be planned within designated area without impacting movement of people 5. Camp site with toilet and drinking water facility will be selected at vacant location of housing complex without impacting local

Work Component	Mitigation measures
	residents and movement of vehicles 6. Noise generation from construction activity will be regulated and activity should be planned during day time only
Construction of Underground reservoir, pumping station and Elevated water storage reservoir – at KMC land of Julpia road	1. Sufficient road width available for transportation of materials at site 2. Pond near the site will be protected and its present use will not be disturbed. No construction materials will be disposed in pond water. Water of the pond will not be polluted with construction waste water 3. Camp site with toilet and drinking water facility will be selected at vacant location 4. Excavated earth will be utilized locally
Construction of Elevated water storage reservoir – at 22 Bigha, WBSETCL near Joka Tram Depot, at SSE STP North west and North East, Ramkantapur, Malpara, Charaktala	1. There are few residence nearby the ESR 2. Caution tape and barricade will be utilized for public safety 3. Material storage will be planned within designated area without impacting movement of people 4. Camp site with toilet and drinking water facility will be selected at vacant location without impacting local residents and movement of vehicles 5. Noise generation from construction activity will be regulated and activity should be planned during day time only 6. Excavated earth will be utilized locally 7. Road available for accessing the site 8. KMC land nearby SSE STP complex – scrub need to be removed 9. Haul road will be constructed for transportation of materials at SSE STP North west and North East
<ul style="list-style-type: none"> • Laying of Transmission Main from existing Daspara PS to UGRs at Pratik Ph III and KMC land of Julpia road; and Transmission Main from UGRs to 8 ESRs • Transmission Main from UGR at KMC land of Julpia road to 3 ESRs 	1. Residential area nearby the pipe laying location 2. Caution tape and barricade will be utilized for public safety 3. Temporary impact on business/ shop 4. Material storage will be planned within designated area without impacting movement of people 5. Safety arrangement near school 6. Mostly narrow road 7. Traffic diversion and road closure as per requirement 8. Camp site with toilet and drinking water facility will be selected at vacant location without impacting local residents and movement of vehicles 9. Noise generation from construction activity will be regulated and activity should be planned during day time only 10. Excavated earth will be utilized locally or disposed as per spoil management plan 11. Pathways and other local infrastructure to be reinstated immediately to at least their pre-project condition upon completion of construction.
<ul style="list-style-type: none"> • Laying of distribution system and house connection within the command area of 8 ESRs (6 proposed + 2 existing). • Distribution system and house connection within command area 	1. Residential area nearby the pipe laying location 2. Caution tape and barricade will be utilized for public safety 3. Mostly narrow road 4. Traffic diversion and road closure as per requirement 5. Material storage will be planned within designated area without impacting movement of people 6. Safety arrangement near school, religious place 7. Camp site with toilet and drinking water facility will be selected at vacant location without impacting local residents and movement of vehicles

Work Component	Mitigation measures
of 3 ESRs	8. Noise generation from construction activity will be regulated and activity should be planned during day time only 9. Excavated earth will be utilized locally or disposed as per spoil management plan 10. Pathways and other local infrastructure to be reinstated immediately to at least their pre-project condition upon completion of construction.
• Dedicated Water Supply Transmission Main from Junction of James Long Sarani to Daspara near existing Pumping Station along James Long Sarani	1. Entry shafts for the micro-tunnels are to be located at places on the road where there are least encroachment on the ROW and least chances of inconveniences to pedestrians and people living in the neighborhood. 2. A traffic management plan as approved by the DSC and PMU is to be in place before construction work commences 3. Suitable bill boards are to be put up at strategic points on the James Long Sarani giving salient information on the work component, time schedule and name & contact numbers of responsible persons of PMU and Contractor 4. Security fencing is to be provided throughout the construction period of the shafts 5. Excess solid waste is to be disposed at sites pre-approved by PMU 6. Slurry is to be stored in container and needs to be disposed of at sites with due permission 7. Pathways and other local infrastructure to be reinstated immediately to at least their pre-project condition upon completion of construction.
• Water Loss Management under Jay Hind WTP Area (Eastern Kolkata) including rehabilitation, expansion of 100 km Distribution network and connection to around 20000 House holds	1. Few residential areas nearby 2. Caution tape and barricade will be utilized for public safety 3. Mostly narrow road 4. Traffic diversion and road closure as per requirement 5. Material storage will be planned within designated area without impacting movement of people 6. Excess solid waste is to be disposed at sites pre-approved by PMU 7. Pathways and other local infrastructure to be reinstated immediately to at least their pre-project condition upon completion of construction.

200. **Table 30** outlines the post-construction activities.

Table 30: Post-Construction Activities (Defects Liability Period)- (to be revised by contractors before operation)

Sr. no.	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
1.	Construction Camp	All structures comprising the construction camp are to be removed from site.	DSC Environment Specialist	Subproject completion
		The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint etc. and these shall be cleaned up.	DSC Environment Specialist	Subproject completion
		All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the	DSC Environment Specialist	Subproject completion

Sr. no.	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
		area shall be top-soiled and re-grassed using the guidelines set out in the re-vegetation specification that forms part of this document.		
2.	Vegetation	All areas that have been disturbed by construction activities (including the construction camp area) must be cleared of alien vegetation.	DSC Environment Specialist	Subproject completion
		Open areas are to be re-planted as per the re-vegetation specification.	DSC Environment Specialist	Subproject completion
		All vegetation that has been cleared during construction is to be removed from site or used as much as per the re-vegetation specification, (except for seeding alien vegetation).	DSC Environment Specialist	Subproject completion
3.	Land Rehabilitation	All surfaces hardened due to construction activities are to be ripped and imported materials thereon removed.	Contractor	Subproject completion
		All rubble is to be removed from the site to an approved disposal site. Burying of rubble on site is prohibited.	Contractor	Subproject completion
		The site is to be cleared of all litter.	Contractor	Subproject completion
		Surfaces are to be checked for waste products from activities such as concreting or asphaltting and cleared in a manner approved by the DSC Environment Specialist.	Contractor	Subproject completion
		The Contractor is to check that all watercourses are free from building rubble, spoil materials and waste materials.	Contractor	Subproject completion
		Pathways and other local infrastructure to be reinstated immediately to at least their pre-project condition upon completion of construction.	DSC Environment Specialist	Subproject completion
4.	Materials and Infrastructure	Fences, barriers and demarcations associated with the construction phase are to be removed from the site unless stipulated otherwise by the DSC Environment Specialist.	DSC Environment Specialist	Subproject completion
		All residual stockpiles must be removed to spoil or spread on site as directed by the DSC Environment Specialist.	DSC Environment Specialist	Subproject completion
		All leftover building materials must be returned to the depot or removed from the site.	Contractor	Subproject completion
		The Contractor must repair any damage that the construction works has caused to neighboring properties.	Contractors	As directed by the DSC Environment Specialist.

Sr. no.	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
5	General	A meeting is to be held on site between the DSC Environment Specialist, PMU Environment Specialist and the Contractor to approve all remediation activities and to ensure that the site has been restored to a condition approved by the DSC Environment Specialist.	DSC Environment Specialist and PMU Environment Specialist	On completion of the construction and maintenance phases
		Temporary roads must be closed and access across these blocked.	DSC Environment Specialist and PMU Environment Specialist	On completion of construction
		Access or haulage roads that were built must be rehabilitated	DSC Environment Specialist and Contractor	On completion of construction
		All areas where temporary services were installed are to be rehabilitated to the satisfaction of the DSC Environment Specialist	DSC Environment Specialist and Contractor	On completion of construction

Table 31: Operation and Maintenance Activities (covering defect liability period)

Sr. No.	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
1.	Pollution monitoring	Monitor the environmental quality in terms of Pumps' discharge, ambient air and noise levels.	Contractor in association with Environmental Monitoring Laboratory of KMC	As necessary on regular basis
2.	Leaks detection and repairs	Conduct pipe repairs the soonest time possible to avoid disruption of service and disturbance to users/sensitive receptors.	KMC	As necessary.
3	Health & Safety	<ul style="list-style-type: none"> • Implement good housekeeping practices at pumping stations. • Strictly implement health and safety measures and audit on a regular basis. • Provide warning signs of hazardous working areas. • Clearly demarcate excavations and provide barriers (not just danger tape) to protect pedestrians from open trenches. • Thoroughly train workers assigned to dangerous equipment. • Workers have the right to refuse work in unsafe conditions. • Ensure all workers are provided with Personal Protective Equipment. • Ensure the visibility of workers through their use of high visibility vests when working at night • Ensure that qualified first-aid can be provided at all times. Ensure equipped first-aid stations are easily accessible throughout the site; • Provide medical insurance coverage for workers. • Provide clean eating areas where workers are not exposed to hazardous or noxious substances; • Ensure moving equipment is outfitted with audible back-up alarms; • Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage 	Contractor KMC	As necessary on regular basis

Sr. No.	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
		shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate.		
3.	Works conduct	Ensure strict control of laborers Minimize working hours to normal working times Control littering	Contractor	On regular basis

C. Environmental Monitoring Program

201. **Table 32** outlines the environmental monitoring program to ensure implementation of the management and mitigation measures specified in the EMP. The table shall be read within the context of the body of the entire EMP. The monitoring program will follow the established system in Project 1.

Table 32: Environmental Monitoring Program

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
1. Site establishment and preliminary activities						
Legislation, Permits and Agreements	CTE and CTO for the hot mix, stone crushers, and diesel generators)	Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.	-	prior to moving onto site and during construction	Contractor	PMU / DSC
	Cutting Permit for Scheduled Trees – if any	West Bengal Trees (Protection and Conservation in Non-Forest Areas) Act, 2006	-	prior to moving onto site	DSC	PMU
	Copy of EMP	ADB SPS	subproject site, offices, website, library, etc.	At all times	Contractor	PMU/DSC
Access to site	Existing conditions New development	EMP	all access and haul roads	prior to moving onto site	DSC Environment Specialist	PMU
Construction camp	Approval of location and facilities	EMP	as identified	prior to moving onto site	Contractor with the DSC Environment Specialist and PMU	PMU/DSC

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
					Environment Specialist	
Equipment Lay-down and Storage Area	Approval of location and facilities	EMP	as identified	prior to moving onto site and during site set-up	Contractor with the DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Materials management – sourcing	Approval of sources and suppliers	EMP	as identified	prior to procurement of materials	Contractor with the DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Education of site staff	Awareness Level Training - Environment - Health and Safety	EMP and records	-	during staff induction, followed by scheduled as determined	Contractor with the DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Social impacts	Public Consultations, Information Disclosure, Communication Strategy	EARF, ADB SPS and EMP	subproject site	prior to moving onto site and ongoing	Contractor with the DSC Environment Specialist, PMU Environment Specialist /DSC	Implementing Agency (KMC)
	GRM Register	EMP	subproject site	prior to moving onto site and ongoing	Contractor with the DSC Environment Specialist, PMU Environment Specialist, PMU/DSC	Implementing Agency (KMC)
Noise	Baseline Data for noise level in dB(A) L_{eq}	National Noise Standards	Two locations near construction sites as specified by the engineer	prior to site set-up	Contractor with the DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Air quality	Baseline ambient data for particulate matters 10 and 2.5 (PM_{10} , $PM_{2.5}$), sulfur dioxides (SO_2), nitrogen dioxide (NO_2), and hydrocarbons (HC)	National Ambient Air Quality Standards	Two locations near construction sites as specified by the engineer	prior to site set-up	Contractor with the DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Soil erosion	Soil erosion	EMP	as identified	during site	Contractor with	PMU/DSC

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
	management measures		by the engineer	set-up and throughout the duration of the subproject	the DSC Environment Specialist and PMU Environment Specialist	
Storm water	Storm water management measures	EMP	as identified by the engineer	during site set-up and throughout the duration of the subproject	Contractor with the DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Water quality	Baseline qualitative characteristics-pond water	EMP	subproject sites ²⁸	prior to site set-up	Contractor with DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Conservation of Natural Environment	Existing conditions	EMP	subproject sites	prior to site set-up	Contractor with DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Waste management procedure	Disposal sites	EMP	as determined	prior to site set-up and ongoing throughout the subproject	Contractor with DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Cultural environment	Chance finds	ASI Act and EMP	as determined	prior to site set-up and ongoing throughout the subproject	Contractor with DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
2. Construction phase						
Access to Site	Qualitative characteristics	Pre-subproject condition and EMP	all access and haul roads	refer to EMP table on management of construction and workforce activities	Contractor	DSC Environment Specialist

²⁸ Subproject sites include approved construction site, equipment lay-down and storage area, water courses along the subproject site, open drainages

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
Construction camp	Qualitative characteristics	Pre-subproject condition and EMP	all access and haul roads	refer to EMP table on management of construction and workforce activities	Contractor	DSC Environment Specialist
Staff conduct	Site Records (Accidents, Complaints)	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Air quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ and HC	National Ambient Air Quality Standards	Two locations near construction sites as specified by the engineer (DSC).	once in four months (three times in an year)	Contractor with close coordination with the DSC Environment Specialist	PMU/DSC
Soil erosion	Soil erosion management measures	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Storm water	Soil erosion management measures	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Water quality	Qualitative characteristics	EMP and pre-existing conditions	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Conservation of Natural Resources	Number of scheduled trees	Tree-cutting permit and EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
	Vegetation conditions	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Materials management	Qualitative characteristics	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Waste management	Qualitative characteristics	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
	Disposal manifests	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Social impacts	Public Consultations, Information Disclosure, Communication Strategy	EARF, ADB SPS and EMP	subproject sites	Ongoing	Contractor with the DSC Environment Specialist, PMU Environment Specialist, PMU/DSC	Implementing Agency (KMC)
	GRM Register	EMP	subproject sites	Ongoing	Contractor with the DSC	Implementing Agency

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
					Environment Specialist, PMU Environment Specialist, PMU/DSC	(KMC)
Cultural environment	Chance finds	ASI Act and EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Noise quality	Noise Level in dB(A) L_{eq}	National Noise standards	Two locations near construction sites as specified by the engineer (DSC).	once in four months (three times in an year)	Contractor with close coordination with the DSC Environment Specialist	PMU/DSC
C. Post-construction activities						
Construction camp	Pre-existing conditions	EMP	construction camp	subproject completion	Contractor	DSC Environment Specialist
Vegetation	Pre-existing conditions	Tree-cutting Permit and EMP	subproject sites	subproject completion	Contractor	DSC Environment Specialist
Land rehabilitation	Pre-existing conditions	EMP	subproject sites	subproject completion	Contractor	DSC Environment Specialist
Materials and infrastructure	Pre-existing conditions	EMP	subproject sites	subproject completion	Contractor	DSC Environment Specialist
General	Records	EMP	subproject sites	subproject completion	Contractor with DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
D. Operation and maintenance (defect liability period)						
Air quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂	National Ambient Air Quality Standards	Two locations as specified by the Environment Spl.	once in 6 months (defect liability period)	Contractor in association with Environmental Monitoring Laboratory	PMU/DSC
Noise quality	Noise Level in dB(A) L_{eq}	As per National Noise standards	Two locations as specified by the Environment Spl	once in 6 months (defect liability period)	Contractor in association with Environmental Monitoring Laboratory	PMU/DSC

202. A training program has been developed to build the capability of KMC and PMU in implementing the EMP. The suggested outline of the training program is presented in **Table 33**.

Table 33: Training Program on environmental safeguards and its implementation

Module	Frequency of sessions	Target participants	Conducting agency
Environmental Safeguards Requirements comprising (i) ADB's Safeguards Policy Statement of 2009, (ii) environmental documentation requirements and (iii) Environmental requirements of India particularly those applicable to KEIIP subprojects, international obligations (common for all subprojects)	Once in Pre-construction stage	Senior Construction Supervisors of DSC, Safety Officers of Contractors, KEIIP Senior Engineers	DSC and PMU with assistance from INRM, ADB, New Delhi and WBPCB
IEE and EMP of water supply subproject	Once during Pre-construction stage	Safety officers of Contractors and Construction supervisors of DSC	DSC and PMU
Workshop on implementation of EMP of water supply subproject of KEIIP: lessons learnt and way forward	Once during Construction stage	Senior Construction Supervisors of DSC, PMC Engineers, Safety Officers of Contractors, KEIIP Senior Engineers	DSC with assistance from PMU

D. Environmental Management and Monitoring Cost

203. The Contractor's cost for site establishment, preliminary, construction, and defect liability activities will be incorporated into the contractual agreements, which will be binding on him for implementation. The air quality, surface water quality, and noise level monitoring of construction and defect liability phases will be conducted by the contractor.

204. The operation phase mitigation measures are again of good operating practices, which will be the responsibility of implementing agency (KMC). The air quality and noise level monitoring during the operation and maintenance phase will be organized by the operating offices of KMC as part of their routine office expenses.

205. The activities identified in environmental monitoring programme mainly includes site inspections and informal discussions with workers and local people and this will be the responsibility of PMU and DSC, costs of which are part of project management. **Table 34** summarizes the indicative cost to implement the EMP.

Table 34: Indicative Costs for EMP Implementation- pre construction and construction phase (to be revised during preparation of SEP)

Item	Parameters	Project Phase	Sampling Station	Duration and Frequency	Quantity	Unit cost (INR)	Total cost (INR)	Source of funds
1. Survey and monitoring							15,12,000	Survey and Investigation /Contingency
Ambient air	PM10, PM2.5, SO ₂ , NO ₂ and CO	Pre Construction & construction	All 9 ESR, 2 UG reservoir and pumping station sites – 2 locations at each sites Pipe laying locations	2 years Once in a quarter for 3 quarter in a year	Approx. 120 nos.	10,000	12,00,000	Contractor budget
Noise	Leq in dBA	Pre Construction & construction	All 9 ESR, 2 UG reservoir and pumping station sites – 2 locations at each sites Pipe laying locations	2 years Once in a quarter for 3 quarter in a year	Approx 120 measurements	1000	1,20,000	Contractor budget
Surface water	As per Drinking water standard	Pre Construction, construction and operation	Nearby ponds	Once in a quarter for 4 quarters in a year for 2 years	16 nos.	12,000	1,92,000	Contractor budget
2. Capacity building/ Training/ workshop expenses							300,000	Survey and Investigation /Contingency
3. Environmental Permits if any							100,000	Government Counterpart funds
Total (INR)							19,12,000	
Total (US\$)							29415	
Note/s: INR 65 = US\$ 1								

E. Monitoring and Reporting

206. Prior to commencement of any civil work, the contractor will submit a compliance report to DSC ensuring that all identified pre-construction environmental impact mitigation measures as detailed in the EMP will be undertaken. DSC will review the report and thereafter PMU will allow commencement of civil works.

207. DSC will organize an induction course for the training of contractors preparing them on:

- (i). EMP/approved SEP implementation including environmental monitoring requirements related to identified mitigation measures; and
- (ii). taking immediate actions to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation.

208. Monthly reports will be prepared by Contractors summarizing compliance with monitoring requirements, details on any noncompliance, remedial actions taken and additional environmental mitigation measures if necessary and will be duly authorized by the respective Construction Supervisors/ Managers. The format of the monthly environmental monitoring report is given in **Appendix 14**.

209. Environmental monitoring activities involving measurements will require engagement of external agencies and will be organized by the Contractors. Based on monthly reports and measurements, DSC will draft a Semi-annual Environmental Monitoring Report (SEMR). The formats of suggested SEMR along with Sample Environmental Site Inspection Report and Sample Checklist for Construction Safety are given in **Appendix 15**.

210. The PMU will review, approve and submit to ADB the SEMR by 1st July and 1st January each year. Once concurrence from the ADB is received the report will be uploaded in the KEIIP website.

211. Based on review of environmental monitoring results, future modifications in the EMP/approved SEP could be undertaken with the concurrence of the ADB. These will be generally undertaken, if required, upon review of the SEMR by the PMU to ADB following agreed procedures and mechanisms.

212. For Projects likely to have anticipated adverse environmental impacts during operation, monitoring may continue at the minimum on an annual basis during the operation phase. Monitoring reports will be posted in a location accessible to the public.

213. For projects likely to have significant adverse environmental impacts, the KMC will retain qualified and experienced external experts to verify its monitoring information. The KMC external auditor will document significant monitoring results, identify the necessary corrective actions, and reflect them in a corrective action plan. The KMC, in each quarter, will study the compliance with the action plan developed in the previous quarter. Compliance with loan covenants will be screened by the KMC.

214. ADB will review project performance against the KMC's commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the subproject's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system.

IX. RECOMMENDATIONS AND CONCLUSION

215. The process described in this document has assessed the environmental impacts of all elements of the water supply subproject of KEIP under Tranche 2 in the Kolkata City. Potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure. No environmental impacts were identified as being due to either the subproject design or location. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the designs for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design.

216. The public participation processes undertaken during project design ensure stakeholders are engaged during the preparation of the IEE. The planned information disclosure measures and process for carrying out consultation with affected people will facilitate their participation during project implementation.

217. The subproject's GRM established in Project 1 has provided the citizens with a platform for redress of their grievances and describes the informal and formal channels, time frame and mechanisms for resolving complaints about environmental performance. This will be continued in the implementation of Project 2.

218. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between KMC, PMU, DSC and the contractors. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensure that safety recommendations are complied with.

219. A copy of the EMP/approved SEP will be kept on site during the construction period at all times. The EMP will be made binding on all contractors operating on the site and will be included within the Contractual Clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance. As being implemented in Project 1, the contractor of Project 2 shall: (a) comply with the measures relevant to the contractor set forth in this IEE, and any corrective or preventative actions set forth in the Safeguards Monitoring Report that KMC will prepare from time to time to monitor implementation; (b) make available a budget for all such environmental measures; (c) provide the KMC with a written notice of any unanticipated environmental risks or impacts that arise during construction, implementation or operation of the subproject that were not considered in this IEE and EMP, and prepare required actions; (d) adequately record the condition of roads, agricultural land and other infrastructure prior to starting to transport materials and construction; and (e) reinstate pathways, other local infrastructure, and agricultural land to at least their pre-project condition upon the completion of construction; and (f) submit to KMC monthly monitoring report on EMP implementation.

220. The subproject is unlikely to cause significant adverse impacts because: (i) most of the individual components involve straightforward construction and operation, so impacts will be mainly localized; (ii) in most cases the predicted impacts are likely to be associated with the construction process and are produced because the process is invasive, involving excavation,

obstruction at specific construction locations; and (iii) being located mainly in built-up areas will not cause direct impact on terrestrial biodiversity values. The potential adverse impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

221. Therefore, as per ADB SPS, the subproject is classified as environmental Category B and does not require further Environmental Impact Assessment.

Appendix 1: Standards Ambient Air, air emission, effluents, receiving water bodies, drinking water at consumer end

A) Notification by Ministry of Environment & Forests, Government of India
Environment (Protection) Seventh Amendment Rules, 2009
Ambient Air Quality Standards

Pollutant	Time Weighted Average	Industrial, Residential, Rural and Other Areas	Sensitive Area (Notified by Central Govt)	Method of Measurement
Sulphur Dioxide (SO ₂), µg/m ³	Annual* 24 hours**	50 80	20 80	<ul style="list-style-type: none"> Improved West & Gaeke method Ultraviolet Fluorescence
Nitrogen Oxide (NO ₂), µg/m ³	Annual* 24 hours**	40 80	30 80	<ul style="list-style-type: none"> Jacobs & Hochheiser modified (NaOH – NaAsO₂) method Gas Chemiluminiscence
Particulate Matter (PM ₁₀) (Size <10 µm) µg/m ³	Annual* 24 hours**	60 100	60 100	<ul style="list-style-type: none"> Gravimetric TOEM Beta Attenuation
Particulate Matter (PM _{2.5}) (Size <2.5 µm) µg/m ³	Annual* 24 hours**	40 60	40 60	<ul style="list-style-type: none"> Gravimetric TOEM Beta Attenuation
Ozone (O ₃) µg/m ³	8 hours** 1 hour**	100 180	100 180	<ul style="list-style-type: none"> UV photometric Chemiluminiscence Chemical method
Lead (Pb) µg/m ³	Annual* 24 hours**	0.5 1.0	0.5 1.0	<ul style="list-style-type: none"> AAS method after sampling using EPM 2000 or equivalent filter paper
Carbon Monoxide (CO), mg/m ³	8 hours** 1 hour**	2.0 4.0	2.0 4.0	<ul style="list-style-type: none"> Non Dispersive Infrared Spectroscopy
Ammonia (NH ₃),	Annual* 24 hours**	100 400	100 400	<ul style="list-style-type: none"> Chemiluminiscence Indophenol blue method
Benzene (C ₆ H ₆) µg/m ³	Annual*	5	5	<ul style="list-style-type: none"> Gas Chromatography continuous analyzer Adsorption & desorption followed by GC analysis
Benzo(o)pyrene (BaP) particulate phase only ng/m ³	Annual*	1	1	<ul style="list-style-type: none"> Solvent extraction followed by GC/HPLC analysis
Arsenic (As), ng/m ³	Annual*	6	6	<ul style="list-style-type: none"> AAS/ICP method after sampling using EPM 2000 or equivalent filter paper
Nickel (Ni) ng/m ³	Annual*	20	20	<ul style="list-style-type: none"> AAS/ICP method after sampling using EPM 2000 or equivalent filter paper

Source: Central Pollution Control Board, New Delhi, Notification dated 18th November 2009

Notes:

* Indicates Annual Arithmetic Mean of Minimum 104 measurement in a year measured twice a week, 24 hourly at uniform intervals

** 24 hourly/8 hourly/1 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed by not on two consecutive days

B) Emission standards for diesel generator sets

1) CPCB emission regulations, Part IV, COINDS/26/1986-87

Stack Height

The minimum height of stack to be provided with each generator set can be worked out using the following formula:

$$H = h + 0.2x (KVA)^{0.5}$$

Where

H = Total height of stack in metre

h = Height of the building in metres where the generator set is installed

KVA = Total generator capacity of the set in KVA

Based on the above formula the minimum stack height to be provided with different range of generator sets may be as follows:

For Generator Sets

50 KVA

50-100 KVA

100-150 KVA

150-200 KVA

200-250 KVA

250-300 KVA

Total Height of stack in metre

Height of the building + 1.5 metre

Height of the building + 2.0 metre

Height of the building + 2.5 metre

Height of the building + 3.0 metre

Height of the building + 3.5 metre

Height of the building + 3.5 metre

Similarly for higher KVA ratings a stack height can be worked out using the above formula.

2) GSR 371(E) 17 May 2002, amendment to Environment (Protection) Rules 2002 and *(The Emission Limits for new diesel engines (up to 800 KW) for Generator Sets (GENSETS) were notified by the Environment (Protection) Amendment Rules 2002 vide GSR 371(E), dated 17th May 2002 at Sl. No. 95 and as amended vide GSR 520(E), dated 1st July 2003, GSR 448 (E) dated 12th July, 2004, GSR 520(E) dated 12th August 2004 and GSR 280(E) dated 11th April, 2008 under Environment (Protection) Act, 1986)*

Para 95. Emission limits for new diesel engines (up to 800 W) for gen set application

The emission limits for new diesel engines up to 800 kw, for gen set applications shall be as follows:

Capacity of diesel engine	Date of implementation	Emission limits (g/kw-hr) for				Smoke limit (light absorption coefficient, m-1) (at full load)	Test cycle	
1	2	3				4	5	
		NO _x	HC	CO	PM		Torque %	Weighting factors
Up to 19 KW	1.7.2005	9.2	1.3	3.5	0.3	0.7	100 75	0.05 0.25
> 19 KW up to 176	1.1.2004	9.2	1.3	5.0	0.5	0.7	50	0.30
	1.7.2004	9.2	1.3	3.5	0.3	0.7	25	0.30

Capacity of diesel engine	Date of implementation	Emission limits (g/kw-hr) for				Smoke limit (light absorption coefficient, m ⁻¹) (at full load)	Test cycle	
KW								
> 176 KW up to 800 KW	1.11.2004	9.2	1.3	3.5	0.3	0.7	10	0.10

3) Environment Protect third amendment rules 2002 vide 489(E) 9 July, 2002

Para 96. Emission standards for diesel engines (engine rating more than 0.8 Mw (800 Kw) for power plant, generator set applications and other requirements

Parameter		Area Category	Total engine rating of the plant (includes existing as well as new generator sets)	Gerator sets commissioning date		
				Before 1/7/2003	Between 1/7/2003 and 1/7/2005	On or after 1/7/2005
NO _x (as NO ₂) (AT 15% O ₂), dry basis, in ppmv		A	Up to 75MW	1100	970	710
		B	Up to 150MW			
		A	More than 75MW	1100	710	360
		B	More than 150MW			
NMHC (as C) (at 15% O ₂), mg/Nm ³		Both A and B		150	100	
PM (at 15% O ₂), mg/Nm ³	Diesel Fuels - HSD & LDO	Both A and B		75	75	
	Furnace Oils - LSHS & FO	Both A and B		150	100	
CO (at 15% O ₂), mg/Nm		Both A and B		150	150	
Sulphur content in fuel		A		<2%		
		B		<4%		
Fuel specification		For A only	Up to 5MW	Only Diesel Fuels (HSD, LDO) shall be used.		
Stack height (for generator sets commissioned after 1/7/2003)		Stack height shall be maximum of the following, in meter: (i) $14 Q^{0.3}$, Q = Total SO ₂ emission from the plant in kg/hr (ii) Minimum 6 m above the building where generator set is installed. (iii) 30 m.				

Note:

1. Acronyms used: MW : Mega (106) Watt, FO : Furnace Oil, NO_x : Oxides of Nitrogen: HSD : High Speed Diesel, NO₂ : Nitrogen Dioxide, LDO : Light Diesel Oil; O₂ : Oxygen, LSHS : Low Sulphur Heavy Stock, NMHC : Non-Methane Hydrocarbon kPa : Kilo Pascal, C : Carbon, mm : Milli (10⁻³) metre, PM : Particulate Matter kg/hr : Kilo (10³) gram per hour, CO : Carbon Monoxide, mg/Nm³ : Milli (10⁻³) gram per ; SO₂ : Sulphur Dioxide Normal metre cubic, ppmv : part per million (106) by volume

2. Area categories A and B are defined as follows:

Category A: Areas within the municipal limits of towns/cities having population more than 1million and also up to 5 km beyond the municipal limits of such towns/cities.

Category B: Areas not covered by category A.

4. Individual units with engine ratings less than or equal to 800 KW are not covered by this notification.

5. Only following liquid fuels viz. High Speed Diesel, Light Diesel Oil, Low Sulphur Heavy Stock and Furnace Oil or liquid fuels with equivalent specifications shall be used in these power plants and generator sets.

6. For expansion Project, stack height of new generator sets shall be as per total Sulphur Dioxide emission (including existing as well as additional load).

7. For multi engine plants, fuels shall be grouped in cluster to get better plume rise and dispersion. Provision for any future expansion should be made in planning stage itself.

8. Particulate Matter, Non-Methane Hydrocarbon and percent moisture (dry basis). Carbon Monoxide results -are to be normalized to 25°C, 1.01 Kilo Pascal (760 mm of mercury) pressure and zero

9. Measurement shall be performed at steady load conditions of more than 85% of the rated load.

10. Continuous monitoring of Oxides of Nitrogen shall be done by the plants whose total engine capacity is more than 50 Mega Waft. However, minimum once in six month monitoring for other parameters shall be adopted by the plants.

ii) Effluent

A) Schedule VI of Environment (Protection) Rules, 1986

General standards for discharge of environmental pollutants: Effluents

Sl no	Parameter	Standards			
		Inland surface water	Public sewers	Land of Irrigation	Marine/ coastal areas
		(a)	(b)	(c)	(d)
1.	Colour and odour	remove as far as practicable			
2.	Suspended solids, mg/l. max.	100	600	200	(a) For process waste water 100 (b) For cooling water effluent 10% above total suspended matter of influent.
3.	Particle size of suspended solids	shall pass 850 micron IS Sieve			(a) Floatable solids, max. 3mm. (b) Settable solids (max 850 micron)
4.	pH value	5.5. to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
5.	Temperature	shall not exceed 50°C above the receiving water temperature			shall not exceed 50°C above the receiving water temperature
6.	Oil and grease, mg./l, max.	10	20	10	20
7.	Total residual chlorine, mg/l. max.	1.0			1.0
8.	Ammonical nitrogen (as N.) mg/l max	50	50		50
9.	Total Kjeldahl Nitrogen (as NH ₃) mg/l. max	100			100
10.	Free ammonia (as NH ₃), mg/l.max	5.0			5.0
11.	Biochemical oxygen demand (3 days at 27°C), mg/l. max.	30	350	100	100
12.	Chemical oxygen demand, mg/l, max.	250			250
13.	Arsenic (as As)	0.2	0.2	0.2	0.2

Sl no	Parameter	Standards			
	mg/l, max.				
14.	Mercury (as Hg), mg/l, max.	0.1	0.1	0.1	0.1
15.	Lead (as Pb) mg/l, max	0.1	1.0		2.0
16.	Cadmium (as Cd) mg/l, max	2.0	1.0		2.0
17.	Hexavalent chromium (as Cr. +6). Mg/l, max	0.1	2.0		1.0
18.	Total Chromium (as Cr) mg/l, max	2.0	2.0		2.0
19.	Copper (as Cu) mg/l, max	3.0	3.0		3.0
20.	Zinc (as Zn) mg/l, max	5.0	15		15
21.	Selenium (as Se) mg/l, max	0.05	0.05		0.05
22.	Nickel (as Ni) mg/l, max	3.0	3.0		5.0
23.	Cyanide (as CN) mg/l, max	0.2	2.0	0.2	0.2
24.	Fluoride (as F) mg/l, max	2.0	15		15
25.	Dissolved phosphates (as P) mg/l, max	5.0			
26.	Sulfide (as S) mg/l, max	2.0			5.0
27.	Phenolic compounds (as C ₆ H ₅ OH) mg/l, max	1.0	5.0		5.0
28.	Radioactive materials: (a)Alfa emitters microcurie/ml, max. (b)Beta emitters micro curie/ml, max.	10 ⁻⁷ 10 ⁻⁶	10 ⁻⁷ 10 ⁻⁶	10 ⁻⁸ 10 ⁻⁷	10 ⁻⁷ 10 ⁻⁶
29.	Bio-assay test	90% Survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
30.	Manganese (as Mn)	2 mg/l	2 mg/l		2 mg/l
31.	Iron (as Fe)	3 mg/l	3 mg/l		3 mg/l
32.	Vanadium (as V)	0.2 mg/l	0.2 mg/l		0.2 mg/l
33.	Nitrate Nitrogen	10 mg/l			20 mg/l

These standards shall be applicable for industries, operations or process other than those industries operations or process for which standards have been specified in schedule of the Environment Protection Rules, 1989

B) CPCB Primary Water Quality Criteria

The Central Pollution Control Board (CPCB), an apex body in the field of water quality management, has developed a concept of "designated best use". According to which, out of several uses a particular water body is put to, the use which demands highest quality of water is called its "designated best use", and accordingly the water body is designated. The CPCB has identified 5 such "designated best uses". All those water bodies, which are used for drinking without any treatment, but with disinfection (chlorination), are termed as "A" Class Water, those which are used for outdoor bathing are termed as "B" Class Water, those which are used for drinking after conventional treatment are termed as "C" Class Water, those which are used for propagation of wildlife and fisheries are termed as "D" Class Water and those which are used for irrigation, cooling and controlled waste disposal are termed as "E" Class Water. For each of these five "designated best uses", the CPCB has identified water quality requirements in terms of few chemical characteristics, known as primary water quality criteria. The "designated best uses" along with respective water quality criteria is given in Table below.

Best use based classification of surface waters in India

Sr. No.	Designated-Best-Use	Class of Water	Criteria
1	Drinking Water Source without conventional treatment but after disinfection	A	1. Total Coliform Organism MPN/100 ml: 50 or less 2. pH: between 6.5 and 8. 3. Dissolved Oxygen: 6mg/1 or more 4. Biochemical Oxygen Demand 5 days 20°C: 2mg/1 or less
2	Outdoor bathing (Organised)	B	1. Total Coliform Organism MPN/100 ml: 500 or less 2. pH: between 6.5 and 8.5 3. Dissolved Oxygen: 5mg/1 or more 4. Biochemical Oxygen Demand 5 days 20°C: 3mg/1 or less
3	Drinking water source after conventional treatment and disinfection	C	1. Total Coliform Organism MPN/100 ml: 5000 or less 2. pH: between 6 to 9 3. Dissolved Oxygen: 4mg/1 or more 4. Biochemical Oxygen Demand 5 days 20°C: 3mg/1 or less
4	Propagation of Wild life and Fisheries	D	1. pH: between 6.5 to 8.5 2. Dissolved Oxygen: 4mg/1 or more
5	Irrigation, Industrial Cooling, Controlled waste disposal	E	1. pH: between 6.0 to 8.5 2. Electrical Conductivity at 25OC micro mhos/cm: Max 2250 3. Sodium Absorption Ratio Max.: 26 4. Boron Max.: 2mg/1

C) Drinking water standard at consumer end is under revision and the draft version is given in the following Table

Indian Standards for Drinking Water - Specification (BIS 10500: 1991) revised draft 2009

Sl. No	Substance or characteristic	Requirement (Acceptable Limit)	Undesirable effect outside the acceptable limit	Permissible limit in the absence of alternate source	Method of Test (Ref to IS)	Remarks
1. Organoleptic and physical parameters						
i)	Colour, Hazen units, Max	5	Above 5 consumer acceptance decreases	15	3025 (Part 5)	
ii).	Odour	Agreeable	-	Agreeable	3025 (Part 5)	a)Test cold when heated b)Test at several dilutions
iii)	Taste	Agreeable	-	Agreeable	3025 (Part 7 & 8)	Test to be conducted only after safety has been established
iv)	Turbidity, NTU, Max	1	Above 5 consumer acceptance decreases	5	3025 (Part 10)	-
v)	Dissolved solids, mg/l, Max	500	Beyond this palatability decreases and may cause gastrointestinal irritation	2000	3025 (Part 16)	-
vi)	pH Value	6.5 to 8.5	Beyond this range the water will affect the mucous membrane and/or water supply system	No Relaxation	3025 (Part 11)	-
vii)	Total hardness (as CaCO ₃), mg/l., Max	200	Encrustation in water supply structure and adverse effects on domestic use	600	3025 (Part 21)	
Note 1: It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under the water not acceptable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under permissible limit in the absence of alternate source in col (5), above which the sources will have to be rejected.						
General parameters concerning substances undesirable in excessive amounts						
i)	Iron (as Fe) mg/l, Max	0.3	Beyond this limit taste/appearance are affected, has adverse effect on domestic uses and water supply structures, and promotes iron bacteria	No relaxation	3025 (Part 53)	Total concentration of Manganese (as Mn) and Iron (as Fe) shall not exceed 0.3 mg/l

Sl. No	Substance or characteristic	Requirement (Acceptable Limit)	Undesirable effect outside the acceptable limit	Permissible limit in the absence of alternate source	Method of Test (Ref to IS)	Remarks
ii)	Aluminium (as Al), mg/l, Max	0.1	Beyond this limit taste/ appearance are affected, has adverse effect on domestic uses and water supply structures	0.3	IS 3025 (Part 59)	-
iii)	Copper (as Cu), mg/l, Max	0.05	Astringent taste, discoloration and corrosion of pipes, fittings and utensils will be caused beyond this	1.5	IS 3025 (Part 42)	-
iv)	Manganese (as Mn), mg/l, Max	0.1	Beyond this limit taste/ appearance are affected, has adverse effect on domestic uses and water supply structures	0.3	IS 3025 (Part 59)	Total concentration of Manganese (as Mn) and Iron (as Fe) shall not exceed 0.3 mg/l
v)	Zinc (as Zn), mg/l, Max	5	Beyond this limit it can cause astringent taste and an opalescence in water	15	IS 3025 (Part 49)	-
vi)	Magnesium (as Mg), mg/l, Max.	30	Encrustation in water supply structure and adverse effects on domestic use	No relaxation	IS 3025 (Part 46)	-
vii)	Barium (as Ba), mg/l, Max	0.7	May lead to cardiovascular problem	No relaxation	Annex F of IS 13428*/ S 15302	-
viii)	Calcium (as Ca) mg/l, Max	75	Encrustation in water supply structure and adverse effects on domestic use	200	3025 (Part 40)	-
ix)	Silver (as Ag), mg/l, Max	0.1	-	No relaxation	Annex J of IS 13428	-
x)	Selenium (as Se), mg/l, Max	0.01	Beyond this the water becomes toxic	No relaxation	3025 (Part 56) or IS 15303*	-
xi)	Molybdenum (as Mo), mg/l, Max	0.07	Beyond this it may cause osteoporosis/bone	No relaxation	3025 (Part 2; 2002)/ ISO 11885:	-

Sl. No	Substance or characteristic	Requirement (Acceptable Limit)	Undesirable effect outside the acceptable limit	Permissible limit in the absence of alternate source	Method of Test (Ref to IS)	Remarks
			disorders		1996	
xii)	Boron (as B), mg/l, Max	0.5	-	1.0	3025 (Part 57)	-
xiii)	Nitrate (as NO ₃) mg/l, Max	45	Beyond this methaemoglobinemia takes place/may be indicative of pollution	No relaxation	3025 (Part 34)	
xiv)	Sulfate (as SO ₄) mg/l, Max	200	Beyond this causes gastro intestinal irritation when magnesium or sodium is present	400	3025 (Part 24)	May be extended to 400 provided that Mg does not exceed 30
xv)	Sulphide (as H ₂ S), mg/l, Max	Below detectable limit	Beyond this it may cause objectionable taste and odour	No relaxation	3025 (Part 29)	-
xvi)	Fluoride (as F) mg/l, Max	1.0	Fluoride may be kept as low as possible. High fluoride may cause fluorosis	1.5	3025 (Part 60)	-
xvii)	Chlorides (as Cl) mg/l, Max.	250	Beyond this taste corrosion and palatability are affected	1000	3025 (Part 32)	-
xviii)	Ammonia (as total ammonia – N), mg/l, Max	0.5	Toxicological effect about 200 mg per kg of body weight	No relaxation	3025 (Part 34)	-
xix)	Chloramines (as Cl ₂), mg/l, Max	0.2	Eyes, nose irritation, anaemia, stomach discomfort	No relaxation	3025 (Part 26) or APHA 4500-CIG	-
xx)	Residual, Free chlorine, mg/l, Min	0.2	-	-	3025 (Part 26)	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be minimum 0.5 mg/l.

Sl. No	Substance or characteristic	Requirement (Acceptable Limit)	Undesirable effect outside the acceptable limit	Permissible limit in the absence of alternate source	Method of Test (Ref to IS)	Remarks
xxi)	Total alkalinity in Calcium carbonate, mg/l, Max	200	Beyond this limit taste becomes unpleasant	600	3025 (Part 23)	-
xxii)	Phenolic Compounds (as C ₆ H ₅ OH) mg/l, Max.	0.001	Beyond this may cause objectionable taste and odour	0.002	3025 (Part 43)	-
xxiii)	Mineral Oil mg/l, Max	Below detectable limit	Beyond this limit undesirable taste and odour after chlorination takes place	No relaxation	3025 (Part 39) Infra red partition method	-
xxiv)	Anionic detergents (as MBAS) mg/l, Max	0.2	Beyond this limit it can cause a light froth in water	1.0	Annex K to IS 13428-	-
Note 2: in case of dispute, the method by ** shall be referee method.						
Note 3: It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under Acceptable render the water not acceptable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under permissible limit in the absence of alternate source in col (5), above which the sources will have to be rejected.						
Parameters concerning toxic substances						
i)	Total Chromium (as Cr ₆₊), mg/l, Max	0.05	May be carcinogenic above this limit	No relaxation	3025 (part 52)	-
ii)	Total Arsenic (as As) mg/l, Max	0.01	Beyond this the water becomes toxic	0.05	3025 (part 37)	-
iii)	Mercury (as Hg) mg/l, Max	0.001	Beyond this the water becomes toxic	No relaxation	3025 (part 48)/Mercury Analyser	-
iv)	Cadmium (as Cd) mg/lit, Max	0.003	Beyond this the water becomes toxic	No relaxation	3025 (part 41)	-
v)	Lead (as Pb) mg/l, Max	0.01	Beyond this the water becomes toxic	No relaxation	3025 (part 47)	-
vi)	Nickel (as Ni), mg/l, Max	0.02	Beyond this the water becomes toxic	No relaxation	3025 (part 54)	-
vii)	Cyanide (CN), mg/l, Max	0.05	Beyond this the water becomes toxic	No relaxation	3025 (part 27)	-
viii)	Polynuclear Aromatic Hydrocarbons (as PAH), mg/l, Max	0.0001	May be carcinogenic	No relaxation	APHA 6440	-
ix)	Polychlorinate	0.0005	May be carcinogenic	No	ASTM	-

Sl. No	Substance or characteristic	Requirement (Acceptable Limit)	Undesirable effect outside the acceptable limit	Permissible limit in the absence of alternate source	Method of Test (Ref to IS)	Remarks
	d biphenyls, mg/l. Max			relaxation	5175/APH A 6630	

Bacteriological quality of drinking water	
Organisms	Guidelines
E. coli or thermotolerant coliform bacteria	Must not be detectable in any 100 ml sample
Total coliform bacteria	Must not be detectable in any 100 ml sample

Appendix 2: Noise standards

A). Noise Pollution (Regulation and Control) Rules, 2002 as amended up to 2010

Rule 3. Ambient air quality standards in respect of noise for different areas/zones

(1) The ambient air quality standards in respect of noise for different areas/zones shall be such as specified below

(2) The State Government shall categorize the areas into industrial, commercial, residential or silence areas/zones for the purpose of implementation of noise standards for different areas.

(5) An area comprising not less than 100 metres around hospitals, educational institutions and courts may be declared as silence area/zone for the purpose of these rules.

Area Code	Category of Area	Limit 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

Notes:

1. Day time is reckoned in between 6 a.m. and 10 p.m.

2. Night time is reckoned in between 10 PM and 6 AM.

3. Silence zone is an area comprising not less than 100 m around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority

4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

* dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

A "decibel" is a unit in which noise is measured.

"A", in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

Leq is an energy mean of the noise level over a specified period.

Rule 5. Restrictions on the use of Loud Speakers/Public Address system and sound producing instruments

(2) Any sound producing instrument shall not be used at night time except in closed premises for communication within, like auditoria, conference rooms, community halls, banquet halls or during a public emergency;

(4) The noise level at the boundary of the public place, where any noise source is being used shall not exceed 10 dB (A) above the ambient noise standards for the area or 75 dB (A) whichever is lower;

Rule 5A. Restrictions on the use of sound emitting construction equipments.

(3) Sound emitting construction equipments shall not be used or operated during night time in residential areas and silence zones.

B) Noise limit for generator sets run with petrol or kerosene

The noise limit for generator sets run with petrol or kerosene notified by Environment (Protection) (Amendment) Rules, 2000, vide G.S.R. 742 (E), dated 25th September, 2000, at serial no. 91, and as amended by Environment (Protection) (Amendment) Rules, 2001, vide

G.S.R. 628 (E), dated 30th August, 2001 and Environment (Protection) (Amendment) Rules, 2011, vide G.S.R. 215 (E), dated 15th March, 2011, under the Environment (Protection) Act, 1986 is as follows:

	Noise Limit from	
	September 1, 2002	September 1, 2003
Sound Power Level LWA	90 dBA	86 dBA

C) Noise limit for generator sets run with diesel

Noise limit for Generator Sets run with Diesel notified by Environment (Protection) second Amendment Rules vide GSR 371(E), dated 17th May 2002 at serial no.94 and its amendments vide GSR No 520(E) dated 1st July 2003; GSR 448(E), dated 12th July 2004; GSR 315(E) dated 16th May 2005; GSR 464(E) dated 7th August 2006; GSR 566(E) dated 29th August 2007 and GSR 752(E) dated 24th October 2008; G.S.R. 215 (E), dated 15th March, 2011 under the Environment (Protection) Act, 1986) is as follows:

Para 50. Noise limit for diesel generator sets (up to 1000 KVA) manufactured on or after the 1st January, 2005

The maximum permissible sound pressure level for new diesel generator (DG) sets with rated capacity up to 1000 KVA, manufactured on or after the 1st January, 2005 shall be 75 dB(A) at 1 metre from the enclosure surface. The diesel generator sets should be provided with integral acoustic enclosure at the manufacturing stage itself.

The implementation of noise limit for these diesel generator sets shall be regulated as given in paragraph 3 below.

2. Noise limit for DG sets not covered by paragraph 1.

Noise limits for diesel generator sets not covered by paragraph 1, shall be as follows:-

2.1 Noise from DG set shall be controlled by providing an acoustic enclosure or by treating the room acoustically, at the users end.

2.2 The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction up to actual ambient noise level, preferably, in the night time). The measurement for Insertion Loss may be done at different points at 0.5 m from the acoustic enclosure/ room, then averaged.

2.3 The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB (A).

2.5 Guidelines for the manufacturers/ users of Diesel Generator sets shall be as under:-

01. The manufacturer shall offer to the user a standard acoustic enclosure of 25 dB (A) insertion loss and also a suitable exhaust muffler with insertion loss of 25 dB(A).

02. The user shall make efforts to bring down the noise levels due to the DG set, outside his premises, within the ambient noise requirements by proper citing and control measures.

03. Installation of DG set must be strictly in compliance with the recommendations of the DG set manufacturer.

04. A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

GSR.7 dated 22 December 1998 amendment to Environment Protection Rules 1986

83. Standards/guidelines for control of Noise Pollution from Stationary Diesel Generator (DG) Sets.

(i) Noise Standards for DG Sets (15-500 KVA)

The total sound power level, L_w , of a DG set should be less than, $94 + 10 \log_{10} (\text{KVA})$, dB(A), at the manufacturing stage, where, KVA is the nominal power rating of a DG set. This level should fall by 5 dB(A) every five years, till 2007, i.e. in 2002 and then in 2007.

(ii) Mandatory acoustic enclosure/acoustic treatment of room for stationary DG sets (5 KVA and above)

Noise from the DG set should be controlled by providing an acoustic enclosure or by treating the room acoustically.

The acoustic enclosure/acoustic treatment of the room should be designed for minimum 25 dB(A) Insertion Loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction up to actual ambient noise level, preferably, in the night time). The measurement for Insertion Loss may be done at different points at 0.5m from the acoustic enclosure/room, and then averaged.

The DG set should also be provide with proper exhaust muffler with Insertion Loss of minimum 25 dB(A).

(iii) Guidelines for the manufacturers/users of DG sets (5KVA and above)

01 The manufacturer should offer to the user a standard acoustic enclosure of 25 dB(A) insertion Loss and also a suitable exhaust muffler, with insertion loss of 25dB(A).

02. The user should make efforts to bring down the noise levels due to the DG set, outside his premises, within the ambient noise

03 The manufacturer should furnish noise power levels of the unsilenced DG sets as per standards prescribed under (A).

04. The total sound power level of a DG set, at the user's end, shall be within 2 dB(a) of the total sound power level of the DG set, at the manufacturing stage as prescribed under (A).

05. Installation of a DG set must be strictly in compliance with the recommendations of the DG set manufacturer.

06. A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

D) GSR 742(E) dated 30.08.1990 amended GSR 422 (E) dated 19 May, 1993

Noise limits for domestic appliances and construction equipments at the manufacturing stage in dB(A)

Window air conditioners of 1 -1.5 tonne	68
Air coolers	60
Refrigerators	46
Compactors (rollers), front loaders, concentrate mixers, cranes (movable), vibrators and saws	75

E) ADB SPS Requirement

During the design, construction, and operation of the project the PMU and PIUs will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's

Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of India regulations differ from these levels and measures, the PMU and PIUs will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU and PIUs will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

WHO Ambient Air Quality Guidelines

Table 1.1.1: WHO Ambient Air Quality Guidelines ^{7, 8}		
	Averaging Period	Guideline value in $\mu\text{g}/\text{m}^3$
Sulfur dioxide (SO_2)	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10 minute	500 (guideline)
Nitrogen dioxide (NO_2)	1-year	40 (guideline)
	1-hour	200 (guideline)
Particulate Matter PM_{10}	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $\text{PM}_{2.5}$	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

World Bank Group's EHS Noise Level Guidelines

Table 1.7.1- Noise Level Guidelines ⁵⁴		
Receptor	One Hour L_{Aeq} (dBA)	
	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational ⁵⁵	55	45
Industrial; commercial	70	70

Appendix 3: Occupational noise exposure

National Institute of Occupational Safety and Health

Criteria for a recommended standard: occupational noise exposure

NIOSH Publication no. 98-126

Combination of noise exposure levels and duration that no worker exposure shall equal or exceed

Exposure Level (dBA)	Duration		
	Hours	Minutes	Seconds
80	25	24	-
81	20	10	-
82	16	-	-
83	12	42	-
84	10	5	-
85	8	-	-
86	6	21	-
87	5	2	-
88	4	-	-
89	3	10	-
90	2	31	-
91	2	-	-
92	1	35	-
93	1	16	-
94	1	-	-
95	-	47	37
96	-	37	48
97	-	30	-
98	-	23	49
99	-	18	59
100	-	15	-
103	-	7	30
105	-	4	43
110	-	1	29

Appendix 4: Hazardous Wastes

(Management Handling and Transboundary Movement) Rules, 2008

S.O. 2265 (E) dated 24 September, 2008

Rule 3. Hazardous waste means waste which by reasons of any of its physical, chemical, reactive, toxic, inflammable, explosive or corrosive characteristics causes danger or is likely to cause danger to health or environment, whether alone or when in contact with other wastes or substances, and shall include wastes having constituents specified in Schedule II if their concentration is equal to or more than the limit indicated in the said schedule.

5. Grant of authorization for handling hazardous wastes

(a) Every person who is engaged in generation, processing, treatment, packaging, storage, transportation, use, collection, destruction, conversion offering for sale, transfer or the like of the hazardous waste shall require to obtain an authorization from the WBPCB.

(b) The hazardous waste shall be collected, treated, re-cycled, re-processed, stored or disposed of only in only in such facilities as may be authorized by the WBPCB for the purpose.

Schedule 2

List of Waste Constituents with Concentration Limits*

Class AConcentration limit: ≤ 50 mg/kg

- A1 Antimony and antimony compounds
- A2 Arsenic and arsenic compounds
- A3 Beryllium and beryllium compounds
- A4 Cadmium and cadmium compounds
- A5 Chromium (VI) compounds
- A6 Mercury and mercury compounds
- A7 Selenium and selenium compounds
- A8 Tellurium and tellurium compounds
- A9 Thallium and thallium compounds
- A10 Inorganic cyanide compounds
- A11 Metal carbonyls
- A12 Naphthalene
- A13 Anthracene
- A14 Phenanthrene
- A15 Chrysene, benzo (a) anthracene, fluoranthene, benzo (a) pyrene, benzo (K) fluoranthene, indeno (1, 2, 3-cd) pyrene and benzo (ghi) perylene
- A16 halogenated compounds of aromatic rings, e.g. polychlorinated biphenyls, polychloroterphenyls and their derivatives
- A17 Halogenated aromatic compounds
- A18 Benzene
- A19 Organo-chlorine pesticides
- A20 Organo-tin Compounds

Class BConcentration limit: $\leq 5,000$ mg/kg

- B1 Chromium (III) compounds
- B2 Cobalt compounds
- B3 Copper compounds
- B4 Lead and lead compounds
- B5 Molybdenum compounds
- B6 Nickel compounds
- B7 Inorganic Tin compounds
- B8 Vanadium compounds
- B9 Tungsten compounds
- B10 Silver compounds
- B11 Halogenated aliphatic compounds
- B12 Organo phosphorus compounds

- B13 Organic peroxides
- B14 Organic nitro-and nitroso-compounds
- B15 Organic azo-and azoxy compounds
- B16 Nitriles
- B17 Amines
- B18 (Iso-and thio-) cyanates
- B19 Phenol and phenolic compounds
- B20 Mercaptans
- B21 Asbestos
- B22 Halogen-silanes
- B23 Hydrazine (s)
- B24 Fluorine
- B25 Chlorine
- B26 Bromine
- B27 White and red phosphorus
- B28 Ferro-silicate and alloys
- B29 Manganese-silicate
- B30 Halogen-containing compounds which produce acidic vapours on contact with humid air or water, e.g. silicon tetrachloride, aluminium chloride, titanium tetrachloride

Class C

Concentration limit: □ 20, 000 mg/kg

- C1 Ammonia and ammonium compounds
- C2 Inorganic peroxides
- C3 Barium compounds except barium sulphate
- C4 Fluorine compounds
- C5 Phosphate compounds except phosphates of aluminium, calcium and iron
- C6 Bromates, (hypo-bromites)
- C7 Chlorates, (hypo-chlorites)
- C8 Aromatic compounds other than those listed under A12 to A18
- C9 Organic silicone compounds
- C10 Organic sulphur compounds
- C11 Iodates
- C12 Nitrates, nitrites
- C13 Sulphides
- C14 Zinc compounds
- C15 Salts of per-acids
- C16 Acid amides
- C17 Acid anhydrides

Class D

Concentration limit: □ 50, 000 mg/kg

- D1 Total Sulphur
- D2 Inorganic acids

- D3 Metal hydrogen sulphates
- D4 Oxides and hydroxides except those of hydrogen, carbon, silicon, iron, aluminum, titanium, manganese, magnesium, calcium
- D5 Total hydrocarbons other than those listed under A12 to A18
- D6 Organic oxygen compounds
- D7 Organic nitrogen compounds expressed as nitrogen
- D8 Nitrides
- D9 Hydrides

Class E

Regardless of concentration limit, Classified as hazardous wastes if the waste exhibits any of the following Characteristics.

- E1 **Flammable**
Flammable wastes with flash point 65.6°C or below.
- E2 **Explosive**
Wastes which may explode under the effect of flame, heat or photochemical conditions. Any other waste of explosive materials included in the Indian Explosive Act.
- E3 **Corrosive**
Wastes which may be corrosive, by chemical action, will cause severe damage when in contact with living tissue.
- E4 **Toxic**
Wastes containing or contaminated with established toxic and or eco- toxic constituents.
- E5 **Carcinogenicity, Mutagenicity and Endocrine disruptivity**
Wastes contaminated or containing established carcinogens, mutagens and endocrine disruptors.

*Waste constituents and their concentration limits given in this list are based on erstwhile BAGA (the Netherlands Environment Protection Agency) List of Hazardous Substances. In order to decide whether specific wastes listed above is hazardous or not, following points be taken into consideration:

- (i) If a component of the waste appears in one of the five risk classes listed above (A,B,C,D or E) and the concentration of the component is equal to or more than the limit for the relevant risks class, the material is then classified as hazardous waste.
- (ii) If a chemical compound containing a hazardous constituent is present in the waste, the concentration limit does not apply to the compound, but only to the hazardous constituent itself.
- (iii) If multiple hazardous constituents from the same class are present in the waste, the concentrations are added together.
- (iv) If multiple hazardous constituents from different classes are present in the waste, the lowest concentration limit corresponding to the constituent(s) applies.
- (v) For determining the concentration of the hazardous constituents in the waste "Toxicity Characteristics Leaching Procedure (TCLP)" as per ASTM-D5233-92 should be adopted.

Appendix 5: Photo illustration

	
Prantik phase III – UG reservoir, pump house and ESR location	KMC land Julpia road – UG reservoir, pump house and ESR location
	
22 Bigha – ESR location	WBSETCL near Joka Tram Depot. – ESR location
	
SSE STP North East- area for ESR	SSE STP North West - area for ESR

Appendix 6: Rapid Environmental Assessment (REA) Checklist

Water supply sub project

Screening Questions	Yes	No	Remarks
A. Project Siting <i>Is the project area...</i>			
▪ <i>Densely populated?</i>	✓		Kolkata is densely populated. As per 2011 census, the urban population of Kolkata is 4.45 million and population density is 24,783 persons per square kilometer. About 60% of KMC area is residential. Industries occupy only about 5% of the area. Infrastructural development is however picking up.
▪ <i>Heavy with development activities?</i>	✓		
▪ <i>Adjacent to or within any environmentally sensitive areas?</i>			No part of the water supply subproject components is within locations in or near sensitive and valuable ecosystems, including protected areas and forests.
• <i>Cultural heritage site</i>		✓	
• <i>Protected Area</i>		✓	
• <i>Wetland</i>		✓	
• <i>Mangrove</i>		✓	
• <i>Estuarine</i>		✓	
• <i>Buffer zone of protected area</i>		✓	
• <i>Special area for protecting biodiversity</i>		✓	
• <i>Bay</i>		✓	
B. Potential Environmental Impacts <i>Will the Project cause...</i>			
▪ <i>pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?</i>		✓	Not applicable. KEIP Tranche 2 will involve network improvement only. The existing water supply source will be utilized
▪ <i>impairment of historical/cultural monuments/areas and loss/damage to these sites?</i>		✓	Not applicable. There are no historical/cultural monuments/areas within or adjacent to subproject sites.
▪ <i>hazard of land subsidence caused by excessive ground water pumping?</i>		✓	Not applicable. KEIP Tranche 2 will not involve groundwater source. The main source of raw water is the Hoogli River, a principal tributary of Ganga River. Water quantity is sufficient and additional abstraction from the river will not have significant impact.
▪ <i>social conflicts arising from displacement of communities ?</i>		✓	No displacements required. Subproject sites are government-owned. Temporary impacts to businesses may occur during pipelaying works and are to be addressed through specific measures in the EMP. Any involuntary resettlement impacts identified will be

Screening Questions	Yes	No	Remarks
			addressed in the Resettlement Plan (RP).
▪ <i>conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?</i>		✓	Not applicable. KEIIP Tranche 2 will involve network improvement only.
▪ <i>unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?</i>		✓	Periodic monitoring and analysis conducted by KMC on raw water from the sources indicate water quality parameters are within prescribed limits.
▪ <i>delivery of unsafe water to distribution system?</i>		✓	The subproject will provide treated water through new pipes to prevent leakages and contamination.
▪ <i>inadequate protection of intake works or wells, leading to pollution of water supply?</i>		✓	Not applicable. KEIIP Tranche 2 will involve network improvement only.
▪ <i>over pumping of ground water, leading to salinization and ground subsidence?</i>		✓	Not applicable.
▪ <i>excessive algal growth in storage reservoir?</i>		✓	Storage reservoirs are only for treated water. The water is chlorinated and the reservoirs covered to prevent algal growth.
▪ <i>increase in production of sewage beyond capabilities of community facilities?</i>		✓	Not anticipated. New sewerage system will be developed at the project area
▪ <i>inadequate disposal of sludge from water treatment plants?</i>		✓	Not applicable. KEIIP Tranche 1 (on-going) includes rehabilitation of existing water treatment plant. The designs and IEE prepared for the subproject civil works package includes sludge management plan.
▪ <i>inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?</i>		✓	Not applicable. KEIIP Tranche 2 will involve network improvement only.
▪ <i>impairments associated with transmission lines and access roads?</i>		✓	Not anticipated. Road closures are not required during pipelaying works. A section-wise approach will limit impairments to traffic and businesses during construction. The EMP ensures measures are included to mitigate the impacts.
▪ <i>health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.</i>		✓	Not applicable. KEIIP Tranche 2 will involve network improvement only.
▪ <i>health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?</i>		✓	Not applicable. KEIIP Tranche 2 will involve network improvement only.
▪ <i>dislocation or involuntary resettlement of</i>		✓	No voluntary resettlement impacts

Screening Questions	Yes	No	Remarks
people?			envisioned. Lands for the subproject are government-owned. Any involuntary resettlement impacts identified will be addressed in the RP.
▪ <i>disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?</i>		✓	Not anticipated. The contractor will be encouraged to hire local workers from the local labor force.
▪ <i>noise and dust from construction activities?</i>	✓		Anticipated during construction activities. Temporary increase in noise level and dusts may be caused by excavation equipment, and the transportation of equipment, materials, and people. The impacts are negative but short-term and site-specific within a relatively small area, and reversible through mitigation measures. Good construction practices will mitigate noise and dust, and will be specified in the EMP.
▪ <i>increased road traffic due to interference of construction activities?</i>	✓		Anticipated during construction activities. The impacts are negative but short-term and site-specific within a relative small area and reversible through mitigation measures. Traffic management will be specified in the EMP.
▪ <i>continuing soil erosion/silt runoff from construction operations?</i>	✓		Due to excavation and run-off from stockpiled materials. The impacts are negative but short-term and site-specific within a relatively small area and reversible through mitigation measures. Good construction practices will mitigate soil erosion and silt runoff and will be specified in the EMP.
▪ <i>delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?</i>		✓	Not applicable. KEIIP Tranche 1 (on-going) includes development of O&M manuals for components included in the tranche. KEIIP Tranche 2 will involve network improvement only.
▪ <i>delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?</i>		✓	KEIIP Tranche 1 (on-going) includes development of O&M manuals to ensure facilities are kept in working condition, including checking and maintenance of distribution network. Any distributed water must comply with the National Drinking Water Quality Standards.
▪ <i>accidental leakage of chlorine gas?</i>		✓	Not applicable. KEIIP Tranche 2 will involve network improvement only.
▪ <i>excessive abstraction of water affecting downstream water users?</i>		✓	Not applicable. KEIIP Tranche 2 will involve network improvement only.

Screening Questions	Yes	No	Remarks
▪ <i>competing uses of water?</i>		✓	
▪ <i>increased sewage flow due to increased water supply</i>		✓	Not applicable. KEIP Tranche 2 will involve network improvement only.
▪ <i>increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant</i>		✓	
▪ <i>large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?</i>		✓	KEIP (both on-going Tranche 1 and proposed Tranche 2) will improve existing systems, through capacity building and institutional development to ensure reduced burden on services and infrastructure due to population influx.
▪ <i>social conflicts if workers from other regions or countries are hired?</i>		✓	Priority in employment will be given to local residents.
▪ <i>risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?</i>		✓	Not applicable. Construction will not involve use of explosives and chemicals.
▪ <i>community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?</i>		✓	Work areas will be clearly demarcated with signage and safety barriers, and access will be controlled. Only workers and project concerned members will be allowed to visit the operational sites.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: India/
Sector : Urban Development
Subsector: Water Supply
Division/Department: Kolkata Municipal Corporation

Screening Questions		Score	Remarks ¹
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	

¹ If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	0	
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Low

Other

Comments: _____

Prepared by: PMU, Kolkata Municipal Corporation

Appendix 7: Sample Traffic Management Plan (TMP)

A. Principles

1. One of the prime objectives of this TMP is to ensure the safety of all the road users along the work zone, and to address the following issues:

- (i) the safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
- (ii) protection of work crews from hazards associated with moving traffic;
- (iii) mitigation of the adverse impact on road capacity and delays to the road users;
- (iv) maintenance of access to adjoining properties
- (v) Avoid hazards in addressing issues that may delay the project.

B. Operating Policies for TMP

2. The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.

- (i) Make traffic safety and temporary traffic control an integral and high-priority element of every project from planning through design, construction, and maintenance.
- (ii) Inhibit traffic movement as little as possible.
- (iii) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
- (iv) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
- (v) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
- (vi) Train all persons that select, place, and maintain temporary traffic control devices.
- (vii) Keep the public well informed.
- (viii) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.

C. Analyze the impact due to street closure, if required

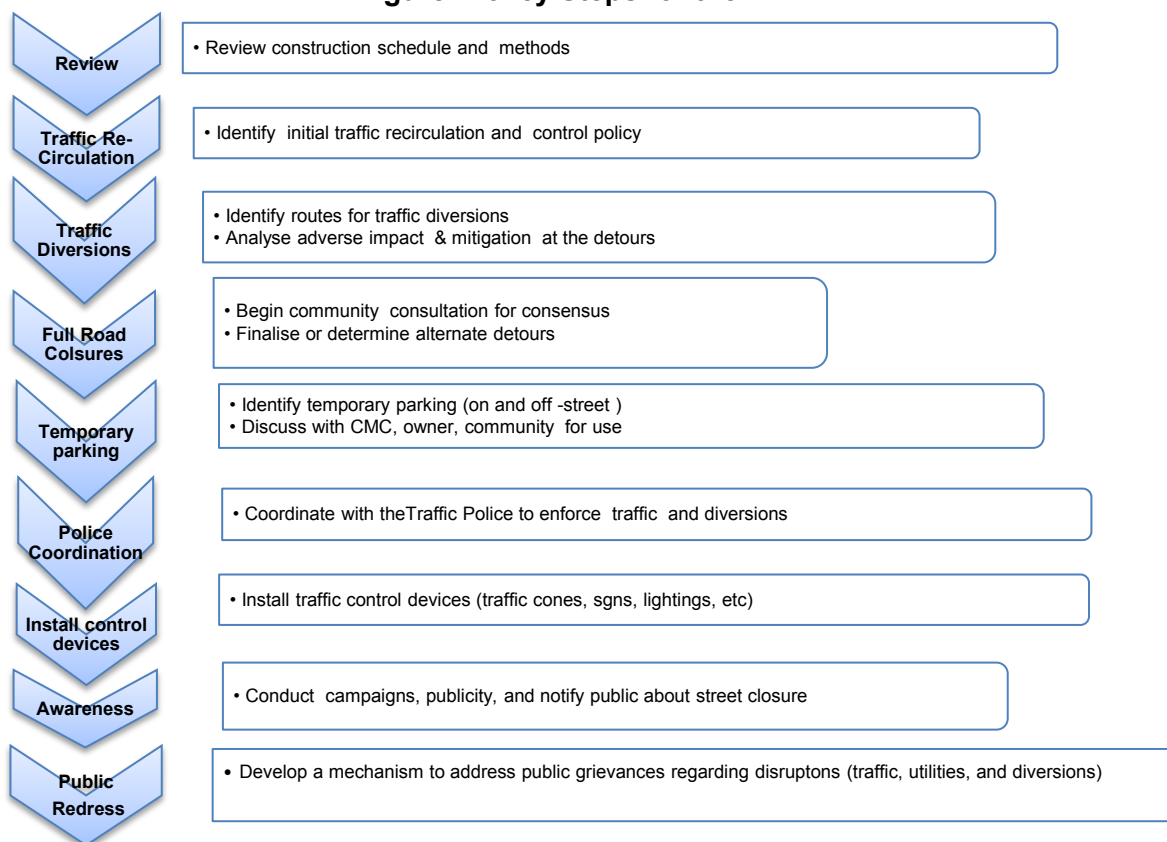
3. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

- (i) approval from the PMU, local administration to use the local streets as detours;
- (ii) consultation with businesses, community members, traffic police, PWD, etc, regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
- (iii) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;
- (iv) determining if additional traffic control or temporary improvements are needed along the detour route;

- (v) considering how access will be provided to the worksite;
- (vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and
- (vii) developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

4. If full road-closure of certain streets within the area is not feasible due to inadequate capacity of the Detour Street or public opposition, the full closure can be restricted to weekends with the construction commencing on Saturday night and ending on Monday morning prior to the morning peak period.

Figure: Policy Steps for the TMP



D. Public awareness and notifications

5. As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, albeit on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.

6. The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the

time when the roadblocks or traffic diversions take place at the particular streets. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the elected representatives.

7. The DSC/ PMU will also conduct an awareness campaign to educate the public about the following issues:

- (i) traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
- (ii) defensive driving behaviour along the work zones; and
- (iii) reduced speeds enforced at the work zones and traffic diversions.

8. It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

9. The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centers. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

- (i) explain why the brochure was prepared, along with a brief description of the project;
- (ii) advise the public to expect the unexpected;
- (iii) educate the public about the various traffic control devices and safety measures adopted at the work zones;
- (iv) educate the public about the safe road user behaviour to emulate at the work zones;
- (v) tell the public how to stay informed or where to inquire about road safety issues at the work zones (name, telephone, mobile number of the contact person; and
- (vi) indicate the office hours of relevant offices.

E. Vehicle Maintenance and Safety

10. A vehicle maintenance and safety program shall be implemented by the construction contractor. The contractor should ensure that all the vehicles are in proper running condition and it comply with roadworthy and meet certification standards of West Bengal Govt./ Gol. All vehicles to be used shall be in perfect condition meeting pollution standards of West Bengal Govt./ Gol. The vehicle operator requires a pre state of shift checklist. Additional safety precautions will include the requirement for:

- Driver will follow the special code of conduct and road safety rules of Government of India
- Drivers to ensure that all loads are covered and secured drivers to ensure operation equipment can't leak materials hauled
- Vehicles will be cleaned and maintained in designed places.

F. Install traffic control devices at the work zones and traffic diversion routes

10. The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices are used in work zones:

- Signs
- Pavement Markings
- Channelizing Devices
- Arrow Panels
- Warning Lights

11. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new city areas are wide but in old city roads very narrow and carry considerable traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”).

12. The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.

13. Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during night time.

14. In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions.

15. The PMU, DSC and contractor will coordinate with the local administration and traffic police regarding the traffic signs, detour, and any other matters related to traffic. The contractor will prepare the traffic management plan in detail and submit it along with the EMP for the final approval.

Appendix 8: Outline of Spoil and Sludge Management Plan (SSMP)

1.0 Purpose and application:

SMP is to describe how the project will manage the spoil generated and reuse related to design and construction works. This is an integral part of EMP. The objective of SMP is to reuse of spoil from works in accordance with the spoil management hierarchy outlined in this document.

2.0 Objectives of SMP:

The objectives of SMP are:

- To minimize spoil generation where possible
- Maximize beneficial reuse of spoil from construction works in accordance with spoil management hierarchy
- Manage onsite spoil handling to minimize environmental impacts on resident and other receivers
- Minimize any further site contamination of land, water, soil
- Manage the transportation of spoil with consideration of traffic impacts and transport related emissions

3.0 Structure of SMP:

Section 1: Introduction of SMP

Section 2: Legal and other requirements

Section 3: Roles and responsibilities

Section 4: Identification and assessment of spoil aspects and impacts

Section 5: Spoil volumes, characteristics and minimization

Section 6: Spoil reuses opportunities, identification and assessment

Section 7: On site spoil management approach

Section 8: Spoil transportation methodology

Section 9: Monitoring, Reporting, Review, and Improvements

4.0 Aspects and Potential Impacts

The key aspects of potential impacts in relation to SMP are listed in table below

Aspects	Potential Impacts
Air Quality	Potential for high winds generating airborne dust from the stock piles
Sedimentation	Potential for sediment laden site runoff from spoil stockpiles and potential for spillage of spoil from truck on roads
Surface and Groundwater	Contamination of water (surface and ground water)
Noise	Associated with spoil handling and haulage and storage
Traffic	Impacts associated with spoil haulage
Land Use	Potential for spoil to be transported to a receivable site that doesn't have permission for storage/disposal
Design specifications	Limitations on opportunities to minimize spoil generation
Sustainability	Limited sites for storage, reuse opportunities

5.0 Spoil volumes, characteristics and minimization

5.1 Spoil volume calculations: Estimate the volumes of spoils produced from each of the construction sites.

5.2 Characterization of spoil: Based on the type of spoil; characterization is done (sand stone, mud mix materials, reusable materials)

5.3 Adopt Spoil Reduce, Reuse Opportunities

An overview of the assessment methodology to be used is mentioned below.

- Consideration of likely spoil characteristics
- Identification of possible reuse sites
- Screening of possible reuse opportunities

5.4 Identification of possible safe disposal sites for spoil: Those spoils which can't be reuse shall be properly disposed in designated areas, such disposal areas should be identified in project locations. Such disposal areas should be safe from environmental aspects and there should be any legal and resettlement related issues. Such areas need to be identified and prior cliental approval should be obtained to use it as spoil disposal area. The local administration must be consulted and if required permission should be obtained from them.

5.5 Storage and stock piling

5.6 Transportation and haulage route

6.0 Based on the above, the contractor will prepare a SMP as an integral part of EMP and submit it to the DSC for their review and approval.

Appendix 9: Health and Safety Plan

(To be implemented by the Construction contractor)

RESPONSIBILITY AND AUTHORITY FOR EHS MANAGEMENT

Project In charge (PI)

- ✓ The project PI will have overall responsibility of Health & Safety (H & S) Management at the site and improving safety and health in all areas. He/ She shall:
- ✓ Comply with Client's requirements, HS-Policy of the company and relevant statutory requirements that are applicable to the relevant work.
- ✓ Ascertain that all plants and machinery utilized at the project site meets the safety standard and are safe for use.
- ✓ Get familiar with and demonstrate his commitment to continual improvement in HS performance;
- ✓ Ensure that all personnel are aware of commitment to environmental protection and worker safety;
- ✓ Monitor HS performance of the personnel and activities under his control;
- ✓ Ensure that safe system of work are implemented and maintained by the project Engineers / Supervisors / Foreman and employees at the work site.
- ✓ Ensure that Site HS Plan is accessible to all relevant parties;
- ✓ Ensure that sufficient induction training for all employees and workers is given before commencement of work at site and subsequently for new inductees;
- ✓ Undertake program of regular HS Inspection at site.
- ✓ Arrange and chair monthly Site HS Management Review Meeting.

Site/Front In-charge

The Site/Front In-charge will be responsible to the PI for implementation of HS operational control procedures. In the absence of PI, he/she would take control of the Site. His/Her duties are similar to that of the PI.

Site Engineers/Supervisors

- They will be responsible to the PI / Site / Front In-charge for implementing the requirements of this plan. In particular they are required to: -
- Be familiar with Site HS Plan;
- Maintain safe working conditions and good housekeeping in all areas under his supervision.
- Enforce use of PPE as requested by Project Specific Rules and regulations.
- Liaise and cooperate with Site Safety HS Officer and ensure that defects brought to attention are corrected.
- Immediately Inform & report to the HS-Officer while any accident, near misses, dangerous occurrence, occupational poisoning or diseases shall be noticed within the project sites.
- Plan safety in accordance with the approved work methodology for daily work activities.
- Prepare Standard Operating Procedure (S.O.P) and General Risk Assessment (GRA) for each activity and it should be explained to employee before begins work.
- Establish and maintain proper communication with all workers with regard to EHS; and
- Provide proper supervision for the work.

Health & Safety (HS) Officer

He will be accountable to the PI for fulfilling the duties assigned to him and ensure implementation of HS Plan.

His / Her duties will include:

- Monitor and advise relevant personnel on compliance with HS statutory obligations at the site;
- Facilitate inclusion of safety elements into work Method Statement.
- Highlight the requirement of safety through Tool-Box / other meetings.
- Conduct investigation of all accident/dangerous occurrences and recommend appropriate safety measures.
- Advice & co-ordinate for implementation of operational control procedures etc.
- Convene safety meeting & minute the proceeding for circulation & follow-up action.
- Provide copies of site / office inspection report to relevant managers
- Plan procurement of PPEs and safety devices and inspect their healthiness.
- Report to PI/Divisional Manager on all matters pertaining to status of safety and promotional program at site level.
- Facilitate administration of FIRST – AID.
- Facilitate screening of workman and safety induction.
- Conduct fire drill and facilitate emergency preparedness.
- Design campaigns, competitions and other special emphasis programs to promote safety in the work place.
- Notify site personnel non-conformance to safety norms observed during site visits / site inspections.
- Attend and participate in Site HS Management Review Meetings;
- Access and advise PI on the perceived HS training needs of project personnel;
- Monitor HS performance of subcontractors and make appropriate recommendations for performance improvement.

Employees

All employees will be accountable for conforming to the requirement of the HS Plan and statutory requirements. In particular every employee will be required to: -

- Take care of environmental protection and safety of himself & others;
- Co-operate to fulfill statutory HS obligations;
- Co-operate in pursuit of continuous HS performance Improvement; and
- Conform to requirement of Project HS plan.
- Report defects in lifting appliances, lifting gears, transport equipments and any other equipments or tools & tackles to your immediate superior.
- Not to remove or interfere with any fencing, gangway, ladder, covering, life saving appliances, lighting and other things whatsoever required by site safety rules & regulations.
- Take care of personal protective equipment
- Don't let your work put another worker in danger.
- Use only means of access provided for specific work at site.
- Avoid horseplay, practical jokes or other activities to create a hazard.
- Don't use drugs or alcohol on the job.
- Keep the latrines, urinals, wash points, canteen and other facilities provided in a clean and hygienic condition
- Report any unsafe work practice and any injury or accident to your supervisor.

SAFETY AND HEALTH OPERATIONAL CONTROL PROCEDURES

To minimize hazards and risks, control measures shall be introduced in the following order of priority: -

- ☞ Engineering controls
- ☞ Administrative controls
- ☞ PPE

SITE SAFETY RULES

- No one (including staff and workers etc.) will be allowed to enter the work site without prior induction training & without required PPE.
- Before start of work every day, five minutes pre work briefing shall be conducted by each respective front engineers / supervisor with subcontractor's job supervisor present. The job to be undertaken that day shall be explained.
- Once every week toolbox talks on specific topics will be conducted by the front engineer/supervisor in the presence of safety officer, all talks will be documented on the company's specified format. Toolbox talks will also be given whenever a new activity is taken up or a new gang turns up for work.
- No Staff or workers will be allowed to enter the work site or to start his everyday activity without necessary job related PPE's. If there is any non compliance, Safety Officer or Site Management will issue a warning and if it is repeated impose fine on the concerned person and concerned Sub contractors.
- Smoking is strictly prohibited in all parts of the worksites except specific smoking zone as authorized by the site safety dept.
- Working under influence of drugs, alcohol etc. is strictly prohibited on worksite.
- Carrying unwanted flammable items, explosives etc. strictly prohibited at site.
- No vehicle shall be permitted to enter the work site or introduced into the job without prior induction by the plant and safety dept.
- It is mandatory that all vehicle driver and operator of lifting equipments etc. (heavy Vehicles like JCB, Tipper, and Crane etc.) should possess valid authorization certificates from the site plant dept. before starting of their respective job.
- It is mandatory that all electrical operated machinery's, equipments etc. (like Vacseal Pump, water pump, welding rectifiers/ transformers, diesel welding generators, panels, Switch gear, starter switch, D G Shed etc.) should be duly certified by Contractor's Electrical dept. prior to introduce into operation.
- Prior to introduction of any lifting tools, tackles, machinery's etc. in operation it is mandatory to conduct Third Party Competent Persons checking as per requirement and the Safe Working Load (SWL) should be marked on the equipment.
- All employees including workers must know about the exact location and use of fire Fighting equipments. Never restrict the access towards the firefighting equipment, always keep the access free from any obstructions.
- Considering emergency situation always keep the access around the work site area free from any obstruction for rescue operation.
- Everyone including workers should inform about the accident / incident and dangerous Occurrence to Site In charge, Site Engineer & Safety Officer.
- Always stay alert and keep your mind on the work, when you are engaged in the site work.
- Before starting of everyday work, routine checking of lifting equipments, Tools & Tackles, Winch, all types of pumps etc. to be done by concern Engineer, Supervisor and Worker.
- Don't carry out unfamiliar work without proper instruction. Any error due to

ignorance can cause serious damage.

- When working at site especially around the moving machinery's, operating winch machine etc., wearing of loose clothing like dhoti, lungi, open sleeve shirt etc. are strictly prohibited.
- Don't leave any tools or materials haphazardly, where they can cause obstruction and create tripping hazards.
- All platforms, walkways, gangways, ramp, work area etc. must be kept clear at all time.
- During gas cutting uses of FLASH BACK ARRESTOR / non return valve are mandatory on each cylinder s & torch side.
- It is mandatory to use of Earth Leakage Circuit Breaker (ELCB) / Miniature Circuit Breaker (MCB) / Residual Current Circuit Breaker (RCCB) etc. on all site temporary electrical facilities.
- Always use minimum three cores double insulated cables for site electrification job.
- During lifting a load by a crane use of guy rope on both ends is mandatory
- Never use compressed air for cleaning of your clothes or getting relief from excessive heat.
- It is mandatory to install Reverse Horn on all vehicles (Like JCB, Tipper and site vehicle) and swing horn & over hoist limit switches for lifting equipments like Cranes.
- All materials must be stored in a safe manner and height of stacking should be maintained (below the man height) to protect collapsing of the stack and when material shifting work is carried out manually
- Horseplay inside the site during or after the job is strictly prohibited.
- Never roll the compressed gas cylinders (DA & O₂) at site, either shift it manually or by gas trolley. Use of gas trolley is mandatory for all cutting sets.
- Keep all gas cylinders inside proper shed in upright condition and lock it properly.
- Keep Diesel / Oil in its tank under the shed. Use oil spill trays below diesel tanks.
- Follow the speed limit of 20 Km/hr inside the work premises religiously.
- Maintaining hygienic environment at camp site
- Consideration of women worker health at working place

FIRST - AID FACILITIES AND MEDICAL TREATMENT

- a) Each worksite/area shall be equipped with it's a first aid box catering to the needs of particular workfront.
- b) Medical causality evacuation and treatment procedures involving the nearest clinic / Hospitals shall be instituted.
- c) Appointment of trained first aider.

EMERGENCY PREPAREDNESS AND RESPONSE PLAN

Approach

The aim of this emergency preparedness and response plan is to guide personnel in an accident or emergency situation to prevent or minimize injury, damage and material loss and also to prevent or mitigate environmental impact from the accident or emergency.

Emergency Preparedness facility

Following emergency preparedness facilities have been provided at the site:

- ☞ All the buildings and structures are well supplied with fire fighting devices.
- ☞ Proper security arrangements are functioning round the clock.
- ☞ There is quick and efficient transport as well as communication system.
- ☞ Smoking is prohibited throughout the flammable premises.
- ☞ Water is kept available for firefighting purpose.

- ☞ Sufficient number of trained manpower is available to extinguish any fire and attend emergency.
- ☞ Sufficient number of Personal Protective Equipment like helmet and gloves are available
- ☞ Audible emergency alarm/whistles are provided.
- ☞ First Aid Kit is available.
- ☞ All key personnel have been provided communication mean such as telephone / walkie-talkie / mobiles. Any message can be communicated immediately.
- ☞ All work fronts / floating crafts will have emergency lights and Torches.
- ☞ All exit doors are kept unobstructed
- ☞ It is ensured that access to fire extinguishers is not obstructed.
- ☞ Proper containers are used for flammable liquids.
- ☞ Safe distance of POL is maintained from any point of ignition.
- ☞ Welding and cutting equipment is checked before and after use.
- ☞ Main electrical equipment is switched off when not in use.
- ☞ All workers and staff are familiarized with the fire fighting system.
- ☞ Escape routes are well defined.
- ☞ The POL dumps and gas cylinders are barricaded.
- ☞ Fire extinguishers are refilled on time.

Sr. No.	Item	Nos.	Location
1	First aid kits	01 each	In all work fronts
3.	Sand / Fire buckets	As required	Store/workshop/office/ Site office container/ All DG Rooms / casting Yard etc.,
4	Fire Extinguishers	As required	Store/workshop/office/ Site office container/ All DG Rooms / casting Yard etc.,
5	Safety Helmets	Depends on no. of labour	Site Store
6	Safety Shoes Pairs	10 Nos. (Each sizes)	Site Store
7	Stretchers	4-6 Nos.	First Aid room / Ambulance / Store
8	Oil spill absorbent materials (Hesian Cloth / Foam)	Sufficient Quantity	Site Store

Reporting System for Emergency

Important Telephone Numbers of Persons at Corporate /Division Level

Local Fire Station
Private Hospital
Police Station

Appendix 10: Minutes of the Meeting

Meeting held on Dec 01, 2015 at Paribesh Bhawan, Salt Lake between officials of WBPCB, KMC and KEIP

The following persons attended the meeting

On behalf of KEIP & KMC			
Sl. No.	Name	Contact no	E-mail
1.	Md. G.A. Ansari	9800862246	pdkeip@gmail.com
2.	Soumya Ganguly	9831080056	soumya.ganguly@rediffmail.com
3.	Subhajit Das Gupta	9830060382	Subhajit.Dasgupta@gmail.com
4.	Ranajit Banerjee	9831074177	rbanerjee1946@gmail.com
5.	Dr. Chinmoy Chakrabarti	9830284360	chin_moy@yahoo.com
6.	Diptarup Kahali	9051022223	Diptarup.kahali@gkw.consult.com
7.	Dr. Ardhendu Mitra	9830415953	ardhendumitra@gmail.com

On behalf of WBPCB			
Sl. No.	Name	Contact no.	E-mail
1.	Dr. Kalyan Rudra	9433507176	chairman@wbpcb.gov.in
2.	Dr. Subrat Mukherjee, IFS	9874948678	ms@wbpcb.gov.in
1.	Dr. Ujjal Mukhopadhyay	9830063508	ujjal@wbpcb.gov.in
1.	S.K. Adhikari	9830596338	shyamala@wbpcb.gov.in
2.	Sarmistha Kundu	9831165615	Sormistha @wbpcb.gov.in
3.	Ranadip Mondal	9331934875	rmondal@wbpcb.gov.in
4.	Ruby Sinha	9330869729	ruby@wbpcb.gov.in
1.	D. Sarkar	9434031887	debasarkar@wbpcb.gov.in
2.	Barna Mujumdar	9038090305	barna@wbpcb.gov.in

At the outset the officials of KEIP and KMC explained that the purpose of their visit to WBPCB and this meeting was to apprise the Board officials about the various activities being undertaken under the Kolkata Environmental Improvement Project (KEIP) and also under the Kolkata Environmental Improvement Investment Program (KEIP).

They mentioned that the purpose of KEIP was primarily to focus on the development and environment of the KMC Wards 1-6 and 101 to 141 which had several infrastructural deficiencies leading to frequent flooding and lack of basic urban services. The duration of the KEIP was from the year 2002 to the year 2013.

Subsequently, the second phase i.e. KEIP started in the year 2014 and is expected to run upto 2022. The KEIP aims at rehabilitation of inefficient and out-dated water supply assets to minimize cost of operation, restoration and enhancement of production capacities, and reduction of water loss in distribution and construction of sewer network to newly developed areas.

They explained and indicated the different locations where the new STPs were planned for installation. During the discussion, the KMC and KEIP officials were intimated about the new CPCB standards of Sewage Treatment Systems for implementation. A copy of the same was handed over to them for reference.

The KMC and KEIP officials submitted that in the course of their activities under the KEIP and KEIP, they would conform to all statutory formalities (CFE and CFO) as and when applicable. Statutory environmental obligation of KEIP with respect to currently planned work programs

including those requiring authorisation from WBPCB was presented by KEIIP which is reproduced below:

1. No Environmental Clearance (EC) under EIA Notification 2006 is required for any work packages under KEIIP
2. Under Tranche 1: Rehabilitation of WTP (20 MGD) at Palta – CTE received on 10.09.2015. CTO to be obtained before commission
3. Under Tranche 1: Rehabilitation of SSE STP - *work for ponds embankment, work on floating aerator, removal of silt & sludge from aerobic, ponds, aerated lagoons and maturation pond* – CTE and CTO exist. No change in design and capacity; therefore no fresh CTE required
4. No CTE and CTO required for other projects under Tranche 1 & 2
5. Tentative KEIIP Works Requiring WBPCB's clearance

Sr. No.	Name	Capacity	Technical summary	Status	Outfall to
1	Jiadgore STP	40 MLD	Sequential Batch Reactor (SBR)	To be applied for CTE & CTO	Keorapukur canal
2	SSE STP*	60 MLD	Facultative Aerated Lagoon (FAL)	To be applied for CTE & CTO	Churial Extension canal
3	Kalagachia & Suti STP	70 MLD	Sequential Batch Reactor (SBR)	To be applied for CTE & CTO	Churial canal
4	Bantala STP	Yet to be worked out	Sequential Batch Reactor (SBR)	To be applied for CTE & CTO	SWF Channel
5	Joka STP	Yet to be worked out	Sequential Batch Reactor (SBR)	To be applied for CTE & CTO	Keorapukur canal
6	Baghajatin STP	Yet to be worked out	Sequential Batch Reactor (SBR)	To be applied for CTE & CTO	TP system

SBR: Probable option of sewage treatment considering the minimum land requirement

* Rehabilitation & renovation (with increase in capacity)

The meeting ended after discussing the following two issues which are not directly connected with the current work program of KEIIP.

1. Wastewater treatment for the dyeing-bleaching units in and around Maheshtala, Chatta area - KEIIP officials informed that they were aware of the fact that MSME Dept. is looking into the matter and that the MSME has already identified a land which may accommodate about 200 units along with the Common Effluent Treatment Plant. It was further informed that MSME Dept. has also appointed a consultant for this purpose.

2. Unauthorised activities of leather shaving units in and around the CLC, Bantala - It was decided that the concerned stakeholders viz. KEIIP, Directorate of Industries, WBPCB, KMC and the local administration would meet on a mutually convenient date to resolve the issue.

Appendix 11: Summary of Community Consultation with Participant List

A Brief Report on Community Consultation at Ward No 143 Prantik Abasan PH-III (Community Hall) Mahatma Gandhi Road

A Community Consultation programme was conducted on 21st December 2015 at above mentioned location for information dissemination and exchange of views for the upcoming Water Supply project under Package WS-15 to WS-17 of Tranche – II, KEIP.

The Consultation programme was organized by the councilor Shri. Indrajit Bhattachariya, Ward No-143. The meeting was conducted in presence of Staffs of Social Safeguard Cell, KEIP, Social Safeguard Specialist of Social Safeguard Cell, 4 female and 46 male participants (Total 50) were present during the programme. The programme continued for 1 hour. Information was exchanged regarding the project work.

Among the female participants, all were housewives. The male participants were mainly businessmen and service holders and retired persons.

Information shared on following topics:

- Introduction of KEIP as an initiatives of Kolkata Municipal Corporation with the financial support of Asian Development Bank for arresting the degradation of environment of Kolkata and adjoining areas.
- Need and scope of work of KEIP.
- KMC being the mother body of KEIP is planning to undertake a Water Supply project in Joka and adjoining areas which are now at the planning stage. By virtue of this project the problem of scarcity of drinking water will be catered.
- Water supply project to be taken up as a part of the entire project at Ward No 143 under package Ws-15 to WS-17 of Tranche – II.
- 1 ESR (Overhead Tank), 1 PS (Pumping Station), 1 UGR (Underground Reservoir) has been proposed in the plan in this ward.
- Entire Plan and design has been prepared to supply house to house for 24 hrs in a day and cover the 100% area of the ward after completion of entire network.
- Availability of land in the Prantik Abasan.
- There will be no adverse impact on structures, livelihood, transportation and other utilities like electricity, water supply etc.
- Importance of Public participation and public awareness in case of short term inconvenience may take place during implementation phase of the project i.e. lying of distribution line, traffic diversion etc.
- Long term Benefits of the project.
- Phase wise implementation of the project.
- S & D work is also in the proposed plan.
- Impact of the project on environment, reducing the chance of water contamination etc.
- Tentative date for commencement and commissioning of the project.
- Necessary arrangements will be done by the project authority before commencing the work, like public information, shifting of utilities etc.
- Cooperation is needed on behalf of the local residents during project implementation phase.

Issues raised by the participants:

- The commencement of the project work and duration.
- Water logging during heavy monsoon is a big challenge for the local people.
- Quality of the water that is being supplied at present by PHE (Public Health Engineering Dept) is not up to the mark for drinking (quantity of iron is above than normal range and salinity is also present).
- Quantity of water supply is inadequate to cater the present demand.
- The residents of Prantik Abasan are very much concerned about their quality of water that is being supplied for them by PHE. They have a query whether there is any provision in the project to supply the treated water in their complex.
- Replacement of present PVC pipe which are in poor condition.
- Application of protection measures including safety during construction
- Policy of house connection in case of joint property recorded in Kolkata Municipal Corporation (erstwhile Joka gram panchayet).
- Policy regarding connection fees in case of house connection.
- Network coverage in remote part of the ward.

Design consideration in respect to raised issues and project requirement

- Work will be started very soon, within 6 months
- Sewerage and drainage package needs to be considered separately to tackle water logging
- Sufficient water will be provided as per demand and completely treated water will be supplied after treatment
- New distribution pipelines will be laid under different packages in the KEIP program
- Design is developed with the consideration of 100% coverage and 24 hrs supply
- Application of Environment Management Plan during project implementation



Community Consultation

Pkg-WS-15

Participants List

Name of place (Ward No) 143, Community Hall,
Prantik Housing, Ph-III
M.G. Road

Date 21/12/2015

SL.No	Name of Participants	Contact No, if any	Signature
1	SYAMAPADA JANA	9433614241	
2	DR BHABANI KUNHA GHOSH	9883185132	
3	MADHU SUDAN GARAI	9681354755	
4	R Raba Parui	9831624050	
5	Samsul Sahni	9088264188	
6	Bijam Mandal	9883174810	
7	Malay Bagh	9433420576	
8	Doddul Mondal	9831667158	
9	Bachchan Mondal	9087589309	
10	KHOKAN DHARMA	9163035038	

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Participants List

Name of place (Ward No) 143


Date 21/12/2015

Sl.No	Name of Participants	Contact No, if any	Signature
11	Sulekh Karmakar	7890884166	Sulekh Karmakar
12	Dilip Kumar Biswas	9433662146	Dilip
13	Swapna Samal	9432674028	S.S.
14	Swapna Kumar Chatterjee	9433625840	S.K. Chatterjee
15	Jyoti Ranjan	9748463503	Jyoti
16	Subhash Bagh	9477350007	Subhash
17	Haran Ch Majumdar	9163635771	Haran Ch Majumdar
18	Nilotpal Bhowmik	9851439842	Nilotpal
19	Manatosh Dey	9331145440	Manatosh
20	Kakuli Chakraborty	8013824153	Kakuli Chakraborty

Participants List

Name of place (Ward No) 143

Date 21/12/2015

Sl.No	Name of Participants	Contact No, if any	Signature
21	Sukhdevdhar		
22	SANKAR ADHIKAR- Y	8222859494	
23	Rabin Mondal.	983722575	
24	মিঃ মৌজা	8983116145	
25	মিঃ মৌজা	8981508810	
26	মোঃ মৌজা সংস্কৃত	9903719 594	
27	Kamal Mondal	7748556399	
28	মিঃ মৌজা	9331683744	
29	মোঃ মৌজা	8478082457	
30	মোঃ মৌজা	81002682 66	

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Participants List

Name of place (Ward No)



Date

Sl.No	Name of Participants	Contact No, if any	Signature
31	Balaraj Naitky	9748639969	
32	Bharat	8017472526	
33	Nimai Bar	9748447862	
34	Ajgar Aliyahi	8890516011	
35	Jebasish Bar	9836636099	
36	Asit Mondal	9038569628	
37	Habul Dhal	8981173249	
38	Sanjoy Roy	9903661567	
39	2/21/43 33	8013581349	
40	Subin Das	8820110919	

Participants List

Name of place (Ward No) 143

Date 21/12/2015

Sl.No	Name of Participants	Contact No, if any	Signature
41	Jagantha Paul	9051832686	
42	பிஷ்ணாபா	9903396138	பிஷ்ணாபா
43	பிஷ்ணாபா	7278426824	பிஷ்ணாபா
44	Pranabchakraborty	8017455738	Pranabchakraborty
45	LAKSHMI DAS	9831091277	Lanka Das
46	Mrs G. Ramesh	24383846	 21/12/15
47	Nirmal Mondal		Nirmal Mondal
48	பிஷ்ணாபா	9743705588	பிஷ்ணாபா
49	Ramesh Mondal	9007128711	Ramesh Mondal
50	Biswajit Mondal	7685950914	

5 of 5

A Brief Report on Community Consultation at Ward No 144 Office of Borough XVI, Diamond Park

A Community Consultation programme was conducted on 19th December 2015 at above mentioned location for information dissemination and exchange of views for the upcoming Water Supply project under Package WS-15 to WS-17 of Tranche – II, KEIIP.

The Consultation programme was organized by the Councilor Smt. Shefali Pramanik, Ward No-144. The meeting was conducted in presence of Staffs of Social Safeguard Cell, KEIIP, 8 female and 54 male participants (Total 62) were present during the programme. The programme continued for 1 hour. Information was exchanged regarding the project work.

Among the female participants, all were housewives. The male participants were mainly businessmen.

Information shared on following topics:

- Introduction of KEIIP as an initiatives of Kolkata Municipal Corporation with the financial support of Asian Development Bank for arresting the degradation of environment of Kolkata and adjoining areas.
- Need and scope of work of KEIIP.
- KMC being the mother body of KEIIP is planning to undertake a Water Supply project in Joka and adjoining areas which are now at the planning stage. By virtue of this project the problem of scarcity of drinking water will be catered.
- Water supply project to be taken up as a part of the entire project at Ward No 144 under package WS-15 to WS-17 of Tranche – II.
- 1 ESR (Overhead Tank), 1 PS (Pumping Station), 1 UGR (Underground Reservoir) has been proposed in the plan in this ward.
- Entire Plan and design has been prepared to supply house to house for 24 hrs in a day and cover the 100% area of the ward after completion of entire network.
- Availability of land in WBESETCL .
- There will be no adverse impact on structures, livelihood, transportation and other utilities like electricity, water supply etc.
- Importance of Public participation and public awareness in case of short term inconvenience may take place during implementation phase of the project i.e. lying of distribution line, traffic diversion etc.
- Long term Benefits of the project.
- Phase wise implementation of the project.
- S&D work is also in the proposed plan.
- Impact of the project on environment, reducing the chance of water contamination etc.
- Tentative date for commencement and commissioning of the project.
- Necessary arrangements will be done by the project authority before commencing the work, like public information, shifting of utilities etc.
- Cooperation is needed on behalf of the local residents during project implementation phase.

Issues raised by the participants:

- The commencement of the project work and duration.
- Water logging during heavy monsoon is a big challenge for the local people.
- Absence of drainage network and Scarcity of drinking water in the area of Dhalipara, Palui Palpara, Chak Thakurani etc.

- Quality of the water that is being supplied at present by PHE (Public Health Engineering Dept) is not up to the mark for drinking (quantity of iron is above than normal range and salinity is also present).
- Application of protection measures including safety during construction
- Quantity of water supply is inadequate to cater the present demand.
- Replacement of poor PVC pipe by new one.
- Policy of house connection in case of joint property recorded in Kolkata Municipal Corporation (erstwhile Joka gram panchayet).
- Policy regarding connection fees in case of house connection.
- Network coverage in remote part of the ward.

Design consideration in respect to raised issues and project requirement

- ✓ Work will be started very soon, within 6 months
- ✓ Sewerage and drainage package needs to be considered separately to tackle water logging
- ✓ Sufficient water will be provided as per demand and completely treated water will be supplied after treatment
- ✓ New distribution pipelines will be laid under different packages in the KEIP program
- ✓ Design is developed with the consideration of 100% coverage and 24 hrs supply
- ✓ Application of Environment Management Plan during project implementation



Community consultation

Participants List

Name of place (Ward No) 144, Office of BR-XV

Date 19.12.2015

Sl.No	Name of Participants	Contact No, if any	Signature
11.	Goutam Mondal	9903514108	
12.	st. Rishi	9038125646	
13.	Hari Mistry	9038213914	H.M
14.	Premodh Bhalle	8961634186	Premodh
15.	Madhusima Patra	8296596149	
16.	Satish Kumar	9088842376	
17.	Sabnam Khater	8921236355	SKhater
18.	Pankin Laskar	8013492081	
19.	Bijay Das	900706513	Bijay Das
20.	মিঃ সত্য	8443827803	-

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Shefali Pramanik (Patra) 19/12/15
 Councilor, Ward No. - 144
 The Kolkata Municipal Corporation
 The Kolkata Municipal Corporation

Participants List

Name of place (Ward No) 144, Office of B2-XVI

Date 19.12.15

Sl.No	Name of Participants	Contact No, if any	Signature
21.	ଅକ୍ଷୟ କୁମାର		
22.	ଅକ୍ଷୟ ଅମର	8583902937	
23.	Prabir Mondal	λ	P.M
24.	Samar Patra	9748883759	Sam
25.	Swapan Kumar	9831744612	
26.	Prakata Mondal	9831630259	Prakata
27.	Tanmoy Debnath	8017494790	B
28.	Rajesh Kumar	16	OK
29.	Gautam Mondal	9836859047	
30.	Rakesh Babbar	8017926324	

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Spramania (Patra)
 Shefali Pramanik (Patra) 19/12/15
 Councilor, Ward No. - 144
 The Kolkata Municipal Corporation

Participants List

Name of place (Ward No) 144, Office of B2-XVI

Date 19/12/15

Sl.No	Name of Participants	Contact No, if any	Signature
31.	Pijush Mondal	no	Pijush Mondal
32.	Subir Mondal	9163722870	Subir Mondal
33.	Mehabab Alam Falls	9883489125	Mehabab Alam falls
34.	Sujay Baiswal	9836145874	Sujay Baiswal
35.	Suneta Das	9038261346	Suneta Das
36.	Prosenjit Bhatui	8981306232	Prosenjit Bhatui
37.	Mad Salim	9088490320	Mad Salim
38.	Teemman Das	8014323410	Teemman Das
39.	Ramesh Mondal	8981888549	Ramesh Mondal
40.	Pranab Chandra	X	Pranab Chandra

4 Oct 7
 Shefali Pramanik (Patra) 19/12/15
 Councillor, Ward No. - 144
 The Kolkata Municipal Corporation

Participants List

Name of place (Ward No) 144, Office of BN-XVI

Date 19.12.15

Sl.No	Name of Participants	Contact No, if any	Signature
41	SK RAJU	9038287538	SK RAJU
42	Sunderam Ram		Sunderam Ram
43	Soni Ganeswarini	9339100737	S. Ganeswarini
44	Suresh Kumar	9147248156	
45	Soumitra Mondal	X	
46	Rajesh Kumar	9038126-16	Rajesh
47	Mrida Mondal	9681398134	Mrida
48	Debashis Mondal	8697901080	D. Mondal
49	PRABIR PATRA	9331615566	Prabir Patra
50	BIJAY MONDAL	8584970179	Bijoy mondal

5 Dec 17

Sporranian (Sahib) 19/12/15
 Shefali Pramanik (Patra)
 Councillor, Ward No. - 144
 The Kolkata Municipal Corporation

Participants List

Name of place (Ward No) 144, Office of B2-XVI

Date 19.12.15

Sl.No	Name of Participants	Contact No, if any	Signature
81/	SH 2017 Z 213 on	1	
52/	Dakrath Batang	9674920165	D. Batang
53/	Poovali Batang	1	P. Batang
54/	Abdul Samim	10	10
55/	Indranil Adhikari	8420904890	
56/	Soumya Pramanik	990346221	
57.	Arshinda Bhowmik	9874921845	
58/	Tijun Pramanik	9831244438	
59/	Kurhan Chakraborty	9433427332	
60.	Gaeraga Batang	9681244455	

6 of 7

Spramanik (Patra)
 Shitali Pramanik (Patra)
 Councilor, Ward No. - 144
 The Kolkata Municipal Corporation

19/12/15

Participants List

Name of place (Ward No) 144, Office St BS - XV,

Date 19.12-15

Sl.No	Name of Participants	Contact No, if any	Signature
61	Bidhan Adhikary	9837349553	
62.	Ranjan Gorum	8013296333	
	 Shefali Pramanik (Patra) Councillor, Ward No. - 144 The Kolkata Municipal Corporation		
			19/12/15

7 of 7

A Brief Report on Community Consultation at Ward No.122 KMC Ward Office (41 Pally, Haridevpore)

A Community Consultation programme was conducted on 16th December 2015 at above mentioned location for information dissemination and exchange of views for the upcoming Water Supply project under Package WS-15 of Tranche – II, KEIIP.

The Consultation programme was organized by the Councilor Smt. Soma Chkarabory, Ward No-122. The meeting was conducted in presence of Staffs of Social Safeguard Cell, KEIIP, Social Safeguard Specialist of Social safeguard Cell and Engineer (DSC/KEIIP), 36 Female and 13 male participants (Total 49) were present during the programme. The programme continued for 1 hour. Information was exchanged regarding the project work.

Among the Female participants, all were Housewives. The Male participants were mainly businessmen and Service Holders and retired persons.

Information shared on following topics:

- Introduction of KEIIP as an initiatives of Kolkata Municipal Corporation with the financial support of Asian Development Bank for arresting the degradation of environment of Kolkata and adjoining areas.
- Need and scope of work of KEIIP.
- KMC being the mother body of KEIIP is planning to undertake a Water Supply project in Joka and adjoining areas which are now at the planning stage. By virtue of this project the problem of scarcity of drinking water will be catered.
- Water supply project to be taken up as a part of the entire project at Ward No 122 under package WS-15 of Tranche – II.
- There will be no adverse impact on structures, livelihood, transportation and other utilities like electricity, water supply etc.
- Importance of Public participation and public awareness.
- Long term Benefits of the project.
- Phase wise implementation of the project.
- S&D work is also in the proposed plan.
- Impact of the project on environment, reducing the chance of water contamination etc.
- Tentative date for commencement of the project.
- Necessary arrangements will be done by the project authority before commencing the work, like public information, shifting of utilities etc.
- Cooperation is needed on behalf of the local residents during project implementation phase.

Issues raised by the participants:

- The commencement of the project work and duration.
- Water logging during heavy monsoon is a big challenge for the local people.
- Water supply and drainage problem at K. K. Road, Sodepur Brickfield Road, Dackar Bagan.
- Water supply line can be damaged during S&D work.
- Public Awareness will be required for not throwing any garbage into the “catch pits” as it blocks the main drain.
- Scarcity of drinking water is also need to be addressed.
- Application of mitigation measures including safety during construction

Design consideration in respect to raised issues and project requirement

- ✓ Work will be started very soon, within 6 months

- ✓ Sewerage and drainage package needs to be considered separately to tackle water logging
- ✓ Sufficient water will be provided as per demand and completely treated water will be supplied after treatment
- ✓ New distribution pipelines will be laid under different packages in the KEIIP program
- ✓ Design is developed with the consideration of 100% coverage and 24 hrs supply
- ✓ Water supply pipeline and S & D pipeline will be laid in different tranches



Community Consultation

Community Consultation PKg - WS-15

Participants List

Name of place (Ward No) 122 K.M.C. ward office
M.G. Road. Kol - 41
Date 16/12/2015

Sl.No	Name of Participants	Contact No, if any	Signature
1	Dobi Sir	7278119948	Dobi Sir
2	Kalpna Das	9883163476	K Das
3	অঞ্জিতা সায়ক		অঞ্জিতা সায়ক
4	Sabina bibi	9163540216	S. bibi
5	Ayesha Gayen		Ayesha gayen
6	Lakshmi Bibi	8961345162	Bibi
7	স্বপ্না সায়ক	8981468445	স্বপ্না সায়ক
8	Gowri Roy	8981172055	Gowri Roy
9	Aklima Gayen		
10	অঞ্জিতা সায়ক		অঞ্জিতা সায়ক

1 of 5

Soma Chakraborty
16/12/15
SOMA CHAKRABORTY
Councillor Ward No - 122
Kolkata Municipal Corporation

Participants List

Name of place (Ward No) 122

Date 16/12/2015

Sl.No	Name of Participants	Contact No, if any	Signature
11	Rakhi Das	9748478417	<u>RDm</u>
12	Lata Prasad	9830085444	L. Prasad.
13	Sukjan Bibi		<u>245777 RRA</u>
14	Rinki Saha.	9433364290	Rinki Saha.
15	Sushamadey	94333588	14. Sushamadey
16	Gita Ghosh		<u>210122</u>
17	Mousumi Pal		Mousumi Paul.
18	Mumukshu Ghosh.	9432521698	<u>Mumukshu</u>
19	Priti Ghosh	8697721482	P. Ghosh
20	SK Sahida	9903685527	S. Sahida

Soma Chakraborty
16.12.15
SOMA CHAKRABORTY
Councillor Ward No - 122
Kolkata Municipal Corporation

2 of 5

Participants List

Name of place (Ward No)

Date

Sl.No	Name of Participants	Contact No, if any	Signature
21	Kalpna Shaha	9831766126	Kalpna Saha
22	Kalpna Dutta	9836029118	Kalpna Dutta
23	Rama Das	8697910452	Rama Das
24	Mona Saha	8820005514	Mona Saha
25	Bulbuli Das	9874696297	Bulbuli Das
26	Rajiyara Banu	8981184744	R Banu
27	Mian	9903114598	Sodof
28	Dipika Das	9830863257	D. Das
29	MUKU SARKAR	8479938933	M. SARKAR
30	9903146755 K. Ganguly	9903146755	K. Ganguly

Soma Chakraborty
16.12.15SOMA CHAKRABORTY
Councillor Ward No - 122
Kolkata Municipal Corporation

3 of 5

Participants List

Name of place (Ward No) 122

Date 16/12/15

Sl.No	Name of Participants	Contact No, if any	Signature
31	Pinku Arch	03224028788	P. Arch
32	GOURI DAS		गुरी दास
33	SIMA SIL		सीमा सील
34	PARUL BHATTACHARYA		पारुल भट्टाचार्य
35	Sangita Kundu	9903785560	Sangita Kundu
36	DEBASHIS GANGULY	9831812022	D. Ganguly
37	Gowon G. Day	9748250171	G. Day
38	अशोक शर्मा	9433221115	A. Sharma
39	Snapna Mondal	8282857594	S. Mondal
40	Jhuma Naskar	9051920836	J. Naskar

4 of 5

Somra Chakraborty
16.12.15SOMA CHAKRABORTY
Councillor Ward No - 122
Kolkata Municipal Corporation

Participants List

Name of place (Ward No) 122

Date 16/12/2015

Sl.No	Name of Participants	Contact No, if any	Signature
41	Ranjit Kumar	9163916902	RK
42	সোমেন্দ্র আশ্র	8961450971	সোমেন্দ্র আশ্র
43	Bappa Ghosh	9804768273	Bhaskar
44	Harish Singh	9748046982	Harish Singh
45	ASHOK SARKAR	9830137611	Ashok Sarkar
46	Sojoy Pore	8420156076	Sojoy
47	অমল রায়		A. Roy
48	কুমার সত্যজি	9831471150	কুমার সত্যজি
49	Dipankar Saha	9007964112	Dipankar
50			

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Soma Chakraborty
16. 12. 15SOMA CHAKRABORTY
Councillor Ward No - 122
Kolkata Municipal Corporation

Appendix 12: Grievance Redressal Mechanism of KEIIP – Approval notice

GRIEVANCE REDRESSAL MECHANISM OF KEIIP WORKS

- Display of address of Contractors' site office at all work locations.
- At Contractors' site office Complaint & Suggestion Books are to be made available for lodging any complaint. The concerned Executive Engineer of KEIIP to periodically monitor these Books and take necessary actions for redressal with intimation to the complainant.
- At every Borough under which works are under progress, a Public Relation & Grievance Redressal Unit, comprising of a few KEIIP staff to be established for availing detailed information of the works, registering of complaint and act as Liaison for its redressal under intimation to the complainant.
- In KEIIP office at 206, A.J.C. Bose Road, Kolkata – 700 017, the Administrative Officer, KEIIP will be In-charge of the grievance redressal matters under the Project Director.
- Complaints may also be lodged through KEIIP website and KMC website.
- Through KMC WhatsApp no. 8335988888, all complaints relating to KEIIP will be sent to the Project Director, KEIIP for redressal.
- A Grievance Redressal Committee (GRC) has been constituted consisting of :
 - 1) Administrative Officer, KEIIP - Member
 - 2) Dy. C.E.(I), KEIIP - Member
 - 3) Social Safeguard Specialist, KEIIP -Member
 - 4) Environmental Specialist, KEIIP -Member
 - 5) Special Officer (Coord.), KEIIP - Member Secretary (Convener)
 - 6) Team Leader, DSC, KEIIP - Member

under the Project Director, KEIIP for regular monitoring of the entire process.

Dt: 12.08.2015

TL/DSC
AO
CO/C

TL/DSC may endorse 'X' above.

As proposed. AO & SO/C
will please also take
necessary action as proposed above.

12/8/15

Appendix 13: Sample Grievance Registration Form

(To be available also in Bengali, Hindi and Urdu)

The _____ Project welcomes complaints, suggestions, queries and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing ***(CONFIDENTIAL)*** above your name. Thank you.

Date		Place of registration			
Contact Information/Personal Details					
Name		Gender	* Male * Female	Age	
Home Address					
Village / Town					
District					
Phone no.					
E-mail					
Complaint/Suggestion/Comment/Question Please provide the details (who, what, where and how) of your grievance below:					
If included as attachment/note/letter, please tick here:					
How do you want us to reach you for feedback or update on your comment/grievance?					

FOR OFFICIAL USE ONLY

Registered by: (Name of Official registering grievance)	
Mode of communication: Note/Letter E-mail Verbal/Telephonic	
Reviewed by: (Names/Positions of Official(s) reviewing grievance)	
Action Taken:	
Whether Action Taken Disclosed:	Yes No
Means of Disclosure:	

Appendix 14: Monthly Environmental Monitoring Report - Format

ENVIRONMENTAL MONITORING AND EVALUATION MONTHLY ENVIRONMENTAL COMPLIANCE MONITORING FORMAT FOR SUB-PROJECT

SECTOR:
MONTH/YEAR:
PROJECT (PACKAGE):
WORKING LOCATION:
DATE OF OBSERVATION:
NAME OF THE MONITORING PERSON FROM DSC (Designation):

Sr. No.	Environmental Issues	Level of application of EMP					Suggestion / Remarks
		Poor	Below Satisfactory	Partially satisfactory	Satisfactory	Excellent	
1.	Mitigation/protection of Land Environment						
1a	Proper storage of construction materials and petroleum products – avoidance of land pollution						
1b	Conservation of top soil						
1c	Proper disposal of unusable soils and spoils to pre-approved disposal sites						
1d	Storm water control and wind screening to prevent soil loss from the site.						
2.	Mitigation/protection of Air Environment						
2a	Water sprinkling at construction site for arresting dust (if any during dry period)						
2b	Cover or damp down sand stockpiled at site						
2c	Utilize screen by using wooden supports and shade cloth where dust is unavoidable in residential/commercial /sensitive receptors areas						
2d	Keep vehicles and machinery in good working order and meet manufacturers specifications for safety, fuel consumption etc						
2e	Covering of materials carrying vehicles-reducing dust hazard						
2f	Vehicles and Equipments having Pollution Under Control Certificate						
2g	No fires are allowed on site						

Sr. No.	Environmental Issues	Level of application of EMP					Suggestion / Remarks
		Poor	Below Satisfactory	Partially satisfactory	Satisfactory	Excellent	
2h	Carrying out air quality monitoring						
3.	Mitigation of Noise						
3a.	Regular maintenance of noise producing equipment						
3b.	At sensitive locations enclosures provided around generator set and other noise producing machinery						
3c.	Use of ear plug by the workers at noise generating location						
3d	Locate concrete batching, asphalt, crushing plants, lay down areas and construction camps away from sensitive receptors						
3e	Plan construction activities to reasonable working hours where near sensitive receptors.						
3f	Fit and maintain silencers to all machinery on site						
3g	Monitor noise levels in potential problem areas						
4.	Mitigation/protection of Water Environment						
4a.	Protection of water bodies nearby the project site by application of suitable mitigation measures- not to discharge waste water in nearby water body						
4b	Chemicals or hazardous substances do not contaminate the water body, or groundwater on site.						
5.	Mitigation/protection of Biological Environment						
5a	Vegetation clearing and tree-felling have prior permission as the work front progresses.						
5b.	Plant and maintain five trees for every one removed- in case of tree felling (if any)						
5c	Clearing of indigenous vegetation is kept in a nursery for use at a later stage (such as site						

Sr. No.	Environmental Issues	Level of application of EMP					Suggestion / Remarks
		Poor	Below Satisfactory	Partially satisfactory	Satisfactory	Excellent	
	rehabilitation process)						
6.	Mitigation of Socio-economic Environment						
6a.	Level of mitigation measures for local people- placement of caution tape and barricade at excavated area						
6b.	Avoidance of pick traffic hour for carrying of materials like pipe						
6c.	Arrangement of employment at least 50% of workforce from communities near sites						
7.	Mitigation of overall environment, safety and health						
7a.	Use of Personal Protective Equipment like helmet, gumboot, gloves, nose mask, safety belt and earplugs at working place						
7b.	Provision of warning signs of hazardous working areas						
7c.	Visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas						
7d.	Maintaining safety during movement of equipment						
7e.	Arrangement of First Aid box and fire extinguisher at Labour camp and site office and First Aid box at all working sites						
7f.	Use of modern vehicles and machinery and maintain as specified						
7g.	Demarcation of excavations and provide barriers (not just danger tape) to protect pedestrians from open trenches.						
7h.	Enclosure at construction site						
7i.	Placement of public information board with mention of safety requirement at working places						

Sr. No.	Environmental Issues	Level of application of EMP					Suggestion / Remarks
		Poor	Below Satisfactory	Partially satisfactory	Satisfactory	Excellent	
7j	Boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage						
8	Material Management						
8a	Storage of stockpiles. Stockpiles do not obstruct natural water pathways						
8b	Exposure of stockpile to windy conditions or heavy rain with vegetation, cloth, or tarps.						
8c	Proper transportation of hazardous materials						
9	Camp site Management						
9a	Camp and working areas are kept clean and tidy						
9b	Proper drainage of the camp site						
9c	Discharge into neighbours' properties.						
9d	Maintenance of toilets in a clean state						
9e	Maintenance of eating area						
9f	Arrangement of solid waste collection bin, dispose wastes at the pre-approved sites						
9g	Collection of litter from the work and camp areas						
8.	Mitigation of Sensitive environment						
8a.	Level of protection at religious, cultural and historic sites if any nearby						
8b.	Maintaining working schedule by avoiding sensitive time						

Note: Put ✓ mark in EMP application column

Remarks column need to be filled up considering present state along with suggestion and site photos

For each sub-project monitoring should be done at all the working sites

Suggestion should be provided against EMP application level

In case of non applicable – please write NA/NR in Remarks column

(Name & Signature of monitoring person of DSC)

(Name & Signature of Safety Officer of Contractor)

(Name and Signature of TL/Dy TL DSC/ Environment Specialist of DSC)

(Name & Signature of Environment Specialist of PMU)

Appendix 15: Environmental Monitoring Format - Semi Annual

I. INTRODUCTION

A. Background

- Overall project description, objectives and outputs

B. Report purpose

- Environmental category of the sub-projects

II. IMPLEMENTATION PROGRESS

A. Status of Subprojects

- Description and Status of sub project- under implementation or to be awarded

Summary of Subprojects

Sr. No.	Package No.	Components	Status

Status of Awarded Sub-project Under the Program

Package No.	Component	Start Date	Number of Days/Months to Complete Work	Target date of completion	% Physical Progress on report date	Works Completed on report date

B Compliance of Safeguard Loan Covenants

- Table provides a summary of compliance to the loan covenants related to environmental safeguards.

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

C Implementation Arrangement

- Implementation arrangement of environment monitoring
- Responsibility of contractor, project management authority and design and monitoring consultant
- Detail safeguard team of the project

III. ENVIRONMENTAL PROCEDURE REVIEW

Environmental Legal Requirement

- Provides a list of national and state laws, rules, policies and regulations applicable to program

Environmental Legal Requirements Applicable to Specific Project

Component	Applicable Legislation	Compliance	Action Required

Compliance with Environmental Legal Requirements

- Describe present status of Environment, forest and other clearances are mentioned below.

Status of Compliance with National and State Legal Requirements upto report period

Package	Main package work	National and State Legal Requirement	Status	Conditions of the Clearance/NOCs

IV. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

- There should be reporting on the following items which can be incorporated in the checklist of routine Environmental Site Inspection Report followed with a summary in the semi-annual report send to ADB. Visual assessment and review of relevant site documentation during routine site inspection needs to note and record the following:

- (i) What are the dust suppression techniques followed for site and if any dust was noted to escape the site boundaries?
- (ii) If muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads;
- (iii) Adequacy of type of erosion and sediment control measures installed on site, condition of erosion and sediment control measures including if these were intact following heavy rain;
- (iv) Are there designated areas for concrete works, and re-fuelling?
- (v) Are there spill kits on site and if there are site procedures for handling emergencies;
- (vi) Is there any chemical stored on site and what is the storage condition?
- (vii) Is there any dewatering activities if yes, where is the water being discharged;
- (viii) How are the stockpiles being managed?
- (ix) How is solid and liquid waste being handled on site?
- (x) Review of the complaint management system;
- (xi) Checking if there are any activities being under taken out of working hours and how that is being managed.

Package wise compliance status as per site specific EMP. Blank sample monitoring table as follows,

Blank Summary Monitoring Table –Water supply sub project

A. Pre-construction Stage

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
Legislation, Permits and Agreements	<p>In all instances, KMC, service providers, contractors and consultants must remain in compliance with relevant local and national legislation.</p> <p>DSC to obtain statutory clearances and permits from government agencies/other entities</p> <p>Contractor to submit proof of compliance to Air Act (in relation to hot mixing, stone crushers, diesel generators)</p> <p>A copy of the EMP/approved SEP must be kept on site during the construction period</p>						
Utilities/Tree cutting	<p>(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and</p> <p>(ii) Require construction contractors to prepare a</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	contingency plan to include actions to be done in case of unintentional interruption of services. (iii) Collection of tree cutting permission (if any) with assistance PMU/DSC						
Traffic Management	(i) Prepare a short traffic management schedule during preconstruction phase.						
Access to the site	<p>Access to site will be via existing roads. The Contractor will need to ascertain the existing condition of the roads and repair damage shall not occur due to construction. For accessing reservoir sites within SSE STP haul road to be constructed</p> <p>The location of all affected services and servitudes must be identified and confirmed.</p> <p>All roads for construction access must be planned and approved ahead of construction activities. They shall not be created on an ad-hoc basis.</p> <p>No trees/shrubs/</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>groundcover may be removed or vegetation stripped without the prior permission.</p> <p>Contractors shall construct formal drainage on all temporary haulage roads in the form of side drains and miter drains to prevent erosion and point source discharge of run-off.</p>						
Setting up of Construction Camp ³⁰	<p>Choice of site for the contractor's camp requires the DSC Environment Specialist's permission and must take into account location of local residents, businesses and existing land uses, including flood zones and slip / unstable zones. A site plan must be submitted to the DSC Environment Specialist for approval.</p> <p>If the Contractor chooses to locate the camp site on private land, he must get prior permission from both the DSC Environment Specialist and the landowner.</p>						

³⁰ Careful planning of the construction camp can ensure that time and costs associated with environmental management and rehabilitation are reduced.

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>In most cases, on-site accommodation will not be required. The construction camp can thus be comprised of:</p> <ul style="list-style-type: none"> • site office • toilet facilities • designated first aid area • eating areas • staff lockers and showers (where water and waterborne sewers are available) • storage areas • batching plant (if required) • re-fuelling areas (if required) • maintenance areas (if required) • crushers (if required) <p>Cut and fill must be avoided where possible during the set up of the construction camp.</p> <p>The contractor shall make adequate provision for temporary toilets for the use of their employees during the construction phase. Such facilities, which shall comply with local authority regulations, shall</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>be maintained in a clean and hygienic condition. Their use shall be strictly enforced.</p> <p>Under no circumstances may open areas or the surrounding bush be used as a toilet facility.</p> <p>Bins and/or skips shall be provided at convenient intervals for disposal of waste within the construction camp.</p> <p>Bins shall have liner bags for efficient control and safe disposal of waste</p> <p>Recycling and the provision of separate waste receptacles for different types of waste shall be encouraged.</p>						
Establishing Equipment Lay-down and Storage Area ³¹	Choice of location for equipment lay-down and storage areas must take into account prevailing winds, distances to adjacent land uses, general on-site topography and water erosion potential of the soil. Impervious surfaces must be						

³¹ Storage areas can be hazardous, unsightly and can cause environmental pollution if not designed and managed carefully

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>provided where necessary</p> <p>Storage areas shall be secure so as to minimize the risk of crime. They shall also be safe from access by children</p> <p>It is very important that the proximity of resident is taken into account when deciding on storage areas for hazardous substances or materials.</p> <p>Residents living adjacent to the construction site must be notified of the existence of the hazardous storage area</p> <p>Equipment lay-down and storage areas must be designated, demarcated and fenced if necessary.</p> <p>Fire prevention facilities must be present at all storage facilities</p> <p>Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>area(s). These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources. Fuel tanks must meet relevant specifications and be elevated so that leaks may be easily detected. Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances to be used on site. Staff dealing with these materials/substances must be aware of their potential impacts and follow the appropriate safety measures. Contractors shall submit a method statement and plans for the storage of hazardous materials and emergency procedures.</p>						
Materials Management	Contractors shall prepare a source						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
nt Sourcing ³² –	statement indicating the sources of all materials (including sands, natural gravels, crushed stone, asphalt, clay liners etc), and submit these to the DSC Environment Specialist for approval prior to commencement of any work. Where possible, a signed document from the supplier of natural materials shall be obtained confirming that they have been obtained in a sustainable manner and in compliance with relevant legislation. Where materials are borrowed (mined), proof must be provided of authorization to utilize these materials from the landowner/material rights owner and the Department of Minerals						
Social impacts	Open liaison channels shall be established between the site owner, the developer, operator, the contractors and interested and affected people such that any						

³² Materials must be sourced in a legal and sustainable way to prevent offsite environmental degradation.

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>queries, complaints or suggestions can be dealt with quickly and by the appropriate person(s).</p> <p>Advance road signage indicating the road detour and alternative routes. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.</p> <p>Storage facilities, elevated tanks and other temporary structures on site shall be located such that they have as little visual impact on local residents as possible.</p> <p>In areas where the visual environment is particularly important or privacy concerns for surrounding buildings exist, the site may require screening. This could be in the form of shade cloth, temporary walls, or other suitable materials prior to the beginning of construction.</p>						
Noise impacts	Construction vehicles/equipments are be						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	to fitted with standard silencers prior to the beginning of construction Equipment that is fitted with noise reduction facilities (e.g. side flaps, silencers, etc) will be used as per operating instructions and maintained properly during site operations						
Dust/ air pollution	Vehicles travelling along the access roads must adhere to speed limits to avoid creating excessive dust. Camp construction / haulage road construction – areas that have been stripped of vegetation must be dampened periodically to avoid excessive dust. The Contractor must make alternative arrangements (other than fires) for cooking and / or heating requirements. LPG gas cookers may be used provided that all safety regulations are followed.						
Storm water	To prevent storm water damage, the increase in storm water run-off resulting from construction						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>activities must be estimated and the drainage system assessed accordingly. A drainage plan must be submitted to the DSC Environment Specialist for approval and must include the location and design criteria of any temporary stream crossings (siting and return period etc).</p> <p>During site establishment, storm water culverts and drains are to be located and covered with metal grids to prevent blockages if deemed necessary by the DSC Environment Specialist. (e.g. due to demolition work).</p> <p>Temporary cut off drains and berms may be required to capture storm water and promote infiltration.</p>						
Water quality	<p>Storage areas that contain hazardous substances must be bunded with an approved impermeable liner</p> <p>Spills in bunded areas must be cleaned up, removed and disposed of safely from the bunded area as soon after detection as possible to</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	minimise pollution risk and reduced bunding capacity. Provision shall be made during set up for all polluted runoff to be treated to the DSC Environment Specialist's approval before being discharged into the storm water system. (This will be required for the duration of the project.)						
Conservation of Natural Environment	No vegetation may be cleared without prior permission from the DSC Environment Specialist. Trees that are not to be cleared shall be marked beforehand with danger tape. The PMU Environment Specialist must be given a chance to mark vegetation that is to be conserved before the Contractor begins clearing the site. Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material)						
Set-up of Waste Management	The excavation and use of rubbish pits on site is						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
nt Procedure	forbidden Burning of waste is forbidden.						
Cultural Environment	Prior to the commencement of construction, all staff need to know what possible archaeological or historical objects of value may look like, and to notify the DSC Environment Specialist/Contract or shall such an item be uncovered.						

DSC = Design Supervision Consultant, PMU = Project Management Unit

B. Construction Stage

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
Climate	Consider seasonal climatic variations during scheduling of construction activities in the area. Do excavations and other clearing activities only during agreed working times and permitted weather conditions. Implement storm water control as per method approved by PMU. No open fires permitted on site						
Air Quality	Guidelines that						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>deal with the control of air pollution and dusts on site have been outlined in the Environmental Management Plan (EMP)</p> <p>Ensure compliance with the Air Act.</p> <p>Ensure compliance with emission standards</p> <p>Undertake monitoring of air pollution levels in potential problem areas.</p> <p>Manage (including storage, transport, handling and disposal) hazardous substances used.</p> <p>Avoid dust generating construction activities during strong winds.</p> <p>Cover soil loads in transit.</p> <p>Cover stockpiles of soil or apply suitable dust palliative such as water or commercial dust suppressants.</p> <p>Regularly service vehicles off-site in order to limit gaseous emissions.</p> <p>No open fires permitted on site</p> <p>Place portable toilets on-site and maintain on a daily basis.</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
Geology and soil	<p>The design of the site drainage system is adequate to control runoff from the micro-tunnels and open areas in line with topographical features of the site. Rehabilitate all sites during construction including construction camps, stockpile area, temporary access and hauling routes, as soon as possible after the disturbance has ceased. Contractor to exercise strict care in the disposal of construction waste, with proof of disposal at an approved site provided after offloading each waste load and this logged/registered. Contain contaminated water and dispose off site at an approved disposal site in consultation with WBPCB. Dispose of waste from the oil interceptors only through suitable waste-handling contractor and request for safe disposal</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>certificates.</p> <p>Mix cement, concrete and chemicals on a concrete plinth and contain spillages or overflows into the soil.</p> <p>Do not allow vehicle maintenance on site.</p> <p>If oil spills occur, dispose contaminated soil at a disposal site in consultation with WBPCB.</p> <p>Stockpile subsoil and overburden in all construction and lay down areas. Protect topsoil and subsoil from contamination.</p> <p>Return for backfilling in the correct soil horizon order.</p>						
Infrastructure and service	<p>Undertake utility shifting prior to commencing pipe laying</p> <p>Keep construction-related disturbances to a minimum.</p> <p>Consult with affected service providers regarding impacts on access to infrastructure and services and alternatives.</p> <p>Consult with affected communities or businesses prior to foreseeable</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>disruptions, for example notifying residents of a temporary severance of water supply.</p> <p>Provide backup or alternative services during construction-related disruptions, for example by providing generators for power supply.</p> <p>Provide access points to infrastructure and services.</p> <p>Monitor complaints by the public.</p>						
Traffic	<p>Reroute traffic and close roads according to the Traffic Management Plan (TMP). The objective of the TMP is to ensure safety of all the road-users along the work zone and to address: (i) protection of work crews from hazards associated with moving traffic; (ii) mitigation of the adverse impact to the road capacity and delays to the road-users; (iii) maintenance of access to adjoining properties; and (iv) issues that may delay the subproject works. Negotiate with</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>privately-owned public transport operators regarding the affected public transport facilities and routing. Negotiate with business owners and social service operations regarding the loss of parking and loading bays. Clear roads signs will be erected for the full length of the construction period. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints. Ensure the City Traffic Police will be available on site. Communicate road closure together with the proposed detour via advertising, pamphlets, radio broadcasts, road signage, etc. The implementation of the road detour is also dependent on advance road signage indicating the road detour and alternative routes. Define clearly construction routes.</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	Strictly control access of all construction and material delivery vehicles. Enforce speed limits. Do not allow deliveries during peak traffic hours						
Drainage and hydrology	The site surface has been engineered and shaped in such a way that rapid and efficient evacuation of runoff is achieved. Provide containment areas for potential pollutants at construction camps, refueling, depots, asphalt plants and concrete batching plants. Implement waste management practices. Control and manage transport, storage, handling and disposal of hazardous substances.						
Biodiversity Fauna and Flora	Permission will be obtained (if required) from the PMU for the cutting/felling of trees prior to start of civil works. Ensure any landscaping to be undertaken will be done with locally indigenous species and low maintenance						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
Land uses	<p>PMU has consulted with various organizations, departments, etc within the area and will be continued during the construction phase.</p> <p>Put a sign of "Keep Clear" near critical roads (e.g. in front of fire and police stations and hospitals).</p> <p>Consult with local departments, organizations, etc regarding location of construction camps, access and hauling routes, and other likely disturbances during construction.</p> <p>Provide clear and realistic information regarding detours and alternative accesses for local communities and businesses in order to prevent unrealistic expectations.</p> <p>Provide clear and realistic information regarding employment opportunities and other benefits for local communities in order to prevent unrealistic expectations.</p> <p>Make use of local</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	labor, materials, goods and services as far as possible Provide walkways and metal sheets where required to maintain access across for people and vehicles. Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools.						
Health and Safety	Implement good housekeeping practices at the construction camp. Strictly implement health and safety measures and audit on a regular basis. Secure enclosed construction site. Use reputable contractors. Provide warning signs of hazardous working areas. Clearly demarcate excavations and provide barriers (not just danger tape) to protect pedestrians from open trenches. Thoroughly train workers assigned to dangerous equipment. Workers have the right to refuse work in unsafe conditions.						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>Control speed and movement of construction vehicles</p> <p>Exclude public from the site</p> <p>Ensure all workers are provided with and use Personal Protective Equipment.</p> <p>Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas</p> <p>Ensure that qualified first-aid can be provided at all times. Ensure equipped first-aid stations are easily accessible throughout the site;</p> <p>Provide medical insurance coverage for workers.</p> <p>Provide clean eating areas where workers are not exposed to hazardous or noxious substances;</p> <p>Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>hazard areas unescorted; Ensure moving equipment is outfitted with audible back-up alarms; Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate.</p>						
Noise and Vibrations	<p>Locate concrete batching, asphalt, crushing plants, lay down areas and construction camps away from sensitive receptors. Restrict construction activities to reasonable working hours where near sensitive receptors. Keep adjacent landowners informed of unusually noisy activities planned. Regulate roadworthiness of</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	vehicles. Ensure that machinery in a good state of maintenance. Fit and maintain silencers to all machinery on site. Monitor noise levels in potential problem areas.						
Aesthetics, Landscape Character, and Sense of Place	Properly fence off storage areas. Collect all domestic solid waste central point of disposal and feed into the city waste collection system. Contractor to exercise strict care in disposing construction waste. Identify suitable waste disposal site with enough capacity to hold additional waste to be generated by the construction activities. Retain mature trees on and around the site where possible. Remove unwanted material and litter on a frequent basis.						
Workers Conduct	Ensure strict control of laborers Minimize working hours to normal working times Control littering Ensure no overnight accommodation is provided.						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
Employment Generation	Employ local (unskilled) labor if possible Training of labor to benefit individuals beyond completion of the subproject. Ensure recruitment of labors will take place offsite. Ensure at least 50% of all labor is from surrounding communities in the contractual documentation.						
Archaeological and Cultural Characteristics	Ensure that construction staff members are aware of the likelihood of heritage resources being unearthed and of the scientific importance of such discoveries. Contact ASI or the State Department of Archaeology if any graves be discovered and all activities will be ceased until further notice. Contact ASI or the State Department of Archaeology if any heritage resources or objects, defined in the Act, be discovered and all activities will be ceased until further notice. Cease all activities immediately and do not move any heritage object found without prior						

Field	Mitigation Measures	Parameter s Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitorin g	Location of Monitorin g	Date of Monitorin g Conducte d	Name and Designatio n of Person Who Conducte d the Monitorin g	Complian ce status
	consultation with ASI or the State Department of Archaeology No structures older than 100 years will be allowed to be demolished, altered or destructed without a permit from ASI or the State Department of Archaeology.						

DSC = Design Supervision Consultant, H&S = health and safety, RPM = respirable particulate matter,, SPM = suspended particulate matter, PMU = Project Management Unit; PIU = Project Implementation Unit

C. Defects Liability Stage

Field	Mitigation Measures	Parameter s Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitorin g	Location of Monitorin g	Date of Monitorin g Conducte d	Name and Designatio n of Person Who Conducted the Monitoring	Complian ce status
Air Quality	Ensure compliance with the Air Act. Ensure compliance with emission standards Regularly service vehicles off-site in order to limit gaseous emissions.						
Biodiversit y Fauna and Flora	Ensure no accidental damage to local flora and fauna.						
Land Uses	Put a sign of "Keep Clear" near critical roads (e.g. in front of fire and police stations and hospitals). Consult with local departments,						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>organizations, etc regarding location of construction camps, access and hauling routes, and other likely disturbances.</p> <p>Provide clear and realistic information regarding detours and alternative accesses for local communities and businesses in order to prevent unrealistic expectations.</p> <p>Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools.</p> <p>Consult businesses and institutions regarding operating hours and factoring this in work schedules.</p> <p>Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.</p>						
Health and Safety	<p>Implement good housekeeping practices at pumping stations.</p> <p>Strictly implement health and safety measures and audit on a regular basis.</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	<p>Provide warning signs of hazardous working areas.</p> <p>Clearly demarcate excavations and provide barriers (not just danger tape) to protect pedestrians from open trenches.</p> <p>Thoroughly train workers assigned to dangerous equipment.</p> <p>Workers have the right to refuse work in unsafe conditions.</p> <p>Ensure all workers are provided with Personal Protective Equipment.</p> <p>Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas</p> <p>Ensure that qualified first-aid can be provided at all times. Ensure equipped first-aid stations are easily accessible throughout the site;</p> <p>Provide medical insurance coverage for workers.</p> <p>Provide clean eating areas where workers are not exposed to hazardous or noxious substances;</p> <p>Provide visitor orientation if visitors to the site</p>						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; Ensure moving equipment is outfitted with audible back-up alarms; Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate.						
Noise and Vibrations	Restrict maintenance activities to reasonable working hours where near sensitive receptors. Keep adjacent landowners informed of unusually noisy activities planned. Fit and maintain silencers to all machinery on site. Monitor noise levels in potential						

Table for Performance Fact Sheet for EMP Implementation of the project

Table 10: Performance Post Effect of EMP Implementation of the Project																		
	Package Number	Name of Contractor	EMP Part of contract Document(Yes / No)	Contractor Social/ Environment Person	Overall Status of EMP Implementation	Field to be Monitored as per EMP												
						Source of Materials	Camp Sites	Landscape and Aesthetics	Air Quality	Noise Level	Traffic	Ecological Resources – Terrestrial	Accessibility	Water Quality	Occupational Health & safety	Community Health & safety	Socio cultural resources	Employment generation
						In compliance (2) / Partial Compliance (1) / Not in compliance (0) / Not applicable (n/a)												

VI. CONSULTATIONS AND DISCLOSURES CONDUCTED

- Detail of consultation done during project implementation and proposed schedule of consultation
- Detail of training conducted

VII. GRIEVANCE REDRESSAL

- Detail of grievances recorded and cases resolve

VIII. FINDINGS AND RECOMMENDATIONS

- Based on site observation and document check corrective action plan to be drawn

Table Corrective Action Plan

	Non-compliance	Action Required	Responsible	Target Date	Indicator of Compliance

Appendix of the Report-

Location map of the project area
 Implementation schedule
 Photo Illustration of project locations covering EMP compliance
 Site specific EMP
 Spoil Management Plan
 Air, noise, water quality data – monitoring test report certificate
 Site specific Health & Safety plan
 Records of trainings conducted during training period
 Workers insurance certificate
 Availability of labour work package wise
 Tree felling permission or other relevant NOC
 Traffic Management plan
 Environment, health and safety budget
 Public consultation during project implementation
 Sample Grievance Registration Form

SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name _____

Contract Number _____

Name: _____ Date: _____

Title: _____ DMA: _____

Location: _____ Group: _____

Weather Condition: _____

Initial Site Condition: _____

Concluding Site Condition:

Satisfactory _____ Unsatisfactory _____ Incident _____ Resolved _____ Unresolved _____

Incident:

Nature of Incident: _____

Intervention Steps: _____

Incident Issues

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Inspection

Emissions	Waste Minimization
Air Quality	Reuse and Recycling
Noise pollution	Dust and Litter Control
Hazardous Substances	Trees and Vegetation

Site Restored to Original Condition Yes

☐☐

Signature _____

Name

Name

SAMPLE CHECKLIST FOR CONSTRUCTION SAFETY

Sl. No.	Safety Issues	Yes	No	Non-Compliance	Corrective Action	Penalty	Remarks
1	Appointment of qualified construction safety officers						
2	Approval for construction safety management plan by the SC						
3	Approval for traffic management/control plan in accordance with IRC: SP: 55-2001						
4	Maintenance of the existing road stretches handed over to the contractor.						
5	Provision of temporary traffic barriers/barricades/caution tapes in construction zones						
6	Provision of traffic signboards						
7	Provision for flags and warning lights						
9	Providing plastic crash barrier						
10	Provision of adequate staging, form work, and access (ladders with handrail) for works at a height of more than 3 m						
11	Provision of adequate shoring / bracing/barricading/lighting for all deep excavations of more than 3 m depth.						
12	Demarcations (fencing, guarding, and watching) at construction sites						
13	Provision for sufficient lighting, especially for						

Sl. No.	Safety Issues	Yes	No	Non-Compliance	Corrective Action	Penalty	Remarks
	night time work						
14	Arrangements for controlled access and entry to construction zones						
15	Safety arrangements for road users/pedestrians						
16	Arrangements for detouring traffic to alternate facilities						
17	Regular inspection of work zone traffic control devices by authorized contractor personnel						
18	Construction workers' safety - Provision of personnel protective equipment						
19	A. Helmets						
	B. Safety shoes						
	C. Dust masks						
	D. Hand gloves						
	E. Safety belts						
	F. Reflective jackets						
	G. Earplugs for labour						
20	Workers employed on bituminous works, stone crushers, concrete batching plants, etc. provided with protective goggles, gloves, gumboots, etc.						
21	Workers engaged in welding work shall be provided with welder protective shields						
22	All vehicles are provided with reverse horns.						
23	All scaffolds, ladders, and other safety devices shall be maintained in safe and sound						

Sl. No.	Safety Issues	Yes	No	Non-Compliance	Corrective Action	Penalty	Remarks
	condition.						
24	Regular health check up for labor/ contractor's personnel						
25	Ensuring sanitary conditions and all waste disposal procedures and methods in the camps.						
26	The contractor shall provide adequate circuit for traffic flow around construction areas, control speed of construction vehicles through road safety and training of drivers, provide adequate signage, barriers, and flag persons for traffic control						
27	Provision of Insurance coverage for the contractor's personnel						

Contractor

Consultant