Initial Environmental Examination

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IND: West Bengal Drinking Water Sector Improvement Project – Bulk Water Supply for North 24 Parganas

Prepared by Public Health Engineering Department, Government of West Bengal for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 11 July 2018)

Currency Unit	–	Indian rupee (₹)
₹1.00	–	$0.014
$1.00	=	₹68.691

ABBREVIATIONS

ADB	–	Asian Development Bank
CTE	–	consent to establish
CTO	–	consent to operate
DBO	–	design, build and operate
DSISC	–	design, supervision and institutional support consultant
EAC	–	expert appraisal committee
EARF	–	environmental assessment and review framework
EHS	–	environment, health and safety
EIA	–	environmental impact assessment
EMP	–	environmental management plan
EMS	–	environmental management specialist
ESZ	–	Eco Sensitive Zone
GLSR	–	ground level service reservoir
GOWB	–	Government of West Bengal
GRC	–	grievance redress committee
GRM	–	grievance redress mechanism
IEE	–	initial environmental examination
MOEFCC	–	Ministry of Environment, Forest and Climate Change
WBPCB	–	West Bengal Pollution Control Board
NOC	–	no objection certificate
OHS	–	occupational health and safety
PHED	–	Public Health Engineering Department
PIU	–	project implementation unit
PMC	–	project management consultant
PMU	–	project management unit
PPTA	–	project preparatory technical assistance
PWSS	–	piped water supply schemes
ROW	–	right of way
SGC	–	safeguards and gender cell
SPS	–	Safeguard Policy Statement
WHO	–	World Health Organization
WTP	–	water treatment plant
WBDWSIP	–	West Bengal Drinking Water Sector Improvement Project

WEIGHTS AND MEASURES

dBA	decibel
°C	degree Celsius
km	kilometer
lpcd	litre per capita per day
m	meter
mgbl	meter below ground level
mm	millimeter
MLD	million liters per day
km^2	square kilometer

NOTE

In this report, "$" refers to United States dollars.

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EXECUTIVE SUMMARY

The proposed West Bengal Drinking Water Sector Improvement Project (WBDWSIP) aims to provide safe, reliable and continuous drinking water as per Government of India's standard to about 2.6million people in the Arsenic, Fluoride, and salinity affected selected areas of North 24 Parganas, South 24 Parganas, East Medinipur and Bankura districts of West Bengal. The Project will adopt a sector approach, and subprojects will be selected and proposed for funding adhering to the agreed Subproject Selection Criteria. Project districts are North 24 Parganas (with two blocks of South 24 Parganas included for distribution network), Bankura and East Medinipur, and subprojects to be covered under the Project will be within these districts only unless otherwise agreed with ADB. Subprojects proposed under the Project stem from a district-wide comprehensive water quality and sustainability planning and completion of the Drinking Water Quality Action Plan (DWQAP) for the concerned district.

WBDWSIP will be implemented over an 6-year period, 2018-2024.

The Subproject. Creation of surface water based bulk water supply system to meet the water demand of arsenic (groundwater) affected blocks of Rajarhat and Haroa in North 24 Parganas and Bhangar II in South 24 Parganas district is taken up in this subproject under the WBDWSIP. These blocks are located in the eastern side of Kolkata city. Subproject includes the following civil works components: (i) 50 million gallons per day (MGD) (227 million liters per day or MLD) water treatment plant (WTP) including raw water intake facility to abstract water from the raw water ponds located within WTP campus, (ii) clear water pumping main from WTP to booster pumping station (5 kilometer or km – 1200 dia, ductile iron); (iii) 5000 kl clear water reservoir and a booster pumping station, (iv) 3 ground level service reservoirs (GLSRs) of 1000 kl, 3200 kl and 4100 kl, respectively at Rajarhat, Haroa and Bhangar II.

Project implementation arrangements. Public Health Engineering Department of Government of West Bengal is the executing and implementing agency for the WBDWSIP. Project Management Unit (PMU) exclusively established in Public Health and Engineering Department (PHED) for the WBDWSIP will implement the project. PMU is assisted by district level Project Implementation Units. Safeguard and Gender Cell (SGC)in the PMU is responsible for safeguards compliance. Project Management Consultant and PIU-wise Design, Supervision and Institutional Support Consultant will assist PMU and PIUs in implementation and management of the project.

Screening and assessment of potential impacts. ADB requires the 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. As per the Government of India, Environmental Impact Assessment (EIA) Notification, 2006, this subproject does not require EIA study or environmental clearance. The potential environmental impacts of the subproject have been assessed using ADB Rapid Environmental Assessment Checklist for Water Supply. The potential negative impacts were identified in relation to pre-construction, construction and operation.

Categorization. Based on results of the assessment and ADB SPS, the subproject is classified as environmental Category B, i.e., the subproject is judged to be unlikely to have significant adverse environmental impacts. An initial environmental examination is required.

Description of the Environment. The subproject components are located in Rajarhat, and blocks in North 24 Parganas and Bhangar II block in South 24 Parganas districts, in the Ganga-Brahmaputra River Delta. 24 Parganas district was a single district before it was bifurcated into

two districts – north 24 Parganas and south 24 Parganas in 1986. Topography of the districts is plain, gently sloping and altitude ranges from 1 m to 14 m above mean sea level (msl). North and south districts are divided into 22 and 29 community development blocks respectively, of which subproject covers 3 blocks. Being a deltaic district, major physiographic units are: natural levee areas, swamps area and older flood plain. Climate is humid and subtropical, characterized by a hot and dry summer from March to May/June, a south-west monsoon season from June to September, a pleasant post-monsoon from October to November and a cool winter from December to February. Project areais blessed with plenty of water bodies – rivers, streams and ponds, etc., Haroa GLSR site is located near the bank of River Bidyadhari in Haroa. Kestopur Khal (canal), originating from Ultadanga in Kolkata, flows near the Booster pumping station site in New Town, Rajarhat, and also adjoining the proposed GLSR Site in Bhangar II. Almost all blocks of North 24 Parganas effected with arsenic contamination in groundwater.

Districts are home to environmental sensitive areas like Sundarbans Biosphere Reserve (SBR) and Eask Kolkata Wetland, however, none of the components are located in or close to these. Small part of Haroa block is in the outer transitional zone of SBR. Subproject components are mostly selected in existing facilities owned by PHED. WTP and clear water reservoir cum booster pumping station will be located within the existing WTP and booster pumping station premises respectively in new town area of Rajarhat. Both the facilities are located in rapidly developing new town area, surrounded by residential and commercial areas. Rajarhat GLSR is proposed in the existing OHR compound, while new sites are identified for Haroa and Bhangar II GLSRs. Rajarhat GLSR site is covered with trees; measures are suggested to minimize, and conduct compensatory tree plantation at a ratio of 1:5. There is a pond in the site, GLSR will be constructed without disturbing / encroaching on pond including bunds, and inlet, outlet channels. Bhangar II site is an agricultural land with a mango orchard. Trees required to be cut; measures suggested to minimize and compensate. Haroa GLSR site is located close to Bidhyadhari River, however, no interference envisaged. It is suggested to safeguard the site in case of heavy flood in the river. Proposed pipeline will be laid along the roads from WTP to booster pumping station along the roads. Overall, there are no notable sensitive environmental features in the project sites.

Potential Environmental Impacts. The subproject is unlikely to cause significant adverse impacts because: (i) the components will involve straightforward construction and operation, so impacts will be mainly localized; (ii) there are no significant sensitive environmental features in the project sites and (iii) predicted impacts are site-specific and likely to be associated with the construction process and are produced because the process is invasive, involving excavation and earth movements. The main design impacts of water supply system in general are due to abstraction of water. This subproject does not include any new source development or augmentation of existing sources. Water will be sourced from an existing raw water supply system that has adequate capacity to meet the project demand. Raw water source is Hooghly River (Ganges), which carries significant quantities of water throughout the year. As per the available data on lean season flow (of the year 1996), the lowest was 580 cubic meter per second (m^3/sec) (i.e., 50,112 MLD), while the total requirement of this WTP is 454 MLD. River also is the source of water for Kolkata and rest of North 24 Parganas and South 24 Parganas districts. The water available during the lean flow season is adequate to meet the demand of this entire area.
Quality of river water is good and is suitable for drinking water supply after conventional treatment and disinfection.

Rajarhat GLSR site is covered with trees; measures are suggested to minimize, and carryout compensatory tree plantation in a ratio of 1:5. There is also a pond in this site; GLSR needs to be constructed without disturbing / encroaching on pond including bunds, and inlet, outlet channels. Bhangar II site is an agricultural land with a mango orchard. Few trees will be required to cut;

measures suggested to minimize and compensate. Haroa GLSR site is located close to Bidhyadhari River, however, no interference envisaged. It is suggested to safeguard the site with proper engineering against heavy floods in the river. Proposed pipeline will be laid along the roads from WTP to booster pumping station along the roads. Overall, there are no notable sensitive environmental features in the project sites.

Construction activities will be confined to the selected sites, and the interference with the general public and community around is minimal. There will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.,), mining of construction material, occupation health and safety aspects. During the construction phase of pipeline work along the public roads, impacts arise from the construction dust and noise; from the disturbance of residents, businesses, traffic by the construction work, and from the need to dispose of large quantities of waste soil. Of the 5 km length of pumping main, 1 km will be laid via trenchless method, especially at sections crossing main roads, congested area etc., The social impacts (access disruptions) due to construction activities are minimal.

Anticipated impacts of water supply during operation and maintenance will be related to operation of WTP, handling and application of chlorine, operation of pump houses, and repair and maintenance activities. Various provisions are already made in the design: to recirculate wastewater from WTP; collect, thicken and dispose sludge; chlorine safety; use energy efficiency equipment, etc., Water supply system will be operated using the standard operating procedures. It is unlikely that there will be any significant negative impacts. Application and handling of chlorine gas will involve certain risks, and appropriate measures are included.

Environmental Management Plan. An environmental management plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels. Locations and siting of the proposed infrastructures were considered to further reduce impacts. The EMP includes design and location related measures such as (i) minimizing tree cutting at 2 GLSR sites by proper planning; (ii) avoiding any disturbance / encroachment into pond at Rajarhat GLSR site; (iii) wash water recovery in WTP to improve the efficiency and avoid wastewater generation and disposal; (iv) collection, treatment and beneficial use of treated sludge; (v) chlorine safety, (vi) energy efficient pumping system, and (v) noise controls.

During construction, the EMP includes mitigation measures such as (i) barricading, dust suppression and control measures (ii) traffic management measures for works along the roads and for hauling activities; (iii) provision of walkways and planks over trenches to ensure access will not be impeded; and (iv) finding beneficial use of excavated materials to extent possible to reduce the quantity that will be disposed of EMP will guide the environmentally-sound construction of the subproject. EMP includes a monitoring program to measure the effectiveness of EMP implementation and include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

The contractor will be required to submit to PIU, for review and approval, a 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 the approved EMP; (iii) monitoring program as per SEP; and (iv) budget for SEP implementation. No works are allowed to commence prior to approval of SEP. A copy of the EMP/approved SEP will be kept on site during the construction period at all times. The EMP is 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.

Consultation, Disclosure and Grievance Redress Mechanism. The stakeholders were involved in developing the IEE through discussions on-site and public consultation at several places in the subproject area, after which views expressed were incorporated into the IEE and in the planning and development of the project. The IEE will be made available at public locations and will be disclosed to a wider audience via the ADB and PHED/PMU websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation. A grievance redress mechanism is described within the IEE to ensure any public grievances are addressed quickly.

Monitoring and Reporting. The PMU and PIU will be responsible for monitoring, and will submit semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website.

Conclusions and Recommendations. Therefore, as per ADB SPS, the project is classified as environmental category B and does not require further environmental impact assessment. However, to conform to government guidelines WTP requires consent to establish (CTE) and consent to operate (CTO) from West Bengal Pollution Control Board, which shall be obtained prior to invitation of bids. This IEE shall be updated during the detailed design stage to reflect any changes, amendments and will be reviewed and approved by PMU, and further submitted to ADB for approval. Civil works on subproject will be initiated only after approval of updated IEE by ADB.

I. INTRODUCTION

A. Background

1. The proposed West Bengal Drinking Water Sector Improvement Project (WBDWSIP) aims to provide safe, reliable and continuous drinking water as per Government of India's standard to about 4 million people in the Arsenic, Fluoride, and salinity affected selected areas of North 24 Parganas, South 24 Parganas, East Medinipur and Bankura districts of West Bengal.

2. The project will adopt a sector approach, and subprojects will be selected and proposed for funding adhering to the agreed Subproject Selection Criteria. Project districts are North 24 Parganas (with two blocks of South 24 Parganas included for distribution network), Bankura and East Medinipur, and subprojects to be covered under the Project will be within these districts only unless otherwise agreed with Asian Development Bank (ADB). Subprojects proposed under the Project stem from a district-wide comprehensive water quality and sustainability planning and completion of the Drinking Water Quality Action Plan (DWQAP) for the concerned district. The DWQAP for the Project districts supported by the Project were prepared by the executing agency, the Public Health and Engineering Department (PHED) of Government of West Bengal (GOWB), with support of project preparatory consultants from the ADB, and has been adopted by PHED to guide present and future drinking water improvement in the districts.

3. The project is aligned with the following impact: drinking water security ensured in West Bengal. The project will have the following outcome: safe, sustainable, and inclusive drinking water service received in project districts. The Project outputs are as follows:

(i) **Output 1: Climate resilient drinking water infrastructure constructed.** The project will provide a minimum of 70 lpcd of continuous potable water through metered connections to the households in selected areas of the project districts. The distribution systems will be designed on a DMA basis. Both the bulk and the distribution systems will be integrated with modern STWM and monitoring tools, including supervisory control and data acquisition and geographic information systems. Bulk water supply systems, consisting of intakes, water treatment plants, and transmission mains, will be sized to provide water supply en route to urban and rural areas. They will be connected into a grid with the existing and the new systems in the project districts, where feasible, to reduce redundancy, improve resilience, and efficiently manage the system; and

(ii) **Output 2: Institutions and capacity of stakeholders for drinking water service delivery strengthened.** The project will strengthen institutions and the capacity of stakeholders, including the PHED and the project gram panchayats, for sustainable service delivery. It will support them to operate the STWM system, including water quantity and quality monitoring, electronic billing and collections, meter reading, and accounting. The project will build capacities and skills of the stakeholders on O&M, and support public awareness on water, sanitation, and hygiene. It will strengthen the sector through introducing and implementing an AMSDF; institutionalizing water and sanitation safety planning; and developing a regulatory framework for, and piloting, fecal sludge and septage management.

4. WBDWSIP initially targets three districts: North 24 Parganas district is the most Arsenic-affected districts in West Bengal; Bankura is heavily affected by Flouride, and East Medinapur is affected by Salinity. These districts are also one of the most water-stressed districts in West Bengal as they are reliant on depleting groundwater sources. Overall, the Project is intended to meet the requirements of "VISION 2020", endorsed by the GOWB and in line within the guidelines and implementation framework of NRDWP.

5. North 24 Parganas District is a worst arsenic affected district in West Bengal state; 21 of 22 blocks of the district are identified as arsenic affected. In South 24 Parganas 9 of total 29 blocks are arsenic affected. Though arsenic contaminated, groundwater is the main source of water supply due to lack of a surface water based system. PHED proposed to provide a safe and sustainable surface water supply system. Accordingly, provision of water supply in blocks2-blocks of Rajarhat, Haroa in North 24 Parganas, and Bhangar-II in South 24 Parganas is taken up on priority by the PHED and is proposed for implementation under the Tranche 1 of the WBDWSIP funded by ADB. The objective of the subproject is to provide sustainable water supply at a rate 70 litres per capita per day (lpcd) to each household in all habitations in the 3 selected blocks. A detailed description of the components is provided in Section III.

B. Purpose of Initial Environmental Examination Report

6. ADB requires the 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 potential environmental impacts of the subproject have been assessed using ADB rapid environmental assessment (REA) checklist for Water Supply (Appendix 1). Then potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure, and results of the assessment show that the subproject is unlikely to cause significant adverse impacts. Thus, this initial environmental examination (IEE) has been prepared in accordance with ADB SPS's requirements for environment category B projects.

7. This IEE is based on the preliminary project report prepared by PHED, and a technical due diligence report prepared by the project preparatory technical assistance (PPTA) team and will be finalized during implementation stage by design, build and operate (DBO) contractor to reflect any changes and latest subproject designs. The IEE was based mainly on field reconnaissance surveys and secondary sources of information. No field monitoring (environmental) survey was conducted however, the environmental monitoring program developed as part of the environmental management plan (EMP) will require the contractors to establish the baseline environmental conditions prior to commencement of civil works. The results will be reported as part of the environmental monitoring report and will be the basis to ensure no degradation will happen during subproject implementation. Stakeholder consultation was an integral part of the IEE.

C. Report Structure

8. This report contains the following ten (10) sections including the executive summary at the beginning of the report:

(i) Executive summary;
(ii) Introduction;
(iii) Description of the project;
(iv) Policy, legal and administrative framework

(v) Description of the environment;
(vi) Anticipated environmental impacts and mitigation measures;
(vii) Public consultation and information disclosure;
(viii) Grievance redress mechanism;
(ix) Environmental management plan; and
(x) Conclusion and recommendation.

II. DESCRIPTION OF THE PROJECT

A. Project Area

9. Proposed project area falls in two districts of north and south 24 Parganas[1] (prior to the bifurcation in 1986, both these areas were part of 24 Parganas district), eastern side of Kolkata City. Rajarhat and Bhangar II share the boundary with Kolkata City, and new development and expansion of city can be witnessed in the blocks, especially in the areas adjoining the city limits. New Town Kolkata, developed in the urban fringes adjoining Kolkata town in Barasat block in North 24 Parganas, adjoins the study area. Total population of 3 project blocks is 651,002 (2011) census and has a geographical area of 388 square kilometer (km^2).

10. The subproject components locations are in three selected blocks of Rajarhat, Haroa, and Bhangar II. As far as possible, based on the land availability, components are located within the existing water facilities.

B. Existing Water Supply Situation

11. Arsenic contamination in groundwater is a serious problem in eastern and northern parts of India, and Uttar Pradesh, Bihar and West Bengal are the worst affected states. Out of 20 districts of West Bengal, eight districts (Malda, Murshidabad, Nadia, North 24 Parganas, South 24 Parganas, Bradhaman, Howrah, Hooghly and Kolkata) are arsenic affected. In terms of administrative blocks, 83 out of 341 administrative blocks are arsenic affected, with a concentration of above 3 milligram per liter (mg/l). In North 24 Parganas district 2,124 habitations of total 7,334 habitations (~29%) are affected by arsenic contamination with the following degrees of contamination, above the maximum concentration as per the Indian drinking water standards (0.05 mg/l):

(i) 75% in the category of 50-200 ppb arsenic content;
(ii) 22% in the category of 200-500 ppb arsenic content;
(iii) 3% in the category of over 500 ppb arsenic content.

C. Proposed Project

12. Following table shows the nature and size of the various components of the subproject. Location of subproject components and conceptual layout plans are shown in Figure 1 to Figure 7.

[1] Subproject location South Parganas is not within the core zone of the Sundarban National Park. No works will be allowed in the core zone. The GLSR and small pipes will be located in the transition zone where construction is allowed.

Table 1: Proposed Water Supply Subproject Components

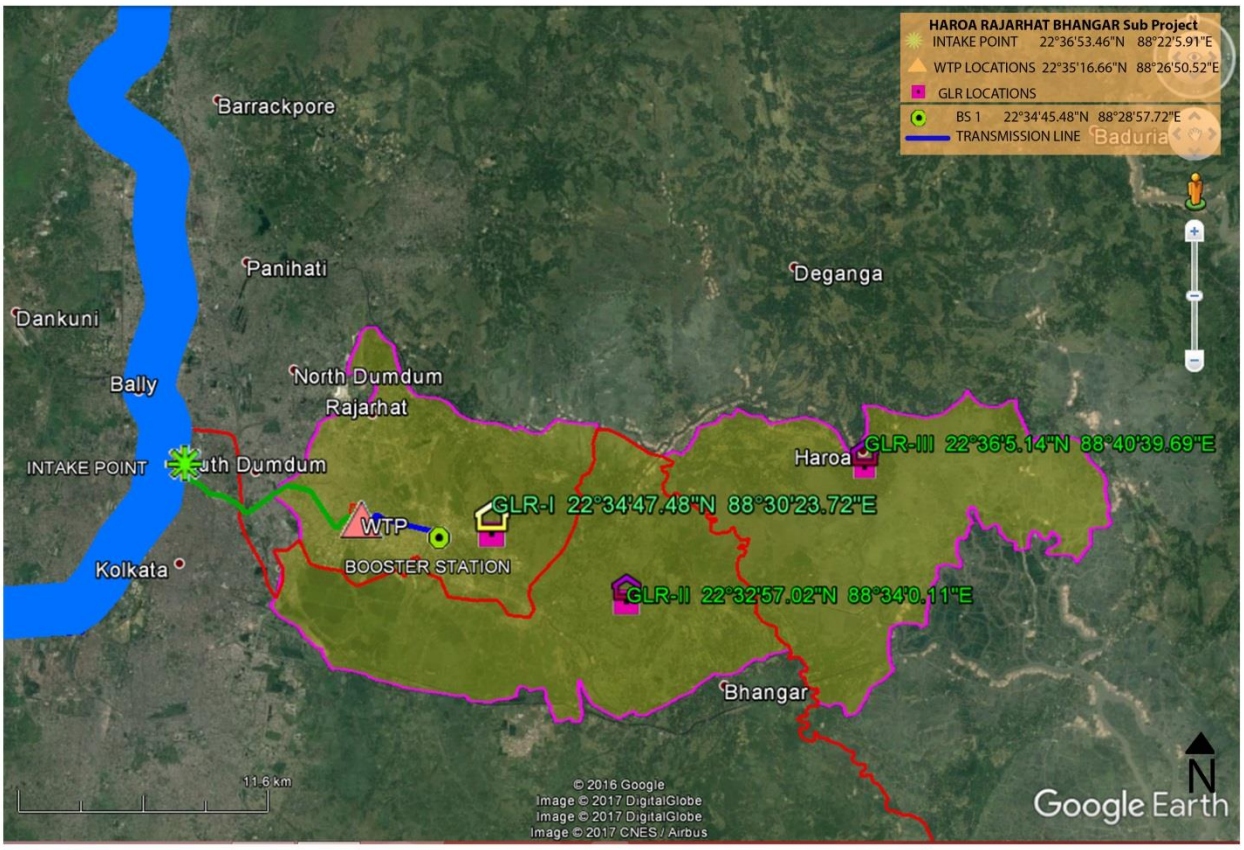
Infrastructure	Function	Description	Location
Raw water intake system	Abstract water from raw water ponds in water treatment plant (WTP) compound, and pump it to WTP inlet	Raw water intake sump - cum - pumping station	New intake will be constructed near the outlet of the Pond 2 and 3 of the existing system comprising 5 ponds. These ponds are located within the existing WTP campus in New Town Rajarhat. Raw water is sourced from Hooghly River at Rani Debendrabala Ghat.
Water Treatment Plant	Treatment of raw water to meet the drinking water standards	50 million gallons per day (MGD) (227 million liters per day or MLD) capacity conventional WTP with the following process: • Alum coagulation and flocculation • Sedimentation • Rapid gravity filtration, • Disinfection with chlorination • Wash water recovery • Sludge drying beds • Water quality testing laboratory • Miscellaneous infrastructure (compound wall, landscaping, lighting, rest rooms etc.). • Clear water reservoir (5000 kl)	New WTP will be constructed within the existing WTP compound in New Town area of Rajarhat in the eastern outskirts of Kolkata City. At present 20 MGD WTP is in operation, and another 20 MGD under construction. Adequate space within the compound is available for construction of the new WTP. Site is vacant. Site is surrounded mostly by residential apartments. However, there is adequate buffer space and boundary wall for the facility.
Clear water pumping main	Clear water transmission from WTP to clear water reservoir at booster pumping station	Clear water main • 5 kilometers (km) length 1200 millimeters (mm) Ductile Iron pipe Of the 5 km, 1 km will be laid using trenchless method, and the rest will be laid by open cut method	From WTP to clear water reservoir at booster pumping station, in the new town area. Pipes will be laid buried along the roads within the roads right of way.
Clear water reservoir	Storage of clear water for further supply	5000 kl RCC ground level circular reservoir	In the booster station compound. Site is currently vacant
Booster pumping stations	To provide adequate pressure to transmit water to Ground level service reservoirs in each block	Pumping machinery and pumping room	In the existing booster pumping station in New Town Area
Ground Level Service Reservoirs (LSRs with pumping stations	Storage of clear water for further supply	RCC reservoirs • 3200 kl ground level service reservoir (GLSR) at Haroa	Haroa GLSR site located in Haroa. The selected site is a vacant land near the bank of River Vidhayadhari. There are no trees in the site. Site is accessible by road, and not flood prone.
		• 1000 KLGLSR at Rajarhat	Rajarhat GLSR site is located in an existing PHED bore well cum pump station compound adjoining Patharghata – Kalikapur Road in Ganragari village. Site is presently

Infrastructure	Function	Description	Location
Raw water intake system	Abstract water from raw water ponds in water treatment plant (WTP) compound, and pump it to WTP inlet	Raw water intake sump - cum - pumping station	New intake will be constructed near the outlet of the Pond 2 and 3 of the existing system comprising 5 ponds. These ponds are located within the existing WTP campus in New Town Rajarhat. Raw water is sourced from Hooghly River at Rani Debendrabala Ghat.
			covered with trees, shrubs and bushes.
		• 4100 KL GLSR at Bhangor-II	Bhangar II GLSR site is located adjacent to KhestopurKhal (canal /drain) near Saduli in Bhangar. This is a privately agricultural land, and currently covered with a mango orchard.

D. Implementation Schedule

13. The project will be implemented on a DBO contract. Bids will be invited in the last quarter of 2017, and the contract will be awarded by March 2018. After which contractor will be mobilized, detailed designs will be prepared from April 2018, the total period of design and construction is 36 months. After which the DBO contractor will operate and maintain for a period of 2 years.

Figure 1: Subproject Components



Source: Google Earth.

Figure 2: Layout Diagram of Proposed Water Treatment Plant

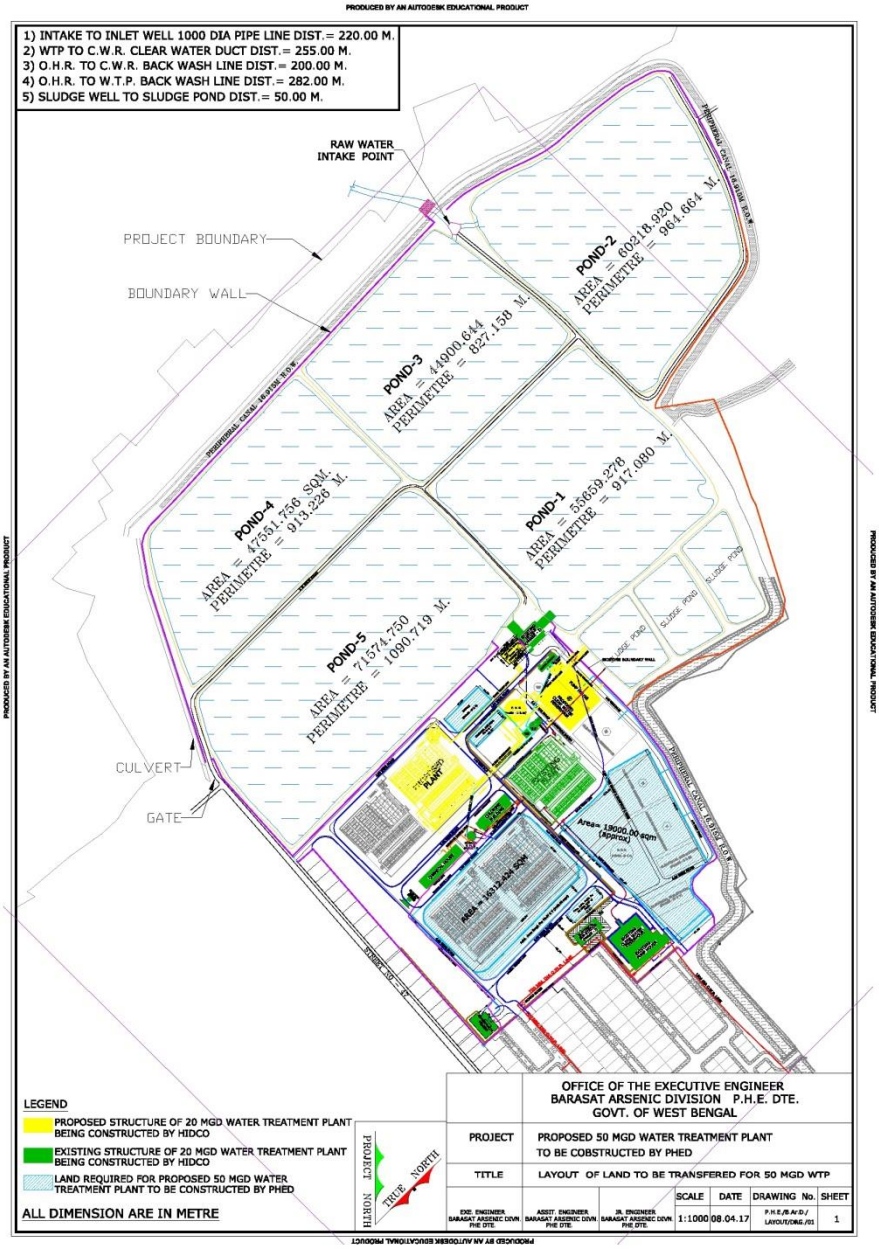
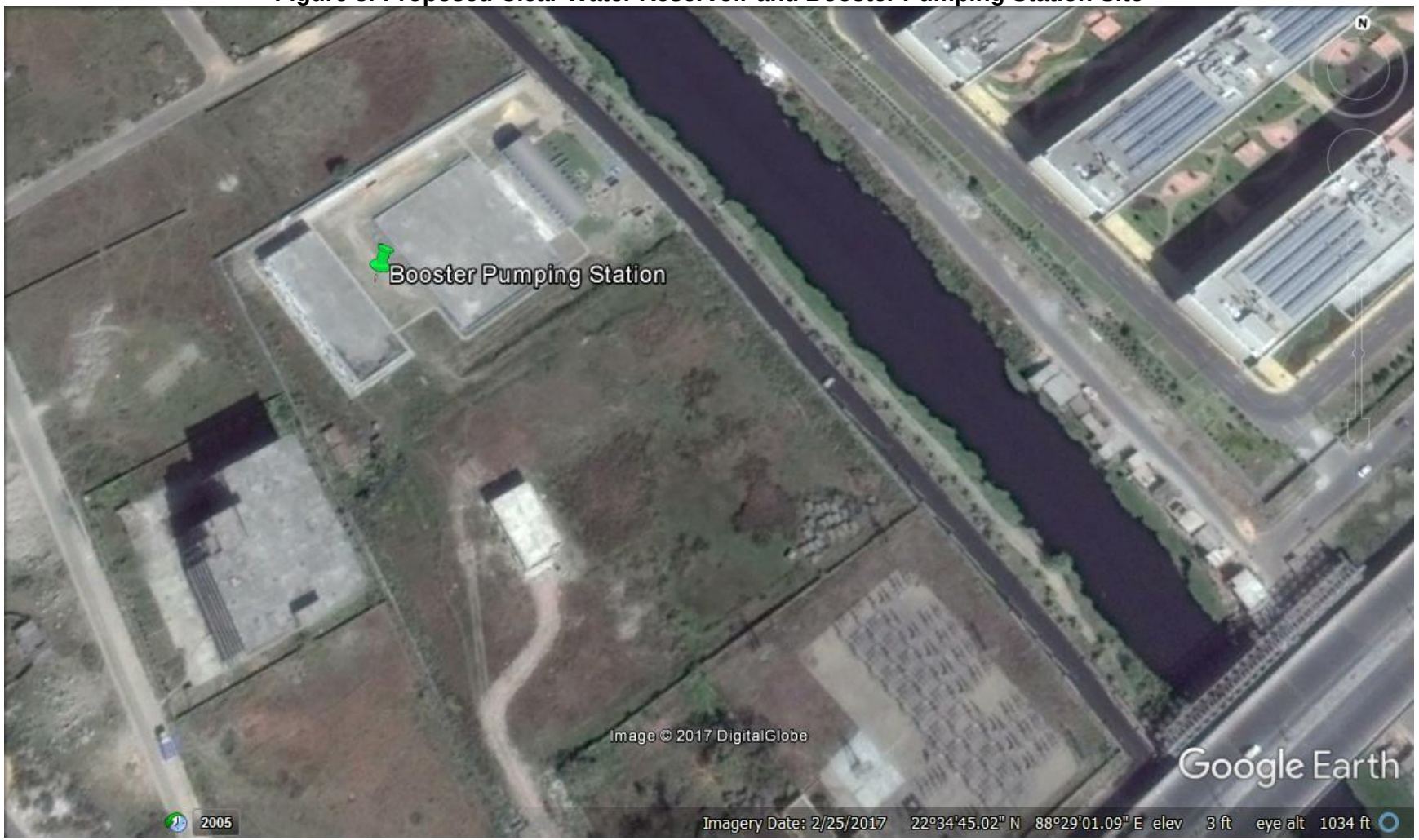
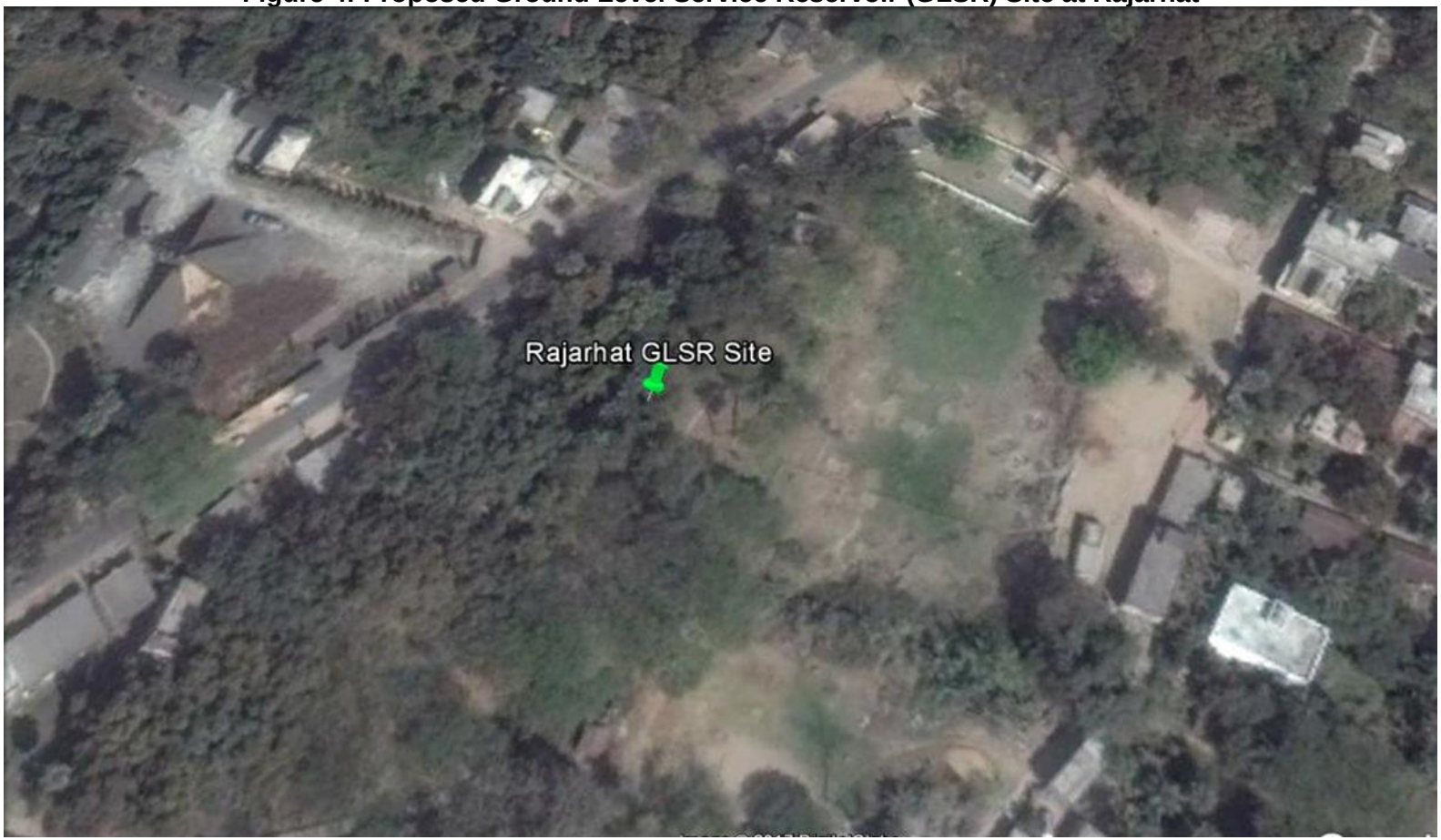


Figure 3: Proposed Clear Water Reservoir and Booster Pumping Station Site



Source: Google Earth.

Figure 4: Proposed Ground Level Service Reservoir (GLSR) Site at Rajarhat



Source: Google Earth.

Figure 5: Proposed Ground Level Service Reservoir Site at Haroa

Source: Google Earth.

Figure 6: Proposed Ground Level Service Reservoir Site Bhangar II

Source: Google Earth.

Figure 7: Proposed Pumping Main Alignment

Note: Sections proposed for trenchless construction are highlighted in orange shade.
Source: Google Earth.

III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

14. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all ADB investments.

15. **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 impacts, and are assigned to one of the following four categories:

(i) **Category A.** Projects could have significant adverse environmental impacts. An environmental impact assessment (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.

16. **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.

17. **Public disclosure.** ADB will post the safeguard documents on its website as well as disclose relevant information in accessible manner in local communities:

(i) for environmental category A projects, 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 implementing agency during project implementation upon receipt.

B. National Environmental Laws

18. **Environmental Assessment.** The Government of India EIA Notification of 2006 (replacing the EIA Notification of 1994), sets out the requirement for Environmental Assessment in India. This states that Environmental Clearance is required for specified 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.

19. Category A projects require Environmental Clearance from the central Ministry of Environment, Forest and Climate Change (MOEFCC). The proponent is required to provide preliminary details of the project in the prescribed manner with all requisite details, after which an expert appraisal committee (EAC) of the MOEFCC prepares comprehensive terms of reference (TOR) for the EIA study. On completion of the study and review of the report by the EAC, MOEFCC considers the recommendation of the EAC and provides the Environmental Clearance if appropriate.

20. Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorizes the project as either B1 (requiring EIA study) or B2 (no EIA study), and prepares terms of reference for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the Environmental Clearance based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is located in whole or in part within 10 kilometer (km) from the boundary of protected areas, notified areas or inter-state or international boundaries.

21. None of the components of this bulk water supply subproject falls under the ambit of the EIA Notification 2006, and, therefore EIA Study or Environmental Clearance is not required for the subproject.

22. **Applicable Environmental Regulations.** Besides EIA Notification 2006, there are various other acts, rules, policies and regulations currently in force in India that deal with environmental issues that could apply to infrastructure development. The specific regulatory compliance requirements of the subproject are shown in Table 2.

Table 2: Applicable Environmental Regulations

Law	Description	Requirement
Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments	Act was enacted to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water. Control of water pollution is achieved through administering conditions imposed in consent issued under to this Act. All pollution potential activities will require consent to establish (CTE) from West Bengal Pollution Control Board (WBPCB) before starting implementation and consent to operate (CTO) before commissioning.	Water treatment plant (WTP) requires CTE and CTO from WBPCB. Application has to be submitted online at http://emis.wbpcb.gov.in
Environment (Protection) Act, 1986 and Central Pollution Control Board (CPCB) Environmental Standards.	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards	Appendix 2 provides applicable standards for ambient air quality. Appendix 3 provides vehicular emission norms
Noise Pollution (Regulation and Control) Rules, 2000 amended up to 2010.	Rule 3 of the Act specifies ambient air quality standards in respect of noise for different areas/zones.	Appendix 4 provides applicable noise standards.
Air (Prevention and Control of Pollution) Act, 1981, amended 1987 and its Rules, 1982.	- Applicable for equipment and machinery's potential to emit air pollution (including but not limited to diesel generators and vehicles); - CTE and CTP from WBPCB; - Compliance to conditions and emissions standards stipulated in the CTE and CTO.	

Law	Description	Requirement
Direction of West Bengal Department of Environment under the Air Act, 1981 Direction No. EN/3170/T-IV-7 /001/2009 dated: 10 December 2009	- issued based on a study by WBPCB with help of ADB on air pollution from construction activities - lays out norms for control of air pollution from construction activities - prescribes two sets of norms: preventive measures, and practices to be discarded - failure to comply will lead to legal action, stoppage of work etc., -All construction activities under WBDWSIP shall follow the norms	Appendix 6 provides the pollution control measures indicated in the direction
Municipal Solid Wastes Management Rules, 2016	Rules to manage municipal solid waste generated; provides rules for segregation, storage, collection, processing and disposal.	Solid waste generated at proposed facilities shall be managed and disposed in accordance with the MSWM Rules
Construction and Demolition Waste Management Rules, 2016	Rules to manage construction and to waste resulting from construction, remodeling, repair and demolition of any civil structure. Rules define C and D waste as waste comprising of building materials, debris resulting from construction, re-modeling, repair and demolition of any civil structure.	Construction and demolition waste generated from the project construction shall be managed and disposed as per the rules (Appendix 5)
Labor Laws	The contractor shall not make employment decisions based upon personal characteristics unrelated to job requirements. The contractor shall base the employment relationship upon equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment or retirement, and discipline. The contractor shall provide equal wages and benefits to men and women for work of equal value or type.	Appendix 7provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works.

23. **ADB Safeguard Policy Statement Requirements.** 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 Environmental, Health and Safety (EHS) 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.

Table 3: WHO Ambient Air Quality Guidelines

Table 1.1.1: WHO Ambient Air Quality Guidelines[7,8]		
	Averaging Period	Guideline value in µg/m³
Sulfur dioxide (SO_2)	24-hour 10 minute	125 (Interim target-1) 50 (Interim target-2) 20 (guideline) 500 (guideline)
Nitrogen dioxide (NO_2)	1-year 1-hour	40 (guideline) 200 (guideline)
Particulate Matter PM_{10}	1-year 24-hour	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $PM_{2.5}$	1-year 24-hour	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) 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)

Table 4: World Bank Group's Environment, Health and Safety Noise Level Guidelines

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

IV. DESCRIPTION OF THE ENVIRONMENT

A. Methodology Used for Baseline Study

24. **Data Collection and Stakeholder Consultations.** Data for this study has been primarily collected through comprehensive literature survey, discussion with stakeholder agencies, and field visits to the proposed subproject sites.

25. The literature survey broadly covered the following:
    (i) Project details, reports, maps, and other documents prepared by technical experts of the PHED, ADB PPTA Team
    (ii) Discussions with Technical experts of the PPTA team, municipal authorities, relevant government agencies like WBPCB, etc.
    (iii) Secondary data from previous project reports and published articles, and
    (iv) Literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and other planning documents collected from Government agencies and websites.

26. **Ocular inspection.** Several visits to the project sites were made during IEE preparation period in 2016-17 to assess the existing environment (physical, biological, and socioeconomic) and gather information with regard to the proposed sites and scale of the proposed project. A separate socioeconomic study was conducted to determine the demographic information, existing service levels, stakeholder needs and priorities.

B. Physical Resources

1. Location, Area and Connectivity

27. Project area is located in the Ganga- Brahmaputra River Delta, in the two administrative districts of North and South 24 Parganas. Located in southern part of West Bengal, 24 Parganas district was a single district before it was bifurcated into two districts – north 24 Parganas and south 24 Parganas in 1986. Geographically, North 24 Parganas district lies between 21°25’30”and 23°16’50” north latitude and 88°01’10”and 89°06’15” east longitude, spreading over 4,094 km^2. The district shares its eastern boundary with Bangladesh, and southern boundary with South 24 Parganas district. Average altitude ranges from 1 to 14 meter above the mean sea level (MSL). With total geographical area of 4,094 km^2, North 24 Parganas district is divided into 5 administrative divisions and 22 Community Development blocks for administrative purpose. Project covers two blocks, Rajarhat and Haroa, located in the western part of the district. Barasat is the district headquarter Rajarhat community development block is located at 22°36′37” N longitude and 88°31′33” E latitude, with an elevation ranges from 2m to 14m AMSL, and the total area of the block is 69.09 km^2. Haroa community development block is located at 22°35′54” N longitude and 88°40′46” E latitude, with an elevation range from 1m to 11m above MSL. The block is extended to an area of 152.81 km^2.

28. South 24-Parganas district is located between 22°30’45” to 20°29’00” North latitude and between 89°4’56” and 88°3’45’’ East longitudes, with a total geographical area of 9,960 sq.km. It is the largest district in West Bengal, and Alipore is the district headquarter town. District is bounded by the river Hooghly in the west, Bay of Bengal in the south, Kolkata city and North 24 Parganas in the north. Its shares its eastern boundary with Bangladesh and Bidyaand Matla River. District is located at an average altitude from 1 m to 7 m above MSL. South 24 Parganas district is divided into 29 community development blocks, and the project covers Bhangar II community development Block, located in the northern part of the district, under Baruipur sub-division.

Bhangar-II is located at 22°31′52.15” N longitude and 88°35′21.66” E latitude, with an elevation ranges from 3 m to 9 m above MSL, and an area of 162.04 km^2.

29. Located close to Kolkata, project area has good road connectivity with Kolkata and the rest of the state and country with national and state highways: NH2 (Kolkata-Delhi Road), NH 34 (Kolkata-Barasat-Dalkhola), and NH 35 (Barasat - Habra - Gaighata - Chandpara - Bangaon - Indo/Bangladesh Border).

2. Topography, Soils and Geology

30. Being a deltaic district, major physiographic units are: natural levee areas, swamps area and older flood plain. The southern part of the district is covered with active and growing delta with a number of tidal rivers, creeks, saline soils, swamps and marshes. North 24 Parganas district geological formation is a part of Gangetic basin and is underline by huge thickness of Quaternary Alluvium, laid down by the southerly flowing Bhagirathi River and its tributaries. The major area of the district is occupied by recent alluvium consists of grey sand, silt and grey clay. Older alluvium sediments occur beneath recent alluvium, comprises grey to brown sand fine to course grained, gravel, clay with kankar and ferrogeneous concretions. In northern and central part of district top surface clay is occurring down to 5 to 12 meters below ground level (mbgl), whereas in the southern and south-eastern part of district average thickness of top clay layer is in the range of 25 mbgl. Other than this, no prominent rock and mineral formations are found in the project district. Geology of Rajarhat and Haroa community development blocks are derived mainly from sedimentary rock formations from the sediments of Gangetic and Bhagirathi river basins.

31. South 24 Parganas district is located in the lower deltaic plain on the composite Gangetic Delta and is covered by the Quaternary sediments deposited by the Ganga and its tributaries. The top of the alluvium is clayee in nature with varying thickness of 15 to 75 meters. Fine sand and silty-clay capping also occurs in small patches in the alluvium. Underlying the clay blankets occur a huge thickness of unconsolidated sediments composed of silt, fine to coarse grained sand and gravel with increasing thickness towards east and southeast. The gravel zone is underlain by another extensive clay zone at varying depths. There is a succession of Tertiary and Mesozoic formations within the depth range of 350 m to 4000 meters. These geological horizons are sloping gently towards south-southeast. Other than this, no prominent rock and mineral formations are found in the project district.

32. **Soils**. The soil of North 24 Parganas district varies widely, and the common soil types found in the area alluvium, sandy and silty soils. As per US soil taxonomy soil type, the district is broadly classified in to two separate zones: Entisols comprises of mainly sandy loam which is found in the northern, central and western part of the district and Alfisols comprise loam, silty loam which is found in the southern and south-eastern part of the district. Soil in Rajarhat and Haroa community development blocks is fine loamy soil characterized by poorly drained and extends very deep in the sub surface soil strata. Soils in South 24 Parganas are mostly sandy loam and clay loam in texture and contain large percentage of silt and clay with good water holding capacity. Soils are highly fertile. Only in areas close to rivers, soils are sandy clay. As per US soil taxonomy soil type in the district are broadly classified in to three groups: Entisols comprises of mainly sandy loam which is found in the western corner of the district; Alfisols which are typically deltaic alluvium soils, are present central part of the district, and Aridisols which are saline and saline-alkali in nature are present in the southern part of the district. Soil in Bhangar-I and Bhangar-II community development blocks is characterized by sandy loamy to clay loamy soil.

3. Seismology

33. As per the seismic zoning map of India, project area in both the districts falls under Zone IV, which is the high earthquake damage risk zone in India. Project area besides earthquake risk, is also vulnerable to various natural calamities like flood, cyclone, hailstorm, drought and embankment erosion etc.

4. Climatic Conditions

34. The climate of the project area is humid and subtropical, characterized by a hot and dry summer from March to May/June, a south-west monsoon season from June to September, a pleasant post-monsoon from October to November and a cool winter from December to February. Majority of the rain is received during the south-west monsoon, from late June to September end. It also receives pre-monsoon torrential rains in summers between March and May. Average annual rainfall North 24 Parganas district recorded is 1525 millimeter (mm), of which 75 percent (%) is received during the southwest monsoon. Maximum and Minimum average temperature registered are 41 degree Celsius (°C) and 9°C. Relative humidity lies between 50% in March and 90% in July. Figure shows average monthly rainfall and monthly mean maximum and minimum temperature of North 24 Parganas district. Average annual rainfall of South 24 Parganas district is 1663 mm. Maximum and Minimum average temperature registered in the project district is 41°C and 10°C. Relative annual humidity in the district is lies from 71% to 85%.

Figure 8: Annual Rainfall and Average Monthly Rainfall in Project Area

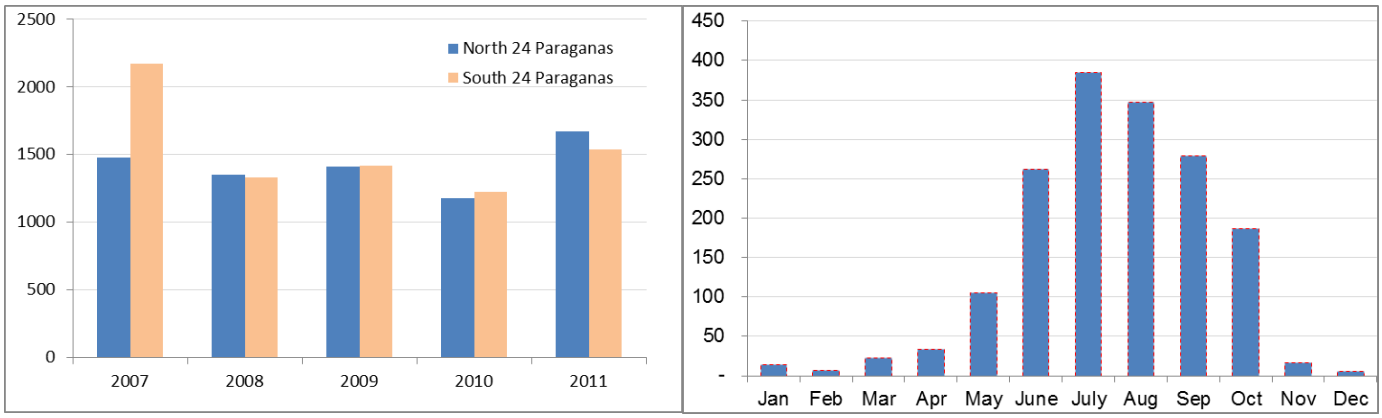
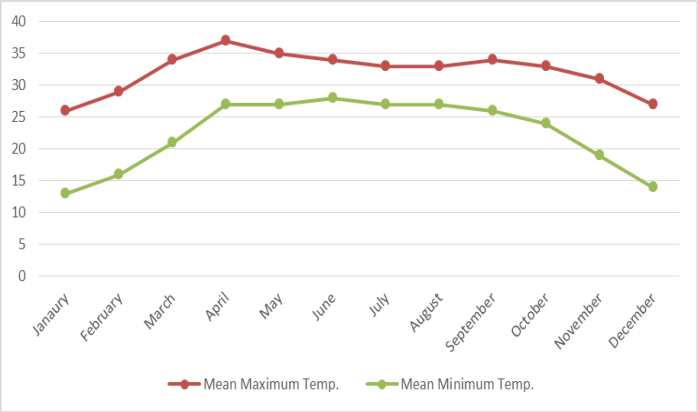


Figure 9: Average Minimum and Maximum Temperature in Project Area



5. Surface Water

35. Project area is blessed with plenty of water bodies – rivers, streams and ponds, distributed across the district. Notable rivers are Hooghly (the Ganges), Ichhamati, Kalindi, Raimangal, Dansa, Borokalagachi, Benti, Haribhanga, Gourchra and Bidyadhari. Ichhamati is the longest among these rivers. It enters the district through Bagdah block in the north of the district from Nadia and flows south through Bangaon, Swarupnagar, Baduria, Bashirhat-I, Hasnabad and Hingalganj. This river flows into river Kalindi and Kalindi in turn flows into Raimangal. It forms international border between India and Bangladesh during its course from Bashirhat to Hingalganj. River Hooghly lies between Hooghly District and North 24 Parganas district.Besides, Sunderban deltas make many rivers flow in this region due to high tidal water entering from Bay of Bengal. Other forms of surface water resources are reservoirs, ponds, lakes, bheris, canals, streams, roadside burrows, Beels etc., are also found in the project blocks. Project area, specially the rural hinterland, is dotted with large number of small water bodies (ponds), mainly used for fisheries.

36. Haroa GLSR site is located near the bank of River Bidyadhari in Haroa. Bidyadharioriginates near Haringhata in Nadia district and then flows through North 24 Parganas before joining the Raimangal River in the Sunderbans. It is the major drainage system of North 24 Parganas and Kolkata and is tidal for 95km.River flows only during the rainy season. KestopurKhal (canal), originating from Ultadanga in Kolkata, flows near the Booster pumping station site in New Town, Rajarhat, and alsoadjoining the proposed GLSR Site in Bhangar II. Flowing through the city of Kolkata, this canal primarily carries wastewater including sewage from several areas along its course and finally joins River Bidyadhari near Makhali in the eastern side. This is one of highly polluted water bodies in the area. There are several shanties/slums developed along this canal.

37. Project water source is River Hoogly (the Ganges), and the existing river intake is at Rani Debendrabala Ghat in Kolkata. River Ganga is formed by two rivers at Devprayag in Uttarakhand State – Bhagirathi and Alakananda, originating from the glaciers of the Himalayas. From Uttarakhand, it flows down to Uttar Pradesh, where it is joined by its largest tributary River Yamuna at Allahabad, and then enters Bihar, where it is joined by another large river Kosi. The river finally enters West Bengal, and then it bifurcates into two branches about 40km downstream of Farakka Barrage. The left branch, called River Padma, flows eastwards and enters

Bangladesh, and the right branch, called River Bagirathi/River Hooghly, flows southwards through West Bengal and ultimately discharges into Bay of Bengal near Kolkata. Of the total river length 2,575 km, the lowest portion of 570 km falls in West Bengal. River Hoogly is perennial in nature and owing to numerous large tributaries it carries huge quantities of water throughout the year. Water quality is suitable for drinking after treatment and disinfection. A study by the Hydraulic Study Department of Kolkata Port Trust assumes the flow in the river to be 1,135 cubic meter per second (m^3/sec). The width of river varies, but near Kolkata it is roughly 1000m wide. The Hooghly is under tidal influence for up to 300 km. The overall spring tide range is 4.27 m to 4.57 m and range of the neap tides is 1.83 m to 2.83 m. Near Kolkata, the water level fluctuates 4.0m per day during the rainy season and 2.75m twice in a day in the dry season. Highest high water level (HHWL) and the lowest low water level (LLWL) are 5.34 m above mean sea level (msl) and 0.95 m below msl, respectively.

6. Groundwater

38. In North 24 Parganas district, the dynamics of ground water resources has been studied and estimated jointly by CGWB and SWID, West Bengal. Ground water scenario in north and central part of district occurs under water table condition. However, isolated patches in Barrackpore, Amdanga, Hadra II and Rajarhat Blocks, imparting semi-confined nature of ground water body. Southern and southeastern part of the district viz., Basirhat, Haroa, Hasnabad, Hingalganj, Sadeshkhali, Minakahn, ground water occurs in confined ground water body. Major water bearing formation is sand (grey to yellow) fine to coarse grained, silt and gravel. Depth of water level in unconfined aquifer during pre-monsoon period varies from 2 to 13.60 mbgl and post-monsoon it is from 1.64 to 10.66 mbgl. In confined region, during pre-monsoon, it varies from 3.47 mbgl to 6.25 mbgl and post-monsoon varies from 1.91 mbgl to 5.89 mbgl. Tube wells in the district are constructed tapping both confined and unconfined aquifers and are capable of yield 50 to 150 m^3/h with nominal drawdown of 4-5m. Transmissivity values ranges from 699 – 8127 m2/day and storability ranges from 1.05 x 10-3 to 1.45 x 10-4. Specific yield ranges from 0.035 to 0.765. Current stage of ground water development is 71.19 % and all the blocks of the district are in “safe category” in terms of groundwater availability.

39. **Groundwater Quality**. The chemical quality of ground water in the region is in general of bicarbonate type. The chloride content of the ground water is low (18-234) mg/l in northern and central part of the district. In southern and south- eastern part of the district upper aquifers are brackish to saline nature with chloride value ranges from 300 – 1241 mg/l. The ground water is mainly neutral to mildly alkaline in nature and pH value ranges between 7.5 and 8.2. Total Hardness as $CaCo_3$ ranges from 140-670 mg/l. Generally Iron content is above permissible limit in all blocks ranges from 1.23 – 18.10 mg/l. Shallow aquifer within a depth of 100mbgl shows Arsenic concentration of more than 0.05 mg/l occurring in 253 Mouzas in 17 blocks of the district.

40. In South 24 Parganas district, the ground water bearing aquifers are present within Quaternary and Tertiary sediments and generally occur under confined condition in the depth range of 75m to 360m with numerous alternations of clayee and sandy layers of varying thickness. The confined aquifers are divided into two groups, from north to extreme south. The upper one, usually in the depth span of 20m to 160m has a sandy gravel layer as a marker bed at its base which pinches out eastward. The ground water in general except at a few places occurring in this upper group of aquifers, is brackish to saline (chloride ranging from 1750 to 6300 ppm) and is not in use. The lower group of aquifer occurring in the depth range of 160m to 360m, is separated from the upper group by a thick impermeable sticky clay bed which is laterally extensive with varying thickness. The ground water occurring in this lower group of aquifer is generally fresh and is used extensively. Groundwater level lies from 1.70 mbgl to 6.00 mbgl during pre-monsoon

period and from 0.50 m to 5.80 mbgl during post-monsoon period. Productive fresh water bearing zones are in depths ranging from 115 to 402 mbgl and are capable to yield 100 to 120 m3/hr, with drawdown ranging from 2.3m to 16.5m. Transmissivity values range from 400 to 6500 m2/day and the Storativity values range from 0.0002 to 0.0015.

41. **Groundwater quality.** Groundwater from unconfined aquifer except a few places is fresher within 60 mbgl than the deeper aquifers within 60 to 125 mbgl. Ground water from the unconfined aquifer is generally neutral to mildly alkaline with pH ranging from 7.2 to 8.1. Ground water in the western and central part of the district is primarily a Calcium-Magnesium-Bicarbonate type. The aquifer within the depth range of 150 mbgl in this area is generally marked by brackishness where chloride value ranges from 1750 to 6300 ppm. The deeper group of confined aquifer occurring within the depth range of 160 to 350 mbgl in the southern and south-eastern part of the district contain fresh water. The ground water is neutral to mildly alkaline with pH ranging from 7.4 to 8.1. Conductivity ranges from714 to 2692 µs/cm and the chloride value ranges from 14 to 596 ppm. In the coastal belt of this district the aquifers under semi confined to confined condition contain ground water with very high dissolved salts. Arsenic content of groundwater has been found to be beyond permissible limit of 0.05 ppm in a number of localized patches in sporadic manner in 9 blocks-Baruipur, Sonarpur-Bhangar-I and II, Jaynagar-I, Bishnupur-IandII, Magrahat-II and Budge Budge-II in this district.

42. **Arsenic in Groundwater**. In 2015, the Indian standard (permissible concentration) for Arsenic in drinking water has been revised from 0.05 mg/l to 0.01 mg/l (WHO guidance value). As per the available data, as of 2016, there are around 13,000 habitations spread over 17 states in India, that have arsenic in groundwater above the permissible concentration. Most of the affected states are in the Ganga- Brahmaputra fluvial plains: Assam, Bihar and West Bengal. Over 50% of total affected habitations are in the state of West Bengal alone. The School of Environmental Studies (SOES), Jadavpur University carried out extensive sampling from the tube wells in the state for over a period of 20 years starting from 1988, and found that out of 135,555 samples analyzed from nine districts, 67,306 (49.7%) samples shown arsenic concentration above 0.01 mg/l and 33,470 (24.7%) samples above 0.050 mg/l. Specifically on project area, PHED sampling and analysis (a total of 5641 samples) indicate that all the 22 blocks in north 24 Parganas have groundwater with arsenic concentration above 0.01 mg/l. The maximum observed arsenic concentration has the lowest value in Barrackpur II and the highest is observed in Habra II, Bongaon and Gaighata (1.0 mg/l) blocks. Relatively low average concentration between 0.01 and 0.5 mg/l is observed in five blocks, out of which three are in the coastal area, and an average concentration between 0.05 mg/land 0.10 mg/l is observed nine blocks. All the remaining eight blocks have an average concentration above 0.10 mg/l (Table 5).

Table 5:Arsenic Concentration in Groundwater, Block-wise, North 24 Parganas

Average Arsenic Concentration (mg/l)	**Name of Block** (Max. Observed Arsenic Concentration in mg/l)
0.01 - 0.05	Barrackpur-I (0.97), Barrackpur-II (0.16), Haroa (0.73), Minakhan (0.5), Sandeshkhali I (0.77)
0.05- 0.1	Amdanga (0.57), Bagda (0.62), Barasat I (0.75), Barasat II (0.95), Basirhat II (0.63), Bongaon (1), Hasnabad (0.96), Hingalganj (0.46), Rajarhat (0.62)
> 0,1	Baduria (0.96), Basirhat I (0.99), Deganga (0.69), Gaighata (1.0), Habra I (0.95), Habra II (1.0), Swarupnagar (0.72)

7. Air Quality

43. West Bengal State Pollution Control Board (WBPCB) monitors air and noise pollution in the State. WBPCB have monitoring stations located at various places across the state; however, covers major cities, district headquarters and industrial locations. There are no monitoring stations in the project blocks of Rajarhat, Haroa and Bhangar I and II. In North 24 Parganas, ambient air quality is monitored by WBPCB at Barrackpore. Data shows that all the monitored ambient air quality parameters, except particulate matter (PM 10), are within the National Ambient Air Quality Standards (NAAQS). PM10 is slightly exceeding the standard while the respirable particulate matter (PM2.5) is almost near the permissible limit. Dust in the ambient air is mainly due to dry atmosphere, dusty roads and traffic.

Table 6: Ambient Air Quality (Daily Average)

	Parameters	Barrackpore	Revised NAAQ Standard (24 hour average)
1	PM 10, µg/m³	103.64	100
2	PM 2.5, µg/m³	58.82	60
3	So2, µg/m³	9.62	80
4	No2, µg/m³	68.17	80
5	CO, mg/m³	0.73	2

C. Ecological Resources

44. South and North 24 Parganas districts are the home of Sundarbans Biosphere Reserve, a unique ecosystem, and a World Heritage Site. This area is part of delta of Ganges and Brahmaputra river system. It is spread over 9,630 km^2 in 6 Community Development blocks of North 24 Parganas (Hingalganj, Hasnabad, Haroa, Seneschal - I, IIandMinakhan) and 13 Community Development blocks in in South 24 Parganas district (Sagar, Namkhana, Kakdwip, Patharpratima, Kultali, Mathurapur-I, II, Jaynagar-I, II, Canning-I, II, Basanti, andGosaba). The extent of mangrove Reserve Forests is around 4260 km2, out of which 55% is under land vegetation cover and balance 45% is under water body/ inter-tidal zone. Nearly 40% of this reserve forest area is notified as protected areas: Sundarban National Park (1330 km^2), Sajnekhali Wildlife Sanctuary (362 km^2), Lothian Wildlife Sanctuary (38 km^2) and Haliday Wildlife Sanctuary (6 km^2). Sundarban Tiger Reserve, covers an area of 2585 km^2, which include Sundarban National Park as its core area, and the balance is the surrounding reserved forest area which forms its buffer zone.

45. Sundarban Biosphere Reserve consists of following zones: Core Zone (protected site for conserving biological diversity and undertaking non-destructive research and other low-impact uses like education etc.,); Buffer Zone (surrounding or adjoining the Core Zone, and is used for activities compatible with sound ecological practices); and Transition Area (contain a variety of agricultural activities, settlements and other uses and in which local communities, management agencies, scientists, NGOs and other stakeholders work together to manage and develop the Area's resources). Biosphere reserves are managed under the existing forest, wildlife and environmental related laws as applicable, and there are no other specific regulations. Except Sundarbans in the southern extreme, there are no forest areas or protected areas in the project area, and consists of agricultural, habitation areas and water bodies etc., Based on preliminary designs, no works will be conducted in the Sundarban areas, except for small civil works in one block of 24 South Parganas when the site for GLSR and small pipes are in the outer periphery of the transition zone. The project preparatory team has noted that this site and alignment are developed areas and construction allowed. No works will be allowed beyond this location. The

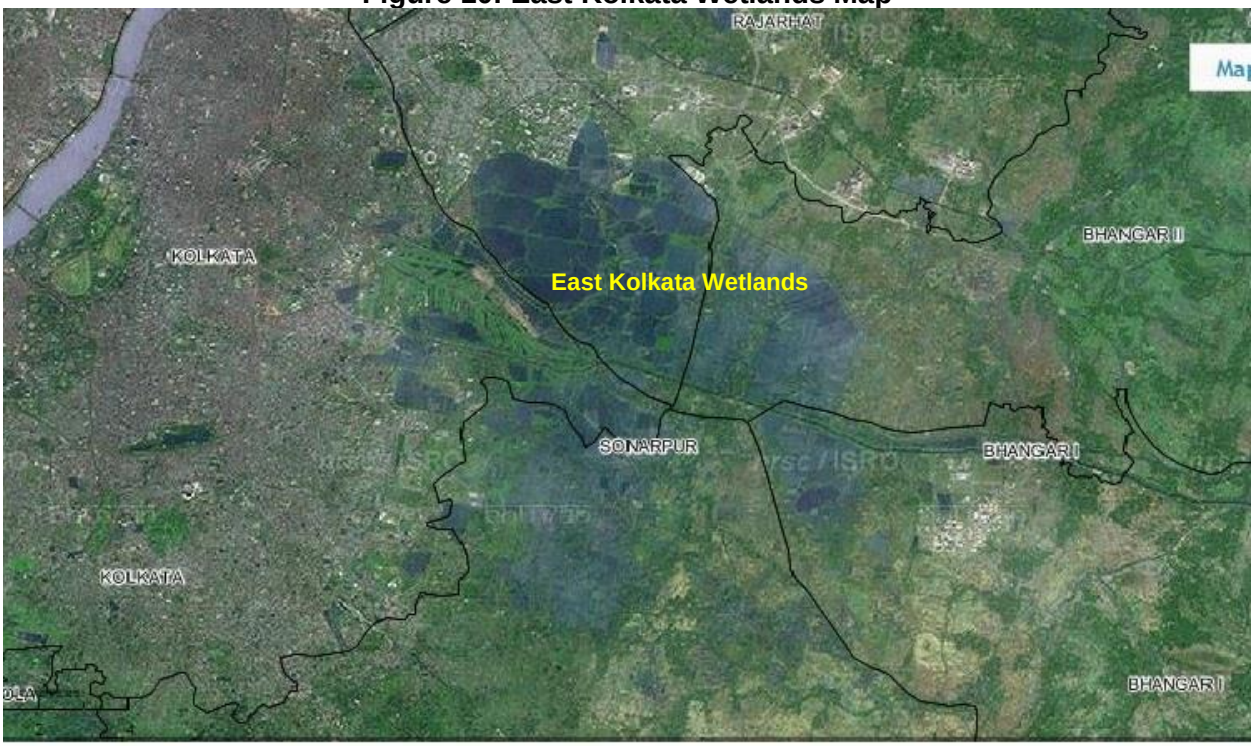
project will not consider any components in the core area. Chintamani Kar Bird Sanctuary is in the southwest of the project area at about 20-30 km from the project area.

46. Floral species present in the project blocks are indigenous in nature. Commonly seen plant species are Tamarind (Tamarindusindica), Neem (Azadirachtaindica), Gulmohur (Delonixregia), Jhau (Casuarinaequisetifolia), Sisso (Dalbergiasisso), Babul (Acacia nilotica), Peepal (Ficusreligiosa), etc., Domestic animals are commonly observed in the project blocks.

47. All the proposed project sites are vacant and there is no notable tree cover, except Rajarhat GLSR site where there are mature trees of local species, and in Bhangar GLSR site, which is currently covered with mango orchard. Some trees required to be cut for the project.

48. **East Kolkata Wetlands (EKW)**. A Ramsar designated wetland of international importance, located in the eastern outskirts of Kolkata city covering a total area of 12.5 km2 (12,500 ha). It comprises large number of water bodies, sewage fed fish forms, agricultural lands and also some built up areas. Administratively, these wetlands are located in Kolkata municipal area and in the districts of north and south 24 Parganas. These water bodies include man-made and as well as natural ponds. Of the total area of 12,500 ha, slightly less than half (~47%) is covered with water bodies, nearly 43% is fish/agriculture farming area, and the remaining 10% consists of built-up area (both rural and urban). These wetlands are unique and used to treat sewage generated here through pisiculture. There are various deep canals, which flow with very low velocity that bring sewage from the city, and circulate in the wetlands. These canals act as facultative lagoons, and while fish ponds act as maturation ponds for completing the sewage treatment. Solid waste also dumped here. So, these wetlands provide natural treatment for both sewage and solid waste, while providing benefits to the local people via fish farming. Outflow from fishponds flows naturally into streams, for further disposal into sea via natural drainage channels/rivers.

Figure 10: East Kolkata Wetlands Map



49. Besides providing the benefits of waste treatment and fish farming, wetlands has very rich biodiversity and is a waterfowl habitat. It is also known migratory birds. There are about 100 plant species recorded in and around the EKW. Several kinds of water hyacinths grow here, which also control land erosion. Area is known for paddy, coconut, vegetable cultivation. Fish species farmed in these sewages fed ponds include silver carp and tilapia. There are about 20 type of mammals and several reptiles in this area, which include: marsh mongoose, small Indian mongoose, Palm Civet, Small Indian Civet, Checkered keel back, smooth water snake, Buff striped keel back, and Bronze back tree snake.

50. However due to its location just outside Kolkata city and the neighboring rapidly developing New Town area of Rajarhat, has put tremendous pressure on the existence and functioning of this wetland ecosystem. Government has set up a EKW Management Authority to regulate the activities in and around the EKW. This wetland is located close to project area (Rajarhat CD block), however, no project components are located within this wetland area.

D. Economic Development

1. Land Use

51. Following table shows the land use/utilization pattern as per Census 2011. In North 24 Parganas district, 57.70 percent land of the total reporting area is under cultivation, and 32.3 percent land is used for nonagricultural purpose (this includes all lands occupied by buildings, roads and railways, water bodies and the lands put to uses other than agriculture). In South 24 Parganas district, nearly 45% of the total reporting area is under forest, 38% land is under cultivation and 15% land is under non-agricultural use. However, in Project block of Bhangar II in the district, there is no forest area.

Table 7: Land Use in Project Area

Land Use Classification	N24PGS District	Rajarhat Block	Haroa Block	S24PGS District	Bhangar II Block
	Area in hectares				
Forests	93.7	2.1	1.1	426,360	-
Area under non-agricultural uses	124,780	1,133.9	2,366.4	143,320	6,002.6
Barren and uncultivable land	-	-	-	70	-
Permanent pastures and other grazing lands	-	-	-	20	-
Land under miscellaneous tree crops	4,810	-	-	2,560	-
Culturable waste land	-	104.5	4,332.1	1,340	43.7
Fallow	33,910	-	-	16,700	-
Net area sown	223,020	3,642.0	3,905.3	358,400	7,935.6
Total reported area (total district area excluding the area under census towns and urban areas)	*386,614*	*4,883*	*4,911*	*948,770*	*13,177.7*
Total Geographical area	**409,400**	**7,290**	**15,273**	**996,000**	**16,204**

Source: Census 2011.

2. Industry and Agriculture

52. Owing to its location close to Capital City Kolkata, and good connectivity, abundance of water infrastructure availability etc., North 24 Parganas is among the top most districts in industrial development in the state of West Bengal. Due to favorable features, the district has been in the forefront of development even during the British era. District is home several industries related to cotton handloom, leather tanning, manufacturing of cutlery, brass and bell-metal industries, pottery, embroidery and lace works (chikan) etc., for many years. Textile and jute industries are very prominent in the district; major jute mills in India are located here, and district exports significant value of handlooms. There are a number of powerlooms manufacturing textiles. There are several large scale industries. There are 6876 registered industrial units and 7 industrial areas in the district.

53. District has also become the Information Technology hub of West Bengal, and is home for several well-known and large Information technology multinational companies. Most of these industries are located in New Town area of Rajarhat Block (eastern and south-eastern part of the block). However, there are notable industries in in Haroa block. Industrial activities are limited to brick kilns, small engineering and manufacturing units and household industries.

54. Located in highly fertile Gangetic delta, soils in the district are very fertile and rich with nutrients. With abundance of water from numbers rivers, creeks, ponds, etc., lands in the district are extensively cultivated. Major crops grown are rice, oil seeds, potato and cash crops like jute, sugarcane, tobacco etc. Because of abundant rivers, creeks, khals etc., fishery is an important economic activity in the district, and provided fish for the domestic market and it is also exported to other states.

55. **South 24 Parganas**. Owing to various natural and man-made factors, industrial development in the district is very limited. Due to presence of large tracts of forest lands, numerous rivers, streams, creeks etc., much of the areas is not accessible to industrial development. Small scale household and cottage industries such as jute, handlooms, manufacturing cutlery, pottery, agricultural based industries, are in the district. There are a small number of large scale industrial units (dealing in food, chemical, engineering and ship building) in the district. Located in the vast delta with number rivers, streams, creeks etc., land suitable for

agriculture is also limited. District comprises area with non-saline soils and with saline (coastal) soils of tidal origin. Non-saline soils are very fertile and rich with nutrient, and are very good for agriculture with abundance of water availability, while the coastal soils are not suitable for agriculture. As per the land use statistics, 38% of the area is under cultivation. Paddy is the main crop, and other include pulses, potato and cash crop Jute. Fishery is an important economic activity in the district. Due to presence of both fresh water and saline water bodies, fresh water and well as saline water fishing is practiced in the district, and a significant number of families depend on this activity for their livelihood.

3. Infrastructure

56. **Water Supply**. The North 24 Parganas District has a predominantly urban profile with almost 50% of the people living in the 27 municipalities. Urban local bodies provide water supply in urban areas while Public Health Engineering Department (PHED) is responsible for rural water supply covering the blocks and the census towns within the blocks. At present 61% of population (mainly rural) under the PHED jurisdiction is provided with piped water supply schemes, and rest depend on tube wells, dug wells etc. Groundwater in the district is not suitable for drinking due to high arsenic content, however, only 5% of habitations are provided with water supply schemes based on surface water sources. Rest all are depending on groundwater which is potentially unsafe. There are 181 commissioned Piped Water Supply Schemes (PWSS) in the district, and additional 32 schemes are under implementation. Out of the 181 commissioned schemes, 170 are based on ground water and 11 are based on surface water. Phasing out of groundwater based schemes as per the recommendation of the Arsenic Master Plan is in progress. Groundwater is the only source for the PWSS in nine blocks, viz. Baduria, Bagda, Barasat - II, Bongaon, Haroa, Rajarhat, Sandeshkhali - I, Sandeshkhali - II, Swarupnagar. The typical groundwater based scheme comprises a borewell and pumping arrangement, supplying water to the households after disinfection through chlorination. Where surface water sources are too far distant, Arsenic Master Plan recommended setting up on Arsenic/Iron Removal Plants (ARPs) and accordingly a number of existing schemes have been retrofitted with ARP and new schemes have been proposed with ARP. In North 24 Parganas, a total of 33 groundwater based PWSS has been considered for provision of ARPs. At present there is only one major surface water based PWSS in the district. This scheme covers four blocks of Amdanga (Part), Deganga, Barasat – I, Barrackpore – II, and a small portion of Basirhat I.

57. **Sewerage and Drainage.** There is no sewage collection system in the project area. Households mainly depend on individual sanitation systems like pit latrines, flush latrines, some connected to septic reservoirs. Due to flat topography, low laying lands, high rainfall and several water bodies around, project area is prone flooding. Cyclones are also common; 2009 cyclone and subsequent torrential rains badly affected 20 of 22 blocks in the district. Large tracts of lands inundated. Storm water drainage system mainly consists of natural stream and major canals. Open drains along the roads are provided in some places. KestopurKhal is a major canal passing through the project, and carries sewage from Kolkata city and other areas during its course. This is highly polluted, and solid waste dumping in the canal is prevalent.

58. **Solid Waste Management**. There is no proper solid waste management system in the project area. Respective village panchayats are responsible for SWM services their areas. Villages lack solid waste collection and disposal systems. Due to this, disposal of solid waste in water bodies, canals and ponds etc., is very common, and is creating unhygienic conditions.

59. **Transport**. Transport infrastructure in the district is well developed with national highways (NH 34 and NH 35) and state highways (SH 1, SH 2 and SH 3) passing through the project area.

Area is well connected with district roads and village roads. District is also well connected by railways. Internal roads in villages are mostly narrow. Due to high population density, traffic on the roads is considerable. Most of the roads are maintained by Public Works Department, except the roads in municipalities, which are maintained by the respective urban local bodies. Road the condition is generally poor, with many roads in need of repairs and resurfacing.

E. Socio Cultural Resources

1. Demography

60. Total population of the project area, comprising 3 community development blocks in the districts of north and south 24 Parganas, is 651,002 (2011 census). Population density is high in the project area, much higher than the state average. As this is one of the fasted developing areas close to Kolkata, the population growth is also higher than the state average. Sex ratio is much lower than the state and district averages. Literacy rate is comparatively higher in north 24 Parganas blocks. Population of schedule castes is higher in the project districts. There is no urban population in Haroa block, while Rajarhat block is highly urbanized (53%). Work participation rate is 33-34%. Agriculture is predominant economic activity in Haroa and Bhangar II blocks, with large number of households engaged in agricultural activities, while in Rajarhat service sector is the major employment generating sector indicating its most urbanized profile. Main language spoken in the project area is Bengali.

Table 8: Demographic Characteristics

Demographic Parameters	West Bengal State	North 24 Parganas	Rajarhat Block	Haroa Block	South 24 Parganas	Bangar II Block
Population (2011)	91,276,115	10,009,781	189,893	214,401	8,161,961	246,708
Geographical area (km^2)	88,752	4,094	72.9	152.77	9960	162.04
Total households	20,380,315	2,348,683	42910	46,888	1,775,756	50,209
Decadal Growth rate (2001-11)	13.84%	12.18%	30.64%	17.48%	18.87%	18.87%
Sex ratio	950	955	945	930	956	940
Population Density, (per km^2)	1028	2,445	2,605	1,403	819	1,523
Household size	4.5	4.3	4.4	4.6	4.6	4.9
literacy rate	76.26%	84.06%	83.13%	73.13%	77.51%	74.45%
literacy rate (male)	81.69%	87.61%	87.25%	78.13%	83.35%	78.01%
literacy rate (female)	70.54%	80.34%	78.78%	67.75%	71.40%	70.64%
% of urban population	31.87%	57.27%	52.8%	0.0%	25.58%	0.00%
SC Population	23.5%	21.67%	35.05%	23.62%	30.19%	19.82%
ST Population	5.8%	2.64%	0.62%	5.94%	1.19%	0.77%
Total workers	38.08%	35.68%	33.49%	34.17%	36.32%	34.27%
Male workers	57.07%	57.53%	56.26%	29.35%	56.46%	29.07%
Female workers	18.08%	12.81%	9.41%	4.82%	15.24%	5.21%
Main workers	28.14%	30.53%	30.45%	26.98%	24.55%	27.30%
Marginal workers	9.94%	5.15%	9.08%	21.02%	11.77%	18.21%
Cultivators	14.72%	8.07%	4.84%	17.94%	11.99%	26.44%
Agricultural Laborers	29.32%	16.77%	4.28%	33.71%	27.21%	24.53%
HH industry workers	7.09%	4.36%	2.86%	3.38%	8.13%	6.20%
Other workers	48.87%	70.80%	88.03%	44.97%	52.68%	42.83%

2. History, Culture and Tourism

61. Prior to their bifurcation in 1986 as separate districts, both south and north 24 Parganas districts were part of 24 Parganas district. Located in the revered Gangetic belt, as per the

legends, reference to this landmass in found in the great epic Mahabharata. References to this place is also found in the writings of Greek navigators, geographers, chroniclers and historians. Ruler of the Sundarbans between 1561 to 1611 A.D is said to be a Hindu Chieftain, named Pratapaditya, and enjoyed independence in the south and south-east of the Gangetic delta. During the middle half of the 16th century A.D., the region was invaded by the Portuguese pirates. In the early 17th century,Maharaja Pratapaditya fought and resisted the Portuguese. Maharaja Pratapadityawas a Bhuian (feudal lord of Bengal who declared their sovereignty from the Mughal Empire along with another 11 Bhuians together referred as the BaroBhuians meanstwelve chieftains) of Jessor, Khulna, Barisal and Greater Twenty-Four Parganas. Maharaja Pratapaditya was defeated and captured in the battles of Salka and Magrahat by the Mughals. Independent Nawab of Bengal Siraj-ud-Dullah faced defeat in the battle of Plassey (1757). Subsequently, the area came under British rule, under which entire Sunderbans were under 24 Parganas.

62. The district name Twenty Four (24) Parganas is derived from the number of Parganas comprised in the Zamindari (Land Lordship) of Calcutta, which was ceded to East India Company in 1757 by the then Nawab of Bengal Mir Jafar. In the year 1824, the district got focus when the sepoys (soldiers) deployed at Barrackpur declared that they will not take part in the Burma war as crossing the sea was forbidden as per Hindu belief. The European troop opened fire; many of them were killed. In the year 1857, the second mutiny by the sepoys broke out at the then headquarters of the Presidency Division of Bengal, Barrackpore. This mutiny is often referred as the First War of Independence. The rebellion was ignited with Mangal Pandey, a Sepoy of the 34th Regiment, stationed at Barrackpore in March, 1857. After the mutiny, India came under the direct rule of the British Emperor from the East India Company. In 1905, some portions of the district were attached neighboring districts, which are now part of Bangladesh. In 1986, the district is divided into two districts – north and south. Satelite township of Kolkata (Salt Lake City) is included in North 24 Parganas district.

63. West Bengal has rich and unique culture and tradition. Many pujas and festivals are celebrated here with gaiety and grandeur. People from all faiths participate in these celebrations. Durga Puja, dedicated to the Goddess Durga is the most prominent and main festivals of the state. This symbolizes the triumph of Goddess Durga over the devil Mahishasura. There are several places of religious importance in the project districts. The most popular tourist attraction in north 24 parganas include Dakshineswar temple, Adyapeath Temple, Mangal Pandey Park, BibhutiBhusan Wild Life Sanctuary, Chandraketugarh, Baraha Mihirer Dhipi, etc. The most popular tourist attractions in South 24 Parganas includes Temple of Sagardiwp, Sunderban National Park, Bakkhali and Frasergunj beach, Diamond Harbour, Maheshtala, etc.

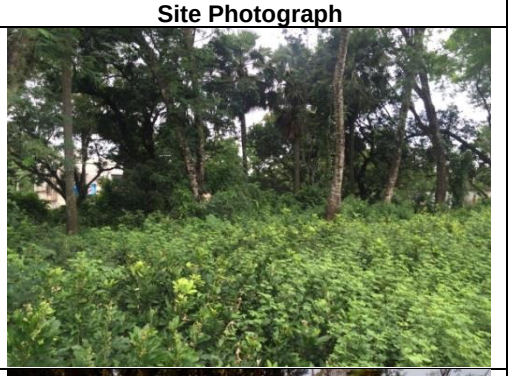
64. There are few protected monuments/archeological places of national importance in north 24 Parganas district. These are: Chandraketu's Fort at Berachampa; Ancient mound known as BarahMihirer Dhipi at Deuliaand Kaukipara; Clive’s House Dum Dum known as Barakothi, Dum Dum; 26 Siva Temples at Barrakpore – Khardah, Warren Hasting’s House in Barasat. JhaterDeul Temple in Jhata is the only protected monument in south 24 Parganas district. None of these monuments are however located in the project area.

F. Subproject Site Environmental Features

65. Features of the selected subproject sites are presented in the following table.

Table 9: Site Environmental Features

Infrastructure	Location and Environmental Features	Site Photograph
Water Treatment Plant (WTP)	New WTP will be constructed within the existing WTP compound in New Town area of Rajarhat in the eastern outskirts of Kolkata. This large land parcel part of New Town developed by New Town Development Authority is earmarked for water supply facility. Currently a WTP of 20 MGD is in operation, and another 20 MGD plant is under construction. The facility also includes 5 large raw water storage ponds. There is adequate vacant space for construction of proposed plants. There is no notable tree cover at the site. However, part of the vacant land is covered with landscaped garden/lawns, part of which will be removed for construction of new plant. Site is surrounded by well developed areas; WTP facility is well confined by a boundary wall. New WTP will be located inside the boundary, as far as possible away from the surrounding houses.	 
Clear water pumping main	Pipeline will be laid along the roads. Pipeline will be buried along the roads connecting WTP and the booster pumping station site, both of which are located in New Town area. For most of the stretch there is adequate land in the road shoulder beside the tarmac, and pipeline will be buried under this. Alignment crosses some busy roads / highways, at these sections, trenchless technology will be adopted to cross the roads. This project area is located in the newly developing new town area; developments are still not dense.	
Booster pumping station + clear water reservoir	Clear water reservoir and booster pumping station will be constructed within an existing booster pumping station compound in New Town area in Rajarhat. Site is situated in an area which is witnessing large scale development all around the site. Immediate surroundings of the site are currently vacant, there is no much activity. KhestopurKhal (canal or drain), which mostly carries wastewater from the city flows near the site. There are no notable sensitive environmental features in and around the site.	

Infrastructure	Location and Environmental Features	Site Photograph
Ground Level Service Reservoir (GLSR) at Rajarhat	Rajarhat GLSR site is located in an existing PHED bore well cum pump station compound adjoining Patharghata – Kalikapur Road in Ganragari village. Site is presently covered with trees, shrubs and bushes.	
	View of a dry pond within GSRL site; GLSR will be constructed without distributing this pond, its bunds or inlet / outflow channels	
GLSR at Bhangar II	Bhangar II GLSR site is located adjacent to KhestopurKhal (canal or drain) near Saduli in Bhangar. This is a privately agricultural land, and currently occupied by a mango orchard.	
GLSR at Haroa	Haroa GLSR is located near the bank of Vidyadhari River in Haroa. This is a privately owned vacant land.	

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

66. Potential environmental impacts of the proposed infrastructure components are presented in this section. Mitigation measures to minimize/mitigate negative impacts, if any, are recommended along with the agency responsible for implementation. Monitoring actions to be conducted during the implementation phase is also recommended to reduce the impact.

67. Screening of potential environmental impacts are categorized into four categories considering subproject phases: location impacts and design impacts (pre-construction phase), construction phase impacts and operations and maintenance phase impacts.

(i) **Location Impacts** include impacts associated with site selection and include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood or any other structures by the development of that site.
(ii) **Design Impacts** include impacts arising from Investment Program design, including technology used, scale of operation/throughput, waste production, discharge specifications, pollution sources and ancillary services.
(iii) **Construction Impacts** include impacts caused by site clearing, earthworks, machinery, vehicles and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.
(iv) **O&M Impacts** include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams, and occupational health and safety issues.

68. Screening of environmental impacts has been based on the impact magnitude (negligible/moderate/severe – in the order of increasing degree) and impact duration (temporary/permanent).

69. This section of the IEE reviews possible project-related impacts, in order to identify issues requiring further attention and screen out issues of no relevance. ADB SPS (2009) require that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the project's area of influence.

70. The ADB rapid environmental assessment (REA) checklist in http://www.adb.org/documents/guidelines/environmental_assessment/eaguidelines002.asp has been used to screen the project for environmental impacts and to determine the scope of the IEE.

71. In the case of this project (i) most of the individual elements involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and some works are located in the reservoir and (iii) being mostly located in an urban area, will not cause direct impact on biodiversity values. The project will be in properties held by the local government and access to the project location is through public rights-of-way and existing roads hence, land acquisition and encroachment on private property will not occur.

A. Pre-Construction Impacts – Design and Location

72. **Design of the Proposed Components**. Technical design of the (i) intake facilities at ponds; (ii) water treatment plant; (iii) clear water mains, (iv) storage reservoirs and other items

like flow meters, follows the relevant national planning and design guidelines, focusing on providing a robust system which is easy to operate, sustainable, efficient and economically viable. Following environmental considerations are included in the project:

(i) Discontinuation of current unsafe and unsustainable groundwater sources and creating a new comprehensive surface water (river) based water supply system
(ii) Recovering wash water from treatment process to optimise the water use;
(iii) Treatment and reuse of sludge from treatment process;
(iv) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage;
(v) Reducing the incidence of water borne diseases by providing 100% population including urban poor with potable water supplies;
(vi) Preparation and implementation of a water quality surveillance program including development of a laboratory as part of the project by DBO contractor to ensure that supplied water meets the drinking water standards;
(vii) Development of laboratory with all necessary EHS measures and adopting international standard procedures for water quality testing;
(viii) Using low-noise and energy efficient pumping systems;
(ix) Installing the noise-producing pumps and motors etc., in enclosed buildings with noise reducing walls, and also maintaining adequate buffer to the nearby inhabited areas;
(x) Provision of appropriate personal protection equipment to the workers and staff.

73. **Water Source Sustainability**. Proposed project does not include development of any new water source as it utilizes an existing source and intake facilities within the available design capacity. The source of water supply is River Hoogly, which is principle source of water supply for the City of Kolkata and many other areas.

74. New Town area, which is part of Rajarhat block is developed by Housing Infrastructure Development Corporation (HIDCO) of Government of West Bengal, is a IT (Information Technology) hub in Kolkata, and houses several large and reputed multinational IT companies. This is a well-developed town with commercial, industrial and residential areas. HIDCO, jointly with the Public Health Engineering Department (PHED) has developed a project for supply of water in New Town, Rajarhat and surrounding areas with a total design capacity of 100 million gallons per day (100 Mgd or 454 MLD), with Hoogly as source of water. This project is being implemented in a phased manner, and at present components of (i) intake and raw water pumping station facility on River Hooghly at Debendrabala Ghat in North Kolkakata, and (ii) raw water pumping main to carry 100 MGD from the intake to WTP and (iii) Water treatment plant of 20 Mgd (91 MLD) capacity, have been completed and put into operation. Another WTP of 20 MGD capacity is under construction. Due to lack of treatment capacity and also the downstream storage and distribution infrastructure, at present, the intake and raw water system is operated only partially.

75. It is proposed to supply water from this New Town WTP in the neighbouring blocks of Rajarhat, Haroa and Bhangar II by enhancing the treatment capacity (by 50 MGD), and creating required clear water transmission and distribution infrastructure. Existing raw water abstraction system (including pumping and conveyance from source to WTP) has adequate capacity and therefore the ADB funded project does not include creation of any new or augmentation of source.

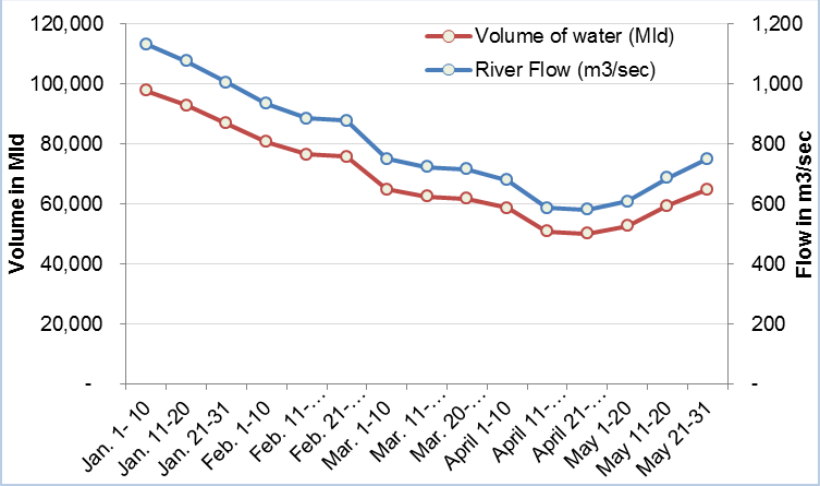
76. River Ganga is formed by two rivers at Devprayag in Uttarakhand State – Bhagirathi and Alakananda, originating from the glaciers of the Himalayas. From Uttarakhand, it flows down to

Uttar Pradesh, where it is joined by its largest tributary River Yamuna at Allahabad, and then enters Bihar, where it is joined by another large River Kosi. The river finally enters West Bengal, and it bifurcates into two branches about 40 km downstream of Farakka Barrage. The left branch, called River Padma, flows eastwards and enters Bangladesh, and the right branch, called River Bagirathi / River Hooghly, flows southwards through West Bengal and ultimately discharges into Bay of Bengal near Kolkata. Of the total river length 2,575 km, the lowest portion of 570 km falls in West Bengal. River Hoogly is perennial in nature and owing to numerous large tributaries it carries huge quantities of water throughout the year.

77. The main source of surface water for this district is River Hooghly. The other rivers of the district, like Ichhamati and Kalindi, are either not perennial or carry insignificant water during the non-monsoon season. Most of the rivers in the southern fringe of the district, which is part of the Sunderban area, are saline in nature due to tidal effects. A study by the Hydraulic Department of Kolkata Port Trust indicates the lowest flow in Hooghly River as 1,135 m^3/sec. The width of river varies, but near Kolkata it is roughly 1000 m wide. The Hooghly is under tidal influence for up to 300km.The overall spring tide range is 4.27 m to 4.57 m and range of the neap tides is 1.83 m to 2.83 m. Near Kolkata, the water level fluctuates 4.0m per day during the rainy season and 2.75 m twice in a day in the dry season. Highest HHWL and the LLWL are 5.34 m above msl and 0.95 m below msl, respectively.

78. As per the available data on lean season flow (of the year 1996), the lowest was 580 m3/sec (which in terms of volume of water translates to 50,112 MLD), while the total requirement of this WTP is 454 MLD. River also is the source of water for Kolkata and rest of North 24 Parganas and South 24 Parganas districts. The water available during the lean flow season is adequate to meet the demand of this entire area.

Figure 11: Hooghly River – Lean Season Flow, 1996



79. **Hooghly Water Quality and Suitability as Drinking Water Source**. Source raw water quality data collected from the WTP laboratory for a period of one year (February 2016 to January 2017, see Table 10) indicates that river water quality is suitable for drinking water supply after the conventional water treatment. This is further confirmed by a baseline sampling survey during the preparation of IEE. All the parameters of water quality in comparison with drinking water standards are well within the limits, except for turbidity and bacteriological contamination. Conventional water treatment and disinfection which is proposed in the project is adequate to make the water

usable for drinking purposes. A regular water quality regime needs to be established for checking the raw water quality. The water supplied to the consumers at all times must meet the drinking water standards (Appendix 8).

80. **Heavy Metals in Water**. Table 11 presents the concentration of heavy metals in the raw and treated water at the WTP. All the parameters tested in raw water are within the desirable limit except, copper, lead and manganese, which are above the desirable limit but well within the permissible concentration limit.

81. Thus, as presented above, in terms of water availability and quality of water, selected source, Hooghly River, is adequate and suitable to meet the project water demand, and there are unlikely to be any issues related source sustainability during the project life cycle.

Table 10: Hooghly River Water Quality (February 2016 to January 2017)

Parameter	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17
pH	7.21	7.23	7.56	7.58	7.83	7.23	7.36	7.74	7.69	7.87	7.8	7.68
TDS, mg/l	153.6	180.4	164.2		178.7	154.7	132.9	130	122.1	145	154.8	174.1
Turbidity, mg/l	10.12	9.21	6.42	30.35	15.78	32.79	32.28	25.09	13.01	46.26	12.7	7.93
Conductivity, mg/l	306	360	424		357	309	266	260	244	290	310	348
Temperature, mg/l	25.3	26.2	27.5		28.1	27.7	27.9	28.3	28.6	25.1	25.1	21.7
Total hardness, mg/l	120	140	120	132	124	84	88	84	100	100	140	128
Total alkalinity, mg/l	100	120	120	180	140	80	80	88	104	104	144	136
Iron, mg/l	0.0058	0.0089	0.0097	0.131	0.0098	0.0062	0.015	0.0089	0.0095	0.0892	0.0124	0.0081
Chloride, mg/l				159.04	19.9	19.95	17.15	19.95	19.95	159.04	14.2	11.36
Fluoride, mg/l			0.3145	BDL	0.1254	0.1956	0.5213	0.1258	0.1021	BDL	0.4471	0.0356
Nitrate, mg/l			10.2641	12.7856	3.6501	12.0021	28.89	32.65	15.64	16.27	10.21	10.41
Arsenic, mg/l			BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
BOD, mg/l	-	-	-	4	-	-	-	-	-	14	-	-
COD, mg/l	-	-	-	10	-	-	-	-	-	65.2	-	-
Total coliform, colony/100 ml	TNC	TNC	TNC	TNC	TNC	TNC	162	TNC	-	TNC	TNC	178
Feacal coliform, colony/100 ml	66	54	28	40	20	64	25	52	-	72	20	22

BDL = below detectable limit, TNC = Too numerous to be counted

Table 11: Heavy Metal Concentration in Raw and Treated Water at Water Treatment Plant

Parameter	May-2016		Nov-2016		Drinking Water Standard
Heavy Metals	**Raw**	**Treated**	**Raw**	**Treated**	*Desirable – Rejection limits**
Iron, mg/l	0.131	0.131	0.0892	0.0461	0.3 – 1.0
Arsenic, mg/l	BDL	BDL	BDL	BDL	0.01
Copper, mg/l	0.1456	0.0222	0.1456	0.1146	0.05 – 1.5
Lead, mg/l	0.0443	0.0036	0.0443	0.0097	0.01 - 0.05
Total Chromium, mg/l	0.0141	0.0036	0.0141	0.0139	0.05
Cadmium, mg/l	0.0046	0.0014	0.0046	0.0019	0.01
Manganese, mg/l	0.1163	0.011	0.1163	0.1128	0.1 – 0.3

* standards prescribe lower and higher values for parameters, lower value is the 'desirable limit' while higher value is the 'permissible limit in the absence of alternate source'; there is only lower value for parameters which have no relaxation. Green shade indicates values below desirable limit, orange indicates above desirable but below permissible limit.

Source: PHED.

82. **Use of Chlorine as Disinfectant**. It is proposed to use chlorine at WTP to disinfect the water prior to supply to consumers. There is invariably a safety risk when considerable quantities of chlorine are handled at the WTP. (Chlorine cylinders will be brought by trucks to the site, installed and operated to disinfect the water supplies). Since facilities are located in the urban area, precautions will thus be needed to ensure the safety of both workers and citizens.

83. The average dose of chlorine for pre-chlorination will be about 4mg/l and that for post-chlorination will be about 2 mg/l. With the design capacity of WTP 50 MGD, nearly 1400 kg of chlorine will be consumed daily. Chlorine cylinders (called tonners of capacity 900 kg) will be procured from nearest manufacturing unit and stored at the site. Tonners sufficient for a month will be stored in the storage; i.e. 45-50 cylinders will be stored at the WTP.

84. To avoid any risk to workers and public, the chlorination facility at the WTP should be designed developed with all appropriate safety features and equipment to meet with any accidental eventuality, which may include:

(i) Chlorine neutralization pit with a lime slurry feeder;
(ii) Chlorine absorption and neutralization facility;
(iii) Proper ventilation, lighting, entry and exit facilities;
(iv) Visible and audible alarm facilities to alert chlorine gas leak;
(v) Facility for isolation in the event of major chlorine leakage;
(vi) Eye wash and shower facility;
(vii) Personal protection and safety equipment for the operators in the chlorine plant (masks, oxygen cylinders, gloves, etc.);
(viii) Provide training to the staff in safe handling and application of chlorine; this shall be included in the contract of Chlorinator supplier;
(ix) Supplier of Chlorinator equipment shall provide standard operating manual for safe operation and as well as maintenance and repairs; preferably these shall be provided both in English and Bengali Languages.

85. **Energy Efficiency**. Owing to almost flat topography of the project area, the water supply system requires pumping (using the electrical energy) to transport and supply water at requisite terminal pressure to the consumers. The raw water from the ponds in the WTP campus will be pumped to WTP inlet; within WTP it is mostly gravity flow, but requires energy to operate all the units. From clear water reservoir at the WTP, water will be pumped to the clear water reservoir at the booster pumping station, and from this, water will be further pumped to 3 GLSRs in 3 blocks of Rajarhat, Haroa and Bhangar II. From GLSRs, water will be further pumped to Overhead Service Reservoirs (OHSRs) located in each block. From OHSRs, water will be supplied by gravity to the consumers.

86. To optimize the power consumption, the hydraulic design shall follow optimal approach, and the following shall also considered in design and selection of pumping systems. According to Manual for the Development of Municipal Energy Efficiency Projects in India (jointly developed by Bureau of Energy Efficiency and International Finance Corporation in 2008), energy savings, at minimum, of 25% to 40% is possible with appropriate measures. The following measures shall be considered and incorporated into the subproject designs:

(i) Installation of Energy Efficient Motors;
(ii) Efficient Pumping system operation;
(iii) Installation of Variable Frequency Drives.

87. **Waste Water and Sludge from Water Treatment Plant - Treatment and Disposal**. Water treatment process will generate sludge from sedimentation of particulate matter in raw water, flocculated and precipitated material resulting from chemical coagulation, residuals of excess chemical dosage, plankton etc., and waste from rinsing and back washing of filter media containing debris, chemical precipitates, straining of organic debris and plankton. Following are included in the subproject design to dispose the sludge and back wash:

(i) Provision of recirculation system for backwash water – backwash water from filter beds will be re circulated to WTP inlet and mixed with raw water; the retention is 2 to 3 hours and 95% of the suspended solid gets removed in this process; this arrangement will minimize wastage of water, which otherwise would have disposed to open drains, and also avoids the pollution of receiving water body

(ii) Provision of sludge drying - accumulated sludge from clariflocculator will be flushed to sludge drying beds, for natural drying.

(iii) Dried sludge will be used as soil conditioner. Periodic testing of dried sludge will be conducted to ensure that it does not contain heavy metals that make it unsuitable for food crops. Tests will be conduct to confirm the concentrations below the following standards. Backwash water and clarifier sludge (if any) will be disposed in line with the guideline issued by West Bengal Pollution Control Board. Contractor in consultation with PHED will identify disposal site for excess dried sludge, if any. As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Municipal Solid Waste Management and Handling Rules, 2000 have been adopted here. The MSWMH Rules stipulate that "In order to ensure safe application of compost, the following table of specifications for compost quality shall be met.

Table 12: Specifications for Compost Quality

Parameters	**Concentration not to exceed**[a] (mg/kg dry basis, except pH value and C/N ratio)
Arsenic	10.00
Cadmium	5.00
Chromium	50.00
Copper	300.00
Lead	100.00
Mercury	0.15
Nickel	50.00
Zinc	1000.00
C/N ratio	20-40
pH	5.5-8.5

[a] Compost (final product) exceeding the above stated concentration limits shall not be used for food crops. However, it may be utilized for purposes other than growing food crops.

88. **Tree Cutting at Selected Project Sites**. Proposed site for GLSR at Rajarhat, and Bhangar II is covered with trees. While in Rajarhat site there are naturally grown mature trees, Bhangar II site is originally an orchard land covered with mango trees. These trees need to be removed. Total number of trees to be felled will be confirmed during implementation phase based on the final alignment of pipes and location of the overhead reservoirs. IEE will be updated during implementation phase, with the actual data

89. Following measures need to be implemented to compensate for the loss of tree cover:

(i) Minimize removal of trees by adopting to site condition and with appropriate layout design of GLSRs;
(ii) Obtain prior permission for tree cutting;
(iii) Plant and maintain 5 trees for each tree that is removed.

90. **Disturbance to Natural Drainage**. There is a pond within the site owned by PHED at Rajarhat, where a GLSR is proposed under the project. Disturbing or encroaching on to the pond, its bunds or inflow of outflow channels will disturb the natural drainage of the area, may lead to flooding. Haroa GLS site is located next to River Bidhyadhari. Proper study to locate and design the GLSR is required to avoid any future flooding issues: Following measures need to be implemented to compensate for the loss of tree cover.

(i) Existing pond at Rajarhat GLSR site shall not be disturbed; GLSR should be constructed without disturbing the pond area, its bunds, inlet and outflow drainage channels;
(ii) Construction GLSR at Haroa away from the flood plain of Bidhyadhari river;
(iii) Integrate measures into GSLR design to avoid risk of flooding.

91. **Utilities**. Telephone lines, electric poles and wires, water lines within the proposed project locations may require to be shifted in few cases. To mitigate the adverse impacts due to relocation of the utilities, the contractor, in collaboration with the PHED will (i) identify the locations and operators of these utilities to prevent unnecessary disruption of services during construction phase; and (ii) instruct construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services.

92. **Site Selection of Construction Work Camps, Stockpile Areas, Storage Areas, and Disposal Areas**. Priority is to locate these near the project location. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems. Residential areas will not be considered for setting up construction camps to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Areas near forests and water bodies will be avoided in the selection of disposal sites.

93. **Site Selection of Sources of Materials**. Significant quantities of coarse aggregate and fine aggregate will be required for construction works. Requirement of gravel is limited. Contractor should procure these materials only from the quarries permitted/licensed by Mines and Geology Department. Contractor should, to the maximum extent possible, procure material from existing quarries, and creation of new quarry areas should be avoided as far as possible. If new quarries are required then the contractor will be responsible for obtaining all permissions and clearances, including environmental clearance for mining. Contractor should factor in the time required for obtaining clearances including conduct of EIA if required under the law. It will be the construction contractor's responsibility to verify the suitability of all material sources and to obtain the approval of Department of Mines and Geology and local revenue administration.

B. Construction Impacts

94. Main civil works in the subproject include construction of water treatment plant, water reservoirs / tanks (ground level and overhead), pumping stations, at the identified sites. These works will be confined to sites, and construction will include general activities like site clearance,

excavation for foundations, and creation of concrete structures will be one of the major construction activities for this project, as many of the subproject components will be fixed to concrete plinths and most will be housed in buildings with at least some concrete structural elements. Most such structures will be constructed from reinforced concrete (RC), where steel reinforcing rods and bars are placed and attached by hand to create an interior skeleton for the foundations, walls, columns, plinths, etc., and heavy-duty metal and timber/plywood formwork is bolted around the outside to build a mould into which pre-mixed concrete is poured. Once the concrete has set, the formwork is removed, and the concrete surface is finished by masons by hand if necessary. Some buildings, such as the pump station, facilities, etc., may be constructed from brick work, in which case this work will be done using standard house-building techniques.

95. Most of the technical components of the WTP (intake pump station, intake screens, pre- and post-treatment systems and reverse osmosis racks) comprise a variety of pre-fabricated elements, which are installed on site as ready-made individual units. These will be directly brought from the manufacturers place to the sites lifted into position by crane, affixed to plinths or other installation points, and connected up to pipework and the electricity supply.

96. Since these works are confined to the boundary of identified sites, there is no direct interference of construction work with the surrounding land use. However, construction dust, noise, use of local roads for transportation of construction material, waste, labour camps etc., will have negative impacts, which needs to be avoided or mitigated properly.

97. Subproject also included laying of pumping main pipeline from WTP to booster pumping station. This alignment is located within the New Town Area, and alignment crosses some important roads which carry significant traffic. Considering this, it is proposed to lay the pipeline partly by trenchless technology, especially at the junctions where the pipeline crosses busy roads. In the other sections, it will be laid by open cut method. Appropriate trenchless technology will be adopted by the contractor such as modern micro tunneling with boring pipe jacking technique. Although the main purpose of trenchless here is to lay the pipelines at the sections where it crosses main roads to avoid road closures and traffic disruptions, other important issues such as large scale public inconvenience, safety, and blocking access to properties, business and houses will also be considered while selecting the sections for trenchless approach.

98. Open cut trenching method of pipe laying involves excavation for laying pipes along the roads, placing pipes in the trench, jointing and testing, and refilling with the excavated soil. The trenches will be of 1.5 m – 2.0 m wide and 2 to 3 m depth. Earth work excavation will be undertaken by machine (backhoe excavator) and include danger lighting and using sight rails and barricades at every 100 m., while pipe laying works will include laying pipes at required gradient, fixing collars, elbows, tees, bends and other fittings including conveying the material to work spot and testing for water tightness. Sufficient care will be taken while laying so that existing utilities and cables are not damaged and pipes are not thrown into the trenches or dragged, but carefully laid in the trenches. As trenches are 2-3 m deep, there is risk of collapse of trenches or damage to surrounding buildings. Necessary precautions such as bracing or shoring in the trench will be provided. Once they are laid, pipes will be joined as per specification and then tested for any cracks of leakages. The minimum working hours will be 8 hours daily, the total duration of each stage depends on the soil condition and other local features. About 95% of the excavated soil will be used for refilling the refilling the trench after placing the pipe and therefore residual soil after pipe laying and refilling is not significant.

99. Although pipe laying work involves quite simple techniques of civil work, the invasive nature of excavation and pipeline alignment in the built-up areas of New Town where there are a

variety of human activities, will result in impacts to the environment and sensitive receptors such as residents, businesses, and the community in general. These anticipated impacts are temporary and for short duration, however, needs to be mitigated.

100. Anticipated impacts during the construction phase are discussed below along with appropriate mitigation measures to avoid, minimize or mitigate those impacts to acceptable levels.

101. **Sources of Materials**. Significant amount of sand and coarse aggregate will be required for this project, which will be sourced from quarries. Quarries inevitably cause extensive physical changes; as construction materials are excavated from the ground, leaving large cavities, or levelling hillsides, etc. The physical damage caused by quarries is controlled by allowing them to operate within specific limited areas only, so the damage is restricted in extent and not allowed to spread indiscriminately. New quarries are subject to a rigorous process of environmental assessment to ensure appropriate siting and adequate environmental controls on the operation. It will therefore be important to ensure that construction materials for this project are obtained from government approved licensed quarries only, to ensure these controls are in place. Contractor should avoid new borrow pits/quarries as far as possible, if necessary, all the permissions, including conduct of environmental assessment, and environmental clearance as necessary shall be obtained prior to start of quarrying activity. The contractor should also make a concerted effort to re-use as much excavated material from this project as possible. The construction contractor will be required to:

(i) Obtain construction materials only from government approved quarries with prior approval of PIU;
(ii) PIU to review, and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval;
(iii) Contractor to submit to PIU on a monthly basis documentation on material obtained from each source(quarry/ borrow pit);
(iv) Avoid creation of new borrow areas, quarries etc., for the project; if unavoidable, contractor to obtain all clearances and permissions as required under law, including Environmental Clearance prior to approval by PIU.

102. **Air Quality**. Construction work, especially from earthwork activities, coupled with dry and windy working conditions, material and debris transport, and works along the public roads carrying significant traffic, have high potential to generate dust. Also, emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality. Anticipated impacts include dust and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons. Dust generation from construction work in individual and confined work sites like WTP, GLSRs, pumping station etc., will be mainly during the initial construction phase of earth work, as the site is confined, dust can be effectively controlled with common measures. Dust generation will be significant during pipeline laying along the roads. Increase in dust/ particulate matter in ambient air is detrimental, and may have adverse impacts on people and environment. To mitigate the impacts, construction contractors will be required to:

103. **For all construction works**

(i) Comply with the air pollution/dust control measures for construction activities stipulated by the “Direction of West Bengal Department of Environment under the Air Act, 1981 Direction No. EN/3170/T-IV-7 /001/2009 dated: 10 December 2009” (Appendix 6);

(ii) Provide a dust screen around the construction sites at GLSR and WTP work sites
(iii) Damp down the soil and any stockpiled material on site by water sprinkling;
(iv) Use tarpaulins to cover the loose material (soil, sand, aggregate etc.,) when transported by trucks;
(v) Clean wheels and undercarriage of haul trucks prior to leaving construction site/quarry;
(vi) Control dust generation while unloading the loose material (particularly aggregate, soil) at the site by sprinkling water and unloading inside the barricaded area;
(vii) Stabilize surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition
(viii) Use tarpaulins to cover the loose material (soil, sand, aggregate etc.,) when transported by trucks;
(ix) Clean wheels and undercarriage of haul trucks prior to leaving construction site/quarry;
(x) Control dust generation while unloading the loose material (particularly aggregate, soil) at the site by sprinkling water and unloading inside the barricaded area
(xi) Stabilize surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition;
(xii) Apply water and maintain soils in a visible damp or crusted condition for temporary stabilization;
(xiii) Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process;
(xiv) Cover the soil stocked at the sites with tarpaulins;
(xv) Control access to work area, prevent unnecessary movement of vehicle, public trespassing into work areas; limiting soil disturbance will minimize dust generation
(xvi) Ensure that all the construction equipment and machineries are fitted with pollution control devises, which are operating correctly, and have a valid pollution under control (PUC) certificate.

104. **For pipeline works**

(i) Barricade the construction area using hard barricades (of 2 m height) on both sides;
(ii) Initiate site clearance and excavation work only after barricading of the site is done;
(iii) Confine all the material, excavated soil, debris, equipment, machinery (excavators, cranes etc.,), to the barricaded area;
(iv) Limit the stocking of excavated material at the site; remove the excess soil from the site immediately to the designated disposal area;
(v) Undertake the work section wise: 100 – 200 m section should be demarcated and barricaded;
(vi) Conduct work sequentially - excavation, pipe laying, backfilling; conduct pipe testing section-wise (for a minimum length as possible) so that backfilling, stabilization of soil can be done;
(vii) Remove the excavated soil of first section to the disposal site; as the work progresses, sequentially, by the time second section is excavated, the first section will be ready for back filling, use the freshly excavated soil for back filling, this will avoid stocking of material, and minimize the dust;
(viii) Backfilled trench at any completed section after removal of barricading will be the main source of dust pollution. The traffic, pedestrian movement and wind will generate dust from backfilled section. Road restoration shall be undertaken immediately.

105. **Surface Water Quality**. Run-off from stockpiled materials and chemicals from fuels and lubricants during construction works can contaminate downstream surface water quality of the streams. Project area receives considerable rainfall, although mostly confined during the monsoon months. There is a small water body within the GLSR site compound in Rajarhat; Haroa GLSR site is located just near the bank of River Bidyadhari and there are five raw water ponds in WTP compound. Kestopur Canal, which is mainly a wastewater channel, flows adjacent to Bhangar II GLSR site and Booster Pumping Station site in New Town Rajarhat. It is important that runoff from the construction areas, which may contain silt and chemical traces do not enter these water bodies. Impact will be temporary, and may not be significant, but needs to be mitigated. Construction contractor will be required to:

(i) All earthworks be conducted during the dry season to prevent the problem of soil run-off during monsoon season;
(ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
(iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, only designated disposal areas shall be used;
(iv) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
(v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
(vi) Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling
(vii) Dispose any wastes generated by construction activities in designated sites; and
(viii) Conduct surface quality inspection according to the environmental management plan (EMP).

106. **Surface and Groundwater Quality**. Another physical impact that is often associated with excavation is the effect on drainage and the local water table if groundwater and surface water collect in the voids. In the project area, groundwater depth is shallow, there are numerous water bodies and ponds, and it also receives high rainfall during the monsoon. Conducting excavation works during non-monsoon season will certainly help, but due to high water table, water may collect in pits as they are excavated. The water collected in excavated pits will contain silt and disposal of this in drainage channels lead to silting. To avoid this the contractor needs to be implement the following measures:

(i) Create a temporary drainage channel around the work area to arrest the entry of runoff from upper areas into the work area
(ii) Pump out the water collected in the pits / excavations to a temporary sedimentation pond; dispose of only clarified water into drainage channels/streams after sedimentation in the temporary ponds
(iii) Consider safety aspects related to pit collapse due to accumulation of water

107. **Generation of Construction Wastes.** Solid wastes generated from the construction activities are excess excavated earth (spoils), discarded construction materials, cement bags, wood, steel, oils, fuels and other similar items. Domestic solid wastes may also be generated from the workers' camp. Improper waste management could cause odor and vermin problems, pollution and flow obstruction of nearby watercourses and could negatively impact the landscape. The following mitigation measures to minimize impacts from waste generation shall be implemented by the contractor:

(i) Prepare and implement a Construction Waste Management Plan;
(ii) As far as possible utilize the debris and excess soil in construction purpose, for example for raising the ground level or construction of access roads etc.;
(iii) Avoid stockpiling any excess spoils at the site for long time. Excess excavated soils should be disposed of to approved designated areas immediately;
(iv) If disposal is required, the site shall be selected preferably from barren, infertile lands; site should be located away from residential areas, forests, water bodies and any other sensitive land uses;
(v) Domestic solid wastes should be properly segregated in biodegradable and non-biodegradable for collection and disposal to designated solid waste disposal site; create a compost pit at workers' camp sites for disposal of biodegradable waste; non-biodegradable / recyclable material shall be collected separately and sold in the local recycling material market;
(vi) Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed of in disposal sites approved by WBPCB;
(vii) Prohibit burning of construction and/or domestic waste;
(viii) Ensure that wastes are not haphazardly thrown in and around the project site, provide proper collection bins, and create awareness to use the dust bins;
(ix) Conduct site clearance and restoration to original condition after the completion of construction work; PIU to ensure that site is properly restored prior to issuing of construction completion certificate.

108. **Noise and Vibration Levels**. While all 3 GLSR sites (Rajarhat, Haroa and Bhangar II) are located in rural areas, rest of the components (WTP, clear water reservoir cum booster pumping station, and pumping main from WTP to clear water reservoir) are located predominantly in a rapidly developing urban area (New town area of Kolkata). All these sites are located close to habitation areas, where there are houses, schools and hospitals, religious places and businesses. The sensitive receptors are the general population in these areas. Increase in noise level may be caused by excavation, particularly breaking of cement concrete or bitumen roads for laying of pumping main, operation of construction equipment like concrete mixers, and the transportation of equipment, materials, and people. Vibration generated from construction activity, for instance from the use of pneumatic drills, will have impact on nearby buildings. This impact is negative but short-term, and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan activities in consultation with PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;
(ii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimise sound impact to surrounding sensitive receptor; and
(iii) Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s;
(iv) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
(v) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach; and
(vi) Consult local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.

109. **Accessibility**. Excavation along the roads for laying of transmission main pipeline, hauling of construction materials and operation of equipment on-site can cause traffic problems. Roads connecting GLSR sites are narrow and carry considerable local traffic, mainly comprise bicycles, 2 wheelers, Mini trucks, auto rickshaws, buses etc., Vegetable cultivation is predominant in Bhangar, Haroa, and large number of vehicles carrying vegetable produce to market can be seen in the area. New Town area comprises mostly of wide roads with earthen shoulder, with main roads carrying heavy traffic almost throughout the day. Pumping main pipeline work will be conducted along roads from WTP to booster pumping station in New Town, which has potential to create accessibility to issues to surrounding houses and business, and may also affect the traffic movement. Works related to all the remaining components will be confined to the selected sites, therefore there is no direct interference of these works with the traffic and accessibility. Hauling of construction material, equipment, construction waste, etc., to and from the work site may increase the road traffic on local roads, which are not in good condition. This will further inconvenience the local community and road users. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

110. **Hauling (material, waste/debris and equipment) activities**

(i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
(ii) Schedule transport and hauling activities during non-peak hours;
(iii) Locate entry and exit points in areas where there is low potential for traffic congestion;
(iv) Drive vehicles in a considerate manner; and
(v) Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

111. **Pipeline works**

(i) Confine work areas along the roads to the minimum possible extent; all the activities, including material and waste/surplus soil stocking should be confined to this area. Proper barricading should be provided; avoid material/surplus soil stocking in congested areas – immediately removed from site/ or brought to the as and when required
(ii) Leave spaces for access between mounds of soil to maintain access to the houses / properties
(iii) Provide pedestrian access in all the locations; provide wooden/metal planks over the open trenches at each house to maintain the access.
(iv) Inform the affected local population 1-week in advance about the work schedule
(v) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum.
(vi) Keep the site free from all unnecessary obstructions;
(vii) Coordinate with Traffic Police for temporary road diversions, where necessary, and for provision of traffic aids if transportation activities cannot be avoided during peak hours

112. **Socio-Economic – Income**. All the project components, except GLSR sites are Haroa and Bhangar II, will located in government lands and there is no requirement for land acquisition or any resettlement. Haroa and Bhanga II GLSR sites, which are under private ownership, have been purchased at market price with the willingness of the land owners to sell their properly for

the project. Resettlement and social issues are being studied in a parallel resettlement planning study of this subproject. Blocking of access to the business / livelihood activities, especially during pipeline laying along the roads, may impact the income of households. However, given the alignment of pipeline, trenchless technology for road crossing, and also the measures suggested for ensuring accessibility during pipeline works, no notable impact is envisaged.

113. **Socio-Economic – Employment**. Manpower will be required during the 24-months construction stage. This can result in generation of temporary employment and increase in local revenue. Thus, potential impact is positive and long-term. The construction contractor will be required to employ local labor force as far as possible.

114. **Occupational Health and Safety**. Workers need to be mindful of the occupational hazards which can arise from working in height and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures. The construction contractor will be required to:

(i) Comply with all national, state and local labour laws (see Appendix 7);
(ii) Develop and implement site-specific occupational health and safety (OHS) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use personal protective equipment; (c) OHS Training[2] for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;
(iii) Ensure that qualified first-aid is provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
(iv) Provide medical insurance coverage for workers;
(v) Secure all installations from unauthorized intrusion and accident risks;
(vi) Provide health and safety orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
(vii) 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;
(viii) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
(ix) Ensure moving equipment is outfitted with audible back-up alarms;
(x) 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; and

[2] Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

(xi) Disallow worker exposure to noise level greater than 85 dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.
(xii) Provide supplies of potable drinking water;
(xiii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances

115. **Asbestos Materials.** Existing water distribution network is mostly asbestos cement pipes, and because of the health risks these will be left in situ and replaced by new pipes. Plan pipeline alignments carefully to avoid any conflict or damage.

116. **Community Health and Safety**. Pipeline works along the road, and hauling of equipment and vehicles have potential to create safety risks to the community. Hazards posed to the public, specifically in high-pedestrian areas may include traffic accidents and vehicle collision with pedestrians. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Restrict construction vehicle movements to defined access roads and demarcated working areas (unless in the event of an emergency);
(ii) Enforce strict speed limit (20-30 kmph) for playing on unpaved roads, construction tracks;
(iii) Night-time driving will be by exception only, as approved by the PIU to minimise driving risk and disturbance to communities;
(iv) Adopt standard and safe practices for micro tunnelling;
(v) Temporary traffic control (e.g. flagmen) and signs will be provided where necessary to improve safety and provide directions;
(vi) All drivers will undergo safety and training;
(vii) Public access to all areas where construction works are on-going will be restricted through the use of barricading and security personnel;
(viii) Warning signs, blinkers will be attached to the barricading to caution the public about the hazards associated with the works, and presence of deep excavation;
(ix) The period of time when the pipeline trench is left open will be minimized through careful planning;
(x) Control dust pollution – implement dust control measures as suggested under air quality section;
(xi) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure;
(xii) Provide road signs and flag persons to warn of on-going trenching activities.

109. **Construction Camps.** Contractor may require to set up construction camps – for temporary storage of construction material (pipes, cement, steel, fixtures, fuel, lubricants etc.,), and stocking of surplus soil, and may also include separate living areas for migrant workers. The contractor will however be encouraged to engage local workers as much as possible. Operation of work camps can cause temporary air, noise and water pollution, and may become a source of conflicts, and unhealthy environment if not operated properly. Potential impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) As far as possible located the camp site within the work sites (at GLSR and WTP sites); if any camp to be established outside these, then select a camp site away from residential areas (at least 50 m buffer shall be maintained)

(ii) Avoid tree cutting for setting up camp facilities
(iii) Ensure that a proper compound wall is provided, and erect a wind/dust screen around
(iv) Camp site shall not be located near (100 m) water bodies, flood plains flood prone/low lying areas, or any ecologically, socially, archeologically sensitive areas
(v) Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit
(vi) Provide proper temporary accommodation with proper materials, adequate lighting and ventilation, appropriate facilities for winters and summers; ensure conditions of liveability at work camps are maintained at the highest standards possible at all times;
(vii) Consult PIU before locating project offices, sheds, and construction plants;
(viii) Minimize removal of vegetation and disallow cutting of trees
(ix) Ensure conditions of liveability at work camps are maintained at the highest standards possible at all times; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GI sheets, tarpaulins, etc., shall not be allowed as accommodation for workers
(x) Camp shall be provided with proper drainage, there shall not be any water accumulation
(xi) Provide drinking water, water for other uses, and sanitation facilities for employees
(xii) Prohibit employees from cutting of trees for firewood; contractor should be provided proper facilities including cooking fuel (oil or gas; fire wood not allowed)
(xiii) Train employees in the storage and handling of materials which can potentially cause soil contamination
(xiv) Recover used oil and lubricants and reuse or remove from the site
(xv) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; provide a compost pit for biodegradable waste, and non-biodegradable / recyclable waste shall be collected and sold in local market
(xvi) Remove all wreckage, rubbish, or temporary structures which are no longer required
(xvii) At the completion of work, camp area shall be cleaned and restored to pre-project conditions, and submit report to PIU; PIU to review and approve camp clearance and closure of work site

C. Operation and Maintenance Impacts

117. Operation and Maintenance of the water supply system will be carried out by Public Health Engineering Department directly or through an external operator. Operation will involve treatment of water in the WTP, disinfection with chlorine, conveying clear water by pumping to clear water storage reservoir at the booster pumping station, and then further transmit water by pumping from booster pumping station to 3 GLSRs in 3 zones of Rajarhat, Haroa and Bhangar II, for distribution in their respective zones via distribution system (comprising of overhead reservoirs and distribution pipes) that will be developed through another subproject under the WBDWSIP.

118. During its operation phase, WTP will treat 50 million gallons (224 million liters) of water every day. The main impact of WTP operation is from (i) generation of wastewater and sludge, (ii) noise from operation of pumps and motors, (iii) chlorine gas leakage risk, and (iv) consumption

of electricity. All of these are duly considered in the design of WTP, and various measures such as the following are already incorporated into the project design:

(i) Recirculation and recovery of wastewater including backwash water generated from treatment process- backwash water from filter beds will be sent to a sump, and after allowing adequate time for settlement of solids, clarified water will be pumped back to WTP inlet. This arrangement will avoid pollution and also minimize wastage of water;
(ii) Collection of accumulated sludge, thickening, drying and reuse;
(iii) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage;
(iv) Using low-noise and energy efficient pumping systems;
(v) Installing the noise-producing pumps and motors etc., in enclosed buildings with noise reducing walls, and also maintaining adequate buffer to the nearby inhabited areas;
(vi) Provision of appropriate personal protection equipment to the workers and staff
(vii) Developing chlorine facility with all necessary safety measures.

119. Since backwash water is recovered and recirculated in the WTP, no wastewater will be generated from water treatment process. Water treatment process will generate sludge from sedimentation of particulate matter in raw water, flocculated and precipitated material resulting from chemical coagulation, residuals of excess chemical dosage, plankton etc.; and waste from rinsing and back washing of filter media containing debris, chemical precipitates, straining of organic debris and plankton. In the WTP sludge will collected, thickened and disposed of or reused as soil conditioner. Sludge will be tested periodically for heavy metal concentration.

120. Water supply system will be operated using the standard operating procedures following an operating manual, which will be prepared by the DBO contractor. This will cover all necessary items such as preventive maintenance, periodic maintenance and emergency maintenance, replacement of pumps, motors, and other electro-mechanical parts as per the design life to optimize energy use and system efficiency etc., Adequate resources – technical and financial, has been taken into consideration in the project design. Manual will also include safety awareness and mock drills for chlorine safety. Thus, considering the design and proposed operational procedures, it is unlikely that there will be any significant negative impacts due to WTP operation.

121. During the system design life (15/30 years for mechanical/civil components) it shall not require major repairs or refurbishments and should operate with little maintenance beyond routine actions required to keep the equipment in working order. The stability and integrity of the system will be monitored periodically to detect any problems and allow remedial action if required. Any 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.

122. The project is designed to deliver potable water in sufficient quantities to the consumers in their homes with proper terminal pressure. Source water quality data shows that Hooghly water is suitable for drinking after conventional treatment and disinfection, and WTP has been designed treat the source water to meet the drinking water standards. The quality of water supplied will be affected by the raw water quality and as well as treatment efficiency at the WTP. To ensure that water delivered to consumers at all times meets the drinking water standards, the following measures are suggested:

(i) Preparation and implementation of a water quality surveillance program including development of a laboratory as part of the project by DBO contractor to ensure that supplied water meets the drinking water standards;
(ii) Water quality surveillance program to cover source, WTP and consumer end water quality;
(iii) Development of laboratory with all necessary environment, health and safety measures and adopting international standard procedures for water quality testing.

123. Recurrence of pipe bursting and leakage problems can be managed by the leak detection and water auditing surveys. PHED will be required to ensure that the leak detection and rectification time is minimized.

124. The citizens of the Rajarhat, Haroa and Bhangar II will be the major beneficiaries of the improved water supply system, as they will be provided with a constant supply of better quality water, piped into their homes at an appropriate pressure. The project will improve the over-all health condition of the project area as diseases due to arsenic in groundwater, and other water borne diseases will be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health. This should also improve the environment of these areas, should deliver major improvements in individual and community health and well-being.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

125. The active participation of stakeholders including local community, NGOs/CBOs, etc., in all stages of project preparation and implementation is essential for successful implementation of the project. It will ensure that the subprojects are designed, constructed, and operated with utmost consideration to local needs, ensures community acceptance, and will bring maximum benefits to the people. Public consultation and information disclosure is a must as per the ADB policy.

126. Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others that are identified during project implementation will be brought into the process in the future. Primary stakeholders of the subproject are: residents, shopkeepers and businesspeople who live and work near sites where facilities will be built (WTP, water reservoirs and pumping main pipeline), PHED, government and utility agencies responsible for provision of various services in project area, and West Bengal Pollution Control Board (WBPCB). Secondary stakeholder are: NGOs and CBOs working in the area, community representatives, beneficiary community in general, government agencies, Government of India and the ADB.

B. Public Consultation

127. The public consultation and disclosure program is a continuous process throughout the project implementation, including project planning, design and construction.

1. Consultation during Project Preparation

128. Institutional consultations were conducted with the project agencies, and Government Departments such as PHED, Pollution Control Board, Kolkata Port Trust etc. The subproject

proposal is formulated in consultation with the local bodies in the project area to suit their requirements.

129. Focus-group discussions with affected persons and other stakeholders were conducted to learn their views and concerns. A socio-economic household survey has been conducted in the project area, covering sample households, to understand the household characteristics, health status, and the infrastructure service levels, and also the demand for infrastructure services. General public and the people residing along the project activity areas were also consulted during visits to the project sites. Important issues or concerns that were raised by the stakeholders during consultations along with photographs and attendance sheets are provided in Appendix 9. Further a project-level consultation workshop will also be conducted in the project area.

130. It has been observed that people are very happy about the project as the project area currently faces severe water problem due to lack of any potable water supply system as the groundwater in the area is arsenic contaminated. People are very much willing to extend their cooperation as the project will be provide much needed potable water and enhance living standard of the public. There are no negative impacts perceived by the community, however, project team explained the likely issues during construction and proposed EMP to manage the negative impacts. Increasing traffic and disturbance to agricultural vehicle movement (vegetable transport from fields to market) during the work is raised during the meeting, and it was informed that proper care will be taken for movement of construction vehicles including traffic management plan, prior information to people etc., It was also informed no road closures anticipated due to this work, and if needed during the construction phase, alternative access will be provided. These measures are included in the EMP.

2. Consultation during Construction

131. Prior to start of construction, PIU in coordination with the local bodies will conduct information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work. Focus group meetings will be conducted to discuss and plan construction work (mainly pipeline work) with local communities to reduce disturbance and other impacts and also regarding the project grievance redress mechanism. A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction phase.

C. Information Disclosure

132. Executive summary of the IEE will be translated in Bengali and made available at the offices of PMU, PIU, Block offices, and also displayed on their notice boards. Hard copies 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 in English and Executive Summary in Hindi will be placed in the official website of the PHED, PMU after approval of the IEE by Government and ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

133. Public information campaigns to explain the project details to a wider population will be conducted. Public disclosure meetings will be conducted at key project stages to inform the public of progress and future plans. Prior to start of construction, the PMU/PIU will issue Notification on the start date of implementation in local newspapers A board showing the details of the project will be displayed at the construction site for the information of general public.

134. Local communities 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 signage, etc.

VII. GRIEVANCE REDRESS MECHANISM

135. A common Grievance Redress Mechanism (GRM) will be in place to redress social, environmental or any other project and/or subproject related grievances. The GRM described below has been developed in consultation with stakeholders. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per project entitlement matrix, and PMU and concerned PIUs will ensure that their grievances are addressed.

136. Affected persons will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaints/suggestion boxes or through telephone hotlines at accessible locations, by e-mail, by post, or by writing in complaints register in GP office or PMU or PIU office. Careful documentation of the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area, and how the problem was resolved will be undertaken. PMU HSGO together with PIU Safeguard Officers will have the joint responsibility for timely grievance redressal on safeguards and gender issues and for registration of grievances, related disclosure, and communication with the aggrieved party. The affected persons will also be encouraged to seek a complaint registration number through the PIU.

137. The grievance redress mechanism provides an accessible, inclusive, gender-sensitive and culturally appropriate platform for receiving and facilitating resolution of affected persons' grievances related to the project. A two-tier grievance redress mechanism is conceived, one, at project level and another, beyond project level. For the project level GRM, a Grievance Redress Cell will be established at PIU; the safeguards officers of the ESSU PIU, supported by the social safeguards specialist of DSICS will be responsible for conducting periodic community meetings with affected communities to understand their concerns and help them through the process of grievance redressal including translating the complaints into Bengali or English, recording and registering grievances of non-literate affected persons and explaining the process of grievance redress mechanism. All expedient and minor grievances will be resolved at field level; should the PIU fail to resolve any grievance within the stipulated time period, the PMU will be consulted and suggested actions by PMU taken by PIU with SPISC support, within specified time. PIU will also be responsible for follow-through for each grievance, periodic information dissemination to complainants on the status of their grievance and recording their feedback (satisfaction/dissatisfaction and suggestions). In the event that certain grievances cannot be resolved at project level, they will be referred to the District Steering Committee (DSC), which will also act as grievance redress committee (GRC), particularly in matters related to land purchase/acquisition, payment of compensation, environmental pollution etc. Any higher than district level inter-departmental coordination or grievance redress required will be referred to the state level Steering Committee.

138. The GRM aims to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. All grievances – major or minor, will be registered. In case of grievances that are immediate and urgent in the perception of the

complainant, the contractor, and supervision personnel from the PIU supported by design, supervision and institutional support consultant (DSISC) will try to successfully resolve them in consultation with the Member, Panchayat and the GP Pradhan. In case of larger issues, they will seek the advice and assistance of the SE PIU. Grievances not redressed through this process within/at the project level within stipulated time period will be referred to the DSC/GRC.

139. The DSC will be set up to monitor project implementation in each district. In its role as a GRC, the DSC will meet every month (if there are pending, registered grievances), determine the merit of each grievance, and resolve grievances within specified time upon receiving the complaint-failing which the grievance will be addressed by the state-level Steering Committee. The Steering Committee will resolve escalated/unresolved grievances received. Grievances remaining unresolved by Steering Committee may be referred by affected persons to appropriate courts of law. The multi-tier GRM for the project is outlined below (Figure 12), each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required. The GRC will continue to function throughout the project duration. The PMU shall issue notifications to concerned PHE Divisions to establish the respective PIU (and field) level GRCs, with details of composition, process of grievance redress to be followed, and time limit for grievance redress at each level.

140. An aggrieved person shall have access to the country's legal system at any stage, and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

141. **Composition of Grievance Redress Committee and District Steering Committee**. The DSC, acting as GRC will have District Magistrate (Chairperson), Superintending Engineer, PIU as Member Secretary, Additional Executive Officer, Zilla Parishad, Assistant (Social and Environmental) Safeguard Officers of the Environment and Social Safeguard Units (ESSU) of the PIU, Institutional Support and Capacity Building Officer, PIU, Block Development Officers from respective blocks, and representatives from the affected village panchayat and / or community, if any, eminent citizens, CBOs and NGOs. The DSC/GRC must have a minimum of two women members. In case of any indigenous people impacts in future subprojects, the DSC/GRC must have representation of the affected indigenous people community, including at least one female indigenous person, the chief of the tribe or a member of the tribal council as traditional arbitrator (to ensure that traditional grievance redress systems are integrated) and an NGO working with indigenous people groups.

142. The Steering Committee will include Chief Secretary, as chair, Principal Secretary/Additional Chief Secretary, PHED, Principal Secretary, Panchayat and Rural Development, Principal Secretary, Finance, Principal Secretary, Irrigation and Waterways Development Department, Principal Secretary, Public Works Department, Engineering in Chief, PHED, Member Secretary, and Others as invitees.

143. **Areas of Jurisdiction.** The areas of jurisdiction of the GRC, headed by the District Magistrate will be (i) all locations or sites within the district where subproject facilities are proposed, or (ii) their areas of influence within the District. The Steering Committee will have jurisdictional authority across the state (i.e., areas of influence of subproject facilities beyond district boundaries, if any).

144. **Recordkeeping**. Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and

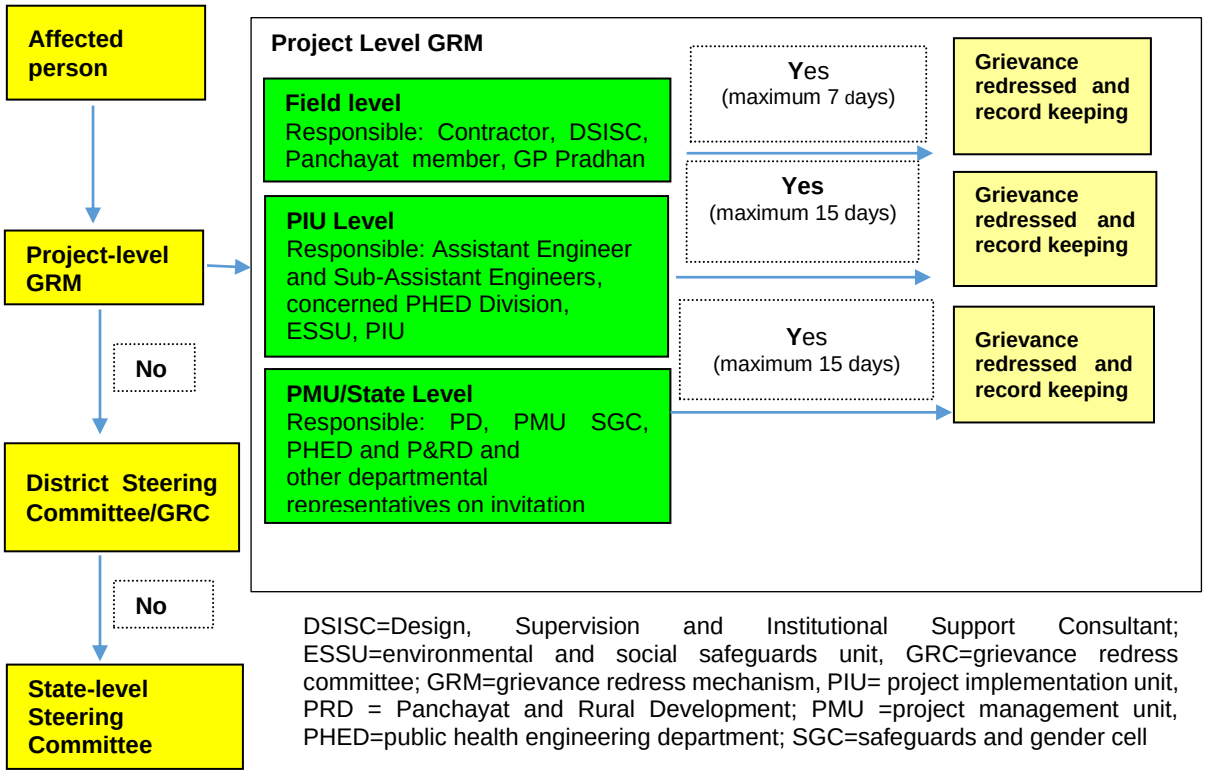
the date these were effected and final outcome will be kept by PIU (with the support of DSISC) and submitted to PMU.

145. **Information dissemination methods of the GRM**. The PIU, assisted by SPISC will be responsible for information dissemination to affected persons on grievance redressal procedure. GP/coverage area/affected area-wide public awareness campaigns will ensure that awareness on grievance redress procedures is generated through the consultation and participation plan. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The PIU assistant safeguard officers (environment and social) will be assisted by DSISC safeguards specialists with information/collateral/ awareness material, etc. and in conducting project awareness campaigns. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per agreed entitlement matrix including. who to contact and when, where/ how to register grievance, various stages of grievance redress process, time likely to be taken for redressal of minor and major grievances, etc. Grievances received and responses provided will be documented and reported back to the affected persons. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the PMU and PIU offices, GP/concerned local panchayat notice boards and on the web, as well as reported in the semi-annual environmental and social monitoring reports to be submitted to ADB. A Sample Grievance Registration Form has been attached in Appendix10.

146. **Periodic Review and Documentation of Lessons Learned.** The PMU ESC will periodically review the functioning of the GRM and record information on the effectiveness of the mechanism, especially on the PIU's ability to prevent and address grievances.

147. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by the PMU. Cost estimates for grievance redress are included in resettlement cost estimates. The grievance redress process is shown in Figure 12.

Figure 12: Grievance Redress Mechanism



DSISC=Design, Supervision and Institutional Support Consultant; ESSU=environmental and social safeguards unit, GRC=grievance redress committee; GRM=grievance redress mechanism, PIU= project implementation unit, PRD = Panchayat and Rural Development; PMU =project management unit, PHED=public health engineering department; SGC=safeguards and gender cell

148. **ADB's Accountability Mechanism.** In the event that the established GRM is not in a position to resolve the issue, the affected person also can use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters or the ADB India Resident Mission. The complaint can be submitted in any of the official languages of ADB's developing member countries. Before submitting a complaint to the Accountability Mechanism, it is recommended that affected people make a good faith effort to resolve their problems by working with the concerned ADB operations department (in this case, the resident mission). Only after doing that, and if they are still dissatisfied, they could approach the Accountability Mechanism. The ADB Accountability Mechanism information will be included in the project-relevant information to be distributed to the affected communities, as part of the project GRM.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

149. An environmental management plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels.

150. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between PHED, project management unit (PMU), project implementing unit (PIU), consultants and 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. The EMP includes a monitoring program to measure the environmental condition and effectiveness of implementation of the mitigation measures. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

151. The contractor will be required to submit to PIU, for review and approval, a 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 the approved EMP; (iii) monitoring program as per SEP; and (iv) budget for SEP implementation. No works are allowed to commence prior to approval of SEP.

152. A copy of the EMP/approved SEP will be kept on site during the construction period at all times. The EMP 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.

153. For civil works, the contractor will be required to (i) carry out all of the mitigation and monitoring measures set forth in the approved SEP; and (ii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and SEP. The contractor shall allocate budget for compliance with these SEP measures, requirements and actions.

154. The following tables show the potential environmental impacts, proposed mitigation measures and responsible agencies for implementation and monitoring.

Table 13: Design Stage Environmental Impacts and Mitigation Measures

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
Design of water supply system	Source sustainability and efficiency	(i) Discontinuation of current unsafe and unsustainable groundwater sources and creating a new comprehensive surface water (river) based water supply system (ii) Recovering wash water from treatment process to optimize the water use (iii) Treatment and reuse of sludge from treatment process (iv) Designing the entire system to maintain optimal flow and terminal pressure, and optimizing the overall energy usage (v) Reducing the incidence of water borne diseases by providing 100% population including urban poor with potable water supplies (vi) Preparation and implementation of a water quality surveillance program including development of a laboratory as part of the project by DBO contractor to ensure that supplied water meets the drinking water standards (vii) Development of laboratory with all necessary environment, health and safety measures and adopting international standard procedures for water quality testing (viii) Using low-noise and energy efficient pumping systems (ix) Installing the noise-producing pumps and motors etc., in enclosed buildings with noise reducing walls, and also maintaining adequate buffer to the nearby inhabited areas (x) Provision of appropriate personal protection equipment to the workers and staff	DBO Contractor / PIU	Project Costs
Chlorine usage as disinfectant at WTP	Chlorine handling and application risk – health and safety risk to workers and general public	Provide the following measure at the chlorine application unit: (i) Chlorine neutralization pit with a lime slurry feeder (ii) Chlorine absorption and neutralization facility (iii) Proper ventilation, lighting, entry and exit facilities (iv) Visible and audible alarm facilities to alert chlorine gas leak (v) Facility for isolation in the event of major chlorine leakage (vi) Eye wash and shower facility (vii) Personal protection and safety equipment for the operators in the chlorine plant (masks, oxygen cylinders, gloves, etc.,) (viii) Provide training to the staff in safe handling and application of chlorine; this shall be included in the contract of Chlorinator supplier (ix) Supplier of Chlorinator equipment shall provide standard operating manual for safe operation and as well as maintenance and repairs; preferably these shall be provided both in English and Bengali Languages	DBO Contractor / PIU	Project Costs
Layout plan of GLSR at Rajarhat and Bhangar II	Tree cutting	(i) Minimize removal of trees by adopting to site condition and with appropriate layout design of GLSRs (ii) Obtain prior permission for tree cutting (iii) Plant and maintain 5 trees for each tree that is removed	DBO Contractor / PIU	Project Costs

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
	Disturbance to natural drainage	(i) Existing pond at Rajarhat GLSR site shall not be disturbed; GLSR should be constructed without disturbing the pond area, its bunds, inlet and outflow drainage channels (ii) Construction GLSR at Haroa away from the flood plain of Bidhyadhari river (iii) Integrate measures into GSLR design to avoid risk of flooding.	DBO Contractor / PIU	Project Costs

Table 14: Pre-Construction Stage Environmental Impacts and Mitigation Measures

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
Utilities	Telephone lines, electric poles and wires, water lines within proposed project area	(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 (ii) Require construction contractors to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services. (iii) Require contractors to prepare spoils (waste)management plan (Appendix 11) and traffic management plan (Appendix 12)	DBO Contractor in collaboration with PIU and with approval of PMU	(i) List of affected utilities and operators; (ii) Bid document to include requirement for a contingency plan for service interruptions (example provision of water if disruption is more than 24 hours), waste management plan and traffic management plan	Project cost-
Construction work camps, stockpile areas, storage areas, and disposal areas.	Conflicts with local community; disruption to traffic flow and sensitive receptors	(i) Prioritize areas within or nearest possible vacant space in the project location;	DBO Contractor to finalize locations in consultation and approval of PIU	(i) List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	Project cost-

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		(ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems; (iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community. (v) For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, written consent from landowners (not lessees) will be obtained; (b) debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located within 50 m downwind side of the site; and (d) site is minimum 250 m away from sensitive		(ii) Written consent of landowner/s (not lessee/s)	

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		locations like settlements, ponds/lakes or other water bodies.			
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	(i) Obtain construction materials only from government approved quarries with prior approval of PIU; (ii) PIU to review, and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval (iii) Contractor to submit to PIU on a monthly basis documentation on material obtained from each source (quarry/ borrow pit) (iv) Avoid creation of new borrow areas, quarries etc., for the project; if unavoidable, contractor to obtain all clearances and permissions as required under law, including Environmental Clearance prior to approval by PIU	DBO Contractor to prepare list of approved quarry sites and sources of materials with the approval of PIU	(i) List of approved quarry sites and sources of materials;	Project cost-
Consents, permits, clearances, NOCs, etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions	(i) Obtain all necessary consents, permits, clearance, NOCs, etc. prior to award of civil works.	PIU and PMC	Incorporated in final design and communicated to contractors.	Cost of obtaining all consents, permits, clearance, NOCs, etc. prior

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
	and/or stoppage of works	(ii) Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (iii) Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc. (iv) Include in detailed design drawings and documents all conditions and provisions if necessary			to start of civil works responsibility of PIU.
Asbestos Cement Pipes	Health risk due to exposure to asbestos materials	(i) Obtain details on location of underground asbestos cement pipes (ii) Locate the new piper carefully to avoid encountering asbestos cement pipes (ii) Leave the asbestos cement pipes undisturbed in the ground.	DBO Contractor in coordination with PIU and PMC	(i) Detailed construction drawings showing alignment of asbestos cement pipes	No cost required. Mitigation measures are part of terms of reference of PIU and DSISC

Table 15: Construction Stage Environmental Impacts and Mitigation Measures

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
Environmental Management Plan (EMP) Implementation Training	Irreversible impact to the environment, workers, and community	(i) Project manager and all key workers will be required to undergo training on EMP implementation including spoils/waste management, Standard operating procedures (SOP) for construction works; occupational health and safety (OHS), core labor laws, applicable environmental laws, etc.	DBO Contractor	Project cost / PMU cost
Air Quality	Emissions from construction vehicles, equipment, and machinery used for installation of pipelines resulting to dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons.	**For all construction works** (i) Comply with the Direction of West Bengal Department of Environment under the Air Act, 1981 in controlling air pollution from construction activities (ii) Comply with the air pollution / dust control measures for construction activities stipulated by the "Direction of West Bengal Department of Environment under the Air Act, 1981 Direction No. EN/3170/T-IV-7 /001/2009 dated: 10 December 2009" (iii) Damp down the soil and any stockpiled material on site by water sprinkling; (iv) Use tarpaulins to cover the loose material (soil, sand, aggregate etc.,) when transported by trucks; (i) Provide a dust screen around the construction sites at GLSR and WTP work sites (iv) Clean wheels and undercarriage of haul trucks prior to leaving construction site/quarry (v) Control dust generation while unloading the loose material (particularly aggregate, soil) at the site by sprinkling water and unloading inside the barricaded area (vi) Stabilize surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition (vii) Use tarpaulins to cover the loose material (soil, sand, aggregate etc.,) when transported by trucks; (xi) Apply water and maintain soils in a visible damp or crusted condition for temporary stabilization (xii) Apply water prior to leveling or any other earth moving activity to keep the soil moist throughout the process (xiii) Cover the soil stocked at the sites with tarpaulins (xiv) Control access to work area, prevent unnecessary movement of vehicle, public trespassing into work areas; limiting soil disturbance will minimize dust generation	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		(xv) Ensure that all the construction equipment, machinery is fitted with pollution control devises, which are operating correctly, and have a valid pollution under control (PUC) certificate **<u>Pipeline works</u>** (i) Barricade the construction area using hard barricades (of 2 m height) on both sides and provide dust/wind screen (such geo textile fabric) up to 3 m height (1m above the hard barricading) (ii) Initiate site clearance and excavation work only after barricading of the site is done (iii)Confine all the material, excavated soil, debris, equipment, machinery (excavators, cranes etc.,), to the barricaded area (iv) Limit the stocking of excavated material at the site; remove the excess soil from the site immediately to the designated disposal area (v) Undertake the work section wise: 100 – 200 m section should be demarcated and barricaded (vi) Conduct work sequentially - excavation, pipe laying, backfilling; conduct pipe testing section-wise (for a minimum length as possible) so that backfilling, stabilization of soil can be done. (vii) Remove the excavated soil of first section to the disposal site; as the work progresses, sequentially, by the time second section is excavated, the first section will be ready for back filling, use the freshly excavated soil for back filling, this will avoid stocking of material, and minimize the dust. (viii) Backfilled trench at any completed section after removal of barricading will be the main source of dust pollution. The traffic, pedestrian movement and wind will generate dust from backfilled section. Road restoration shall be undertaken immediately.		
Surface water quality	Mobilization of settled silt materials, and chemical contamination from fuels and lubricants during construction can contaminate nearby surface water quality. Ponding of water in the pits/foundation excavations	(i) All earthworks be conducted during the dry season to prevent the problem of soil run-off during monsoon season; (ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; (iii)Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, only designated disposal areas shall be used; (iv) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies; (v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies; (v) Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling (vi)Dispose any wastes generated by construction activities in designated sites; and	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		(viii) Conduct surface quality inspection according to the Environmental Management Plan (EMP). (ix) Create a temporary drainage channel around the work area to arrest the entry of runoff from upper areas into the work area (x) Pump out the water collected in the pits / excavations to a temporary sedimentation pond; dispose of only clarified water into drainage channels/streams after sedimentation in the temporary ponds (xi) Consider safety aspects related to pit collapse due to accumulation of water		
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	(i) Plan activities in consultation with PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; (ii) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach; (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimize sound impact to surrounding sensitive receptor; and (iv) Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s. Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach; Consult local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.
Landscape and aesthetics – waste generation	Impacts due to excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers, spoils, oils, lubricants, and other similar items.	(i) Prepare and implement a Construction Waste Management Plan (ii) As far as possible utilize the debris and excess soil in construction purpose, for example for raising the ground level or construction of access roads etc., (ii) Stockpiles, lubricants, fuels, and other materials should be located away from steep slopes and water bodies; (iii)Avoid stockpiling any excess spoils at the site for long time. Excess excavated soils should be disposed of to approved designated areas immediately; (iv) If disposal is required, the site shall be selected preferably from barren, infertile lands; site should be located away from residential areas, forests, water bodies and any other sensitive land uses (iv) Domestic solid wastes should be properly segregated in biodegradable and non-biodegradable for collection and disposal to designated solid waste disposal site; create a compost pit at workers' camp sites for disposal of biodegradable waste; non-biodegradable / recyclable	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		material shall be collected separately and sold in the local recycling material market (v) Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed of in disposal sites approved by local authorities/WBPCB; (vi) Prohibit burning of construction and/or domestic waste; (vii) Ensure that wastes are not haphazardly dumped thrown within and around the project site and adjacent areas; provide proper collection bins, and create awareness to use the dust bins. (ix) Conduct site clearance and restoration to original condition after the completion of construction work; PIU to ensure that site is properly restored prior to issuing of construction completion certificate		
Existing Infrastructure and Facilities	Disruption of service and damage to existing infrastructure at specified project location	(i) Prepare a list of affected utilities and operators if any; (ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of service	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.
Ecological Resources – Terrestrial	Loss of vegetation and tree cover	(i) Minimize removal of vegetation and disallow cutting of trees; (ii) If tree-removal will be required, obtain tree-cutting permit and (iii) Plant 5 native trees for every one that is removed.	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.
Accessibility	Traffic problems and conflicts near project locations and haul road	**Hauling (material, waste/debris and equipment) activities** (i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites (ii) Schedule transport and hauling activities during non-peak hours; (iii) Locate entry and exit points in areas where there is low potential for traffic congestion; (iv) Drive vehicles in a considerate manner (v) Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints. **Pipeline works** (i) Confine work areas along the roads to the minimum possible extent; all the activities, including material and waste/surplus soil stocking should be confined to this area. Proper barricading should be provided; avoid material/surplus soil stocking in congested areas – immediately removed from site/ or brought to the as and when required	Construction Contractor	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		(ii) Leave spaces for access between mounds of soil to maintain access to the houses / properties (iii)Provide pedestrian access in all the locations; provide wooden/metal planks over the open trenches at each house to maintain the access. (iv) Inform the affected local population 1-week in advance about the work schedule (v) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum. (vi) Keep the site free from all unnecessary obstructions; (vii) Coordinate with Traffic Police for temporary road diversions, where necessary, and for provision of traffic aids if transportation activities cannot be avoided during peak hours		
Socio-Economic - Employment	Generation of temporary employment and increase in local revenue	(i) Employ local labor force as far as possible (iii) Comply with labor laws	DBO Contractor	Contractor costs
Occupational Health and Safety	Occupational hazards which can arise during work	(i) Comply with all national, state and local core labor laws (see Appendix 7of this IEE) (ii) Develop and implement site-specific occupational health and safety (OHS) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use personal protective equipment like helmet, gumboot, safety belt, gloves, nose musk and ear plugs; (c) OHS Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; (ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; (iii) Provide medical insurance coverage for workers; (iv) Secure all installations from unauthorized intrusion and accident risks; (v) Provide supplies of potable drinking water; (vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) Provide health and safety orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; (viii) 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; (ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; (x) Ensure moving equipment is outfitted with audible back-up alarms;	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		(xi) 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; and (xii) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.		
Asbestos Cement Materials	Health risks associated with asbestos cement pipes	(i) leave asbestos cement pipes in-situ untouched	DBO Contractor	Contractor costs
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste transportation	(i) Restrict construction vehicle movements to defined access roads and demarcated working areas (unless in the event of an emergency) (ii) Enforce strict speed limit (20-30 kmph) for playing on unpaved roads, construction tracks (iii) Night-time haulage will be by exception only, as approved by the PIU to minimize driving risk and disturbance to communities (iv) Adopt standard and safe practices for micro tunneling (vi) Temporary traffic control (e.g. flagmen) and signs will be provided where necessary to improve safety and provide directions (vii) All drivers will undergo safety and training (viii) Public access to all areas where construction works are on-going will be restricted through the use of barricading and security personnel (ix) Warning signs, blinkers will be attached to the barricading to caution the public about the hazards associated with the works, and presence of deep excavation (x) The period of time when the pipeline trench are left open will be minimized through careful planning (xi) Control dust pollution – implement dust control measures as suggested under air quality section (xii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. Provide road signs and flag persons to warn of on-going trenching activities.	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.
Work Camps and worksites	Temporary air and noise pollution from machine operation, water pollution from storage and use of	(i) As far as possible located the camp site within the work sites (at GLSR and WTP sites); if any camp to be established outside these, then select a camp site away from residential areas (at least 50 m buffer shall be maintained) (ii) Avoid tree cutting for setting up camp facilities	DBO Contractor	Cost for implementation of mitigation measures

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
	fuels, oils, solvents, and lubricants Unsanitary and poor living conditions for workers	(iii) Ensure that a proper compound wall is provided, and erect a wind/dust screen around (iv) Camp site shall not be located near (100 m) water bodies, flood plains flood prone/low lying areas, or any ecologically, socially, archeologically sensitive areas (v) Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit (vi) Provide proper temporary accommodation with proper materials, adequate lighting and ventilation, appropriate facilities for winters and summers; ensure conditions of livability at work camps are maintained at the highest standards possible at all times; (vii) Consult PIU before locating project offices, sheds, and construction plants; (viii)Minimize removal of vegetation and disallow cutting of trees (ix) Ensure conditions of livability at work camps are maintained at the highest standards possible at all times; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GI sheets, tarpaulins, etc., shall not be allowed as accommodation for workers (x) Camp shall be provided with proper drainage, there shall not be any water accumulation (xi) Provide drinking water, water for other uses, and sanitation facilities for employees (xii) Prohibit employees from cutting of trees for firewood; contractor should be provided proper facilities including cooking fuel (oil or gas; fire wood not allowed) (xiii)Train employees in the storage and handling of materials which can potentially cause soil contamination (xiv) Recover used oil and lubricants and reuse or remove from the site (xv) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; provide a compost pit for biodegradable waste, and non-biodegradable / recyclable waste shall be collected and sold in local market (xvi) Remove all wreckage, rubbish, or temporary structures which are no longer required (xvii) At the completion of work, camp area shall be cleaned and restored to pre-project conditions, and submit report to PIU; PIU to review and approve camp clearance and closure of work site		responsibility of contractor.
Chance Finds	There are no protected properties in the subproject sites.	(i) Consult Archaeological Survey of India (ASI) or West Bengal State Archaeology Department to obtain an expert assessment of the archaeological potential of the site		

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
	However, in case of chance finds, contractors will be required to follow a protocol as defined in the mitigation measures.	(ii) Include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available. (iii) In case of chance finds, works must be stopped immediately until such time chance finds are cleared by experts		
Submission of EMP implementation report	Unsatisfactory compliance to EMP	(i) Appointment of (I) Environment, Health and Safety (EHS) Supervisor to ensure EMP implementation (ii) Timely submission of monitoring reports including pictures	DBO contractor	Contractor cost
Post-construction clean-up	Damage due to debris, spoils, excess construction materials	(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ii) All excavated roads shall be reinstated to original condition. (iii) All disrupted utilities restored (iv) All affected structures rehabilitated/compensated (v) 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. (vi) All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be top soiled and regrassed using the guidelines set out in the revegetation specification that forms part of this document. (vii) The contractor must arrange the cancellation of all temporary services. (viii) Request PIU to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work.	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.

Table 16: Operation Stage Environmental Impacts and Mitigation Measures

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
WTP operation – malfunction and effect on efficiency	Public health, safety and environmental impacts	(i) Operate as per the Operational Manual following Standard Operating Procedures as per the WTP design (ii) Undertake preventive and periodic maintenance activities as required (iii) Ensure periodic training to staff in WTP operation, especially in chemical handling and dosing, filter backwash, etc., (iv) replace pumps, motors and other parts as per the operating life prescribed by manufacturer (v) Maintain the mechanical parts as per the maintenance plan to avoid any hazards (vi) Ensure that all safety apparatus at WTP including personal protection	DBO Contractor	Operating costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		equipment are in good condition all times; and are at easily accessible and easily identifiable place; periodically check the equipment, and conduct mock drills to deal with emergency situations (vii) Ensure that backwash recirculation system and sludge management system are operated as per the manual		
Check for blockage and leakage problems reducing the water losses	Loss of water, increased demand and inconvenience to consumers and general public	Effectiveness of leak detection and water auditing to reduce the water losses	DBO Contractor	Operating costs
Occupational health and safety	Health, social and economic impacts on the workers	(i) Provide appropriate PPE and training on its proper use and maintenance. (ii) Use fall protection equipment when working at heights. (iii) Maintain work areas to minimize slipping and tripping hazards. (iv) Implement a training program for operators who work with chlorine regarding safe handling practices and emergency response procedures. Prepare escape plans from areas where there might be a chlorine emission. (v) Install safety showers and eye wash stations near the chlorine equipment and other areas where hazardous chemicals are stored or used. (vi) Prohibit eating, smoking, and drinking except in designated areas.	DBO Contractor	Operating costs
Increased in sewage generation	Water pollution, and impacts on public health and environment	(i) Sanitation and sewerage/septage facilities needs to be improved/provided in the project area to suit the increased sewage generation	PHED and respective local bodies	To be identified

Table 17: Construction Stage Environmental Monitoring Plan

Monitoring field	Monitoring Location	Monitoring Parameters	Frequency	Responsibility	Cost and Source of Funds
Construction disturbances, nuisances, public and worker safety,	All work sites	Implementation of dust control, noise control, traffic management, and safety measures. Site inspection checklist to review implementation is appended at Appendix13	Weekly during construction	Supervising staff and safeguards specialists	No costs required
Ambient air quality	5 locations (WTP, Booster pumping station, 3 GLSRs)	• PM10, PM2.5 NO2, SO2, CO	Once before start of construction Quarterly (yearly 4-times) during construction (2-year period considered)	DBO Contractor	Cost for implementation of monitoring measures responsibility of contractor (45 samples x 5000 per sample = 225,000)

Ambient noise	5 locations (WTP, Booster pumping station, 3 GLSRs)	• Day time and night time noise levels	Once before start of construction Quarterly (yearly 4-times) during construction (2-year period considered)	DBO Contractor	Cost for implementation of monitoring measures responsibility of contractor (45 samples x 1500 per sample = 67,500)
Surface water quality	2 locations (Bidyadhari River and Kestopur Canal)	• pH, Oil and grease, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalinity	Once before start of construction Half yearly during construction (2-yearconstruction period considered)	DBO Contractor	Cost for implementation of monitoring measures responsibility of contractor (10 samples x 4000 per sample = 40,000)
Chance Finds	Areas protected by ASI or West Bengal State Archaeology Department	• Chance finds protocol	Before finalization of detailed design, consult with ASI or West Bengal State Archaeology Department	DBO Contractor	Cost for implementation of monitoring measures responsibility of contractor

Table 18: Operation Stage Environmental Monitoring Plan

Monitoring field	Monitoring Location	Monitoring Parameters	Frequency	Responsibility	Cost and Source of Funds
Source water quality	Raw water intake pond in the WTP	pH, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalinity, heavy metals and pesticides	Yearly twice (pre and post monsoon)	DBO Contractor / PHED	O&M costs(water quality will be tested at the internal laboratory part of WTP)
Monitoring of quality of water supplied to consumers	Consumer end- random sampling in all zones	pH, Nitrite, Nitrate, Turbidity BOD, Total Alkalinity, Total coliform and Feacal coliform	Monthly once	DBO Contractor / PHED	O&M costs(water quality will be tested at the internal laboratory part of WTP)
Sludge quality and suitability as manure	WTP	Analysis for concentration of heavy metals and confirm that value are within the following limits (all units are in mg/kg dry basis except pH) • Arsenic - 10.00 • Cadmium - 5.00 • Chromium - 50.00 • Copper - 300.00 • Lead - 100.00 • Mercury - 0.15 • Nickel - 50.00 • Zinc - 1000.00 • PH - 5.5-8.5	Yearly once	DBO Contractor / PHED	O&M costs(testing to be done at an accredited external laboratory)

B. Implementation Arrangements

155. PHED is the Executing and Implementing Agency for the WBDWSIP, responsible for management, coordination and execution of all activities funded under this sector project. PMU, established within the PHED, will implement the project. PMU will be supported by district level Project Implementation Units (PIUs). PMU will be headed by a Project Director (PD) in the rank of Chief Engineer. Each PIU will be headed by a Superintending Engineer (SE), reporting to the PD. PMU with the support of PIUs will be responsible for planning, implementation, monitoring and supervision, and coordination of all activities under the WBDWSIP.PMU will be supported by a Project Management Consultant (PMC) to supervise, monitor and oversee the implementation. Each PIU will be supported by a DSISC;

156. **Safeguards Compliance Responsibilities**. A Safeguard and Gender Cell (SGC) will be established in PMU with the overall responsibility of ensuring compliance with ADB SPS to ensure consistency with PAM. SGC will be headed by a Head, Safeguards and Gender Officer (HSGO) and will report to the Project Director directly. The HSGO will have overall responsibility in implementation of the resettlement framework, EARF, RPs, EMPs, SEMP, GESI action plan, and appropriate monitoring and reporting responsibilities. Key safeguard tasks and responsibilities at the PMU level are as follows:

(i) Ensure subprojects confirms to exclusion criteria and project selection guidelines as stipulated in the EARF;
(ii) Approve subproject environmental category;
(iii) Approve IEEs; ensure that updated IEEs/EMPs reflect final project designs;
(iv) Ensure that EMPs are included in bidding documents and civil works contracts;
(v) Ensure proper implementation of EMPs by contractors;
(vi) Facilitate and ensure compliance with all government rules and regulations regarding site and environmental clearances, as well as any other environmental requirements (e.g. location clearance certificates, environmental clearance certificates), as relevant;
(vii) Oversee public consultation and disclosure;
(viii) Approve quarterly EMP implementation reports;
(ix) Review and approve semi-annual monitoring reports prepared by PMC; and submit to ADB;
(x) Oversee grievances redress process and ensure timely redress;
(xi) Undertake regular review of safeguards related loan covenants, and the compliance in program implementation; and
(xii) Organize periodic capacity building and training programs for WBDWSIP stakeholders, PHED, PMU and PIU staff on safeguards.

157. The SGC will be supported by environmental, social and gender safeguard specialists in the PMC. Key safeguard tasks and responsibilities of Environmental Management Specialist of the PMC on environmental safeguards are as follows:

(i) Review and finalize REA checklist and classify the project;
(ii) Review and confirm project selection/ design; ensure compliance with exclusion criteria and project environmental selection guidelines;
(iii) Review and finalize IEE reports including EMPs prepared/updated by PIUs/DSISCs;
(iv) Oversee public consultation and information disclosure activities; ensure timely disclosure;

(v) Provide advise/support in obtaining government clearance/ approvals;
(vi) Review and confirm that IEEs/EMPs are included in bids and contracts;
(vii) Review and confirm SEMPs prepared by contractor;
(viii) Oversee the implementation of SEMP by contractors and ensure corrective actions, where necessary;
(ix) Review and approve quarterly environmental monitoring reports submitted by PIU/DSISCs;
(x) Conduct site visits of project facilities and work sites to oversee implementation;
(xi) Prepare semi-annual environmental monitoring reports and submit to PMU SGC HSGO;
(xii) Oversee grievance redress process; advise on critical grievance related to environmental issues and concerns; and
(xiii) Organize training and capacity development programs.

158. **Project Implementation Unit.** At each PIU, an Assistant Engineer will be given additional responsibilities of safeguard tasks and will be designated as Assistant Safeguards Officer. The Safeguards Officer will oversee the safeguards implementation at PIU level, coordinate public consultations, information disclosure, regulatory clearances and approvals, RP implementation, EMP implementation and grievance redressal. Key environmental safeguard tasks and responsibilities of Safeguards Officer are as follows:

(i) Coordinate public consultation and information disclosure;
(ii) Liaise with local offices of regulatory agencies in obtaining clearances /approvals; assist PMU for clearances obtained at state level;
(iii) Review and approve contractors SEMPs;
(iv) Oversee day-to-day implementation of SEMPs by contractors, including compliance with all government rules and regulations;
(v) Take necessary action for obtaining rights of way;
(vi) Ensure continuous public consultation and awareness;
(vii) Coordinate grievance redress process and ensure timely actions by all parties;
(viii) Review monthly contractor's SEMP Monitoring Reports;
(ix) Review and forward quarterly monitoring reports to PMU; and
(x) Inform PMU of unanticipated impacts and formulate corrective action plan; and
(xi) Recommend issuance of work construction work completion certification to the contractor upon verification of satisfactory post-construction clean-up.

159. The PIUs will be assisted by DSISC teams which will include an Environmental Specialist and a Social Safeguards Specialist. Following are the key tasks of Environmental Specialist of DSISC:

(i) Assist PIU in identifying projects/components in compliance with the project exclusion criteria and selection guidelines stipulated in EARF;
(ii) Prepare environmental screening checklists and submit to PMU for categorization; update checklist and category as and when required to reflect project changes, and report to PMU;
(iii) Work closely with PIU and design teams to include environmental considerations in project location, design and technical specifications;
(iv) Identify statutory clearance / permissions / approvals required for subproject; assist PIU in obtaining them;
(v) Assist in including standards/conditions, if any, stipulated in regulatory clearances, consents in the project design;

(vi) Update IEE and EMP to reflect any changes in subproject during detail design / implementation; IEE shall reflect the final project design;
(vii) Lead / assist PIU in public consultation in compliance with the EARF; reflect inputs from public consultation in IEEs, EMPs, and project design;
(viii) Advise/assist PIU in disclosing relevant information on safeguards to stakeholders, affected people etc.;
(ix) Assist / ensure all EMP measures related project design and location and included in the detailed designs;
(x) Integrate EMP into the bid and contract documents (for DBO contracts, include full IEE including EMP in bids);
(xi) Advise contractor in preparation of SEMP as per the final design, prior to start of construction;
(xii) Ensure that all necessary clearances/permission (including those required by Contractor) are in place prior to start of construction;
(xiii) Monitor implementation of SEMP;
(xiv) ensure Contractors including subcontractor's, if any, comply with the measures set forth in the EMP;
(xv) Assist PIU in establishing GRM for the Project:
(xvi) Assist PIU in grievance redress, advise the contractor on appropriate actions on grievances, ensure timely resolution and proper documentation;
(xvii) Identify, if any, non-compliance or unanticipated impacts; initiate corrective actions, report to PMU;
(xviii) Review and approve monthly monitoring reports submitted by Contractor; consolidate and prepare quarterly Environmental Monitoring Reports (EMR) and submit to PMU; and
(xix) Conduct training and capacity building activities (workshops, hands-on trainings, visits etc.,) in EMP implementation.

160. **Civil works contracts and contractors.** IEEs are to be included in bidding and contract documents. The PMU and PIUs will ensure that bidding and contract documents include specific provisions requiring contractors to comply with: (i) all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste; and (c) elimination of forced labor; and with (ii) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites. The contractor will be required to appoint an Environment, Health and Safety (EHS) supervisor to implement EMP. The EHS Supervisor will update the EMP and submit an SEMP for approval of PIU. Contractors will carry out all environmental mitigation and monitoring measures outlined in EMP, approved SEMP and their contracts. Key responsibilities of the EHS supervisor are:

(i) Prepare SEMP and submit to PIU for approval prior to start of construction;
(ii) Conduct orientation and daily briefing sessions to workers on environment, health and safety;
(iii) Ensure that appropriate worker facilities are provided at the work place and labour camps as per the contractual provisions;
(iv) Records accidents and undertake remedial actions;
(v) Implement SEMP measures and report to PIU/DSISC if any new impacts are surfaced; seek guidance from as required in EMP implementation;
(vi) Conduct environmental monitoring (air, noise etc.,) as per the monitoring plan
(vii) Ensure conduct of water quality surveillance program;

(viii) Prepare monthly EMP monitoring reports and submit to PIU;
(ix) Work closely with PIU SO and consultants to ensure communities are aware of project-related impacts, mitigation measures and GRM; and
(x) Address any public compliance and grievances effectively and in timely manner.

C. Capacity Building and Training

161. PMU HSGO and PIU SOs will be trained by PMC and DSISC's safeguards experts on safeguards issues related to the project, GESI action plan and GRM. The EARF, RF, IPPF and GESI action plan provided indicative capacity building program which included modules on: (i) introduction and sensitization to ADB SPS on environmental, involuntary resettlement and indigenous people policies and requirements; (ii) project related requirements as provided in the EARF, RF, IPPF and GESI action plan, (iii) review, updating and preparation of the IEEs, SEMPs, RPs, DDRs and IPPs (as required) upon the completion of project detailed design; (iii) improved coordination within nodal departments; (iv) monitoring and reporting system; and (v) project GRM. Briefings on safeguards principles, GRM and GESI action plan will also be conducted to the contractors upon their mobilization by PIU SOs supported by DSISCs.
162. The following Table 18presents the outline of capacity building program to ensure EMP implementation. The estimated cost is ₹275,000 (excluding trainings of contractors which will be part of EMP implementation cost during construction) to be covered by the project's capacity building program. The detailed cost and specific modules will be customized for the available skill set after assessing the capabilities of the target participants and the requirements of the project by the ES of PMC.

Table 19: Outline Capacity Building Program on EMP Implementation

Description	Target Participants and Venue	Estimate (₹)	Cost and Source of Funds
1. Introduction and Sensitization to Environmental Issues (1 day) - ADB Safeguards Policy Statement - Government of India and West Bengal applicable safeguard laws, regulations and policies including but not limited to core labor standards, OHS, etc. - Incorporation of EMP into the project design and contracts - Monitoring, reporting and corrective action planning	All staff and consultants involved in the project At PMU (combined program for all subprojects)	-	Included in the overall program cost
2. EMP implementation (1/2 day) - EMP mitigation and monitoring measures -Roles and responsibilities - Public relations, - Consultations - Grievance redress - Monitoring and corrective action planning - Reporting and disclosure - Construction site standard operating procedures (SOP) -- Chance find (archeological) protocol - asbestos cement pipe protocol - Traffic management plan - Waste management plan - Site clean-up and restoration	All PIU staff, contractor staff and consultants involved in the subproject At PIU	₹100,000 (Lump sum)	Included in subproject cost estimates
3. Contractors Orientation to Workers (1/2 day) - Environment, health and safety in project construction	Once before start of work, and thereafter regular briefing every month once. Daily briefing on safety prior	-	Contractors cost

Description	Target Participants and Venue	Estimate (₹)	Cost and Source of Funds
	to start of work All workers (including unskilled laborers)		

D. Monitoring and Reporting

163. Immediately after mobilization and prior to commencement of the works, the contractor will submit a compliance report to PIU that all identified pre-construction mitigation measures as detailed in the EMP are undertaken. Contractor should confirm that the staff for EMP implementation (EHS supervisor) is mobilized. PIU will review, and approve the report and permit commencement of works.

164. During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PIU. DSC will review and advise contractors for corrective actions if necessary. Quarterly report summarizing compliance and corrective measures taken will be prepared by DSC team at PIU and submitted to PMU (Appendix 14). During operation, the contractor will conduct management and monitoring actions as per the operation stage EMP, and submit to PMU a quarterly report on EMP implementation and compliance.

165. Based on monthly and quarterly reports and measurements, PMU (assisted by PMC) will submit semi-annual environmental monitoring report (SEMR).Once concurrence from the ADB is received the report will be disclosed on PHED/PMU websites.

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

167. ADB's monitoring and supervision activities are carried out on an on-going basis until a Project Completion Report (PCR) is issued. ADB issues a PCR within 1-2 years after the project is physically completed and in operation.

E. Environmental Management Plan Implementation Cost

168. Most of the mitigation measures require the contractors to adopt good site practices, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. The costs which are specific to EMP implementation and are not covered elsewhere in the projects are given below.

Table 20: Cost Estimates to Implement the Environmental Management Plan

	Particulars	Stages	Unit	Total No.	Rate (₹)	Cost (₹)	Costs Covered By
A.	**Implementation staff**						
1	Environment, Health and Safety Supervisor	Construction	per month	24	50,000	1,200,000	Design, build and operate (DBO) contract

	Particulars	Stages	Unit	Total No.	Rate (₹)	Cost (₹)	Costs Covered By
	Subtotal (A)					**1,200,000**	
B.	**Mitigation Measures**						
1	Consent for establishments and consent for operation from West Bengal Pollution Control Board (WBPCB)	Pre-construction	Lump sum			200,000	Project costs
2	Provision for tree cutting and compensatory plantation measures (1: 5 ratio replantation)	Construction	Per tree	100	1,000	100,000	DBO contract
3	Traffic management at work sites (Pavement Markings, Channelizing Devices, Arrow Panels and Warning Lights)	Construction	Lump sum	-	-	100,000	DBO contract
	Subtotal (B)					**400,000**	
C.	**Monitoring Measures**						
1	Air quality monitoring	Construction	per sample	45	5,000	225,000	DBO contract
2	Noise levels monitoring	Construction	Per sample	45	1,500	67,500	DBO contract
3	Surface water monitoring	Construction	Per sample	10	4,000	40,000	DBO contract
4	Source water quality, water quality at consumer end, sludge quality	Operation	Lump sum / year	-	-	10,000	DBO Contract
	Subtotal (C)					**342,500**	
D.	**Capacity Building**						
1.	Training on environmental management plan (EMP) implementation	Pre-construction	lump sum			100,000	PMU
2	Preparation of plans and protocols (traffic management plan, waste (spoils) management plan etc.,	Pre-construction	Lump sum			25,000	DBO contract
5.	Contractors Orientation to Workers on EMP implementation	Prior to dispatch to worksite	Lump sum			25,000	DBO contract
	Subtotal (D)					**150,000**	
	Total (A+B+C+D)				**₹**	**2,092,500**	

Contractor Cost - 1,992,500
PMU Cost - 100,000
Total - 2,092,500

IX. CONCLUSION AND RECOMMENDATIONS

169. The process described in this document has assessed the environmental impacts of all elements of the proposed bulk water supply subproject for Rajarhat, Haroa, and Bhangar II Blocks. All potential impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations have been reviewed and

incorporated into the site planning and design process wherever possible; thus, environmental impacts as being due to the project design or location were not significant.

170. The main design impacts of water supply system in general are due to abstraction of water. This subproject does not include any new source development or augmentation of existing sources. Water will be sourced from an existing raw water supply system that has adequate capacity to meet the project demand. Raw water source is Hooghly River (Ganges), which carries significant quantities of water throughout the year. Available river flow data indicates that, even during the lean flow season (January to May), project water demand will be only a fraction of total water availability in the river. Quality of river water is good and is suitable for drinking water supply after conventional treatment and disinfection.

171. Locations for subproject components are mostly selected in existing facilities owned by PHED. WTP and clear water reservoir cum booster pumping station will be located within the existing WTP and booster pumping station premises respectively in new town area of Rajarhat. Both the facilities are located in rapidly developing new town area, surrounded by residential and commercial areas. Rajarhat GLSR is proposed in the existing OHR compound, while new sites are identified for Haroa and Bhangar II GLSRs. Rajarhat GLSR site is covered with trees; measures are suggested to minimize, and carryout compensatory tree plantation in a ratio of 1:5. There is also a pond in this site, GLSR needs to be constructed without disturbing / encroaching on pond including bunds, and inlet, outlet channels. Bhangar II site is an agricultural land with a mango orchard. Few trees will be required to cut; measures suggested to minimize and compensate. Haroa GLSR site is located close to Bidhyadhari River, however, no interference envisaged. It is suggested to safeguard the site with proper engineering against heavy floods in the river. Proposed pipeline will be laid along the roads from WTP to booster pumping station along the roads. Overall, there are no notable sensitive environmental features in the project sites.

172. Construction activities will be confined to the selected sites, and the interference with the general public and community around is minimal. There will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.,), mining of construction material, occupation health and safety aspects. During the construction phase of pipeline work along the public roads, impacts arise from the construction dust and noise; from the disturbance of residents, businesses, traffic by the construction work, and from the need to dispose of large quantities of waste soil. The social impacts (access disruptions) due to construction activities are minimal. Trenchless technology is suggested at critical sections where pipeline crosses the main transportation corridors. These are all general impacts of construction in urban and habitation areas, and there are well developed methods of mitigation that are suggested in the EMP.

173. Anticipated impacts of water supply during operation and maintenance will be related to operation of WTP, handling and application of chlorine, operation of pump houses, and repair and maintenance activities. Various provisions are already made in the design: to recirculate wastewater from WTP; collect, thicken and dispose sludge; chlorine safety; use energy efficiency equipment, etc., Water supply system will be operated using the standard operating procedures following an operating manual, which will be prepared by the DBO contractor. Thus, considering the design and proposed operational procedures, it is unlikely that there will be any significant negative impacts due to operation of water supply system. It is important that proper O&M system as per the SOPs is must. Application and handling of chlorine gas will involve certain risks, and appropriate measures are suggested for safe application including PPEs, awareness programs and mock drills. The DBO Contractor will implement the operation stage EMP. There may be requirement of repairs in pipelines due to leaks and pipe bursts. Proper design and selection of

good quality pipe material shall mean that leaks are minimal. Leak repair work will be similar to the pipe-laying work.

174. The public participation processes undertaken during project design ensured 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.

175. The project's grievance redress mechanism will provide the citizens with a platform for redress their grievances, and describes the informal and formal channels, time frame, and mechanisms for resolving complaints about environmental performance.

176. The EMP will assist the project agencies and DBO contractor in mitigating the environmental impacts, and guide them in the environmentally sound execution of the proposed project.

177. A copy of the EMP/approved SEP shall be kept on-site during the construction period at all times. The EMP shall be made binding on all contractors operating on the site, and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document shall constitute a failure in compliance.

178. The project will benefit the general public by contributing to the long-term improvement of water supply system and community livability in the project blocks of Rajarhat, Haroa and Bhangar II. The potential adverse environmental impacts are mainly related to the construction period, which can be minimized by the mitigating measures and environmentally sound engineering and construction practices.

179. Therefore, as per ADB SPS, the project is classified as environmental category B and does not require further environmental impact assessment. However, to conform to government guidelines WTP requires consent to establish (CTE) and consent to operate (CTO) from WBPCB, which shall be obtained prior to invitation of bids.

180. This IEE shall be updated during the detailed design stage to reflect any changes, amendments and will be reviewed and approved by PMU, and further submitted to ADB for approval. Civil works on subproject will be initiated only after approval of updated IEE by ADB.

RAPID ENVIRONMENTAL ASSESSMENT CHECKLIST

WATER SUPPLY

Instructions:
- ❑ This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- ❑ This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- ❑ This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- ❑ Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: India / West Bengal Drinking Water Sector Improvement Project – Rajarhat, Haroa and Bhangar II Bulk Water Supply Subproject

Sector Division: Urban Development

SCREENING QUESTIONS	Yes	No	REMARKS
Water Supply			
A. Project Siting Is the project area…			
▪ Densely populated?		√	
▪ Heavy with development activities?		√	
▪ Adjacent to or within any environmentally sensitive areas?		√	
• Cultural heritage site		√	
• Protected Area		√	
• Wetland		√	
• Mangrove		√	
• Estuarine		√	
• Buffer zone of protected area		√	
• Special area for protecting biodiversity		√	
• Bay		√	

B. Potential Environmental Impacts Will the Project cause…			
• Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?		√	Project involves no new source development. Raw water quality is tested and found that it is suitable for domestic use after conventional treatment and disinfection. Water surveillance program will be included to monitor the raw water quality.
• Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	-
• Hazard of land subsidence caused by excessive ground water pumping?		√	Not applicable; subproject does not involve groundwater abstraction
• Social conflicts arising from displacement of communities?		√	Project does not involve land acquisition /displacement. No social conflicts envisaged
• Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		√	Project involves no new source development. Adequate capacity raw water system is already available.
• Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		√	Raw water quality is tested and found that it is suitable for domestic use. Bacteriological contamination is noticed, and water will be subjected for treatment prior to supply
• Delivery of unsafe water to distribution system?		√	Water will be treated and disinfected prior to supply
• Inadequate protection of intake works or wells, leading to pollution of water supply?		√	Project involves no new source development. Raw water quality is tested and found that it is suitable for domestic use after conventional treatment and disinfection. Water surveillance program will be included to monitor the raw water quality.
• Over pumping of ground water, leading to salinization and ground subsidence?		√	-
• Excessive algal growth in storage reservoir?		√	Regular cleaning of storage reservoirs will be conducted during operation
• Increase in production of sewage beyond capabilities of community facilities?	√		Sanitation and sewerage system needs to be developed in the project area
• Inadequate disposal of sludge from water treatment plants?		√	Appropriate provisions for sludge drying and disposal is included in the project
• Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		√	Adequate buffer is available; all the pumping stations will be located in enclosed buildings with noise control walls to minimize noise propagation
• Impairments associated with transmission lines and access roads?		√	-
• Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		√	Measures for safe handling of chlorine are included

• Health and safety hazards to workers from the management of chlorine used for disinfection and other contaminants?		√	Measures for safe handling of chlorine are included
• Dislocation or involuntary resettlement of people		√	There is no resettlement of people for project implementation.
• Social conflicts between construction workers from other areas and community workers?		√	The contractor will be utilizing the local labor force as far as possible; in case if it is unavoidable, labor camps and facilities will be provided appropriately. No conflicts envisaged
• Noise and dust from construction activities?	√		All the construction machineries employed will comply with noise emission standards of Central Pollution Control Board. Dust suppression measures such as water sprinkling will be employed
• Increased road traffic due to interference of construction activities?	√		Excavation and laying pipelines along public roads will interfere with the traffic. Construction material transport will increase traffic on the local roads. Proper traffic management and construction planning will be ensured to minimize the interference
• Continuing soil erosion/silt runoff from construction operations?	√		Construction work during monsoon shall be carried out with due care so that silt run off due to construction operation is prevented. No construction will be allowed during rains.
• 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?		√	No; appropriate O&M will conducted
• Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		√	Not envisaged
• Accidental leakage of chlorine gas?		√	Measures for safe handling of chlorine are included
• Excessive abstraction of water affecting downstream water users?		√	River carries huge flow, and the water abstraction for the project is negligible even during lean season
• Competing uses of water?		√	Project involves no source augmentation; existing raw water system is being utilized within its available capacity
• Increased sewage flow due to increased water supply	√		Sanitation & sewerage needs to be improved
• Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	√		Sanitation & sewerage needs to be improved

Climate Change and Disaster Risk Questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	Yes	No	Remarks
Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes?	√		Area is prone for floods and cyclones
Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., changes in rainfall patterns disrupt reliability of water supply; sea level rise creates salinity intrusion into proposed water supply source)?		√	Unlikely as river carries significant quantities of water; although there will be change in flow due to these events, but may be insignificant.
Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		√	No
Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by using water from a vulnerable source that is relied upon by many user groups, or encouraging settlement in earthquake zones)?		√	No

NATIONAL AMBIENT AIR QUALITY STANDARDS

	Pollutants	Time Weighted Average	Concentration in Ambient Air		Method of Measurement
			Industrial, Residential, Rural and Other Areas	Ecologically Sensitive Areas	
1	Sulphur Dioxide (SO_2) $\mu g/m^3$	Annual 24 hours	50 80	20 80	Improved West and Geake-Ultraviolet fluorescence
2	Nitrogen Dioxide (NO_2) $\mu g/m^3$	Annual 24 hours	40 80	30 80	Modified Jacob and Hochheiser (Na-Arsenite) Chemiluminescence
3	Particulate Matter (Size less than 10 µm) or PM10 $\mu g/m^3$	Annual 24 hours	60 100	60 100	Gravimetric -TOEM -Beta attenuation
4	Particulate Matter (Size less than 2.5 µm) or PM2.5 $\mu g/m^3$	Annual 24 hours	40 60	40 60	Gravimetric -TOEM -Beta attenuation
5	Carbon Monoxide (CO) mg/m^3	8 hours 1 hours	02 04	02 04	Non Dispersive Infra Red (NDIR) Spectroscopy

VEHICLE EXHAUST EMISSION NORMS

1. Passenger Cars

Norms	CO(g/km)	HC+ NOx(g/km)
1991Norms	14.3-27.1	2.0(Only HC)
1996 Norms	8.68-12.40	3.00-4.36
1998Norms	4.34-6.20	1.50-2.18
India stage 2000 norms	2.72	0.97
Bharat stage-II	2.2	0.5
Bharat Stage-III	2.3	0.35 (combined)
Bharat Stage-IV	1.0	0.18 (combined)

2. Heavy Diesel Vehicles

Norms	CO(g/kmhr)	HC (g/kmhr)	NOx (g/kmhr)	PM(g/kmhr)
1991Norms	14	3.5	18	-
1996 Norms	11.2	2.4	14.4	-
India stage 2000 norms	4.5	1.1	8.0	0.36
Bharat stage-II	4.0	1.1	7.0	0.15
Bharat Stage-III	2.1	1.6	5.0	0.10
Bharat Stage-IV	1.5	0.96	3.5	0.02

Source: Central Pollution Control Board

CO = Carbon Monixide; g/kmhr = grams per kilometer-hour; HC = Hydrocarbons; NOx = oxides of nitrogen; PM = Particulates Matter

NATIONAL AMBIENT AIR QUALITY STANDARDS IN RESPECT OF NOISE

Area code	**Category of area/zone**	**Limit** (dBA)	
		Day time	**Night time**
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silence zone	50	40

EXTRACT FROM CONSTRUCTION AND DEMOLITION MANAGEMENT RULES, 2016

[Published In the Gazette of India, Part-II, Section-3, Sub-section (ii)]
Ministry of Environment, Forest and Climate Change

NOTIFICATION

New Delhi, the 29th March, 2016

G.S.R. 317(E).-Whereas the Municipal Solid Wastes (Management and Handling) Rules, 2000 published vide notification number S.O. 908(E), dated the 25th September, 2000 by the Government of India in the erstwhile Ministry of Environment and Forests, provided a regulatory frame work for management of Municipal Solid Waste generated in the urban area of the country;

And whereas, to make these rules more effective and to improve the collection, segregation, recycling, treatment and disposal of solid waste in an environmentally sound manner, the Central Government reviewed the existing rules and it was considered necessary to revise the existing rules with a emphasis on the roles and accountability of waste generators and various stakeholders, give thrust to segregation, recovery, reuse, recycle at source, address in detail the management of construction and demolition waste.

And whereas, the draft rules, namely, the Solid Waste Management Rules, 2015 with a separate chapter on construction and demolition waste were published by the Central Government in the Ministry of Environment, Forest and Climate Change vide G.S.R. 451 (E), datedthe 3rd June, 2015 inviting objections or suggestions from the public within sixty days from the date of publication of the said notification;

And Whereas, the objections or suggestions received within the stipulated period were duly considered by the Central Government;

Now, therefore, in exercise of the powers conferred by sections 6, 25 of the Environment (Protection) Act, 1986 (29 of 1986), and in supersession of the Municipal Solid Wastes (Management and Handling) Rules, 2000, except as respect things done or omitted to be done before such supersession, the Central Government hereby notifies the following rules for Management of Construction and Demolition Waste –

1. Short title and commencement.-(1) These rules shall be called the Construction and Demolition Waste Management Rules, 2016.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. Application.-The rules shall apply to every waste resulting from construction, re-modeling, repair and demolition of any civil structure of individual or organisation or authority who generates construction and demolition waste such as building materials, debris, rubble.

3. Definitions –(1) In these rules, unless the context otherwise requires,-

(a) " ACT' means the Environment (Protection) Act, 1986 (29 of 1986);

(b) "**construction**" means the process of erecting of building or built facility or other structure, or

building of infrastructure including alteration in these entities,;

(c) "**construction and demolition waste**" means the waste comprising of building materials, debris and rubble resulting from construction, re-modeling, repair and demolition of any civil structure;

(d) **"de-construction"** means a planned selective demolition in which salvage, re-use and recycling of the demolished structure is maximized;

(e) **"demolition"** means breaking down or tearing down buildings and other structures either manually or using mechanical force (by various equipment) or by implosion using explosives.

(f) **"form" means a Form annexed to these rules;**

(g) **"local authority"** means an urban local authority with different nomenclature such as municipal corporation, municipality, nagarpalika, nagarnigam, nagarpanchayat, municipal council including notified area committee and not limited to or any other local authority constituted under the relevant statutes such as gram panchayat, where the management of construction and demolition waste is entrusted to such agency;

(h) **" schedule"** means a schedule annexed to these rules;

(i) **"service provider'** means authorities who provide services like water, sewerage, electricity, telephone, roads, drainage etc. often generate construction and demolition waste during their activities, which includes excavation, demolition and civil work;

(j) **"waste generator" means any person or association of persons** or institution, residential and commercial establishments including Indian Railways, Airport, Port and Harbour and Defence establishments who undertakes construction of or demolition of any civil structure which generate construction and demolition waste.

(2) Words and expressions used but not defined herein shall have the same meaning defined in the ACT.

(4) Duties of the waste generator -

(1) Every waste generator shall prima-facie be responsible for collection, segregation of concrete, soil and others and storage of construction and demolition waste generated, as directed or notified by the concerned local authority in consonance with these rules.

(2) The generator shall ensure that other waste (such as solid waste) does not get mixed with this waste and is stored and disposed separately.

(3) Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar and shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodeling work and keep the concerned

authorities informed regarding the relevant activities from the planning stage to the implementation stage and this should be on project to project basis.

(4) Every waste generator shall keep the construction and demolition waste within the premise or get the waste deposited at collection centre so made by the local body or handover it to the authorised processing facilities of construction and demolition waste; and ensure that there is no littering or deposition of construction and demolition waste so as to prevent obstruction to the traffic or the public or drains.

(5) Every waste generator shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities; Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month shall have to pay for the processing and disposal of construction and demolition waste generated by them, apart from the payment for storage, collection and transportation. The rate shall be fixed by the concerned local authority or any other authority designated by the State Government.

(5) Duties of service provider and their contractors -

(1) The service providers shall prepare within six months from the date of notification of these rules, a comprehensive waste management plan covering segregation, storage, collection, reuse, recycling, transportation and disposal of construction and demolition waste generated within their jurisdiction.

(2) The service providers shall remove all construction and demolition waste and clean the area every day, if possible, or depending upon the duration of the work, the quantity and type of waste generated, appropriate storage and collection, a reasonable timeframe shall be worked out in consultation with the concerned local authority.

(3) In case of the service providers have no logistics support to carry out the work specified in sub-rules (1) and (2) , they shall tie up with the authorised agencies for removal of construction and demolition waste and pay the relevant charges as notified by the local authority.

(6) Duties of local authority-The local authority shall,-

(1) issue detailed directions with regard to proper management of construction and demolition waste within its jurisdiction in accordance with the provisions of these rules and the local authority shall seek detailed plan or undertaking as applicable, from generator of construction and demolition waste;

(2) chalk out stages, methodology and equipment, material involved in the overall activity and final clean up after completion of the construction and demolition ;

(3c) seek assistance from concerned authorities for safe disposal of construction and demolition waste contaminated with industrial hazardous or toxic material or nuclear waste if any;

(4) shall make arrangements and place appropriate containers for collection of waste and shall remove at regular intervals or when they are filled, either through own resources or by appointing private operators;

(5) shall get the collected waste transported to appropriate sites for processing and disposal either through own resources or by appointing private operators;

(6) shall give appropriate incentives to generator for salvaging, processing and or recycling preferably in-situ;

(7) shall examine and sanction the waste management plan of the generators within a period of one month or from the date of approval of building plan, whichever is earlier from the date of its submission;

(8) shall keep track of the generation of construction and demolition waste within its jurisdiction and establish a data base and update once in a year;

(9) shall device appropriate measures in consultation with expert institutions for management of construction and demolition waste generated including processing facility and for using the recycled products in the best possible manner;

(10) shall create a sustained system of information, education and communication for construction and demolition waste through collaboration with expert institutions and civil societies and also disseminate through their own website;

(11) shall make provision for giving incentives for use of material made out of construction and demolition waste in the construction activity including in non-structural concrete, paving blocks, lower layers of road pavements, colony and rural roads.

(7) Criteria for storage, processing or recycling facilities for construction and demolition waste and application of construction and demolition waste and its products-

(1) The site for storage and processing or recycling facilities for construction and demolition waste shall be selected as per the criteria given in **Schedule I**;

(2) The operator of the facility as specified in sub- rules (1) shall apply in **Form I** for authorization from State Pollution Control Board or Pollution Control Committee.

(3) The operator of the facility shall submit the annual report to the State Pollution Control Board in **Form II.**

(3) Application of materials made from construction and demolition waste in operation of sanitary landfill shall be as per the criteria given in **Schedule II.**

(8) Duties of State Pollution Control Board or Pollution Control Committee-

(1) State Pollution Control Board or Pollution Control Committee shall monitor the implementation of these rules by the concerned local bodies and the competent authorities and the annual report shall be sent to the Central Pollution Control Board and the State Government or Union Territory or any other State level nodal agency identified by the State Government or Union Territory administration for generating State level comprehensive data. Such reports shall also contain the comments and suggestions of the State Pollution Control Board or Pollution Control Committee with respect to any comments or changes required;

(2) State Pollution Control Board or Pollution Control Committee shall grant authorization to construction and demolition waste processing facility in **Form-III** as specified under these rules after examining the application received in **Form I**;

(3) State Pollution Control Board or Pollution Control Committee shall prepare annual report in **Form IV** with special emphasis on the implementation status of compliance of these rules and forward report to Central Pollution Control Board before the 31st July for each financial year.

(9) Duties of State Government or Union Territory Administration-

(1) The Secretary in-charge of development in the State Government or Union territory administration shall prepare their policy document with respect to management of construction and demolition of waste in accordance with the provisions of these rules within one year from date of final notification of these rules.

(2) The concerned department in the State Government dealing with land shall be responsible for providing suitable sites for setting up of the storage, processing and recycling facilities for construction and demolition waste.

(3) The Town and Country planning Department shall incorporate the site in the approved land use plan so that there is no disturbance to the processing facility on a long term basis.

(4) Procurement of materials made from construction and demolition waste shall be made mandatory to a certain percentage (say 10-20%) in municipal and Government contracts subject to strict quality control.

(10) Duties of the Central Pollution Control Board - (1) The Central Pollution Control Board shall,-

(a) prepare operational guidelines related to environmental management of construction and demolition waste management;

(b) analyze and collate the data received from the State Pollution Control Boards or Pollution Control Committee to review these rules from time to time;

(c) coordinate with all the State Pollution Control Board and Pollution Control Committees for any matter related to development of environmental standards;

(d) forward annual compliance report to Central Government before the 30th August for each financial year based on reports given by State Pollution Control Boards of Pollution Control Committees.

(11) Duties of Bureau of Indian Standards and Indian Roads Congress -The Bureau of Indian Standards and Indian Roads Congress shall be responsible for preparation of code of practices and standards for use of recycled materials and products of construction and demolition waste in respect of construction activities and the role of Indian Road Congress shall be specific to the standards and practices pertaining to construction of roads.

Schedule III
Timeframe for Planning and Implementation
[See Rule 13]

Sl. No.	Compliance Criteria	Cities with population of 01 million and above	Cities with population of 0.5-01 million	Cities with population of less than 0.5 million
1	Formulation of policy by State Government	12 months	12 months	12 months
2	Identification of sites for collection and processing facility	18 months	18 months	18 months
3	Commissioning and implementation of the facility	18 months	24 months	36 months
4	Monitoring by SPCBs	3 times a year – once in 4 months	2 times a year – once in 6 months	2 times a year – once in 6 months

The time Schedule is effective from the date of notification of these rules.

FORM – I
See [Rule 7 (2)]
Application for obtaining authorisation

To,
The Member Secretary

_____Name of the local authority or Name of the agency : appointed by the municipal authority

Correspondence address Telephone No. Fax No.	
Nodal Officer and designation (Officer authorized by the competent authority or agency responsible for operation of processing or recycling or disposal facility)	
Authorisation applied for (Please tick mark)	Setting up of processing or recycling facility of construction and demolition waste
Detailed proposal of construction and demolition waste processing or recycling facility to include the following Location of site approved and allotted by the Competent Authority. Average quantity (in tons per day) and composition of construction and demolition waste to be handled	

DEPARTMENT OF ENVIRONMENT'S DIRECTION UNDER AIR ACT, 1981 FOR CONTROL OF AIR POLLUTION FROM CONSTRUCTION ACTIVITIES IN WEST BENGAL

Department of Environment
Government of West Bengal
Writers' Buildings, "G" Block, (2nd. Floor),
Kolkata-700 001.

No. EN/3170/T-IV-7/001/2009 Dated: December 10th, 2009.

DIRECTION

WHEREAS, Department of Environment, Govt. of West Bengal is entrusted to look after the execution of the different environmental laws within the territorial jurisdiction of West Bengal and also responsible for maintaining pollution free environment and also responsible for restraining different environment hazardous activities which are causing serious impact on human beings, other living creatures, plant, micro-organism, property or the environment ;

AND WHEREAS, Department of Environment has already taken different steps for controlling air pollution in the atmosphere generated from the different sources i.e. industrial source, vehicular source and burning of bio-mass;

AND WHEREAS, Department of Environment in exercising the power conferred under section 19 of the Air (Prevention & Control of Pollution) Act, 1981, has already declared entire West Bengal as `Air Pollution Control Area';

AND WHEREAS, West Bengal Pollution Control Board conducted a study with the help of the Asian Development Bank and it is revealed that the contribution of the construction activities is one of the source of air pollution in Kolkata and its surroundings ;

AND WHEREAS, it is further revealed that burning of old tyres in hot mix plant as a fuel during construction and repairs of road for melting coal tar contributes significant obnoxious element into the air which cause a serious problem of the human beings ;

HENCE, in view of the above and in consultation with the West Bengal Pollution Control Board and in exercise of the power conferred under Air (Prevention & Control of Pollution) Act, 1981 and Environment (Protection) Act, 1986, all the municipalities, local authorities and all other concerned Govt. Departments within the State of West Bengal, are now directed to take immediate steps to implement the following norms which need to be strictly followed by the developers, contractors or any other infrastructure developers ;

- Preventive measures need to be taken: -

a) Wrap construction area/buildings with geotextile fabric, installing dust barriers, or other actions, as appropriate for the location,
b) Apply water and maintain soils in a visible damp or crusted condition for temporary stabilization,
c) Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process;
d) Limit vehicle speeds to 15 mph on the work site.
e) Clean wheels and undercarriage of haul trucks prior to leaving construction site.
f) Apply and maintain dust suppressant on haul routes.
g) Apply a cover or screen to stockpiles and stabilize stockpiles at completion of activity by water and maintain a dust palliative to all outer surfaces of the stockpiles;
h) Stabilize surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition where loaders, support equipment and vehicles will operate;
i) Stabilize adjacent disturbed soils following paving activities with immediate landscaping activity or installation of vegetative or rock cover.
j) Maintain dust control during working hours and clean track out from paved surfaces at the end of the work shift/day. Track out must now extend 50 feet or more and must be cleaned daily, at the minimum.
k) Stabilize sloping surfaces using soil binders until vegetation or ground cover can effectively stabilize the slope,
l) Disposal of debris in consultation with the local authorities following proper environmental management practice.
m) During construction work, including cutting of marbles, ambient noise level should not exceed more than 65 dB(A).

Local Police Station is also directed to render all necessary help to the Local Authorities to implement the aforementioned direction in a befitting manner.

This order will take effect from 01-01-2010 through out the State of West Bengal.

By Order,
Sd/-
(M. L. Meena)
Principal Secretary to the Govt. of West Bengal.
Department of Environment.

SALIENT FEATURES OF MAJOR LABOR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN CONSTRUCTION OF CIVIL WORKS

(i) Workmen Compensation Act, 1923 - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

(ii) Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days' wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

(iii) Employees' PF and Miscellaneous Provisions Act, 1952 - The Act provides for monthly contributions by the employer plus workers @10 % or 8.33 %. The benefits payable under the Act are: (a) Pension or family pension on retirement or death as the case may be; (b) deposit linked insurance on the death in harness of the worker; (c) payment of PF accumulation on retirement/death etc.

(iv) Maternity Benefit Act, 1951 - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

(v) Contract Labour (Regulation and Abolition) Act, 1970 - The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.

(vi) Minimum Wages Act, 1948 - The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employment.

(vii) Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

(viii) Equal Remuneration Act, 1979 - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions etc.

(ix) Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing Rs. 3,500/- per month or less. The bonus to be paid to employees getting Rs. 2,500/- per month or above up to Rs.3,500/- per month shall be worked out by taking wages as Rs.2,500/- per month only. The Act does not apply to certain establishments. The newly set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.

(x) Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

(xi) Industrial Employment (Standing Orders) Act, 1946 - It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer on matters provided in the Act and get the same certified by the designated Authority.

(xii) Trade Unions Act, 1926 - The Act lays down the procedure for registration of trade unions of workmen and employees. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.

(xiii) Child Labor (Prohibition and Regulation) Act, 1986 - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in Building and Construction Industry.

(xiv) Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979 - The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.

(xv) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996 - All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

DRINKING WATER STANDARDS

No.	Substance or Characteristic	Requirement Desirable Limit	Undesirable Effect Outside the Desirable	Permissible Limit in the Absence of Alternate Source	Remarks
Essential Characteristic					
1.	Color Hazen Units, Max	5	Above 5, consumer acceptance decreases	25	Extended to 25 only if toxic Substance are not suspect in absence of alternate sources
2.	Odor	Unobjectionable	-	-	a) test cold and when heated b) test are several dilutions
3.	Taste	Agreeable	-	-	Test to be conducted only after safely has been established
4.	Turbidity (NTU) Max	5	Above 5, consumer acceptance decreases	10	-
5.	pH value	6.5 to 8.5	Beyond this range the water will after the mucous membrane and/or water supply system	No relaxation	-
6.	Total Hardness (mg/L) CaCO3	300	Encrustation in water supply structure and adverse effects on domestic use	600	-
7.	Iron (mg/L, Fe) Max	0.3	Beyond this limit taste/appearance are affected; has adverse effects on domestic uses and water supply structure and promotes iron bacteria	1.0	-
8.	Chlorides 250 (mg/L, Cl) Max	250	Beyond effects outside the desirable limit	1000	-
9.	Residual free Chlorine (mg/L), Max	0.2	-	-	To be applicable only when water is chlorinated. Tested at customer end. When protection against viral infection is required, it should be min. 0.5 mg/L.
Desirable Characteristics					
10.	Dissolved solids mg/L. Max	500	Beyond this, palatability decreases and may cause gastrointestinal irritation.	2000	-
11.	Calcium (mg/L, Ca) Max.	75	Encrustation in water supply structure and adverse effects on domestic use.	200	-
12.	Magnesium (mg/L, Mg) Max	30	Encrustation in water supply structure and adverse effects on domestic use.	100	-
13.	Copper (mg/L, Cu) Max	0.05	Astringent taste dis coloration and corrosion of	1.5	-

No.	Substance or Characteristic	Requirement Desirable Limit	Undesirable Effect Outside the Desirable	Permissible Limit in the Absence of Alternate Source	Remarks
			pipes fittings and utensils will be caused beyond this.		
14.	Manganese (mg/L, Mn) Max	0.1	Beyond this limit taste/appearance are affected, has adverse effect on domestic use and water supply structure	0.3	-
15.	Sulphate (mg/L, SO4) Max.	200	Beyond this causes gastro intestinal irritation when magnesium or sodium are present	400	May be extended up to 400 provided magnesium (as Mg) does not exceed 30
16.	Nitrate (mg/L, NO3) Max.	45	Beyond this methaemoglobinemia takes place.	100	-
17.	Fluoride (mg/L, F) Max.	1.0	Fluoride may be kept as low as possible. High fluoride may cause fluorosis.	1.5	-
18.	Phenolic Compounds (mg/L C6H5OH) Max.	0.001	Beyond this, it may cause objectionable taste and odor	0.002	-
19.	Mercury (mg/L Hg) Max	0.001	Beyond this the water becomes toxic	No Relaxation.	To be tested when pollution is suspected
20	Cadmium (mg/L, Cd) Max	0.01	Beyond this the water becomes toxic	No Relaxation.	To be tested when pollution is suspected
21.	Selenium (mg/L, Se) Max	0.01	Beyond this the water becomes toxic.	No Relaxation.	To be tested when pollution is suspected
22.	Arsenic (mg/L, As) Max.	0.01	Beyond this the water becomes toxic	No Relaxation	To be tested when pollution is suspected
23.	Cyanide	0.05	Beyond this the water becomes toxic	No Relaxation	To be tested when pollution is suspected
24.	Lead (mg/L Pb) Max.	0.05	Beyond this the water becomes toxic	No Relaxation	To be tested when pollution is suspected
25.	Zinc (mg/L, Zn) Max.	5	Beyond this limit it can cause astringent taste and an opalescence in water	15	To be tested when pollution is suspected
26.	Anionic detergents (mg/L, MBAS) Max	0.2	Beyond this limit it can cause a light froth in water	1.0	To be tested when pollution is suspected
27.	Chromium (mg/L, Cr6+	0.05	May be carcinogenic above this limit	-	-
28.	Polynuclear Aromatic Hydrocarbons (mg/l, PAH) Max	-	May be carcinogenic	-	-
29.	Mineral oil (mg/L)	0.01	Beyond this limit, undesirable taste and odor after chlorination takes place	0.03	To be tested when pollution is suspected
30.	Pesticides (mg/L) max	Absent	Toxic	0.001	-
Radioactive materials					
31.	Alpha emitters Bq/L Max	-	-	0.1	-
32.	Beta emitters Pci/L Max	-	-	1.0	-

No.	Substance or Characteristic	Requirement Desirable Limit	Undesirable Effect Outside the Desirable	Permissible Limit in the Absence of Alternate Source	Remarks
33.	Alkalinity (mg/L,) Max	200	Beyond this limit, taste becomes unpleasant	600	-
34.	Aluminum (mg/L, Al) Max	0.03	Cumulative effect is reported to cause dementia	0.2	
35.	Boron (mg/L) Max	1.0	-	5.0	-

STAKEHOLDER CONSULTATIONS

Table A9.1. Consultation at Proposed GLR Site, Rajarhat

	Date of Visit	Block	Mouza	Gram Panchayat	OHR/ GLR Zone Code	No. of Participants	Concerns / Issues Discussed
1	08.02.17	Rajarhat	Kashinathpore	Rajarhat, Garaguri GP, Patharghata	GLSR	Male : 1 Female : 4 Total : 5	At the site of the proposed GLR and OHT under Pathatghaata GP the land is Vested as per the available records of land dept. still a small health unit was seen which caters mainly for Women & Children for the GP. The Center runs with 2 Health Workers (1 male & 1 Female), 3 ASHA Worker (Female), 1 Trained Dai (Mid Wife) (Female), 1 Community Health Guide (Male). The centre functions under the control of Block Primary Health Office at Rekjuani Average 250 - 300 cases are recorded per month at the centre covering 3 surrounding villages Kashinathpur, Gara Guri & Karigar Para approx. 5000 families of mixed community. The Health Unit will be shifted to a nearby location for constructing the GLR & OHT. The new spot (Govt. Land) is also just beside the present location and will not be difficult to access for the villagers. As per their opinion, the proposed project of PHE will benefit the village women and children mostly and it is required too.

Photographs of consultation meeting at Primary Health Sub-center, Rajarhat GLR Site

Table A9.2. Consultation at Primary School near Proposed GLR Site, Rajarhat

	Date Of Visit	Block	Mouza	Gram Panchayat	OHR/ GLR Zone Code	No. of Participants	Concerns / Issues Discussed
2	08.02.17	Rajarhat	Kashinathpore	Garaguri GP Free Primary School, Patharghata	GLSR	Head of the Institution Mrs. Runa Chowdhury and 4 teaching staff of school	The Primary School is situated just behind the proposed Rajarhat GLR site. The School runs with 96 students and three teaching staffs. Ms. Runa Roy, head of the Institute said that, there is a tubewell within the school campus which is the main source of water and that too 350 - 400 mt deep. She stated that arsenic free water has been a long standing demand for the area, hence the initiatives taken by PHE must be praised

Photographs of consultation meeting at Primary School near Rajarhat GLR Site

Table A9.3. Consultation with Local Community Members at Bhangar

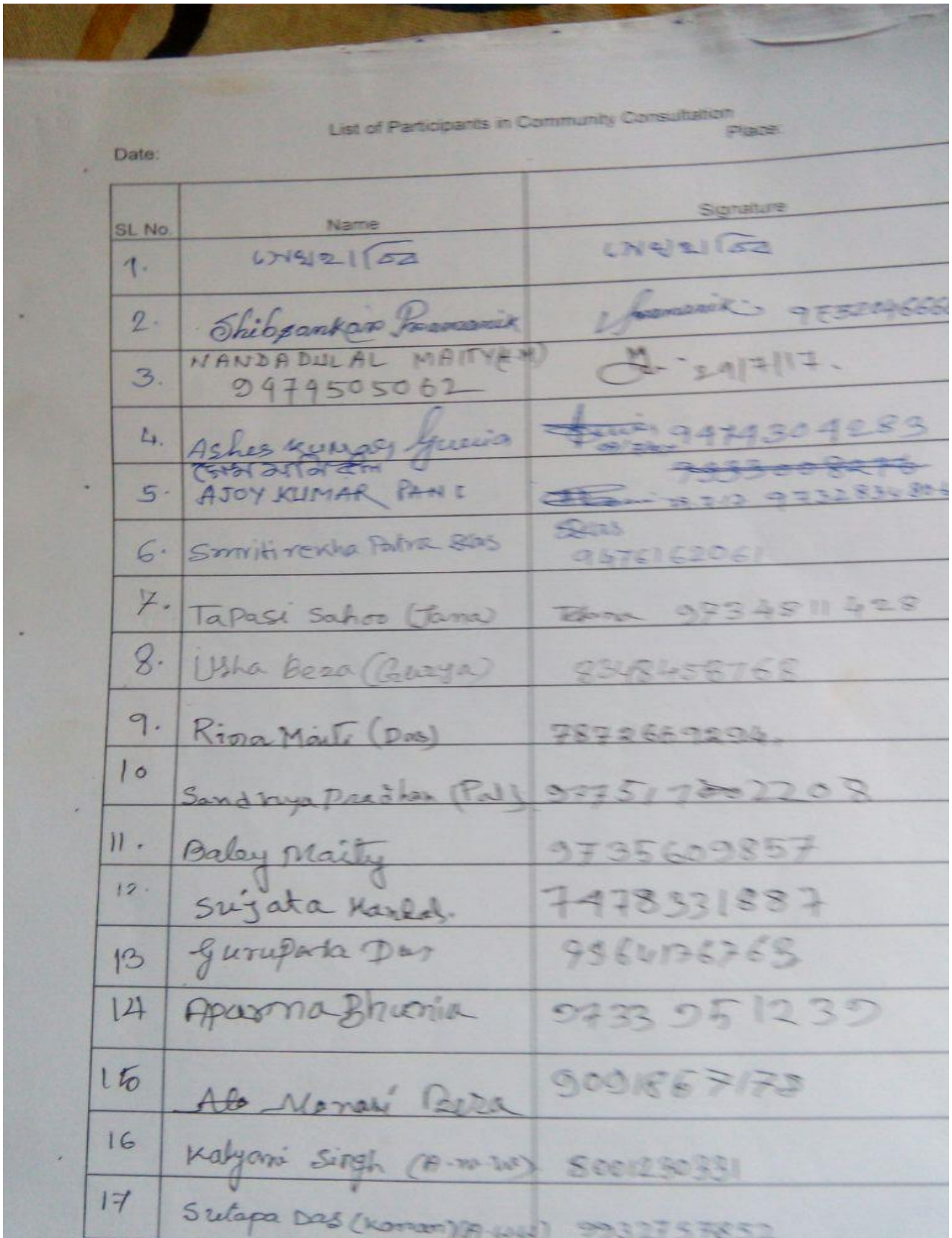
	Block	Mouza	GP	OHR/GLR Zone Code	No. of Participants	Concerns/Issues Discussed
1	Bhangar- II	Satulia	Bhagabanpur	GLR Site	Male : 7 Female : 2 Total : 9	• Requirement of piped water supply in the area is broadly accepted by all the participants. • Poor quality of drinking water causing threat for the health of local villagers and cattle's too. • Ground Water can be contaminated by Arsenic, hence, surface water is ideal. • Apart from domestic connection, if possible, the authority may consider to expand the scope of use of piped water to agricultural purpose also. • A reasonable and affordable water tariff fixed by the government will be gladly accepted by all.
2	Bhangar- II	Satulia	Bhagabanpur	Irrigation Department land near approach to GLR site	8 women 2 girls Total=10	A cluster of squatter households is located on Irrigation Department land close to the proposed GLR site, Bhangar. On being asked where they collect water from at present, the participants replied that women and girl children had to travel almost 1 Km distance to fetch water from a tubewell, and spend about 2 hours each day for the same. As squatter/non-titleholder households, they were concerned whether they would receive water from the project. Every household was desirous of an individual connection and indicated willingness to pay a reasonable user charge, while expressing inability to bear connection charge at one go. In case the project could not provide individual connections, they urged that their cluster be provided with standposts, which they would maintain.

3	Bhangar- II	Pithapukuria	Bhagabanpur	Bamunia sch (Z-1)	Male : 8 Female : 2 Total : 10	• Consultation with the local people revealed that, they are aware about the side effects of consuming arsenic contaminated water. As they do not have any alternate choices so they choose to use the same. Local tube wells are checked periodically through Panchayats and health dept. officials. • The proposed water supply project of PHED will solve their problem permanently. Treated Surface water will not only be good for their health but at the same time people purchasing water from private source will be able save money. Health related expenses due to water will be reduced which will indirectly increase the savings. Women & children are expected to have more benefits. • In the question of affordability, the respondents unanimously said that they are willing to pay charges if provided individual household connections.

Table A9.4. Consultation with Affected Persons and Community Members at Proposed GLR Site, Haroa

	Date of Visit	Block	Mouza	Gram Panchayat	OHR / GLR Zone Code	No. of Participants	Concerns/Issues discussed
2	15.1.17	Haroa	Nazarnagar	Sonapukur Sankarpur	GLSR	7 male	By lessee: whether 5 bighas land really required, as any land sale over 4 bighas would lead to loss of income of more than Rs. 1 lakh per month to the kiln and would affect him and his workers. By owners/family members: Whether project operation related job could be assured for a member of the land seller's families. By community members: When the project would be operational, how much would be the connection and operation charges.

List of Participants in Consultation: Rajarhat



List of Participants in Community Consultation

Date: Place:

SL No.	Name	Signature
1.	[illegible]	[illegible]
2.	Shibsankar Pramanik	Pramanik 97520466[illegible]
3.	NANDADULAL MAITY(E.M) 9474505062	[illegible] 29/7/17.
4.	Ashes kumar Guria	[illegible] 9474304283
5.	[illegible] AJOY KUMAR PANI	[illegible] 97322834[illegible]
6.	Smritirekha Patra Bas	[illegible] 9576162061
7.	Tapasi Sahoo (Jana)	[illegible] 9734511428
8.	Usha Bera (Guraya)	9348458768
9.	Rina Maiti (Das)	7872669294.
10	Sandhya Pradhan (Pal)	97751[illegible]2208
11.	Baloy Maity	9735609857
12.	Sujata Kandal.	7478331887
13	Gurupada Das	9564176768
14	Aparna Bhunia	9733951239
15	Alo Manasi Bera	9001867178
16	Kalyani Singh (A-W-W)	5001230331
17	Sutapa Das (Koman)(A-WW)	9932757852

List of Participants in Consultation: Rajarhat

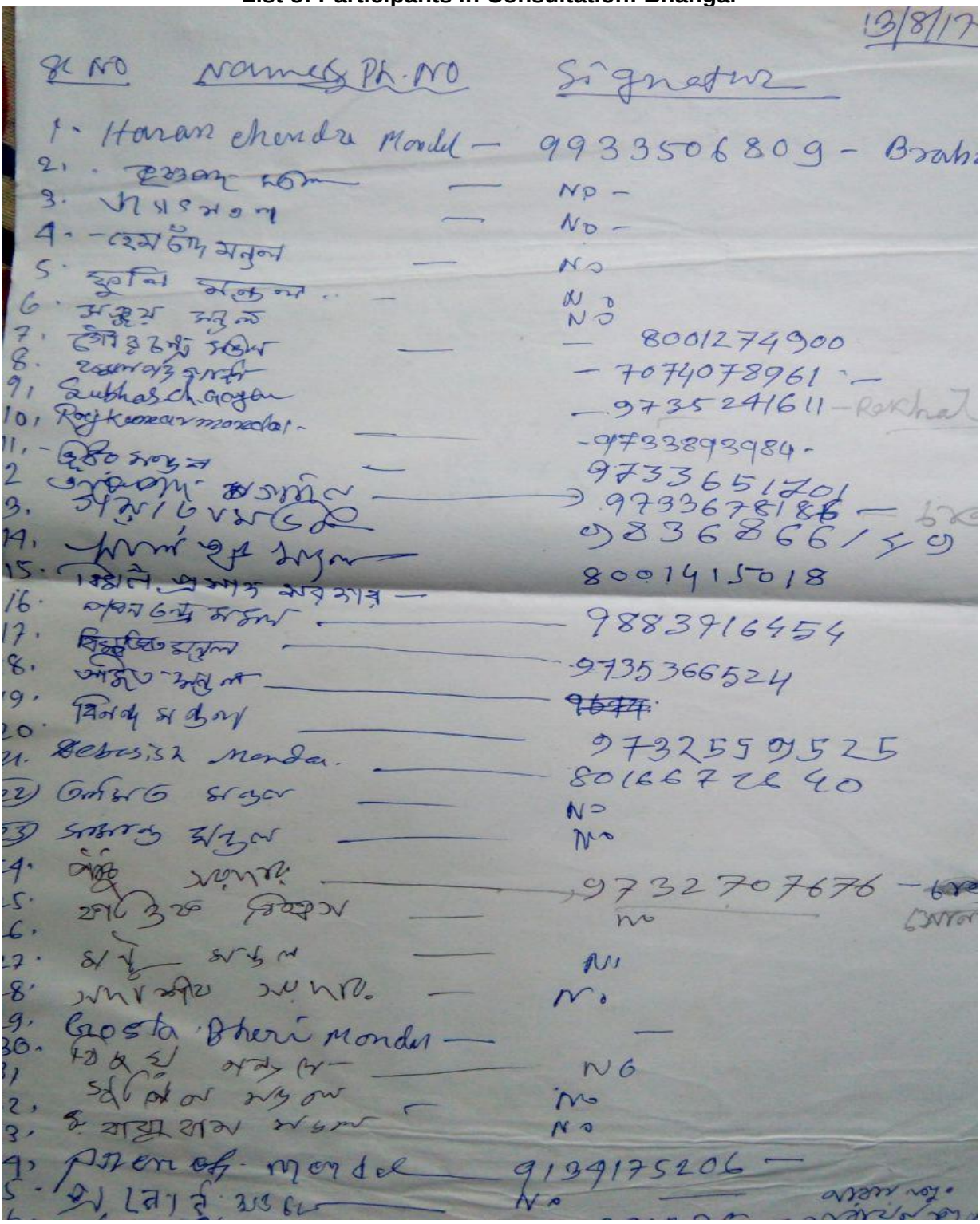
LIST OF PARTICIPANTS IN COMMUNITY CONSULTATION

DATE :

PLACE :

SL. NO.	NAME	PHONE NO.	SIGNATURE
	Mayna Mondal	9748204577	মমতা S.H.G
	Madhabi Jar	9775190060	Madhabi Jar
	Pampa Jar	9134910675	Pampa Jar
	মুক্তি মন্ডল	969494[illegible]	মুক্তি মন্ডল
	কল্যাণী মন্ডল		
	জ্যোৎস্না মন্ডল	83460975 18	
	শিউলী মন্ডল	9134175230	মমতা S.H.G
	নমিতা মন্ডল		মমতা S.H.G
	লক্ষ্মী মন্ডল		লক্ষ্মী মন্ডল
	সরোজ মন্ডল	9735319162	সরোজ মন্ডল
	নারগিস খাতুন	7074010247	
	গীতবালা মন্ডল	"	
	বাসন্তী মন্ডল		
	কাজল বিবি	9735455058	উজ্জ্বল S.H.G
	কবিতা মন্ডল		
	[illegible]		
	জ্যোৎস্না বিবি	9934309834 (SHG)	
	কুসুম মন্ডল	8766236256	

List of Participants in Consultation: Bhangar



List of Participants in Consultation: Haroa

5/8 Haroa

List of Participants in Community Consultation

Place:

Sl. No.	Name	Signature
	[illegible]	[illegible]
	Bithika Mondal	Bithika Mondal (Ph-8101388583)
	[illegible]	[illegible] (Ph-9093633734)
	[illegible]	[illegible]
	[illegible]	[illegible] (9735319162)
	ছায়া মণ্ডল	ছায়া মণ্ডল 8346097518
	[illegible]	[illegible]
	Madhabi Mondal	Ma ph-8420726994
	[illegible]	7679756576
	[illegible]	
	[illegible] 9800538063	
	Amita Ghosal	8001112824
	[illegible]	9681702785
	বিজলী মণ্ডল	9593465091
	[illegible]	
	[illegible]	7076540581
	[illegible] ([illegible] SH-07)	8509718395

Photos of Stakeholder Consultations

SAMPLE GRIEVANCE REGISTRATION FORM

(To be available in Bengali and English)

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	Project Town Project:			
Contact information/personal details					
Name		Gender	* Male * Female	Age	
Home address					
Place					
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 officials reviewing grievance)	
Action taken:	
Whether action taken disclosed:	Yes No
Means of disclosure:	

SAMPLE OUTLINE SPOILS (CONSTRUCTION WASTE) MANAGEMENT PLAN

- The Spoil Management Plan should be site specific and be part of the monthly Construction Management Plan.
- The contractor, in consultation with the PIU, has to find out appropriate location/s for the disposal of the excess soil generated. The spoils should be deposited only at these sites.
- Further precautions need to be taken in case of the contaminated spoils
- The vehicle carrying the spoil should be covered properly.
- The spoils generating from each site should be removed on the same day or immediately after the work is complete. The site / road should be restored to the original condition.

I. Spoils information

The spoil information contains the details like a) The type / material, b) Potential contamination by that type, c) Expected volume (site / component specific), d) Spoil Classification etc.

II. Spoils management

The Spoil Management section gives the details of a) Transportation of spoil b) disposal site details c) Precautions taken d) Volume of contaminated spoil, if present, d) Suggested reuse of disposal of the spoil

III. Documentation

The volume of spoil generated (site specific, date wise), site disposed, reuse / disposal details should be documented properly.

SAMPLE OUTLINE TRAFFIC MANAGEMENT PLAN

A. Principles for Traffic Management Plan around the Water Pipes Construction Sites

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; and
(v) 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 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.

3. **Figure A12.2 to Figure A12.12** illustrates the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

C. Analyze the impact due to street closure

4. 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 ULB/Public Works Department (PWD) 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.

5. 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 A12.1: Policy Steps for the TMP

D. Public awareness and notifications

6. 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 PIU 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. 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**.** **Figure A11.2 to Figure A11.6** illustrates a typical set-up for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics:

- Work on shoulder or parking lane
- Shoulder or parking lane closed on divided road
- Work in Travel lane
- Lane closure on road with low volume
- Street closure with detour

13. 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.

14. 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. Flagggers/ 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.

16. 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.

Figure A12.2 and A12.3: Work on Shoulder or Parking Lane and Shoulder or Parking Lane Closed on Divided Road

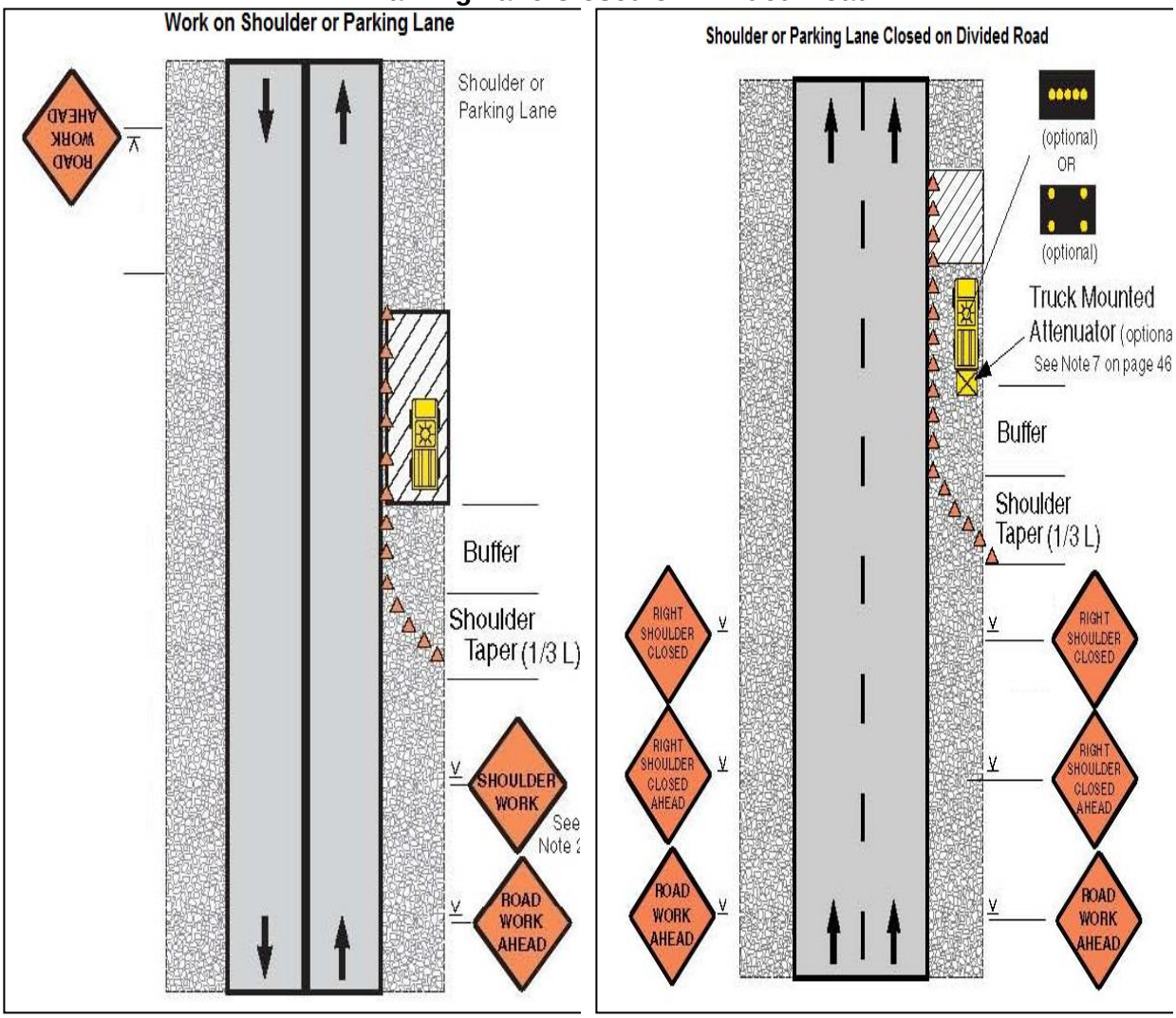


Figure A12.4 and A12.5: Work in Travel lane and Lane Closure on Road with Low Volume

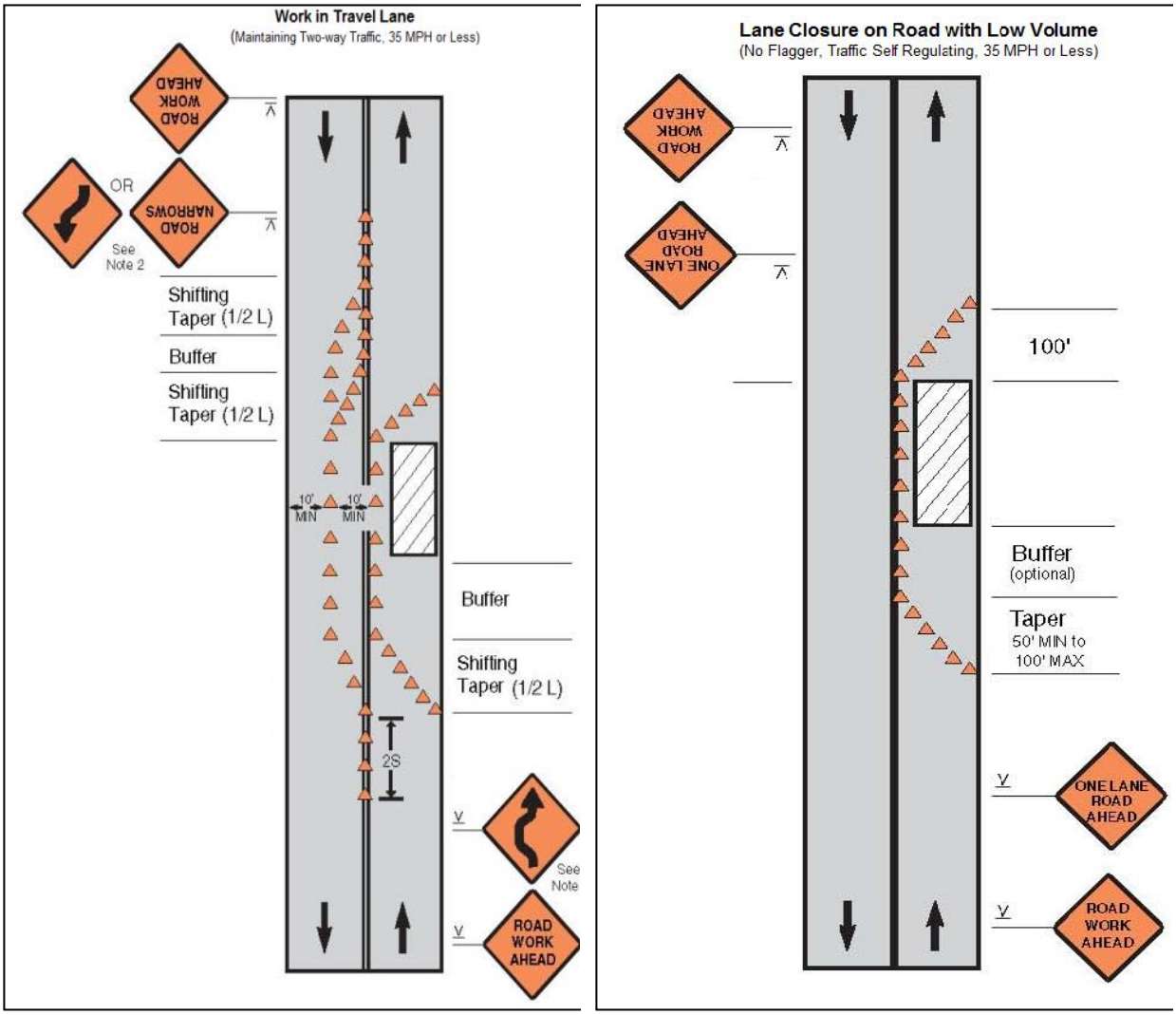
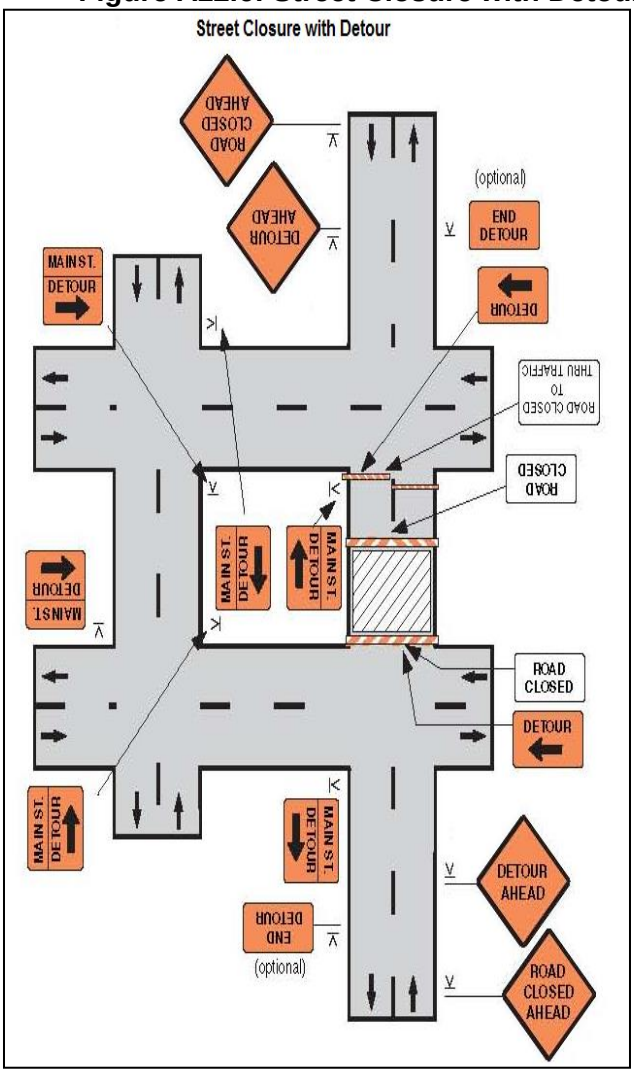


Figure A12.6: Street Closure with Detour



SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name
Contract Number

NAME: _____ DATE: _____
TITLE: _____ DMA: _____
LOCATION: _____ GROUP: _____

WEATHER:

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Monitoring Items	Compliance
Compliance marked as Yes / No / Not applicable (NA) / Partially Implemented (PI)	
EHS supervisor appointed by contractor and available on site	
Construction site management plan (spoils, safety, schedule, equipment etc.,) prepared	
Traffic management plan prepared	
Dust is under control	
Excavated soil properly placed within minimum space	
Construction area is confined; no traffic/pedestrian entry observed	
Surplus soil/debris/waste is disposed without delay	
Construction material (sand/gravel/aggregate) brought to site as and when required only	
Tarpaulins used to cover sand and other loose material when transported by vehicles	
After unloading, wheels and undercarriage of vehicles cleaned prior to leaving the site	
No asbestos cement pipes disturbed/removed during excavation	
No chance finds encountered during excavation	
Work is planned in consultation with traffic police	
Work is not being conducted during heavy traffic	
Work at a stretch is completed within a day (excavation, pipe laying and backfilling)	
Pipe trenches are not kept open unduly	
Road is not completely closed; work is conducted on edge; at least one line is kept open	
Road is closed; alternative route provided and public informed, information board provided	
Pedestrian access to houses is not blocked due to pipe laying	
Spaces left in between trenches for access	
Wooden planks/metal sheets provided across trench for pedestrian	
No public/unauthorized entry observed in work site	
Children safety measures (barricades, security) in place at works in residential areas	
Prior public information provided about the work, schedule and disturbances	
Caution/warning board provided on site	
Guards with red flag provided during work at busy roads	
Workers using appropriate PPE (boots, gloves, helmets, ear muffs etc.)	
Workers conducting or near heavy noise work is provided with ear muffs	
Contractor is following standard and safe construction practices	
Deep excavation is conducted with land slip/protection measures	
First aid facilities are available on site and workers informed	
Drinking water provided at the site	
Toilet facility provided at the site	

Monitoring Items	Compliance
Separate toilet facility is provided for women workers	
Workers camps are maintained cleanly	
Adequate toilet and bath facilities provided	
Contractor employed local workers as far as possible	
Workers camp set up with the permission of PIU	
Adequate housing provided	
Sufficient water provided for drinking/washing/bath	
No noisy work is conducted in the nights	
Local people informed of noisy work	
No blasting activity conducted	
Pneumatic drills or other equipment creating vibration is not used near old/risky buildings	

Signature

_____

Sign off

_____ _____

Name **Name**
Position **Position**

SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORT TEMPLATE FOR DSC/PIU

1. Introduction

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

Name	Designation/Office	Email Address	Contact Number
1. PMU			
2. PIUs			
3. Consultants			

- Overall project and sub-project progress and status
- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

Package Number	Components/List of Works	Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Completed/O&M)[a]	Contract Status (specify if under bidding or contract awarded)	If On-going Construction	
				%Physical Progress	Expected Completion Date

[a] If on-going construction, include %physical progress and expected date of completion.

2. Compliance status with National/State/Local statutory environmental requirements[a]

Package No.	Subproject Name	Statutory Environmental Requirements[b]	Status of Compliance[c]	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish[d]

[a] All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.

[b] Specify (environmental clearance? Permit/consent to establish? Forest clearance? etc.).

[c] Specify if obtained, submitted and awaiting approval, application not yet submitted.

[d] *Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.*

3. Compliance status with environmental loan covenants

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

4. Compliance status with the environmental management plan (refer to EMP Tables In Approved IEE/s)

- Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

Package-wise Implementation Status

Package Number	Components	Design Status (Preliminary Design Stage/Detailed Design Completed)	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? (Yes/No)	Remarks
			Not yet due (detailed design not yet completed)	Submitted to ADB (Provide Date of Submission)	Disclosed on project website (Provide Link)	Final IEE provided to Contractor/s (Yes/No)		

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.
- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as appendix all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below

- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).

- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:

  (i) **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).

  (ii) **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

  - Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
  - Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
  - Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
  - Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.
  - Confirm spill kits on site and site procedure for handling emergencies.
  - Identify any chemical stored on site and provide information on storage condition. Attach photograph.
  - Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
  - Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
  - Provide information on barricades, signages, and on-site boards. Provide photographs.
  - Provide information on
  - Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary of Environmental Monitoring Activities (for the Reporting Period)[a]

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

[a] Attach Laboratory Results and Sampling Map/Locations.

Overall Compliance with CEMP/ EMP

No.	Sub-Project Name	EMP/ CEMP Part of Contract Documents (Y/N)	CEMP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

5. Approach and Methodology for Environmental Monitoring of the Project

- Brief description on the approach and methodology used for environmental monitoring of each sub-project

6. Monitoring of environmental Impacts on Project Surroundings (Ambient Air, Water Quality and Noise Levels)

- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

As a minimum the results should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 µg/m^3	SO2 µg/m^3	NO2 µg/m^3

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m^3	SO2 µg/m^3	NO2 µg/m^3

Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Site No.	Date of Sampling	Site Location	Parameters (Monitoring Results)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Noise Quality Results

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Monitoring Results)	
			Day Time	Night Time

7. Summary of Key Issues and Remedial Actions

- Summary of follow up time-bound actions to be taken within a set timeframe.

8. Appendixes

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- Other

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

Resolution

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 ☐ No ☐

Signature
_____

Sign off

_____ _____

Name **Name**
Position **Position**