



**DANIDA SUSTAINABLE  
INFRASTRUCTURE FINANCE**



# SAIDABAD WATER TREATMENT PLANT PROJECT, PHASE III

**DESIGN & SUPERVISION CONSULTANTS (DSC)** FOR THE MANAGEMENT, DESIGN, AND SUPERVISION FOR DESIGN REVIEW AND SUPERVISION OF CONSTRUCTION FOR COMPONENT 2 OF THE SAIDABAD III WATER TREATMENT PROJECT, COMPRISING WATER TREATMENT PLANT AND SLUDGE TREATMENT PLANT

CONTRACT NO. 46.113.620.12.011.100.2018-32

**PROJECT MANAGEMENT CONSULTANTS (PMC)** FOR THE MANAGEMENT, DESIGN, AND SUPERVISION FOR DESIGN REVIEW AND SUPERVISION OF CONSTRUCTION FOR COMPONENTS 1&3 OF THE SAIDABAD III WATER TREATMENT PROJECT, COMPRISING INTAKE, RAW WATER PUMPING STATION AND TRANSMISSION PIPELINE AND ENHANCEMENT OF THE DISTRIBUTION SYSTEM

CONTRACT NO. 46.113.620.12.00.099.2018-27

## **ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)**

**DSC & PMC COMBINED VERSION AUGUST 2023,  
FOLLOWED BY PMC UPDATE IN APRIL 2025**

**CLIENT  
FINANCER**

Dhaka Water Supply and Sewerage Authority (DWASA)  
DANIDA Sustainable Infrastructure Finance (DSIF)



**DANIDA SUSTAINABLE  
INFRASTRUCTURE FINANCE**



**COWI**

ADDRESS COWI A/S  
Parallelvej 2 2800 Kongens  
Lyngby Denmark

PROJECT OFFICE House No 14, Road-32,  
Gulshan, Dhaka, Bangladesh

TEL +45 56 40 00 00  
WWW cowi.com

# SAIDABAD WATER TREATMENT PLANT PROJECT, PHASE III

**DESIGN & SUPERVISION CONSULTANTS (DSC)** FOR THE MANAGEMENT, DESIGN, AND SUPERVISION FOR DESIGN REVIEW AND SUPERVISION OF CONSTRUCTION FOR COMPONENT 2 OF THE SAIDABAD III WATER TREATMENT PROJECT, COMPRISING WATER TREATMENT PLANT AND SLUDGE TREATMENT PLANT  
CONTRACT NO. 46.113.620.12.011.100.2018-32

**PROJECT MANAGEMENT CONSULTANTS (PMC)** FOR THE MANAGEMENT, DESIGN, AND SUPERVISION FOR DESIGN REVIEW AND SUPERVISION OF CONSTRUCTION FOR COMPONENTS 1&3 OF THE SAIDABAD III WATER TREATMENT PROJECT, COMPRISING INTAKE, RAW WATER PUMPING STATION AND TRANSMISSION PIPELINE AND ENHANCEMENT OF THE DISTRIBUTION SYSTEM  
CONTRACT NO. 46.113.620.12.00.099.2018-27

## ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA) DSC & PMC COMBINED VERSION AUGUST 2023, FOLLOWED BY PMC UPDATE IN APRIL 2025

PROJECT NO. DOCUMENT NO.  
A201608; 100398092 DSCJV-ENV-RP-CMP2-0028  
(MOTT MACDONALD)

VERSION	DATE OF ISSUE	DESCRIPTION	PREPARED	CHECKED	APPROVED
01	08 MARCH 2023	Draft issue to DWASA for comment	COWI-MM JV TEAM	Quentin Rea, Rubén Asorey	Ahbar Choudhury, Rubén Asorey
02	17 APRIL 2023	For Approval	COWI-MM JV TEAM	Quentin Rea	Ahbar Choudhury, Rubén Asorey
03	1 JUNE 2023	Updated following DSIF comments dated 12 May 2023	COWI-MM JV TEAM	Quentin Rea	Ahbar Choudhury, Rubén Asorey
04	24 JULY 2023	Combined Report updated with DSIF's and AFD's comments. This version was approved by DSIF for Component-2.	Mohammad Nurul Alam Siddique, Farzana Rahman Moury COW-MM JV TEAM	Cristobal Martinez Garcia, Quentin Rea, Ahbar Choudhury	Dipankar Basak, Rubén Asorey

VERSION	DATE OF ISSUE	DESCRIPTION	PREPARED	CHECKED	APPROVED
05	03 MAY 2024	PMC (Led by Mott MacDonald) updated this version in COWI's reporting template for Final ESIA "No Objection" from EIB, DSIF, KfW and AFD. All the previous comments on ESIA were discussed during the working sessions attended by Dhaka WASA and all the project funders on 29 <sup>th</sup> April 2024 and 2 <sup>nd</sup> May 2024	Mohammad Nurul Alam Siddique, Shamsunnahar, Farzana Rahman Moury	Selvihan Balcioğlu, Ahbar Choudhury	Dipankar Basak
06	14 MAY 2024	EIB's new set of comments given on 15 <sup>th</sup> Oct 2024 after the final ESIA Meeting on 2 <sup>nd</sup> May 2024	Mohammad Nurul Alam Siddique, Shamsunnahar, Farzana Rahman Moury	Ahbar Choudhury	Dipankar Basak
07	19 DECEMBER 2024	EIB's follow-on comments given on 12 <sup>th</sup> Nov 2024 and 17 <sup>th</sup> Dec 2024 addressed	Mohammad Nurul Alam Siddique, Farzana Rahman Moury	Ahbar Choudhury	Dipankar Basak
08	16 JANUARY 2025	ESIA Conditional Approval comments given by EIB on 24 <sup>th</sup> December 2024 are addressed	Mohammad Nurul Alam Siddique, Farzana Rahman Moury	Ahbar Choudhury	Dipankar Basak
09	17 APRIL 2025	EIB comments given on Apr 2025 addressed	Farzana Rahman Moury	Dipankar Basak	Dipankar Basak

**DISCLAIMER**

This document is issued for the party which commissioned it for specific purposes connected with the above-captioned project only. It should not be relied upon any other party or used for any other purpose. We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any errors or omission which is due to an error or omission in data supplied to us by other parties. This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

# PREAMBLE

## Objective

The Environmental and Social Impact Assessment of the Saidabad Water Treatment Plant Phase III was done in August 2014 by EGIS and IWM during the feasibility stage of the project and licensed from the Department of Environment in due course. As Dhaka Water Supply and Sewerage Authority (DWASA) started, project implementation from July 2021, it was required to review and update, as necessary for the change(s) happened with time and planning of the project. To implement the project components, DWASA has appointed two sets of consultants, namely, Project Management Consultant (PMC) for the execution of component 1 and 3, and Design and Supervision Consultant (DSC) for the execution of component 2. **Version 4 of this ESIA document was updated by both PMC and DSC as a combined report covering the overall impact to proposed works for Saidabad Phase-III and consequently approved by DSIF for Component-2.**

This document is further updated to Version 7 to address EIB's follow-on comments on Component-1 and therefore this version is updated by PMC only, led by Mott MacDonald (COWI was not involved in updating to Version-5, 6 & 7 although the previous template was used for continuity as per DWASA's instruction to prepare a combined ESIA document for Component 1&3 and Component 2 of sub-projects together). The project financiers' representatives from EIB, DSIF, KFW and AFD were present during group working sessions on 29<sup>th</sup> April 2024 and 2<sup>nd</sup> May 2024 where all the previous comments received separately from each financier were discussed and agreed. This Version-5 of the ESIA is submitted on 3<sup>rd</sup> May 2024 for ESIA "No Objection" from each financier separately, so that a unified approval of the document can be given to proceed with individual financier's loan agreement with Government of Bangladesh (GoB).

EIB provided follow-on comments on 15/10/24, 12/11/24, and 17/12/24, all of which have been addressed in Version-7 of the ESIA. EIB then gave conditional approval of Version-7, subject to addressing several minor comments. **This final Version-9 of the ESIA addresses all the previous comments (ESIA conditional approval comments given by EIB in Dec 2024 and follow-on comments in Apr 2025) and is now ready for use during the construction delivery of the Saidabad Water Treatment Plant Project Phase-III.**

This updated document is weighed against various changes that are now deemed necessary to deliver the SWTPPP III project including an update on the studies conducted over the months of May 2022 and December 2022 to January 2023 by PMC and DSC respectively. This establishes a set of current baseline requirements. The original structure of the 2014 ESIA report was retained with brief updates introduced in sections wherever needed.

The scope of this updating aligns with the requirements as defined in the activity G: Review and Update of ESIA and Associated Documents of the Terms of References of PMC and DSC. As per the DSC contract ToR, DSC has led the ESIA aspect of overall Saidabad Phase-III project and will coordinate with PMC, as necessary.

## Background Information

The Saidabad Water Treatment Plant Phase-III is comprised of the following three components:



- > Component 1: A new raw water intake at Meghna River at a point with good water quality and transmission system to convey 950,000 m<sup>3</sup>/day to water treatment plants at Saidabad in Dhaka.
- > Component 2: New Water Treatment Plant (WTP) of 450,000 m<sup>3</sup>/day capacity and a combined sludge treatment facility with capacity to treat the sludge generated from Saidabad I, II and III WTPs.
- > Component 3: Extension of the primary and secondary distribution network comprising approximately 54kms of pipelines that carry the treated water to consumers.

Component 1 & 3 is financed by Agence Française de Développement (AFD) and Kreditanstalt für Wiederaufbau (KfW). European Investment Bank (EIB) is financing Component 1 only. All taxes and custom duties will be financed by Government of Bangladesh (GoB). The Project Management Consultant (PMC) consists of a joint venture (JV) of Mott MacDonald-SWECO-Artelia will be undertaking design review and construction supervision.

Component 2 is financed by DANIDA Sustainable Infrastructure Finance (DSIF) and Government of Bangladesh (GoB). Component 2 shall be supervised by the Design and Supervision Consultant (DSC) which is a joint venture between COWI and Mott MacDonald.

A significant proportion of the baseline data presented in the 2014 ESIA report has undergone changes. PMC have proposed realignment of the feasibility stage raw water pipeline route (component 1) to avoid the constraints along the Dhaka-Sylhet highway and improve buildability conditions of the raw water transmission pipeline. Apparently, there is no change in the planning of components 2 and 3.

It is envisaged that the construction stage Environmental and Social Management Plan (ESMP) will be based on this ESIA.

The key tasks carried out as part of this review and updating of the 2014 ESIA report are:

- 1 Conduct a review of the 2014 ESIA report
- 2 Identify aspects which need update
- 3 Ensure coordination between the PMC and DSC for Components 1, 2 and 3 of the Saidabad Phase-3 project and any specific environmental authority on regulatory aspects
- 4 Consult with Knowledge Management Consultant regarding RAP (1, 2 and 3) and review relevant sections of the RPF in this document
- 5 Conducting necessary environmental and social baseline survey to establish the current baseline
- 6 Updating the ESIA
- 7 Contributing to DSC led CSR plan

The raw water pipeline route has undergone significant changes between Kanchpur circle and Mridhabari including introduction of major subsurface crossings such as tunnels and shafts and the use of Demra canal for pipeline construction. Similarly, modifications have been introduced in the distribution network pipeline route as well to facilitate new connections and to reduce construction hazards.

DWASA has appointed KMC to prepare Resettlement Action Plans (RAP) for the project components. It is worth noting that the areas for the component 2, Saidabad Water Treatment Plant Phase III has already been under the possession of DWASA and does not demand any resettlement. The component 3 (Primary & Secondary Distribution Mains for Saidabad Phase-III WTP) route will follow Dhaka South City Corporation Road alignment; hence no RAP is required but necessary permission (signing of MOU) will be needed. KMC have planned and are under the process of developing necessary RAPs for the part of component 1 that covers the Raw Water Transmission line route starting from Raw water pumping station at Haria to Mridhabari Sluice Gate. The whole route is divided into 4 sections and covered by 3 RAPs as stated below:

- > RAP-1: From Raw water pumping station to near Darikandi Bus stand of Dhaka- Chittagong Highway (6 km.)
- > RAP-2: From Mridhabari Sluice Gate to Saidabad Water Treatment Plant's existing site boundary,
- > RAP-3a: 8.5 km along Dhaka-Chittagong Highway up to Kanchpur Bridge Circle.
- > RAP3b: Along the DND canal (from Demra to Mridhabari.
- > RAP3c: 54 km Primary & Secondary Distribution Mains for Saidabad Phase-III WTP.

*Source: Table 0:1: Project Alignment at a Glance, December 2018 RAP-1 of KMC.*

It is noted that RWP route along Dhaka – Chattogram highway is currently being finalized between PMU and RHD and is awaiting a final MoU between the two departments. In absence of a finalized route and a MoU, Resettlement Action Plan-3 (RAP3a) could not be progressed by KMC as on date. RAP1 and 2 have however been progressed to a large extent and land access has been secured. The RAP report summary is addressed in subsection 6.5 of Section 6 of this ESIA report. For detail study, the RAP report is also annexed in this ESIA report as Annex-F.

Preliminary surveys conducted in February 2022 and January 2023

A preliminary short reconnaissance site visit was carried out by a team of specialists from PMC (social and gender specialist, environmental specialist and engineers) on 14th February 2022. Subsequently a meeting was held with the MD, KMC (Resettlement NGO) on 16 February 2022, and 19 January 2023 to enquire about the present status of their activities relevant to RAP 1, 2 and 3.

During the visit, informal group discussions were held with local people and various stakeholders. Based on the preliminary survey PMC recommended the following further studies comprising site visits and surveys to assess current scenario of the locations and peoples' perspectives:

- > A sample social survey to get final sex-disaggregated stakeholder list and confirmed list of compensations and mitigation measures
- > Approximately 3 (three) Focus Group Discussions (FGD), numbers are likely to be required with at least one with only-women stakeholders
- > Key Informants Interview (KII) around 5 (five) of the affected people and local leaders

Detail investigations  
and surveys  
conducted in May  
2022 and December  
2022 and January  
2023

**May 2022**

A 5-days site visit was carried out on 12th to 16th May 2022 together with Social and Gender Specialist, a 4-members survey team and a project Engineer. During the visit, some informal group discussions were held with local people and various stakeholders. A sample social survey was conducted while a total of 100 individual stakeholders were interviewed through a questionnaire survey. A total of 15 Focus Group Discussions (FGDs) were held, and some affected people's in-depth interview were conducted.

**December 2022 and January 2023**

A total of 9 (nine) Focus Group Discussions organized in different locations of neighbourhood locations of WTP Component-2 construction area for updating the ESIA report. To get people's view on possible impact on social aspects due to the project intervention a total of 140 local people were consulted through group discussions and noted their opinions.

There was a courtesy site visit carried out on 11th December 2022 in presence of Social and Gender Specialist and Environmental Specialist of DSC to assess current scenario of the locations for WTP and peoples' perspectives specifically officials of Saidabad WTP Phase-II of DWASA and project staff. An informal meeting was held with SWTPP-II O&M Team to be acquainted with the WTP site for Component-2 of Saidabad WTP Phase III. A transect walk was done by the group of experts during the site visit held in December 2022, to oversee the construction site of WTP C-2 of Saidabad Phase III. It was observed that the land for construction of WTP C-2 site is protected by the boundary wall which already belongs to DWASA. Then some informal discussions held with local people of neighbourhood locality including entrance and future pathway for construction materials carrying to the site.

Then another meeting was held at Saidabad WTP site office with the O&M Team and laboratory officials of SWTPP-II to know the probable competence or obstacles based on their experiences. There was another meeting held with Managing Director and RAP team of Knowledge Management Consultants (KMC / Resettlement NGO) and Project Director including Executive Engineer of SWTPP-III at the DWASA office to understand the RAP status of C-1 and C-3 and requirement of RAP for C-2 including present status of their activities in relation to resettlement and socio-economic status.

Detail information and data from this survey and FGDs are analysed and incorporated in this report. Some case studies were written based on in-depth interviews. Some tables, various charts, and location map of FGDs are inserted in this report for further review and visit.

To update the ESIA report, the PMC and DSC environmental team conducted some environmental monitoring in the 3<sup>rd</sup> week of May 2022 and 4<sup>th</sup> Week of December 2022. During this monitoring period, ambient air, noise, and surface water quality parameters were tested at the sites as well as sampled for laboratory testing. Chapter-3 provides an update with the latest baseline monitoring data obtained for the purpose of updating the ESIA report.

Overall approach used for surveys

- > A short Reconnaissance Site Visit
- > A Sample Social Questionnaire Survey
- > Focus Group Discussions (FGDs)

- > Key Informants Interview (KII)
- > Onsite monitoring of Ambient Air Quality at two locations
- > Onsite Noise Monitoring at 10 locations
- > Collection of River Water Sample from 3 Locations
- > Testing of collected surface water samples from the accredited Lab BCSIR and reporting

**Salient features of the updated ESIA Report**

The following paragraphs provide brief description of the updates that were made in the existing ESIA report.

**Project description (Chapter 2)**

This chapter is updated with the latest route alignment's description along with updated Maps and Figures relevant to the project description. In particular, the following maps are newly updated in this section:

- 1 Figure 2-2: Project Base Map for Saidabad Phase-III WTP
- 2 Figure 2-3: Cross Sectional Profile of Proposed RWT Mains along Dhaka-Chittagong Highway
- 3 Figure 2-6: Injection Point of Saidabad Phase III in the Distribution Network
- 4 Figure 2-7: Location of Landfill Site Operated by Dhaka South City Corporation
- 5 Figure 2-8: Saidabad Water Treatment Plant Project Phase-III Integrated Programme

### **Baseline Environment: Physicochemical (Chapter-3)**

This chapter updates the baseline environmental conditions in particular the ambient air, noise level and surface water quality. Subsections 5.3.4, 5.3.5 and 5.3.6 have been updated with the latest field information.

### **Baseline Environment: socio-economic (Chapter-7 of ESIA Report)**

This chapter was updated to reflect on the surveys and field visits that were conducted in 2022.

### **Descriptions and Findings of Field Visits**

The social surveys re-visited some households which are affected by planned construction of pipeline along the proposed route.

DWASA have appointed Knowledge Management Consultancy (KMC) to address all latest developments that may affect the Resettlement Action Plan (RAP). A validation of the RAP against the approved Resettlement Policy Framework (RPF) is currently being undertaken by KMC.

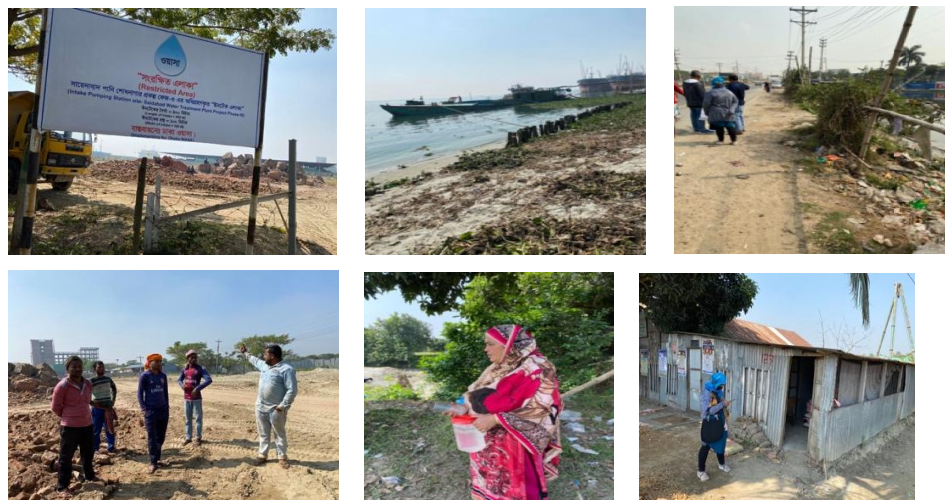
In Chapter-8, the public consultations findings, recommendations and proposals are narrated with tables and photos.

The following section of this report is an updated version of the ESIA baseline environment socio-economic part prepared as per social survey, FGDs, in-depth Interviews and informal meetings.

### **Reconnaissance Site Visit**

A short reconnaissance site visit was carried out on 14th February 2022 in presence of Social and Gender Specialist, Environmental Specialist and Project Engineers to assess current scenario of the locations and peoples' perspectives because the ESIA has been undertaken in 2014 about 8 years back. A meeting also held with the MD, KMC (Resettlement NGO) to understand the present status of their activities in relation to resettlement and socio-economic status.

During the site visit held in February 2022, a transect walk was done by the group of experts to oversee the construction of two mosque sites, river side of Meghna and other work sites. Then some informal group discussions held with local people & various stakeholders and an interview held with a local woman. Some photos are provided below:

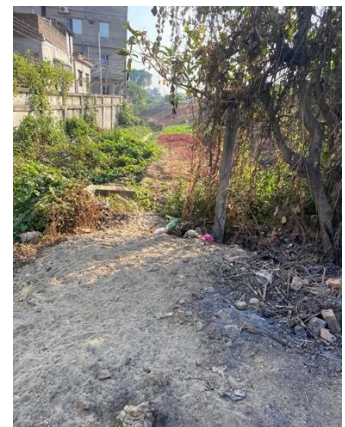




### Updates from December 2022 and January 2023

There was a courtesy site visit carried out on 11th December 2022 in presence of Social and Gender Specialist and Environmental Specialist of DSC to assess current scenario of the locations for WTP and peoples' perspectives specifically officials of Saidabad WTP Phase-II of DWASA and project staff. An informal meeting was held with the Quality Health Safety Security Environment (QHSSE) Manager and the Plant Manager of SWTP II to be acquainted with the WTP site for Component-2 of Saidabad WTP Phase III. A transect walk was done by the group of experts during the site visit held in December 2022, to oversee the construction site of WTP C-2 of Saidabad Phase III. It was observed that the land for construction of WTP C-2 site is protected by the boundary wall which already belongs to DWASA. Then some informal discussions held with local people of neighbourhood locality including entrance and future pathway for construction materials carrying to the site.

Then another meeting was held at Saidabad WTP site office with the SE, WSTP Circle of DWASA (accompanied by the Plant Manager and Microbiologist of Saidabad WTP Phase-II), to know the specific obstacles based on their experiences. There was another meeting held with Managing Director and RAP team of Knowledge Management Consultants (KMC / Resettlement NGO) and Project Director including Executive Engineer of SWTPP-III at the DWASA office to understand the RAP status of C-1 and C-3 and requirement of RAP for C-2 including present status of their activities in relation to resettlement and socio-economic status. Some photos from the WTP C-2 proposed construction site as below:



### May 2022 social survey

The reconnaissance site visit of February was further supplemented by a more comprehensive sample social survey carried out in May 2022 for 5-days from Haria of Sonargaon Upazila of Narayanganj district and ended at the Nandi Para. A total of 18 (eighteen) locations were visited where a sample questionnaire survey including FGDs and interviews were conducted. The specific objective of the social sample survey was to gather information on the existing social environment surrounding the proposed project sites. The social survey primarily focused on identifying the status of important economic and social factors / circumstances / attributes of the project areas. A total of one hundred inhabitants were interviewed in a prescribed questionnaire with a professional group of field researchers.

### **TEXT DELETED IN 2023**

The respondents raised concerns related to disruption during construction of the pipelines as the neighbourhood will be affected by noise/sound-dust pollution, contractor's working area and presence of construction staff which will affect usual movement of girls and women. They requested that remedial measures must be addressed in the contract to reduce this disturbance.

Another observation is that the small businessmen, vendors, and floating shops will also be affected by the construction work for the time being within the Resettlement Action Plan-3 (RAP3) boundary. The Social Expert team of PMC discussed this with KMC, the RAP team who will identify issues specific to each location and suggest remedial measures accordingly in the final RAP.

The respondents' concerns during the Focus Group Discussion (FGD), as part of 2014 ESIA update, were relayed to Dhaka WASA for grievance recording and future necessary actions. The grievance mechanism, defined in RAP-1 (December 2018) and RAP-2 (May 2019) reports, will be implemented under RAP Implementation. Above findings during FGD are more appropriate to report via the grievance mechanism rather than the ESIA report itself. Notably, the number of affected households and their legal entitlements for land acquisition were resolved under the "Acquisition and Requisition of Immovable Property Ordinance, 1982". The District Commissioners' (DC) offices of Dhaka and Narayanganj have already compensated the project-affected persons following the land acquisition ordinance of 1982.

### **Social Survey held in January 2023**

A social survey has been conducted for the Component 2 of SWTPP-III in January 2023 to collect primary data and information while a total of 60 people (Male 50 and female 10) had been interviewed through a prescribed questionnaire survey, 86 people (Male 65 and female 21) participated in the 9-Focus Group Discussions (FGD) in different locations close to WTP C2 sites including 5-Key Informants Interview (KII). More than 601 people have been directly interacted during the study (including survey, FGD, KII of 2013, May 2022 and January 2023); the questionnaire survey covered 272 respondents, 334 people participated in the 27 FGDs, and others participated in the formal/informal meetings.

Based on this ESIA (reviewed and updated), a set of recommendation in respect of the development of a Corporate Social Responsibility Plan (Annex-G) in compliance with item 2. Corporate Social Responsibility Plan under activity G: Review and Update of ESIA and Associated Documents is given in subsection 9.5 of Section 9 Environmental and Social Management Plan (ESMP) in this updated ESIA report.





# EXECUTIVE SUMMARY

## Background

Dhaka Water Supply and Sewerage Authority (DWASA), entrusted with the responsibility to supply potable water to Dhaka Metropolitan City and adjacent areas, meets 75% of the water demand through extraction from ground water sources. But the high rate of extraction to meet the demand of the city population is proving to be unsustainable as the ground water table is declining at an alarming rate of 2 – 3 m per year with a possibility of alarming environmental consequences in the future. To respond to this emerging scenario, DWASA has made a strategic decision to shift from ground water source to conjunctive use of surface and ground water source, as per direction of the Government of Bangladesh. Saidabad Phase – III surface water treatment plant (SWTP) will be a part of that endeavour. Therefore, the objective of the project is to increase the capacity of DWASA in supplying safe drinking water to the city population utilizing surface water sources and thereby diminishing the reliance on ground water resources and thereby, ensure water security.

The major activities associated with the implementation of the Saidabad phase-III project will be:

- 1 Construction of a 450 MLD surface water treatment plant at Saidabad site. The plant will include components such as clarification, rapid sand filtration, storage and high lift pumping facilities for treated water as well as treated water primary. Works will include sludge treatment for the phases I, II and III.
- 2 Construction of twin primary transmission line for raw water from the proposed intake in the Meghna River to the SWTP at Saidabad.
- 3 Construction of main feeder lines from the SWTP at Saidabad to the injection points of the water distribution system.

As a part of the feasibility study, a full scale Environmental and Social Impact Assessment (ESIA) of the proposed project has been carried out in 2014. As per the Environmental Conservation Rules 1997 (GoB, 1997) of the GoB, the proposed project involving construction of raw water transmission line, water treatment plant, and treated water transmission line, falls under “RED category” which makes it mandatory to conduct a full-scale ESIA study.

## Outline of Methodology

This study has used various data collection techniques to obtain primary and secondary information for conducting the environmental and social assessment. Relevant secondary information about the project areas and their surroundings were gathered from published literature. In addition, data and information were also collected from different government and non-government organizations. Climatic data of the project area was collected from the Bangladesh Meteorological Department (BMD).

Field visits were carried out by the study team to obtain first-hand information on the surrounding environment of the intake structure, water treatment plant, and routes of the raw water transmission lines. During these field visits, formal and informal discussions were carried out with people living in and around the project areas. A detailed reconnaissance survey was conducted to gather route specific information. In addition, a detailed route survey has been carried out along the proposed routes of raw and treated water transmission lines, covering the right of way (RoW) along the line.

An environmental baseline survey (including physical and ecological survey) and a social survey have been carried out to gather information on the existing physical, biological, and socio-economic environment of areas surrounding the proposed locations of intake structure, water treatment plant and the routes of water transmission lines. Subsequently, the possible environmental and social impacts of the project activities have been evaluated against these baseline environmental conditions. A stakeholder engagement plan has been prepared to list down the interested parties involved in this project. For this study, consultation with the DWASA officials, focus group discussions (FGDs) and Public Consultations in and around the project area have been carried out to get feedback from local people regarding different aspects of the proposed project.

For identification of potential environmental and social impacts of the project, the specific project activities to be carried out have been identified. The activities have been identified separately for construction phase and operational phase of the project. Impacts of these activities on the existing physical, ecological and social environments at the project sites and along the entire route of water transmission line have been assessed, both for construction and operational phases of the project. This exercise was followed by prediction and evaluation of the most significant impacts.

After detailed evaluation of impacts, mitigation measures have been devised for all potential adverse impacts that could result from the proposed project activities. Mitigation measures have been developed separately for adverse impacts during construction and operational phases. Finally, an environmental and social management plan has been developed, incorporating the mitigation measures and monitoring requirements.

#### Project Activities and Objectives of ESIA

The major activities to be carried out during the construction phase include: (i) Acquisition of required land (about 9 ha); (ii) Construction of intake channel, intake structure, raw water pumping station, and twin pipe raw water transmission line; (iii) Construction of water treatment plant (WTP) including all treatment units and ancillary facilities (e.g., pre-chlorination unit, clarification units, rapid sand filter units, clear water reservoir, clear water pumping facilities, sludge treatment facilities, administrative building, workshop building, generator room, guard room); (iv) Installation of water transmission line on land and (v) Installation of water transmission lines across 2 rivers (Old Brahmaputra and Shitalakhya rivers). The important issues to be addressed during the operational phase include: (i) Stability of river bank and intake facility; (ii) Availability of raw water; (iii) Raw water quality; (iv) Treated water quality; (v) Proper operation of treatment plant; (vi) Public health and DWASA service facilities; (vii) Sludge treatment and disposal; (viii) Safety of water distribution network; (ix) Disposal of additional volumes of wastewater that will be generated due to increased water supply in Dhaka city after completion of the project; and (x) Navigation in rivers and khals through which water transmission line has crossed.

In addition to above consideration, following assessment is included in relevant sections in this report. Regarding noise monitoring, noise and air pollution could result from excavation and other construction activities; and noise generated by construction activities will typically be for a short duration with minor adverse impact. During the operation phase, the raw water intake site is located between Aman Group Industrial plots; and raw water pumps will be contained in a building;

and with the measures to be taken during the operation phase, the anticipated impacts would be minimum. Identified impacts will be mitigated through measures described in Section 11.2 Mitigation Measures for both construction and operation phases. Noise Rating thresholds for operational activities ins

For the project, land appropriation for the project has completed within the scope of Saidabad Phase-3 upgrade. As summarised in section Preamble, number of affected households and their legal entitlements for land acquisition were resolved under the "Acquisition and Requisition of Immovable Property Ordinance, 1982". The District Commissioners' offices of Dhaka and Narayanganj have already compensated the project-affected persons following the land acquisition ordinance of 1982. After completing above-described land appropriation, no additional appropriation is anticipated; therefore, no new impact is envisaged.

During the operation phase, the intake site will experience some additional traffic due to operational staff movement. Operational staff movements will be monitored by implementing good industry practices during operation phase. Although minimum impact is anticipated, working hours to be adjusted in a way to avoid school hours, and spread across the shifts of the staff during operation.

The overall objectives of the ESIA of the proposed project were to identify potential significant environmental and social impacts, both positive and negative, during construction and operational phases of the project, recommend mitigation measures to avoid or reduce adverse environmental impacts and to enhance positive impacts, and to develop a comprehensive environmental management plan (EMP), including monitoring requirements, for both construction and operational phases of the project.

**Baseline  
Environment**

The environmental baseline survey has been carried out in areas surrounding the proposed locations of intake and water treatment plant, and along the route of the proposed water transmission line. The specific objectives of the baseline study were to gather information on the existing physical environment of the areas within and around the project sites, and to assess peoples' perception on different aspects of the proposed project.

**Physio-chemical  
Environment**

As a part of the baseline survey, a topographic survey was carried out along the route of the proposed transmission line from the proposed intake location at Haria to water treatment plant site at Saidabad in Dhaka. Locations of various features in the project areas, such as roads, drainage channels, water bodies, rivers, filling stations, electric poles, human settlement, and other permanent structures were identified. Relevant data on climate, geology and soils, air quality, noise level, and water quality (surface water and groundwater) were collected through field investigation as well as secondary sources.

***TEXT ADDED 2022 (by PMC and DSC)***

To update the ESIA report prepared in 2014, PMC (in 2022) and DSC (in 2023) studied the current baseline particularly ambient air quality, noise level, and surface water quality of the rivers within the study area. This updated ESIA report incorporated the current baseline information in the same baseline tables of 2014 to understand the changes of environmental and social parameters in the last 8 years. The changes are significant in comparison with the 2014 baseline data but are generally within the national standards of ECR'2023.

**Ecological  
Environment**

Ecological information in and around the project areas were collected through field research, consultation with local people, and literature review. The baseline ecological survey primarily focused on identifying floral and faunal diversity and their distribution and abundance as well as their biological status in Bangladesh (e.g. threatened flora and fauna). Protected areas, wildlife sanctuaries, game reserves and ecologically critical areas were also identified. No threatened floral species have been identified in the project area. However, endangered wildlife and fish species have been identified in the study areas which are considered threatened throughout the country as well.

Table E-0-1 and Table 6-5 list the threatened wildlife and fish species as declared by the World Conservation Union (IUCN). Yellow Monitor Lizard from reptilian family, Tire-trak Spinyeel and Indian Chaca from Osteichthyes family; and Ganges River Dolphin from mammals' family are identified as endangered species within project area.

No Protected Areas exists near any of the proposed project sites, though an ancient city namely Panam city –exist near the water intake point at Sonargaon. There is no National Park, Game Reserves, Wildlife Sanctuaries exist at or near the proposed project sites. The raw water transmission pipeline will cross the Sitalakhya river which has been declared as an Ecologically Critical Area.

In order to avoid impacts on endangered species along Sitalakhya River; the river crossing will be carried out by full bore deeps tunnel (3.5m dia., 2.2 km long). The risk of polluting Sitalakhya River and interaction with road traffic was fully eliminated by changing the design to full bore tunnel at Kanchpur river and road crossings.

**Socio-economic  
Environment**

***TEXT MODIFIED IN 2022 (by PMC)***

The assessment of the baseline of socio-economic conditions / attributes of the areas surrounding the proposed project sites was first made in 2013 and for the current baseline in May 2022 and December 2022. The specific objective of the social sample survey was to gather information on the existing social environment surrounding the proposed project sites. The social survey primarily focused on identifying the status of important economic and social factors / circumstances / attributes of the project areas.

For the current baseline, a total of 100 (one hundred) habitants have been interviewed in a prescribed questionnaire with a professional group of field researchers where 19% respondent were female. Most respondents are not involved with agriculture / cultivation, rather they are primarily involved with other types of income generating professions such as businesses. Respondents who are involved with cultivation prefer to cultivate paddy during winter season; during monsoon, they prefer fishing. Cattle rearing and poultry farming is a good source of income for local people. In the low laying areas, fodder is available throughout the year. Rearing of domestic fowl and duck is a common practice in the study areas. The egg and meat of these animals' supply nutrition to the local community. Few commercial poultry firms were also observed.

Efforts were made to identify the socio-economic attributes that may be impacted due to the proposed project activities by conducting field study, questionnaire survey, formal and informal interviews. The significant findings notified by the respondents are loss of land, houses, trees, commercial structures, loss of business due to construction of DWASA pipelines. Similar findings are that during construction of the pipelines the neighbourhood will be affected by noise/sound-dust pollution,

land (that was not acquired) will be used for keeping and carrying the equipment to the sites; crowded the locality by strangers which will affect usual movement of girls and women. So, the required mitigation measures shall be taken by the contractor during construction to reduce this disturbance. Another observation is that the small businessman, vendors, and floating shops will also be affected by the construction work for the time being.

The "Acquisition and Requisition of Immovable Property Act (ARIPA) 2017" was effective from September 2017. Private land under Dhaka and Narayanganj districts were acquired by Dhaka WASA before the 2017 act was applicable. The District Commissioners' offices of Dhaka and Narayanganj have followed Acquisition and Requisition of Immovable Property Ordinance, 1982 to compensate the affected persons. The legal entitlement of acquired land was 1.5 times of mouza rate at the time of land acquisition. Since 2017 Dhaka WASA has been the owner of the land and for more than six years the affected persons are using the acquired land. That is already an additional benefit provided to the affected persons excluding top-up. The RAP implementation consultant will assess the exact amount of top-up case by case in the coming months.

There are also positive comments about the employment opportunity will be increased for the local poor people as day labours and unskilled labours as well as the local women will also get work for the engagement of cooking, water carrying, caretaking, earth work, etc. The local people's expectation is that they will get mitigations measures of all negative impacts and will have more positive impacts like opportunities for employment, entrepreneurship, supply of good quality water, proper maintenance of the services will be provided.

***TEXT MODIFIED IN 2023 (by DSC)***

The assessment of the baseline of socio-economic conditions / attributes of the areas surrounding the proposed project sites was first made in 2013 and for the baseline in May 2022; then further social survey held in January 2023 at the surrounding locations of Construction site of Component-2 of SWTPP-III. The specific objective of the social sample survey was to gather information on the existing social environment surrounding the proposed project sites. The social survey primarily focused on identifying the status of important economic and social factors / circumstances / attributes of the project areas.

The Social survey held in January 2023, a total of 60 (Sixty) habitants have been interviewed in a prescribed questionnaire with a professional group of field researchers where 17% respondent were female. While in May 2022, a total of one 100 (one hundred) habitants have been interviewed in a prescribed questionnaire with a professional group of field researchers where 19% respondent were female.

Efforts were made to identify the socio-economic attributes that may be impacted due to the proposed project activities by conducting field study, questionnaire survey, formal and informal interviews. The significant findings notified by the respondents are that during construction of the WTP C-2 nearest neighbourhood will be affected by noise/ sound-dust pollution, land (that was not acquired) will be used for keeping and carrying the equipment to the sites; crowded the locality by strangers which will affect usual movement of girls and women. So, the required measurements must be taken by the authority to reduce this disturbance. Another

observation is that the small businessman, vendors, and floating shops may also be affected by the construction work for the time being.

There are also positive comments about the employment opportunity will be increased for the local poor people as day labours and unskilled labours as well as the local women will also get work for the engagement of cooking, water carrying, caretaking, earth work, etc. The local people's expectation is that they will get mitigations measures of all negative impacts and will have more positive impacts like opportunities for employment, entrepreneurship, supply of good quality water, proper maintenance of the services will be provided. Throughout the surveys and RAP studies, vulnerable people were identified as labours such as rickshaw pullers, students, unemployed people and housewives whereas business owners are observed as mixture of high/middle income group as they have relatively steady income.

*Summary of Resettlement Action Plans (RAP) I, II and III:* Summary of socio-economic environment along the Project route was described by below excerpts from Resettlement Action Plans (RAP) I, II and III:

*RAP-I:* The study covered the project area from Raw water pumping station to near Darikandi Bus stand of Dhaka- Chittagong Highway (6km). The RAP-I is for the land acquired for raw water pumping station and 6.00km pipeline alignment (six km) under Narayanganj district based on the 100% census and survey of the affected households. The affected households are 232 and during survey we reached to 100 households.

*RAP-II:* The study covered the project area from Middhabari Sluice Gate to Saidabad WTP in Dhaka district. The Project will require acquisition of 2.0276-acre land under RAP -II. Due to the acquisition of land, a total of 54 project affected units will be affected including 53 titled households and one Dhaka WASA structure. Of the affected households, 12 are residential structures, 37 commercial structures, and four both commercial structures. Apart from these impacts, 246 wage labourer, 76 tenants and 11 trees will also be affected by the project.

*RAP-III:* (a) The study covered the project area along Dhaka-Chittagong Highway up to Kanchpur Bridge Circle (8.5 Km), (b) along the DND canal from Demra to Mridhabari Sluice and (c) Primary & Secondary Distribution Mains from Saidabad WTP to water supply distribution zones(54Km).

The total number of projects affected unit is 54 (including Dhaka WASA structure), which makes the total number of PAPs is 227. The breakdown of the socio-economic situation of PAPs; 52% are male and (117 no.) 48% are female (110 no.) The average household size among affected people is 4.28. 7.93 of the people (5.13% male and 2.73 female) were recorded as being over 60 years old. The education level in the project-affected area is about 90%; small businesses and agriculture is the main profession dominated by males.

*Income Livelihood Restoration:* About 16.98% of affected households indicated that they required help with employment opportunities in construction work, about 28.30% want assistance or loan from other ongoing development scheme, and about 54.72% showed their interest in vocational & skill development training.

Socioeconomic environment was treated as a place with geographically defined boundaries that also has economic, educational, social, cultural, and political characteristics. The socioeconomic environment shapes resources, opportunities, and



exposures (positive and negative)<sup>i</sup>. Theoretically, the neighbourhood socioeconomic environment could influence health outcomes either directly or indirectly<sup>ii</sup>. Direct effects on health include injuries from crime or environmental hazards or illness from socially patterned toxic exposures. In addition, many aspects of the neighbourhood socioeconomic environment — including poverty and discrimination — can be considered stressors. Rich people are considered secure in having more than they need to eat, a place to live that is comfortable and safe, and are certain their basic needs will be easily met.

Poor people are considered not having security in having the minimum they need to avoid hunger, housing insecurity, or having to exchange one basic need to meet another and/or having little or no money, goods, or other means of support. The vulnerable include not only the poor, but those with less power, such as women, children, the aged, persons with disabilities, immigrants, refugees, minorities, the persecuted, prisoners and victims of human trafficking. Vulnerability to poverty can be measured as the risk a household or community will fall into poverty at least once in the next few years. This means that vulnerability is measured as a probability.

### Environmental Impacts

Environmental impacts of the specific project activities on different ecological, physicochemical and human-interest related parameters, both during the construction phase and the operation phase, have been identified and assessed.

### Ecological Impacts

Construction activities associated with crossing of rivers/water bodies by water transmission line are likely to have some adverse impact on aquatic environment, especially on aquatic flora, fauna, fish and water quality. Sitalakhya River is identified as Ecologically Critical Area (ECA) along the project route, although there are endangered species (i.e. Tire-trak Spinyeel, Indian Chaca as per IUCN list of threatened species for Bangladesh:

<https://portals.iucn.org/library/sites/library/files/documents/RL-549.3-003-v.1.1.pdf>) identified in Meghna River which is not listed as ECA. Nonetheless, construction within intake site will be contained and there will be no direct waste disposal to the Meghna River; potential minor impacts on endangered species such as Ganges River Dolphins are anticipated if they approach/get closer to water intake structure during construction phase; or they may be disturbed of construction activities and leave their habitat for a temporary period whilst construction continues. Therefore, special care to Gange River Dolphins to be shown via dolphin monitoring programme to avoid interaction during construction of raw water intake. It should be mentioned here that the potential hotspot of Ganges river dolphin in Bangladesh along the Meghna river is at Bhairab Bridge in Bhairab, Brahmanbaria district ([Bangladesh Dolphin Action Plan 2020-2030 Final report April 2019.pdf \(portal.gov.bd\)](#)) is relatively located 68Km up of the intake site. There will be no direct impact due to the construction/operation works of the project.

In order to avoid impacts on endangered species along Sitalakhya River; the river crossing will be carried out by full bore deeps tunnel (3.5m dia, 2.2 km long). The risk of polluting Sitalakhya River and interaction with road traffic was fully eliminated by changing the design to full bore tunnel at Kanchpur river and road crossings.

In addition, potential minor impacts on endangered species such as Ganges River Dolphins are anticipated if they approach/get closer to water intake structure during construction phase. Works specification requires construction methodology to ensure endangered species do not enter offshore intake area as temporary cofferdams will

be installed to segregate construction working area from the river. However, there is a minor residual risk that endangered species may be disturbed by the noise of construction activities and leave their habitat for a temporary period whilst construction continues. The ESMP will require the contractor to be vigilant and take special care to avoid interaction with any visible Ganges River Dolphins prior to driving sheet piles on the river during construction of raw water intake.

It is anticipated that sheet piled cofferdam and offshore jetty will be constructed to allow piling and subsequent construction of the intake structure. The Contractor will be responsible for various safeguarding aspects and is specified in detail through the ESMP which forms part of the contract. Refer chapter 6 of the ESMP document (enclosed) and the PS-CR which imposes an obligation on the Contractor to comply with the ESMP.

Interaction with dolphins during operation stage is also mitigated as the intake will be installed with PWWC (Passive Wedge Wire Screens) which have a screen pass velocity as low as 0.10~0.15m/s and the entry slots are only 4mm in width. The screen pass velocity is lower than the average river flow velocity in vicinity of the intake and will therefore allow aquatic animals adequate flexibility to avoid the screens all together. Additionally, the slot size being very small, will eliminate any possibility of entrapment of aquatic life in the intake. In addition, some mammalian species also utilize village vegetation throughout the year or seasonally as permanent or temporary habitat. Project activities, e.g., movement of vehicle and people could displace potential prey species for some mammal within the project areas. However, disturbances associated with the proposed project works are considered temporary and identified as minimum to have any measurable effect on the prey for mammals with the best industry practices and mitigation listed in Section 11.2.1 Construction Phase Mitigation Measures.

Potential impacts of sewage discharge on soil / water to reptiles, bird and mammals are identified as negligible as labour camps and temporary site offices will have appropriate latrine and temporary toilet facilities. Sewage will be treated within the designated locations, to ensure no immediate impacts of raw sewage on environment and on reptiles, birds and mammals along with the best industry practices implemented via ESMP. Apart from temporary welfare facilities, there will be no sewage generated from project activities during construction that may impact to reptiles, bird and mammals.

During operational phase, ecological impacts of improper disposal of dewatered sludge in the environment is mitigated by transferring dry sludge to designated landfill site at Matuail. ESMP will make sure to minimise impacts identified in below:

Table E-0-1. It also summarizes the impacts on terrestrial and aquatic flora and fauna resulting from different project activities in the form of a compatibility matrix. It shows that most of the evaluated impacts are of low or moderate intensity and are short-term in nature. No long-term adverse impacts to the floral species as well as to the populations of the mammals, reptiles, amphibian, birds and fishes are expected.

The full list of identified species is included in the Table below and in Table 6-5 in Section 6.4 Threatened Flora and Fauna in the ESIA Report. The list is included here for information purposes.

*List of Critically Endangered, Endangered and Vulnerable wildlife and fish fauna in the study area*



Biological Class	English name	Scientific name	O	CE	E	V	CT	T	DD
Reptilia	Grey Monitor Lizard	Varanus bengalensis				√			
	Yellow Monitor Lizard	Varanus salvator			√				
	Common Wolf Snake	Lycodon aulicus				√			
Mammalia	Ganges River Dolphin	Platanista gangetica			√				
Osteichthyes	Mottled Nandus	Nandus				√	√		
	Asiatic Snakehead	Channa orientalis				√	√		
	Ticto / Firefin Barb	Puntius ticto				√	√		
	Tire-trak Spinyeel	Mastacembelus armatus			√		√		
	One-stripe Spinyeel	Macrognathus aculeatus				√	√		
	Long-whiskered Catfish	Aorichthys aor				√	√		
	Indian Chaca	Chaca			√				
	Grey Featherback (V)	Notopterus				√	√		
	Gangetic mudeel (V)	Monopterusuchia				√	√		

[Legend: O = Observed, CE = Critically Endangered, E = Endangered, V = Vulnerable, CT = Commercially T = Threatened, DD = Data Deficient].

Table E-0-1 Evaluation of ecological impacts resulting from different project activities (Originally Table 1)

Ecological Issues											
Source of Potential Impacts	Flora		Fish	Fauna							
				Amphibia		Reptile		Bird		Mammal	
	AQ	TR		AQ	TR	AQ	TR	AQ	TR	AQ	TR
During construction											
Camp setting	0	-1 S	0	0	-1 S	0	-1 S	0	-1 S	0	-1 S
Access road construction	-1 S	-1 S	0	0	-1 S	0	-1 S	0	0	0	-1 S
Land clearing	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	0	-1 S	0	-1 S
Soil excavation	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	0	0	0	-1 S
Generation of Noise	0	0	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	0	-1 S
Deterioration of water quality	0	0	-1 S	-1 S	-1 S	-1 S	0	-1 S	0	-1 S	0

Ecological Issues											
Source of Potential Impacts	Flora		Fish	Fauna							
				Amphibia		Reptile		Bird		Mammal	
	AQ	TR		AQ	TR	AQ	TR	AQ	TR	AQ	TR
Sewage discharge on soil / water	-1 S	0	-1 S	0	-1 S	0	0	0	0	0	0
Water body crossing (during pipeline construction)	-1 S	0	-1 S	-1 S	0	-1 S	0	-1 S	0	-1 S	0
Traffic	0	0	0	0	-1 S	0	-1 S	0	-1 S	0	-1 S
During Operation											
Spills (oil / Chemical) on land/water	-1 S	-1 S	-2 S	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	0	-1 S
Waste/sludge disposal	0	0	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	0	-1 S
Water Intake	0	0	0	0	0	0	0	0	0	0	0
Generation of Noise	0	0	-1 S	0	0	0	0	0	0	0	0
Traffic	0	0	0	0	-1 S	0	-1 S	0	-1 S	0	-1 S
Land use	0	0	-1 S	-1 S	0	-1 S	0	-1 S	0	0	0
[Legend: AQ = Aquatic; TR = Terrestrial; 0 = No impact (negligible impact), 3 = High impact, 2 = moderate impact, 1 = Low impact, S = Short term impact, L = Long-term impact, +/- = positive/negative impact, AQ = Aquatic, TR = Terrestrial]											

## Physicochemical Impacts

Major physicochemical parameters considered for assessment of environmental impacts of project due to construction and operation activities include drainage congestion, air and noise pollution, sanitation and solid waste, water pollution, soil pollution and erosion. Although all the impacts were found to be low to moderate in nature, some of the activities (e.g., solid/hazardous waste generation) have the potential to generate long-term adverse impacts on different environmental compartments if proper mitigation measures are not taken. (Table E-0-2)

In addition, some mammalian species also utilize village vegetation throughout the year or seasonally as permanent or temporary habitat. Project activities, e.g., movement of vehicle and people could displace potential prey species for some mammal within the project areas. However, disturbances associated with the proposed project works are considered temporary and identified as minimum to have any measurable effect on the prey for mammals with the best industry practices and mitigation listed in Section 11.2.1 Construction Phase Mitigation Measures.

In order to avoid impacts on endangered species along Sitalakhya River; the river crossing will be carried out by full bore deeps tunnel (3.5m dia, 1.3 km long). The risk of polluting Sitalakhya River and interaction with road traffic was fully eliminated by changing the design to full bore tunnel at Kanchpur river and road crossings.

The riverbank stability risk of the intake site is mitigated through "design and build" works specifications for the intake site. Foundations for the Intake structure and transfer pipes shall be designed to protect against annual changes in riverbed level and the anticipated maximum riverbed scour when the river is at Maximum Flood Level. The Contractor shall conduct monthly bathymetric surveys of the riverbed level over at least a 100m radius around the centre of the Intake structure to monitor changes in bed level during construction. The Contractor shall also carry out physical modelling of river flow around and inside the Intake using an independent organisation specialising in hydraulic modelling. The design of the Intake structure and all underwater structures, including scour protection measures, shall be based on the results of the modelling. The Contractor shall provide river training works and scour protection to protect the structures and the riverbank from scour with the river flowing at the Maximum Flood Level.

Availability of raw water: Maximum 40% of 80% dependable flow is needed for the Environment requirement. Here only 6.25% of the 80% dependable flow will be withdrawal. Therefore, impact on the river water flow is projected due to the project intervention. In addition, Hydrology and Modelling Report for the project recommended minimum water level of 0 mPWD for the raw water pump abstraction. Works specifications required water abstraction from the minimum water level of the River Meghna as specified.

Table E-0-2: Physicochemical impacts from activities associated with the construction and operation of SWTPPP III. (Originally Table 2)

Physicochemical Impacts								
Phases	Project Activities	Drainage congestion / fast drainage	Noise level	Air quality	Surface Water quality	Groundwater quality	Soil Erosion	Soil quality
During Construction	Labour camp setting and its operation	0	0	0	-1 S	-1 S	0	0
	Access road construction	-1 S	-1 S	-1 S	-1 S	0	-1 S	0
	Land clearing	-1 S	0	0	0	0	-2 S	0
	Soil excavation	-2 S	-2 S	-2 S	-1 S	0	-1 S	-1 S
	Piling work	0	-2 S	-1 S	-1 S	-1 S	0	0
	Concreting work	0	-2 S	-1 S	0	0	0	0
	Water body crossing work (pipeline laying)	-1 S	-2 S	-1 S	-1 S	0	0	0
	Provision for safe water and sanitation facilities for workers	0	0	0	0	0	0	0
	Traffic	0	-2 S	- 1 S	0	0	0	0
During Operation	Solid /hazardous waste and wastewater generation	0	0	0	-1 L	-2 L	0	-2 L
	Access to safe water supply	0	0	0	0	+2 L	0	0
	Accidental chemical oil leaks, spills on land/ water	0	0	0	-1 S	0	0	-1 S
	Traffic	0	-2 S	- 1 S	0	0	0	0
[+3 = High Positive Impact, +2 = Moderate positive impact, +1 = Low Positive Impact, 0 = No impact, -1 = Low Negative Impact, -2 = Moderate Negative Impact, -3 = High Negative Impact S = Short term impact, L = Long term impact]								

### Social-economic Impacts

Major social parameters considered for assessment of social impacts of the proposed project include loss of land, loss of income, traffic congestion and safety, public health, effect on archaeological sites, impact on topsoil, employment, and commercial activities. It can be seen from Table E-0-3 that although the project may have minor negative impacts related to loss of land and income, significant beneficial impacts are associated with employment and commercial activities as well as access to safe water supply to the people under its service.

In addition, it should be noted that there are 2 major rivers (Old Brahmaputra and Shitalakhya rivers) along the proposed route of the transmission line which will be disturbed during the construction activities. Construction activities associated with crossing of rivers/water bodies by water transmission line are likely to have some adverse impact on fisherman using the Brahmaputra River for commercial/other purposes. There will be passage maintained along crossing of rivers/water bodies during construction activities such that river users are not significantly impacted. In addition, full cofferdam is prohibited during the pipeline crossing of the Old Brahmaputra River to avoid flow interruption and disturbance to the aquatic flora and fauna as well as navigability of the local small boats for the livelihood of fisherman along Brahmaputra River. Full dry season is recommended for the construction works of the river crossing activity. With above-mentioned measures and ESMP to be implemented during the life cycle of the project, the impact on fisherman is not identified to be permanent and back to original state once construction phase is complete. No impact is envisaged on fisherman during the operation phase. Because there are no fishing activities near the intake site area of the Meghna River, as well as no river route will be used during the operation period of the project.

During operation phase, there will be no issue for navigation at river crossings at Shitalakhya and Brahmaputra rivers as raw water transmission pipes will be installed below the riverbed. Inspections, cleaning, and maintenance will be done from either side of the river. The intake structure is located at the west bank of riverbank in agreement with Bangladesh Inland Water Transport Authority as navigation route is located at the middle section of the river where draft is more favourable to ship manoeuvre.

*Table E-0-3: Socio-economic impacts from activities associated with the construction and operation of SWTPPP III (Originally Table 3)*

Socio-economic Impacts								
Phases	Project Activities	Loss of Land	Loss of income and displacement (Economic or Physical)	Impact on topsoil	Public Health and safety	Effect on Archaeological sites	Health and Safety	Employment and commercial activities
During Construction	Land acquisition	-2 L	-2 L	0	0	0	0	0
	Labour camp setting	0	0	0	-2S	0	-1S	+2 S
	Access road construction	0	-1 S	-2 S	-1 S	0	-1 S	+2 S
	Land clearing	0	-1 S	-2 S	0	0	-1 S	+2 S

Socio-economic Impacts								
Phases	Project Activities	Loss of Land	Loss of income and displacement (Economic or Physical)	Impact on topsoil	Public Health and safety	Effect on Archaeological sites	Health and Safety	Employment and commercial activities
	Soil excavation	0	-1 S	-1 S	-1 S	0	-1 S	+2 S
	Piling work	0	0	0	-1 S	0	-1 S	+2 S
	Concreting work	0	0	0	-1 S	0	-1 S	+2 S
	Water body crossing work	0	-1 S	0	-1 S	0	-1 S	+2 S
	Provision for safe water and sanitation facilities for workers	0	0	0	+2 S	0	+2S	0
	Traffic	0	0	0	-1 S	-1 S	-1 S	0
During Operation	Accidental chemical oil leaks, spills on land/ water	0	0	-1 S	-1 S	0	-1 S	0
	Solid /hazardous waste and wastewater generation	0	0	-1 S	-1 S	0	-1S	0
	Access to safe water supply	0	0	0	+3 L	0	+3L	0
	Traffic	0	0	0	-1 S	-1 S	-1 S	0
[+3 = High Positive Impact, +2 = Moderate positive impact, +1 = Low Positive Impact, 0 = No impact, -1 = Low Negative Impact, -2 = Moderate Negative Impact, -3 = High Negative Impact S = Short term impact, L = Long term impact]								

## Public Consultation

### TEXT MODIFIED IN 2022

Three Focus Group Discussions (FGDs) in 2013 and 15 FGDs in 2022 were carried out at 18 different locations during the field visits, in order to document and record opinions of a wide range of stakeholders on different aspects of the proposed project.

These eighteen locations were selected to represent the viewpoints of the general people residing in and around the intake location (at Haria), the water transmission route (along Dhaka-Chittagong Highway), and the treatment plant at Saidabad.

In the FGDs, an effort was made to invite a wide range of stakeholders including small/medium business, teacher, student, shop keeper, driver, housewife and various categories of families, i.e., poor, rich, medium, female headed households etc. who had given their valuable opinions. In addition to the FGDs, a number of formal / informal meetings with stakeholders were carried out in the project areas; the study team interacted with more than 30 people during these meetings.

A total of 68 people in 2013 and 163 people (40% were female) in 2022 participated in the FGDs. The participants expressed their opinions regarding different issues including their knowledge about the proposed project, socio-economic condition of people in their localities, possible impact of the proposed project on the environment and in their localities, and mitigation measures to address adverse impacts.

**TEXT MODIFIED IN 2023**

Three Focus Group Discussions (FGDs) in 2013, 15 FGDs in 2022 and 9 FGDs in 2023 were carried out at 27 different locations during the field visits, in order to document and record opinions of a wide range of stakeholders on different aspects of the proposed project. These twenty-seven locations were selected to represent the viewpoints of the general people residing in and around the intake location (at Haria), the water transmission route (along Dhaka-Chittagong Highway), treatment plant at Saidabad and the nearest surrounding neighbourhoods of Component-2 WTP site.

In the FGDs, an effort was made to invite a wide range of stakeholders including small/medium business, teacher, student, shop keeper, driver, Imam, day labour, housewife and various categories of families, i.e., from low-income people to medium-income people, female headed households etc. In addition to the FGDs, a number of formal / informal meetings with stakeholders were carried out in the project areas; during these meetings the study team interacted with more than 52 people who are the overall beneficiaries of the project; and total of 42% individuals out of 52 people, are directly impacted by the project activity.

A total of 163 individuals actively participated in the FGDs, with 40% of the participants being female. A total of 48% individuals out of 163, are directly affected and 52% are indirectly affected by the project activity. They expressed opinions on various topics, encompassing their understanding of the proposed project, the potential environmental and local impacts of the project and suggested mitigation measures to counter any adverse effects. Apart from the FGDs, numerous formal and informal meetings were conducted, engaging more than 30 individuals.

**TEXT ADDED IN 2022**

An assessment of alternative sites for the location of the intake and alternate raw water transmission routes for Saidabad Phase III project were made. The summary of the comparison of the Intake and the RWT Routes are Tabulated below in Table-E-4 & E-5 respectively.

**Option 1:** Existing raw water intake at Sarulia along the Sitalakhya River

**Option 2:** Common intake at Bisnondi along the Meghna River to supply raw water to Saidabad phase III WTP as well as the proposed water treatment plant at Char Gandharbpur

**Option 3: Separate intake at Haria along the Meghna River**

*Table E-0-4: Three Alternate Locations Considered for the Raw Water Intake for Saidabad phase III (new table)*

SI. No.	Water Quality	Prone to the discharge of Wastewater and Solid Waste	Capital and Operation Costs	Land Acquisition	Implementation Constraint
1	Poor	Yes	Less compared to 2 options	Not required	Better than other 2 options for one season only
2	Good	No	Highest to other 2 options	30% more land acquisition would be required which would be costlier	Land acquisition will be a challenge
3	Good	No	Less compared to Option 2 (4km shorter TL than Option 2)	Less costly than Option 2	Major portion will be within the Right of Way of Roads and Highways Department

SI. No.	Multiple independent intakes	Raw water transmission lines	Pumping head	Secured Water Supply
1	Less secured	Less compared to other 2 options	New arrangement required to set	Less
2	Less secured	Highest to other 2 options	15% more pumping head compared to the Haria option	Les
3	33% water security will be increased	Less compared to Option 2 (4km shorter RWTL than Option 2)	15% less pumping head compared to the Option 2	33% more

*Table E-0-5: Different Options wise Raw Water Transmission Route Length (new table)*

Options	Common length from Haria intake to Demra Circle for all phases	Additional length from Demra Circle to SWTP		Total length from Haria intake to SWTP		Total length of pipeline for Phase-I, II & III
		Transmissi on Main for Phase-I & II	Transmission Main for Phase-III	Transmissi on Main for Phase-I & II	Transmissi on Main for Phase-III	
	(km)	(km)	(km)	(km)	(km)	(km)



Option 1	19.2	3.95	5.49	23.15	24.69	47.84
Option 2	19.2	0	5.49	19.2	24.69	43.89
Option 3	19.2	3.95	6.045	23.15	25.25	48.4
Option 4	19.2	4.78	6.045	23.98	25.25	49.23
Option 5	19.2	0	6.045	19.2	25.25	44.45

The total length required for raw water transmission lines for Options 2 and 5 is less because these options use the existing DND canal to partly convey the Meghna River water (by gravity flow) for Saidabad phase I and II. As a result, the operational cost (for pumping energy) and capital cost would be somewhat lower compared to other options. Options 3 to 5 use an alternate route to convey raw water from Demra circle to the box culvert at the downstream end of the DND canal. This strip of land from Demra-Amulia road to the connecting box culvert belongs to DWASA (no land acquisition required) and can be considered if it is desired to avoid the disruption to traffic caused by the construction of pipelines along the northern side of the heavily travelled Demra-Jatrabari road. However, considering all factors, option 1 has been selected as the most viable option during this ESIA update 2022 in order to eliminate interaction with road traffic and potential resettlement requirement at shaft locations along Dhaka-Sylhet highway.

Table E-0-6: Option Analysis in Consideration of Environmental and Social Aspects

Sl. No.		Items	Option 1	Option 2	Option 3	Option 4	Option 5	Remarks
1	Current status of route	1. Agriculture on the route	Yes	Yes	Yes	Yes	Yes	
2		2. Fisheries on the route	No	No	No	No	No	
3		3. Homestead on the route	Yes	Yes	Yes	Yes	Yes	
4		4. River Crossing	Yes	Yes	Yes	Yes	Yes	
5		5. Road Crossing	Yes	Yes	Yes	Yes	Yes	
6		6. Route condition	Better	Better	Not good	Not good	Not good	Soil Quality improvement would be required for option 3, 4 & 5
7		7. Availability of Existing corridor for use	No	Yes	No	No	Yes	Option 2&5 has existing DND canal to partly convey the Meghna River water (by gravity flow)
8	Technical	1. Route length (km)	47.84	43.89	48.4	49.23	44.45	
9		2. Pipeline Construction would be-	Easier	Easier	Difficult	Difficult	Difficult	Pile foundations may be required to secure pipeline stability for option 3, 4 & 5
10		3. Accessibility (Access to the route for construction work)	Easier	Easier	Difficult	Difficult	Difficult	
11		4. Soil Condition of the Route	Good	Good	Bad	Bad	Bad	low land within a swampy area which needs to be treated for soil quality improvement and flood protection for option 3, 4 & 5
12	Social	6. Any hill cutting issue in the route	No	No	No	No	No	
13		A.						
14		1. Does the route require Land Acquisition?	Yes	Yes	Yes	Yes	Yes	
15		2. Has the Land Owner become landless due to Pipeline land acquisition	No	No	No	No	No	
16		3. Does Compensation include actual and "Top-up"?	Yes	Yes	Yes	Yes	Yes	
17		B.						
18		1. Land Cost	High	High	Less	Less	Less	Options 3 to 5 use an alternate route to convey raw water from Demra circle to the box culvert at the downstream end of the DND canal. This strip of land from Demra-Amulla road to the connecting box culvert belongs to DWASA (no land acquisition required)
19		2. Land Income Loss	Yes	Yes	Yes	Yes	Yes	
20		3. Does the project affect? (Please Tick) Indigenous people/Indigenous Ethnic Minorities/Tribal groups/Other vulnerable groups/Individuals/ Poorest and Landless community/ Disaster Prone areas (Char, Embankment, Coastal)	No	No	No	No	No	
21		If yes provide number of indigenous people/ ethnic community/Poorest and Landless covered.....	N/A	N/A	N/A	N/A	N/A	
22		6. Does the project affect cultural property? (Please Tick) Graveyard/Mosque/Temple/Pagoda/Church/Archeological/Paleontological/His toric/Others	No	No	No	No	No	
23	Environmental	1. Loss of productive land	Yes	Yes	Yes	Yes	Yes	
24		2. Loss of Agri. Yields	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	
25		3. Increase of Agri. Yields	No	No	No	No	No	
26		4. Effect on national food production	No	No	No	No	No	
27		5. Cumulative and long-term effect	No	No	No	No	No	
28		6. Fish-yielding Capacity	No	No	No	No	No	
29		7. Loss of Forest	No	No	No	No	No	
30		8. Loss of indigenous species	No	No	No	No	No	
31		9. Loss of Biodiversity	No	No	No	No	No	
32	Financial	Project Cost	Less	Higher	Higher	Higher	Higher	Pile foundations may be required to secure pipeline stability for Options 3-5, which will increase the capital cost. Also, these alternate routes will have a larger number of bends; hence maintenance requirement would also be high. Also, a service road needs to be constructed for maintenance purpose. All of these issues may add up to both operational and capital cost. As a result, options 3, 4 and 5 were not considered to be viable option.

In this updated ESIA report, Environmental and Social expert team has incorporated the feasibility review of the PMC on the RWP route from Kanchpur Circle to Mridhabari Sluice Gate. In the new alignment three major environmental and social benefits were achieved compared to the ToR alignment. The benefits are completely avoiding the pipe installation along sections of the busy N2 and R201 highways; avoid the need to cross the river adjacent to Sultana Kamal Bridge and finally reduces social impact, resettlement activities and public interface by laying pipes within Demra canal. For completeness, the "no project" scenario has also been discussed. Alternative technology options for crossing of rivers by raw water transmission pipelines were also assessed.

## Mitigation Measures

Table E-0-7 and

Table E-0-8 show the mitigation measures corresponding to specific adverse impacts during construction and operation phase respectively. The measures presented in Table E-0-7 and

Table E-0-8 are aimed at minimizing the effects of the possible adverse impacts and enhancing the positive impacts. The tables show that most of the adverse impacts

could be minimized or even removed if appropriate mitigation measures are taken. It should be noted that all plans mentioned in the ESMP or produced within the scope of ESMP requires monitoring listed in below items.

*Table E-0-7: Environmental impact during construction phase and mitigation measures  
(Originally Table 4)*

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Land acquisition/requisition	Loss of land / property	<ul style="list-style-type: none"> <li>&gt; Raise awareness of PAPs through public consultation process prior to actual land acquisition.</li> <li>&gt; Serve land acquisition notices to actual landowners/land users.</li> <li>&gt; Provide adequate (considering present market value), fair, and quick compensation to real landowners/users and tops up any outstanding compensation in accordance with applicable local laws of GoB (as listed in Acquisition and Requisition of Immovable Property Act (2017)) and international standards.</li> <li>&gt; Provide appropriate and quick compensation for loss of property on acquired land.</li> <li>&gt; Involve local people and peoples' representatives in settling social tension related to land acquisition and those that may develop during the progress of work from the very beginning of project implementation. The community engagement and grievance mechanism established for the project will be followed. Formed GRMs described in Chapter-9 of the Resettlement Action Plans will be functional to safeguard the PAPs grievances.</li> </ul>	DWASA, District Lands Office

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
	Tree cutting along RoW	<ul style="list-style-type: none"> <li>&gt; Provide adequate, quick, and fair compensation to owners</li> <li>&gt; Plantation/afforestation program for tree replacement (plantation of at least two trees of similar species for each cut tree) as a habitat restoration efforts. This commitment is included in ESMP that will be followed by the Contractor.</li> <li>&gt; Not removing undergrowth fully where possible, so that they may re-grow naturally after the project activity.</li> </ul>	DWASA Contractor
Construction and operation of labour shed for workers	Generation of sewage and solid waste	<ul style="list-style-type: none"> <li>&gt; Construction of sanitary latrine and septic tank system</li> <li>&gt; Erection of "no litter" sign, provision of waste bins/cans, where appropriate</li> <li>&gt; Waste minimization, recycle and reuse principles to be followed</li> <li>&gt; Proper disposal of solid waste as per national "Solid Waste Management Rules 2021".</li> <li>&gt; Provide 24x7 CCTV camera coverage of the camps to ensure adequate level of safeguarding and security of occupants</li> </ul>	Contractor (Monitoring by Employer's Representative)

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
	Provision for accommodation, safe water and sanitation facilities for workers	<ul style="list-style-type: none"> <li>&gt; Potable Water supply facilities provision shall be at the working place and the labore shed areas</li> <li>&gt; Worker's accommodation should be followed as per international processes and standards such as "Workers accommodation: Processes and Standards- Guidance Note by IFC/EBRD." ANNEX I: Checklist on Workers' Accommodation will be used to ensure compliance.</li> <li>&gt; Ensure the provision of toilets for men and women as per laws</li> <li>&gt; Toilets must be marked by gender (male/female)</li> <li>&gt; Ensure the cleaning monitoring systems</li> <li>&gt; Ensure the number of toilets are- 1 toilet for 25 female workers and 1 toilet for 40 male workers as per legal provisions.</li> </ul>	
	Training to the Construction Workers	<ul style="list-style-type: none"> <li>&gt; Excavation and Trenching</li> <li>&gt; OSHA Construction Training</li> <li>&gt; Protection from Falling</li> <li>&gt; Rigging types of Construction Training</li> <li>&gt; Welding Safety Training</li> <li>&gt; Power Tools Handling Training</li> <li>&gt; Personal Protective Equipment Training</li> <li>&gt; Emergency and Preparedness Training</li> </ul>	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Construction and operation of labour shed for workers	Labour influx (Risk of social conflict, Increased risk of illegal behaviour, or behaviour that violates social norms in the project area, Influx of additional population ("followers"), Increased burden on and competition for public service provision, Increased risk of communicable diseases and burden on local health services, Gender-based violence (GBV), Child labour and school dropout, Local inflation of prices, Increased pressure on accommodations and rents, Increase in traffic and related accidents)	<ul style="list-style-type: none"> <li>&gt; Developing a CoC for workers and making it part of the employment contract, including sanctions for non-compliance (e.g., termination),</li> <li>&gt; Mandatory and repeated training and awareness raising of the workforce about the CoC, the need to refrain from unacceptable conduct toward local community members, including any particular concerns, such as cultural norms towards women.</li> <li>&gt; Informing workers about national laws that make sexual harassment and GBV a punishable offence which is prosecuted and that the project will cooperate fully with any official investigation into allegations; and</li> <li>&gt; Contractors adopting a policy to cooperate with law enforcement agencies in investigating complaints, including those about GBV. In rural settings, where the presence of law enforcement is often low, the risk of sexual harassment for local women may be higher, for younger women and girls, but also boys.</li> <li>&gt; No force bonded or child labour (under-aged) should be allowed. Children aged 14 – 18 years can engage in lighter works only as per the government law.</li> <li>&gt; A worker influx management plan should be developed as per IFC Performance Standards 2, if more than 500 workers are brought on site from outside of the project/local area.</li> </ul>	Contractor  (Monitoring by DWASA)

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Construction and operation of labour shed for workers	Gender Based Violence and Harassment (GBVH)	<ul style="list-style-type: none"> <li>&gt; Ensure all workers have contracts and background checks including references from most recent employers.</li> <li>&gt; Use robust recruitment processes to select, train, manage and monitor security companies and personnel.</li> <li>&gt; Deliver periodic mandatory training on GBVH to all workers, including contractors, subcontractors, and core suppliers, as well as relevant consultants and clients.</li> <li>&gt; Consider engaging expertise (e.g. from local women's rights organisations or NGOs working on GBVH) to conduct awareness campaigns to provide information to local communities, such as what is unacceptable behaviour and how to report an incident of GBVH.</li> </ul>	Contractor (Monitoring by DWASA)



Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
	Workers OHS and Public Health and Safety	<ul style="list-style-type: none"> <li>&gt; Take measures to avoid or minimize transmission of communicable diseases that may be associated with the influx of temporary or permanent project labor.</li> <li>&gt; Clean bill of health a condition for employment</li> <li>&gt; Provide appropriate PPE for the Workers</li> <li>&gt; Construction of tube-wells with acceptable water quality</li> <li>&gt; Raising awareness about hygiene practices among workers</li> <li>&gt; Regular medical monitoring of workers</li> <li>&gt; Implement measures and actions to control the safety of deliveries of hazardous materials, and of storage, transportation and disposal of hazardous materials and wastes</li> <li>&gt; Implement measures to avoid or control community exposure to the hazardous material</li> </ul>	
	Emergency Preparedness Plan	<ul style="list-style-type: none"> <li>&gt; Perform the threat assessment</li> <li>&gt; Document contact information</li> <li>&gt; Assign roles and responsibilities</li> <li>&gt; Take stock of current resources within organization</li> <li>&gt; Determine the response plan steps</li> <li>&gt; Decide how to communicate with the employees</li> </ul>	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Construction of Pumping Station at Intake and RWP, Distribution Lines	Flora and Fauna	<ul style="list-style-type: none"> <li>&gt; Maximize the replanting of native vegetation following the completion of construction activities.</li> <li>&gt; Preserve existing vegetation whenever possible and consider replanting trees where necessary.</li> <li>&gt; Reduce machinery-related damage by favouring manual construction techniques over mechanical ones.</li> <li>&gt; Safeguard the local ecosystem, ensuring all construction activities include measures to protect plants and wildlife.</li> <li>&gt; Educate all personnel on-site about the company's protocols for managing oil spills and leaks, including the use of dispersants or biological agents to accelerate the degradation of oil from construction equipment. The contractor must present a cleanup method for approval.</li> </ul>	Contractor  (Monitoring by DWASA)

General Environmental Protection	<ul style="list-style-type: none"> <li>&gt; Develop and implement a comprehensive waste management strategy.</li> <li>&gt; Install waste bins and sanitary facilities at the contractor's campsite to prevent environmental contamination.</li> <li>&gt; Construction materials should be properly covered while hauled and stored, roads properly cleaned, and water sprayed in order to minimize concentration of dust in air.</li> <li>&gt; Equipment producing excessive noise should not be operated after dark.</li> <li>&gt; Use of equipment like stone crushers, which produce excessive noise as well as particulate matter must not be used at the site.</li> <li>&gt; Hauling of materials and equipment to and from project sites should preferably be done after the regular working hours, so that it causes minimum disturbances to the regular traffic in and around the project site.</li> <li>&gt; Contractor should take responsibility of proper traffic flow and management within the immediate vicinity of the project site.</li> <li>&gt; Waste/ wastewater (e.g., human waste from labour camps, fuel and wash-water from equipment/ material sheds) should be appropriately disposed, so that they do not find their way into adjacent water bodies.</li> <li>&gt; Solid waste and wastewater should be disposed of in compliance with local legislation and best industry practices. Wastewater should be disposed of by constructing septic tanks. Solid waste, including construction</li> </ul>	Contractor (Monitoring by DWASA)
--	--	--

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		<p>debris, should be regularly collected and transported away from the site for disposal in a designated municipal dump site. Excavated materials from the existing sludge drying beds should be tested for toxicity before disposal.</p> <p>&gt; Appropriate measures should be taken to avoid temporary drainage congestion during construction activities (e.g., keeping existing drains clear, building alternative drainage line/ network, where an existing drainage canal has been filled up).</p>	
Traffic impacts on people, communication problems		<p>&gt; Schedule deliveries of material/ equipment during non-school hours and after regular working hours</p> <p>&gt; Arrangement of alternative communication routes during laying of pipeline across roads.</p> <p>&gt; Prepare and implement a traffic and transport management plan.</p> <p>&gt; Use signage at the roadside for the safety of the localities.</p> <p>&gt; Deploy Security at the camp gate and adequate flagman at the roadside nearby the camp.</p> <p>&gt; Build good rapport with local peoples through consultation during the construction and operation of labor shed for workers.</p>	Contractor (Monitoring by DWASA)

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
	Traffic impacts on flora and fauna	<ul style="list-style-type: none"> <li>&gt; Restrict activities within the RoW during transportation and laying of water pipeline across a water body, keep rest of the water body undisturbed.</li> <li>&gt; Keep noise level (e.g., from traffic, construction vehicles, equipment) to a minimum level, as certain fauna is very sensitive to loud noise.</li> <li>&gt; Special care (Addressed in Potential Impacts of "Flora and Fauna" in this Table below) for the protection of threatened terrestrial species such as lizards, mammals, birds species that have been identified in the project areas and listed in Table 4-5.</li> <li>&gt; Traffic impacts on amphibian population will be monitored by the changes of species composition and richness and their relative abundance.</li> </ul>	Contractor (Monitoring by DWASA)
	Drainage management (Congestion and excessive drainage)	<ul style="list-style-type: none"> <li>&gt; Appropriate measures should be taken to avoid temporary drainage congestion during construction activities (e.g., keeping existing drains clear, building alternative drainage line/network, where an existing drainage canal has been filled up).</li> <li>&gt; Provide adequate diversion channel, if required</li> <li>&gt; Ensure adequate monitoring of drainage effects (such as drainage flooding), especially if construction works are carried out during the wet season</li> </ul>	Contractor (Monitoring by DWASA)

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
	Impact on fisherman and other users of river	<p>&gt; Full cofferdam is prohibited during the pipeline crossing of the Old Brahmaputra River to avoid flow interruption and disturbance to the aquatic flora and fauna as well as navigability of the local small boats. Full dry season is recommended for the construction works of the river crossing activity.</p>	Contractor (Monitoring by DWASA)

Destruction of aquatic habitat and reduction of fisheries, aquatic fauna (including threatened species & ECA)	<ul style="list-style-type: none"> <li>&gt; Prohibit discharge of fuel, lubricants, chemicals, and wastes into surface waters.</li> <li>&gt; Preservation of aquatic habitats by restricting movement of people/ equipment into them and preventing entry of sediments into these water bodies.</li> <li>&gt; Restrict activities within the RoW during laying of water pipeline across a water body, keep rest of the water body undisturbed.</li> <li>&gt; Keep noise level (e.g., from equipment) to a minimum level and continuously monitored, as endangered species such as Ganges River Dolphins, lizards, and fish species is very sensitive to loud noise.</li> <li>&gt; The intake will be installed with PWWC (Passive Wedge Wire Screens) which have a screen pass velocity as low as 0.10~0.15m/s and the entry slots are only 4mm in width. The screen pass velocity is lower than the average river flow velocity in vicinity of the intake and will therefore allow aquatic animals adequate flexibility to avoid the screens all together. Additionally, the slot size being very small, will eliminate any possibility of entrapment of aquatic life in the intake.</li> <li>&gt; It is anticipated that sheet piled cofferdam and offshore jetty will be constructed to allow piling and subsequent construction of the intake structure. The Contractor will be responsible for various safeguarding aspects and is specified in detail through the ESMP which forms part of the contract. Refer chapter 6 of the ESMP document (enclosed) and the PS-CR which imposes an obligation on the</li> </ul>	Contractor (Monitoring by DWASA)
---	--	-------------------------------------

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		Contractor to comply with the ESMP.	
		<ul style="list-style-type: none"> <li>&gt; Special care (Addressed in Potential Impacts of "Flora and Fauna" in this Table below) for the protection of threatened species such as Ganges River Dolphins, lizards and fish species that have been identified in the project areas and listed in Table 4-5.</li> <li>&gt; Impacts on amphibian population will be monitored by the changes of species composition and richness and their relative abundance.</li> </ul>	

*Table E-0-8: Environmental impact during operation phase and mitigation measures (Originally Table 5)*

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Pumping operation at the intake	Screening waste accumulation	<ul style="list-style-type: none"> <li>&gt; Screening waste needs to be removed regularly from the coarse screens. Local labour may be employed for such operations.</li> <li>&gt; Waste should be stored in a designated Waste Storage Area.</li> <li>&gt; Proper disposal of screening wastes, floating debris (to be treated as a solid waste) by available Sonargaon Municipal Solid Waste Management System.</li> </ul>	DWASA
	Noise management (on ambient environment and flora and fauna)	<ul style="list-style-type: none"> <li>&gt; Plant noise will be maintained following the National Noise Pollution (Control) Rules -2006.</li> <li>&gt; Keep noise level at the raw water intake and pumping operations to a minimum level, as certain fauna (such as Ganges River Dolphins) is sensitive to loud noise.</li> <li>&gt; Specific care</li> </ul>	



Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
	Accidental Spillage of fuel (to run generators)	<ul style="list-style-type: none"> <li>&gt; Embedded design features (such as automatic shut-off valves) to prevent discharge of fuel, lubricants, chemicals, and wastes into surface waters or on land.</li> <li>&gt; Adopt proper disposal techniques for any hazardous waste</li> <li>&gt; The intake does not house any rotary equipment or motorised drives which are all located onshore in the RWPS. Therefore, risks of water contamination due to fuel spillage or similar incidents is nil. The only effluent that is likely to be generated at the Intake is domestic sewage from the staff resident at the intake. This shall be provisioned through the Contract as part of Contractor's delivery.</li> </ul>	
	Presence of silt, oil and grease in raw water	<ul style="list-style-type: none"> <li>&gt; Design feature for not collecting water from the surface to avoid oil and grease.</li> <li>&gt; Avoid collecting water very close to the riverbed to prevent excess silt from entering.</li> <li>&gt; Keeping a provision in the intake system to collect water from different depths depending on the water level of Meghna River</li> </ul>	
	Public Health and Safety	<ul style="list-style-type: none"> <li>&gt; Take measures to avoid or minimize transmission of communicable diseases that may be associated with the influx of temporary or permanent project labor.</li> <li>&gt; Implement measures and actions to control the safety of deliveries of hazardous materials, and of storage, transportation and disposal of hazardous materials and wastes</li> <li>&gt; Implement measures to avoid or control community exposure to the hazardous material</li> <li>&gt; Emergency Response plan of DWASA will include the public evacuation procedures.</li> </ul>	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Treatment plant operation	Accidental Spills and leaks oil, toxic chemicals	> Good house keeping	DWASA
		> Proper handling of lubricating oil and fuel	
		> Collection, proper treatment, and disposal of spills.	
		> Arranging designated areas for storage facilities for all hazardous materials to prevent spillage into the environment	
		> All hazardous materials storage facilities must be located on an impermeable surface and must be enclosed by a sealed bund wall. The bund wall must be capable of containing 110% of the maximum volumes stored to ensure that soil or watercourses are not polluted in the event of a spill in the storage areas. This is ensured by the design specification.	
	Chlorine Gas Emission	> Chlorine Gas Cylinder will be used to minimized the risk of Chloride handling.	
	Generation of sludge dry cakes after sludge dewatering operation	> Assessment of characteristics of sludge through TCLP test to confirm that the material is not hazardous. > Exploring beneficial options for dewatered sludge disposal (e.g., land application, co-disposal with sewage sludge) > If beneficial options are not available, consider landfilling in a suitable land/location. > If lands are not available, make arrangements with Dhaka City Corporation to dispose the sludge dry cakes in one of their designated landfills.	
	Generation of liquid residuals after sludge dewatering operation	> Direct disposal to nearby lowlands if the residuals meet the effluent discharge criteria as per ECR 2023 (see Annex-C) > If discharge criteria are not met, return to the head end of the plant for treatment. Must not be discharged to the head end as a pulse, rather metered in at a flow rate compatible with the hydraulic loading of the plant preferably during diurnal high flows.	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Operation of water transmission pipeline and water treatment plant	Air Pollution	> Ensure that all project vehicles are in good operating condition	Contractor (Monitoring by DWASA)
		> Spray water on dry surfaces/ unpaved roads regularly reduce dust generation	
		> Pave access roads	
		> Maintain adequate moisture content of soil during transportation, compaction, and handling	
	Traffic congestion, communication problems	> Sprinkle and cover stockpiles of loose materials (e.g., fine aggregates).	
		> Not using equipment such as stone crushers at site (if any during operation), which produce significant amount of particulate matter	
		> Schedule deliveries of material/ equipment during non-school hours and after regular working hours	
		> Arrangement of alternative communication routes during laying of pipeline across roads	
	Noise pollution	> Use of noise suppressors and mufflers in heavy construction equipment.	
		> Avoid using of construction equipment producing excessive noise during school hours and also at night	
		> Avoid prolonged exposure to noise (produced by equipment) by workers.	
		> Regulate use of horns and avoiding use of hydraulic horns in project vehicles.	
	Disruption of local drainage	> Provide adequate diversion channel, if required	
		> Provide facilities for pumping of congested water, if needed	
		> Ensure adequate monitoring of drainage effects, especially if construction works are carried out during the wet season.	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Operation of Treatment Plant and its Components	Disposal of additional volumes of wastewater to be generated due to increased water supply of Dhaka city after project completion	<p>&gt; The project objective is to reduce (a) ground water abstraction and (b) replace polluted Sitalakhya River water with Meghna River. There will not be significant volume of additional wastewater generation from the current level of usage.</p> <p>&gt; Additional wastewater due to population growth within Saidabad Phase-I and II supply zones are currently being treated by Dasherbandi Sewage Treatment Plant and the proposed expansion of Saidabad Phase-III distribution network will be treated by upgrading Pagla Sewage Treatment Plant under Dhaka Sanitation Improvement Project (WB). Therefore, conventional wastewater treatment process will be in place to treat and dispose of water production from all three phases of Saidabad project.</p>	Monitoring by DWASA in cooperation with the authority
	Site security	<p>&gt; No special security personnel are envisaged during the operation phase; and has been addressed in design specifications. EIB's International human rights standards and principles include (i) the UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials, (ii) the UN Code of Conduct for Law Enforcement Officials, (iii) the Voluntary Principles on Security and Human Rights and (iv) the International Code of Conduct on Private Security Providers will be followed if security personnel are employed.</p>	Contractor (Monitoring by DWASA)

### Environmental and Social Management Plan

It is recommended that the Project Director (PD) for this specific project takes the overall responsibility of environmental management and monitoring. The PD will form a team with required manpower and expertise to ensure proper environmental monitoring, and to take appropriate measures (as outlined in Table E-0-7 and

Table E-0-8) to mitigate any adverse impact and to enhance beneficial impacts, resulting from the project activities. An environmental monitoring plan during construction and operation phase has also been developed. Specific monitoring requirements for the environmental issues listed in Table E-0-7 are presented in Table E-0-9.

The primary objective of environmental management and monitoring is to record environmental impacts resulting from the project activities and to ensure implementation of the "mitigation measures" identified in Table 11-1 and Table 11-2 in the ESIA report in order to reduce adverse impacts and enhance positive impacts from specific project activities. Besides, it would also address any unexpected or

unforeseen environmental impacts that may arise during construction and operation phases of the project.

The ESMP will clearly lay out: (a) the measures to be taken during both construction and operation phases of the project to eliminate or offset adverse environmental impacts or reduce them to acceptable levels; (b) the actions needed to implement these measures; and (c) a monitoring plan to assess the effectiveness of the mitigation measures employed. Environmental management and monitoring activities for the proposed transmission line project could be divided into management and monitoring: (a) during construction phase, and (b) during operation phase. It should be noted that all plans mentioned in the ESMP or produced within the scope of ESMP requires monitoring listed in below items.

*Table E-0-9: Monitoring issues/ requirements during construction phase of the project  
(Originally Table 6)*

<b>Environmental Issue</b>	<b>Monitoring requirements/issues</b>
<b>Air pollution</b>	<ul style="list-style-type: none"> <li>&gt; Construction materials should be properly covered while hauled and stored, roads properly cleaned, and water sprayed in order to minimize concentration of dust in air.</li> <li>&gt; Use of equipment like stone crushers, which produce excessive noise as well as generate particulate matter must not be used close to human settlement.</li> <li>&gt; Concentration of particulate matter within and around the project site should be measured, at least once every three months, and air quality management plan should revise, if needed.</li> </ul>
<b>Noise pollution</b>	<ul style="list-style-type: none"> <li>&gt; Equipment producing excessive noise should not be operated after dark.</li> <li>&gt; Use of equipment like stone crushers, which produce excessive noise as well as particulate matter must not be used at the site.</li> <li>&gt; Vehicle movement to and from the site should be properly managed in order to ensure that this causes minimum disturbance to the people living in the surrounding areas.</li> </ul>
<b>Traffic congestion</b>	<ul style="list-style-type: none"> <li>&gt; Hauling of materials and equipment to and from project sites should preferably be done after the regular working hours, so that it causes minimum disturbances to the regular traffic in and around the project site.</li> <li>&gt; Contractor should take responsibility of proper traffic flow and management within the immediate vicinity of the project site.</li> </ul>
<b>Drainage management (congestion and excessive drainage)</b>	<ul style="list-style-type: none"> <li>&gt; Appropriate measures should be taken to avoid temporary drainage congestion during construction activities (e.g., keeping existing drains clear, building alternative drainage line/ network, where an existing drainage canal has been filled up).</li> <li>&gt; Provide adequate diversion channel, if required</li> </ul>

	<ul style="list-style-type: none"> <li>&gt; Ensure adequate monitoring of drainage effects (such as drainage flooding), especially if construction works are carried out during the wet season.</li> </ul>
Disposal of construction waste	<ul style="list-style-type: none"> <li>&gt; Waste/ wastewater (e.g., human waste from labour camps, fuel and wash-water from equipment/ material sheds) should be appropriately disposed, so that they do not find their way into adjacent water bodies.</li> <li>&gt; Solid waste and wastewater should be disposed of in compliance with local legislation and best industry practices. Wastewater should be disposed of by constructing septic tanks. Solid waste, including construction debris, should be regularly collected and transported away from the site for disposal in a designated municipal dump site. Excavated materials from the existing sludge drying beds should be tested for toxicity before disposal.</li> </ul>
Surface Water Quality	<ul style="list-style-type: none"> <li>&gt; Monitor the Surface Water Quality of the nearby Kajla khal (canal).</li> </ul>
Labour issues and OHSS	<ul style="list-style-type: none"> <li>&gt; Ensuring safety and well-being of workers is crucial, monitoring the working conditions and implementing safety measures such. as proper ventilation, protective gear, and training programs is essential</li> <li>&gt; Monitoring the air quality, water quality, waste management of the worker camps</li> <li>&gt; Construction of tube wells with acceptable water quality should be checked</li> <li>&gt; Waste minimization, recycle and reuse principles to be followed by the labours</li> <li>&gt; Worker's awareness about hygiene practices</li> <li>&gt; Regular medical monitoring of workers</li> <li>&gt; Proper monitoring and management of solid waste disposal, minimizing environmental impacts and ensuring worker safety</li> <li>&gt; Strictly follow and implement the H&amp;S guidance for COVID-19 at worksite</li> <li>&gt; Monitoring working hours and managing worker fatigue are important considerations. Excessive working hours can lead to increased accidents and decreased productivity.</li> <li>&gt; No force bonded labour or child labour (under-aged) in compliance with ILO Convention No.138 on Minimum Age, Convention No. 182 on the Worst Forms of Child Labour; and Bangladesh Labor Law.</li> </ul>
Commercial activities	<ul style="list-style-type: none"> <li>&gt; Efforts should be made to ensure that local communities are benefited from the increased commercial activities during the construction phase of the project (e.g., by ensuring their participation in the activities).</li> <li>&gt; Care should be taken to avoid haphazard development of commercial activities (e.g., shops) in and around the project sites, which would adversely affect the local environment.</li> </ul>

Table E-0-10: Monitoring issues/ requirements during operation phase of the project (Originally Table 8)

Environmental Issue	Monitoring requirements/issues
Disposal of treatment waste	<ul style="list-style-type: none"> <li>&gt; Regular (once every three months) assessment of the characteristics of sludge through TCLP test to ensure that it is not hazardous.</li> <li>&gt; Monitoring of discharge parameters of liquid residuals from sludge drying operations.</li> <li>&gt; Studies to explore the possibility beneficial sludge disposal options (e.g., land application), and in designated landfills (coordinating with the Dhaka City Corporation)</li> </ul>
Treated water quality	<ul style="list-style-type: none"> <li>&gt; Regular monitoring of treated water quality (as part of the ongoing regular plant operation) to ensure that it is safe for public consumption.</li> <li>&gt; Modification of treatment process (e.g., increase/decrease alum dose of chlorine dose), if needed.</li> </ul>
Raw water quality	<ul style="list-style-type: none"> <li>&gt; Regular monitoring of raw water quality, as part of ongoing regular plant operation.</li> <li>&gt; In association with the Department of Environment (DoE), developing of a long-term management plan for the protection of raw water quality in Meghna River (including restriction on establishment of industries producing liquid effluent within certain reaches upstream and downstream of the intake point).</li> </ul>
Generation of additional volume of wastewater as treated water supply increases	<ul style="list-style-type: none"> <li>&gt; This issue should be taken into consideration in the ongoing planning and implementation activities of DWASA aimed at expanding sewerage network and treatment facilities in Dhaka city. This would obviously necessitate additional sewage treatment plant at appropriate locations.</li> </ul>
Safety of water distribution network	<ul style="list-style-type: none"> <li>&gt; Monitoring and detection of leaks and expansion and up-gradation of water distribution network of, as part of DWASA's regular monitoring and expansion works.</li> </ul>

Environmental and Social monitoring during Construction Phase

Table E-0-11: Monitoring of Air Quality and Noise level during construction phase (Originally Table 7)

Parameters	Monitoring Frequency	Resource Required and Responsibility	Comment
Particulate Matter (PM10, PM2.5)	Once every 3 months, and as directed by the PD	PM <sub>10</sub> and PM <sub>2.5</sub> measuring equipment; Contractor's responsibility	Results to be verified by the Environmental Expert of DSC team.
Noise Level	Once every month, and as directed by the PD	Noise level meter; Contractor's responsibility	
Surface Water Quality (pH, Turbidity, BOD, COD, TDS, DO, Ammonia (NH3-N))	Once every Quarter and as directed by PD	From Accredited Laboratory; Contractor's responsibility	Results to be verified by the Environmental Expert of DSC team.

and Oil & Grease) of  
Kajla Khal

Note: Actual monitoring time and location will be decided by DWASA and the Design Supervision Consultant (DSC) and included in the Employer's Requirements

Environmental and  
Social monitoring  
during Operation  
Phase

Specific monitoring requirements for the environmental issues listed in

Table E-0-8 are presented in Table E-0-12 shows the frequency of monitoring activities during operation phase.

Table E-0-12: Monitoring of water quality and sludge during operational phase of proposed WTP (Originally Table 9)

Monitoring	Water Quality / Other Parameters	Monitoring Frequency
Raw water	pH, Colour, Turbidity, Ammonia, Nitrate, Phosphate, Sulphate, TC, FC	Daily
	Lead, Chromium, Mercury, Cadmium, Total Suspended Solids, COD, BOD <sub>5</sub> , Oil & grease	Once a month
Treated water	pH, Colour, Turbidity, Ammonia, Nitrate, Residual Chlorine, TC, FC	Daily
	BOD <sub>5</sub> , COD, Aluminium, Total Dissolved Solids	Once every two months
Dewatered sludge	TCLP test and determination of Al, Pb, Cr, Cd in TCLP extract	Once every three months
Liquid residuals from dewatering operation	pH, Ammonia-N, BOD <sub>5</sub> , COD, Cd, Cr, Mercury, Chloride, Total Dissolved Solids, Total Suspended Solids, Nitrate, Sulphide	Once a month

Notes:

(1) The parameters listed above are based on water quality measurements of Meghna River as a part of this study. The list should be updated based on monitoring results and information on possible pollution of river water by contaminants (e.g., from an industrial source).

(2) Actual monitoring time and location will be decided by DWASA and the Design Supervision Consultant (DSC) and included in the Employer's Requirements

Table E-0-13 and Table E-0-14 show preliminary cost estimates for monitoring activities during construction and operation phases respectively.

Table E-0-13: Preliminary cost estimates of Particular Matters and Noise Level, surface waters quality, dust control and waste disposal for monitoring and other mitigation activities during construction phase (Originally Table 10)

Parameter/Activity	Frequency of activity	Preliminary cost estimate	Preliminary cost for 1 year activity period
Particulate Matter (PM <sub>10</sub> , PM <sub>2.5</sub> )	Once every 3 months	Tk. 30,000/- per each set of PM <sub>10</sub> and PM <sub>2.5</sub> measurement	Tk. 1,20,000/-



Parameter/Activity	Frequency of activity	Preliminary cost estimate	Preliminary cost for 1 year activity period
Noise Level	Once every month (day and night)	Tk. 25,000/- (per set of measurement)	Tk. 3,30,000/-
Surface Water Quality (pH, Turbidity, BOD, COD, TDS, DO, Ammonia (NH <sub>3</sub> -N) and Oil & Grease) of Kajla Khal	Once every 3 months	Tk. 30,000/- (per set of measurement)	Tk. 120,000/-
Water spraying for dust control	At least twice a day	Tk. 10,000/- per site per month	Tk. 1,20,000/-
Waste Disposal	Every Day	Tk. 80,000/- per site per month	Tk. 960,000/-
Total annual cost for monitoring during construction phase			Tk. 16,50,000/-

Notes: (1) Actual monitoring time and location will be decided by DWASA and the Design Supervision Consultant (DSC) and included in the Employer's Requirements (2) The estimated costs for particular matter (PM) and noise level measurements are based on current rates charged by BRTC, BUET for analysis of the parameters.

Table E-0-14: Preliminary cost estimates for monitoring and other mitigation activities during operational phase (Originally Table 11)

Parameter/Activity	Frequency of activity	Preliminary cost estimate	Preliminary cost for 1 year activity period
Raw water: pH, Colour, Turbidity, Ammonia, Nitrate, Phosphate, Sulphate	Daily	Tk. 6,000/- per set of measurement	Tk. 21,90,000/-
Raw water: Lead, Chromium, Mercury, Cadmium, Total Suspended Solids, COD, BOD <sub>5</sub> , Oil & grease	Once a month	Tk. 15,000/- per set of measurement	Tk. 1,80,000/-
Treated water: pH, Colour, Turbidity, Ammonia, Nitrate, Residual Chlorine, TC, FC	Daily	Tk. 5,500/- per set of measurement	Tk. 20,07,500/-
Treated water: BOD <sub>5</sub> , COD, Aluminium, Total Dissolved Solids	Once every two months	Tk. 8,500/- per set of measurement	Tk. 51,000/-
Sludge from Clarifiers: TCLP test and determination of Al, Pb, Cr, Cd in TCLP extract	Once every three months	Tk. 14,000/- per set of measurement	Tk. 56,000/-
Total annual cost for monitoring during operation phase			Tk. 44,84,500/-

*Notes: (1) The parameters listed above are based on water quality measurements of Meghna River as a part of this study. The list should be updated based on monitoring results and information on possible pollution of river water by contaminants (e.g., from an industrial source) (2) Actual monitoring time and location will be decided by DWASA and the Design Supervision Consultant (DSC) and included in the Employer's Requirements. (3) The estimated costs are based on current rates charged by BRTC, BUET for analysis of the parameters.*

The treated water quality parameters must be checked against the Bangladesh drinking water quality standard (ECR 1997). In addition to the above, alum dose should also be checked on a regular basis. The parameters of the liquid residuals should be checked against the standards for disposal of wastewater/effluent from industrial units or project waste as per ECR, 2023 Schedule-4.

### Grievance Redress Mechanism

The Grievance Redressal Mechanism (GRM) for the planned construction works aims to provide a structured approach for addressing and resolving grievances related to the works. This procedure ensures that individuals or organizations affected by the construction activities have a fair and transparent mechanism to express their concerns and seek resolution.

The GRM applies to all stakeholders, including local communities, residents, employees, contractors, and any other party directly or indirectly affected by the proposed works. Grievances will include, but are not limited to, the following categories:

- Water quality/pollution issues.
- Temporary interruptions or disruptions during construction.
- Environmental concerns.
- Health and safety issues.
- Resettlement matters.
- Communication and public relations matters.

Grievance Redress Procedure is detailed in Section 7.6.

### Conclusion and Recommendations

It has been found that for the Saidabad Phase III WTP project, most of the adverse impacts during construction phase could be minimized or even removed if appropriated mitigation measures are taken. Possible adverse impacts during operational phase are found to be insignificant. However, a monitoring program needs to be put in place to assess any unexpected adverse impacts on the environment. The report has engaged with diverse stakeholders, including community representatives, indigenous groups, non-governmental organizations, and governmental agencies, to understand their perspectives and incorporate their inputs. The report also considered the potential social impacts, including community displacement, cultural heritage preservation, and the overall well-being of local populations. The mitigation measures include the implementation of pollution control technologies, habitat restoration, community engagement programs, and the establishment of grievance mechanisms addressing the concerns and needs of affected communities, which was listed in Table E-0-7. The report has also identified the potential for positive social opportunities, such as employment generation and social benefit from infrastructure improvement. The ESMP should be carried out as an integral part of the project planning and execution. It has also been pointed out that for long-term sustainability of the water treatment plant, the source water quality

and quantity must be ensured to meet the requirements of the treatment plant and water demand. The Department of Environment (DoE), DWASA and BIWTA should take proactive measures so that the source water quality is protected against pollution and the riverbanks remain free from illegal land grabbing in future.

## 2022 ESIA Update Recommendations

The ESIA baseline condition of 2014 is updated in this 2022 version of the report. The PMC has assessed the current baseline condition, particularly ambient air quality, noise level, surface water quality of the river, Focus Group Discussion and Socioeconomic survey in relation to public consultation and socioeconomic condition assessment. This updated ESIA report incorporated the current baseline information in the same baseline table of 2014 to understand the changes of environmental and social parameters in the last 8 years. The changes are significant in comparison with the 2014 baseline data but are generally within the national standards of ECR'2023.

A comparison of the baseline data in 2022 demonstrates the changes in environmental and socio-economic conditions are within the limit and will not warrant a new formal approval from the Department of Environment (DoE). An extension of the existing permit will be adequate for the implementation of proposed C1&3 and C-2 works as "Conclusion and Recommendations" given in 2014 ESIA study are still valid.

# CONTENTS

1	Introduction	1
1.1	Background	1
1.2	Objective	3
1.3	Scope of Study	4
1.4	The ESIA Report	4
2	Project Description	6
2.1	General Features of the Project	6
2.1.1	Water Source	6
2.1.2	Intake	7
2.1.3	Raw Water Transmission Pipeline	9
2.1.4	Water Treatment Process	11
2.1.5	Sludge Management	11
2.1.6	Treated Water Transmission Line	14
2.1.7	Existing Solid Waste Disposal Sites	14
2.2	Project Activities During Construction Phase	15
2.3	Project Activities During Operational Phase	16
2.4	Project Schedule	17
3	Legislative, Regulatory and Policy Consideration	19
3.1	Literature Review	19
3.2	AFD Principles for Direct Financed Projects	20
3.3	Government Policies, Laws, Regulations	41
3.3.1	Industrial Policy 1991	41
3.3.2	National Environmental Policy 1992	41
3.3.3	National Safe Drinking Water Supply and Sanitation Policy 1998	42
3.3.4	National Conservation Strategy 1992	42
3.3.5	National Environmental Management Plan	42
3.3.6	National Water Management Plan	43
3.4	Conventions, Treaties and Protocols	44
3.4.1	Environment Conservation Act 1995 Amended in 2000 & 2002	44
3.4.2	The Acquisition and Requisition of Immovable Property Ordinance, 1982	46
3.4.3	Acquisition and Requisition of Immovable Property Act (2017)	47
4	Compliance with DoE EIA guideline	48
4.1.1	Environment Conservation Rules 2023	48
4.1.2	Environment Court Act 2000 Amendment in 2010	49
4.2	Harmonization of Environmental and Social Policies of EIB/WB/IFC and GOB	52

4.2.1	Harmonization of environmental policies of EIB/WB/IFC and GOB	52
4.2.2	Harmonization of Social Policies of EIB/WB/IFC and GOB	57
4.3	International Conservations, Treaties and Protocols	62
4.4	Relevant Occupational Health and Safety Laws and Rules	63
4.5	Applicable Environment Standards	63
4.5.1	Ambient Air Quality Standards	63
4.5.2	Water Quality Standards	65
4.5.3	Ambient Noise Standards	66
5	Baseline Environment: Physicochemical	68
5.1	Introduction	68
5.2	Physical Features of the Study Area	68
5.2.1	Topographic Survey	68
5.2.2	Physical Features of Haria Intake Site	69
5.2.3	Physical Features along Route of Water Transmission Line	69
5.2.4	Physical Features of Existing Water Treatment Plant Site	73
5.2.5	Physical Features along Route of Water Distribution Line	73
5.3	Physicochemical Environment	75
5.3.1	Climate	75
5.3.2	Geology and Seismicity	79
5.3.3	Soil Quality	80
5.3.4	Water Quality	83
5.3.5	Ambient Noise Level	93
5.3.6	Air Quality	96
5.3.7	Traffic Survey	100
6	Baseline Environment: Ecological	102
6.1	Introduction	102
6.2	Ecological Perspective of Project Area	102
6.3	Ecological Features	103
6.3.1	Faunal Diversity	103
6.3.2	Floral diversity	110
6.4	Threatened Flora and Fauna	116
6.5	Protected Areas, National Park, Game Reserves, Wildlife Sanctuaries and ECA	117
7	Baseline Environment: Socio-Economic	119
7.1	Introduction	119
7.2	Approach And Methodology	119
7.3	Socio-Economic Perspective of the Study Areas	121

7.4	Baseline Social Attributes from Questionnaire Survey	122
7.5	Socioeconomic Profile of Affected Households	141
7.5.1	Demographic Characteristics in Project Affected Area	141
7.5.2	Distribution of Household Head	142
7.5.3	Age Composition	142
7.5.4	Marital Status	143
7.5.5	Household by Religion	144
7.5.6	Education	144
7.5.7	Income and Expenditure of HHs	145
7.5.8	Occupation Pattern	146
7.5.9	Economic Activities of PAPs	148
7.5.10	Status of Access to Different Amenities	148
7.6	Grievance Redress Mechanism	149
7.6.1	Grievance Redressal Official (GRO)	150
7.6.2	Grievance Evaluation and Investigation:	150
7.6.3	Grievance Resolution	150
8	Public Consultation and Communication	152
8.1	Introduction	152
8.2	Methodology	152
8.3	Key Findings from FGDs and Key Informant Interview	155
8.4	Concluding Remarks	161
9	Analysis of Alternatives	164
9.1	Introduction	164
9.2	Alternate Intake Location	164
9.2.1	Intake at Sarulia	164
9.2.2	Intake at Bisnondi	165
9.2.3	Intake at Haria	166
9.3	Alternate Raw Water Transmission Route	166
9.4	Alternate Options for Water Courses crossing by Transmission Lines	184
9.5	No Project Scenario	184
10	Impact Evaluation	185
10.1	Introduction	185
10.2	Environmental and Social Impacts During Construction Phase	185
10.2.1	Ecological Impacts	186
10.2.2	Evaluation of Ecological Impact	190
10.2.3	Risk Assessment	192
10.2.4	Physicochemical Impacts	194
10.2.5	Social-economic Impacts	195

10.3	Environmental Impacts During Operational phases	198
10.4	Evaluation of Physicochemical and Socio-Economic Impacts	199
10.5	Climate Change Impact	201
10.6	Cumulative Impact	204
11	Environmental and Social Management Plan	209
11.1	Introduction	209
11.2	Mitigation Measures	209
11.2.1	Construction Phase	209
11.2.2	Operational Phase	222
11.3	Environmental and Social Management Plan	226
11.3.1	Scope of ESMP	226
11.3.2	Work Plans and Schedules	226
11.4	Environmental and Social Monitoring Plan	227
11.4.1	Monitoring during Construction Phase	227
11.4.2	Monitoring during Operational Phase	233
11.4.3	Cost of Environmental Monitoring	236
11.5	Summary of the Resettlement Action Plan (RAP)	238
11.6	Stakeholder Engagement	243
11.7	Corporate Social Responsibility (CSR)	243
12	Conclusions and Recommendation	245
12.1	Conclusions	245
12.2	Recommendations	246

13	References	248
	ANNEX-A: QUESTIONNAIRE SAMPLE FOR SOCIAL BASELINE STUDY	250
	ANNEX-B: LIST OF PARTICIPANTS	273
	ANNEX-C: DEPARTMENT OF ENVIRONMENT'S (DOE) STANDARDS FOR WASTE DISCHARGE	275
	ANNEX-D: DECLARATION OF SHITALAKSHYA RIVER AS ECOLOGICAL CRITICAL AREA (ECA)	277
	ANNEX-E: CHANCE FIND PROCEDURE	279
	ANNEX-F: CORPORATE SOCIAL RESPONSIBILITY (CSR)	280
	ANNEX-G: AMBIENT AIR QUALITY REPORT	307
	ANNEX-H: PHOTOGRAPHS OF NOISE MONITORING	311
	ANNEX-I: LABORATORY TEST REPORT OF SURFACE WATER QUALITY	317
	ANNEX-J: ECC OF SWTP PROJECT PHASE III	341
	ANNEX-K: KEY MAP OF ENVIRONMENTAL RISK AND INTERVENTIONS	343
	ANNEX-L: KEY MAP OF SOCIAL RISK AND INTERVENTIONS	344
	ANNEX-M: CONSTRUCTION RELATED OCCUPATIONAL HEALTH AND SAFETY PLAN	345
	ANNEX-N: VULNERABILITY ASSESSMENT	357
	ANNEX-O: GRIEVANCE REDRESSAL PROCEDURE	358



# LIST OF FIGURES

Figure 2-1: Water source selection depending on season (DWASA, 2013). (Originally Table 12)	6
Figure 2-2: Project Base Map for Saidabad WTP Phase III (Updated from Figure 2)	8
Figure 2-3: Cross Sectional Profile of Proposed RWT Mains along Dhaka-Chittagong Highway (Updated from figure 3)	10
Figure 2-4: Treatment Process Flowchart for Saidabad Phase-III (Original Figure 4)	11
Figure 2-5 Proposed layout of Saidabad Phase-III Plant (DWASA, 2013) (Original Figure 5)	12
Figure 2-6: Injection Point of Saidabad Phase III in the Distribution Network (Updated Figure 6)	14
Figure 2-7: Location of Landfill Site Operated by Dhaka South City Corporation (Updated Figure 7)	15
Figure 2-8: Saidabad Water Treatment Project Phase III Integrated Programme (Phases 1 & 2). (Prepared in 2022)	18
Figure 5-1: Cross-sectional Survey Locations from Proposed Intake at Haria to SWTP	70
Figure 5-2: Strip map of the Intake Structure at Haria and part of the proposed route of the water transmission pipeline. (Original Figure 10)	71
Figure 5-3: A contour map of the proposed Saidabad WTP Site (DWASA, 2023) (Replaces original Figure 11)	72
Figure 5-4: Location of the Study Area on the Rainfall Map of Bangladesh (map source: <a href="http://www.banglapedia.org">www.banglapedia.org</a> ) (Original Figure 12)	76
Figure 5-5: Monthly Temperature at the Dhaka BMD Station, 1989-2019 (Replaces Original Table 16)	77
Figure 5-6: Monthly Relative Humidity at Dhaka BMD station (1988-2017)	77
Figure 5-7: Monthly maximum and average Rainfall at Dhaka BMD station (1988-2017)	78
Figure 5-8: Annual Rainfall at Dhaka BMD station (1988-2017) Source: Dhaka BMD station (1988-2017)	78
Figure 5-9: Project area on Seismic Map (left) and Soil Tract Map (right) of Bangladesh (map source: <a href="http://www.banglapedia.org">www.banglapedia.org</a> ) (Original Figure 13)	80
Figure 5-10: Map Showing Soil, Sediment and Groundwater Sampling Locations (Original Figure 14)	81
Figure 5-11: Surface Water Sampling Locations (Prepared in 2022)	84
Figure 5-12: Kajla Khal Surface Water Sampling Location (Prepared in 2023)	92

Figure 5-13: Noise Monitoring at the Water Treatment Plant Site (Dec'22)	94
Figure 5-14: Ambient Air Quality Monitoring at Intake and at D-C Highway respectively	97
Figure 5-15: Briefing to PMC about Ambient Air Quality Monitoring Testing at Intake	97
Figure 5-16: Air Quality Monitoring Location at the Water Treatment Plant Site (Dec'22) (Figure Prepared in 2023)	98
Figure 5-17: Particulate Matters (PM10 & PM2.5) at the Saidabad Water Treatment Plant Site (Figure Prepared in 2023)	99
Figure 5-18: Location of Traffic Survey near the SWTP access route	100
Figure 5-19: Traffic of Saidabad Access Route (Outwards SWTP) (Dec'22)	101
Figure 5-20: Traffic of Saidabad Access Route (Towards SWTP) (Dec'22)	101
Figure 6-1: Terrestrial fauna at Haria, Sonargaon, Narayanganj (Original Figure 15)	104
Figure 6-2: Terrestrial fauna at Baiddherbazar, Sonargaon, Narayanganj (Original Figure 16)	104
Figure 6-3: Terrestrial fauna at Madan Circle and nearby areas (Original Figure 17)	104
Figure 6-4: Terrestrial fauna adjacent to Saidabad water treatment plant area (Original Figure 18)	105
Figure 6-5: Distribution of terrestrial fauna in the project areas (Original Figure 19)	105
Figure 6-6: Aquatic fauna at Sonargaon and adjacent areas (Original Figure 20)	109
Figure 6-7: Aquatic fauna at Baiddherbazar, Sonargaon and adjacent areas (Original Figure 21)	109
Figure 6-8: Distribution of aquatic fauna (Original Figure 22)	110
Figure 6-9: Terrestrial flora at project sites and adjacent areas (Original Figure 23)	111
Figure 6-10: Terrestrial flora in the project sites and adjacent areas (Original Figure 24)	111
Figure 6-11: Distribution of terrestrial floral habit in the project areas (Original Figure 24)	112
Figure 6-12: Aquatic flora in the project sites and adjacent areas (Original Figure 25).	115
Figure 6-13: Distribution of aquatic floral habit in the project areas (Original Figure 26)	115
Figure 7-1: Surveyors filling out questionnaire sheets by interviewing local people in the study areas. (Original Figure 27)	121
Figure 7-2: Some photographs of the project sites (Original Figure 28)	123

Figure 7-3: Some photographs from Sonargaon (Original Figure 29)	123
Figure 7-4: Questionnaire findings: (a) Respondents' reason for migration and (b) Occupation pattern of respondents. (Original Figure 30)	124
Figure 7-5: Respondents' experience with earthquake from questionnaire survey (Original Figure 31)	124
Figure 7-6: Questionnaire finding: Respondents' access to (a) source of light, (b) natural gas supply, and (c) source of energy used for cooking. (Original Figure 32)	125
Figure 7-7: Questionnaire Findings: Respondents' (a) Disease pattern, and (b) Pattern of getting (Original Figure 32)	125
Figure 7-8: Questionnaire Findings: Education level of respondents in the study areas (Original Figure 32)	126
Figure 7-9: Educational institutions in the study area: (a) a local high school, and (b) a local madrasa (Islamic educational institution). (Original Figure 33)	127
Figure 7-10: Questionnaire Findings: Status of road condition – respondents' opinions (Original Figure 34)	127
Figure 7-11: (a) a Hindu religious establishment and (b) the ancient Panam city conserved by Archaeological Department of GOB. (Original Figure 35)	127
Figure 7-12: Questionnaire Findings: Respondents' income pattern (Original Figure 35)	128
Figure 7-13: Small businesses in the study area: (a) Wood shop for furniture making, and (b) A small shop beside a local road. (Original Figure 36)	128
Figure 7-14: Questionnaire findings regarding respondents' opinion on: (a) land acquisition, and (b) reasons for supportive attitude for the proposed project. (Original Figure 36)	128
Figure 7-15: Respondent by Sex	130
Figure 7-16: Affected People by Sex	131
Figure 7-17: Received Compensation from DC Office	132
Figure 7-18: Gender of the household head	132
Figure 7-19: No. of Households as per Occupations	133
Figure 7-20: Health service from various Institutions	133
Figure 7-21: Sources of Utilities as per Households	134
Figure 7-22: Level of Education of Respondent	134
Figure 7-23: Respondent by Sex	136
Figure 7-24: Household head by Sex	137
Figure 7-25: Households by Occupations	138
Figure 7-26: Sources of Utilities by Households	138
Figure 7-27: Level of Education of Respondent	139
Figure 7-28: Number of Households by Health Services	139
Figure 7-29: Households using sanitary Latrine	140
Figure 7-30: Households by Income	140
Figure 7-31: Households affected by Common diseases	141

Figure 7-32: Economic Activities of Eligible PAPs	148
Figure 8-1: Focus Group Discussions	152
Figure 8-2: Location Map of FGDs	153
Figure 8-3: Pictures from FGDs/other meetings of January 2023	155
Figure 8-4: FGDs Location Map of January 2023	161
Figure 9-1: Proposed Raw Water Transmission Route from Haria to SWTP (Option 1) (Original Figure 40)	168
Figure 9-2: Proposed Raw Water Transmission Route from Haria to SWTP (Option 2) (Original Figure 41)	169
Figure 9-3: Proposed Raw Water Transmission Route from Haria to SWTP (Option 3) (Original Figure 42)	170
Figure 9-4: Proposed Raw Water Transmission Route from Haria to SWTP (Option 4) (Original Figure 43)	171
Figure 9-5: Proposed Raw Water Transmission Route from Haria to SWTP (Option 5) (Original Figure 44)	172
Figure 9-6: Tunnel crossing of Shitalakshya River (Option-1 & 2)	180
Figure 9-7: River crossing alignment Option 3	181
Figure 9-8: River crossing alignment Option 4	181
Figure 9-9: Indicative schematic of large diameter twin pipeline construction at Demra canal	183
Figure 10-1 Location of Haria Intake	205
Figure 10-2 Depth Average Velocity vector near Haria intake during the 1 in 10 year flood event	206

## LIST OF TABLES

Table E-0-1 Evaluation of ecological impacts resulting from different project activities (Originally Table 1)	xxi
Table E-0-2: Physicochemical impacts from activities associated with the construction and operation of SWTPPP III. (Originally Table 2)	xxiv
Table E-0-3: Socio-economic impacts from activities associated with the construction and operation of SWTPPP III (Originally Table 3)	xxv
Table E-0-4: Three Alternate Locations Considered for the Raw Water Intake for Saidabad phase III (new table)	xxviii
Table E-0-5: Different Options wise Raw Water Transmission Route Length (new table)	xxviii
Table E-0-6: Option Analysis in Consideration of Environmental and Social Aspects	xxx
Table E-0-7: Environmental impact during construction phase and mitigation measures (Originally Table 4)	xxxii
Table E-0-8: Environmental impact during operation phase and mitigation measures (Originally Table 5)	xliv
Table E-0-9: Monitoring issues/ requirements during construction phase of the project (Originally Table 6)	xlix

Table E-0-10: Monitoring issues/ requirements during operation phase of the project (Originally Table 8)	li
Table E-0-11: Monitoring of Air Quality and Noise level during construction phase (Originally Table 7)	li
Table E-0-12: Monitoring of water quality and sludge during operational phase of proposed WTP (Originally Table 9)	lii
Table E-0-13: Preliminary cost estimates of Particular Matters and Noise Level, surface waters quality, dust control and waste disposal for monitoring and other mitigation activities during construction phase (Originally Table 10)	lii
Table E-0-14: Preliminary cost estimates for monitoring and other mitigation activities during operational phase (Originally Table 11)	liii
Table 3-1: Summarized Applicable ESSs/PSs for the AFD/KfW /DANIDA Financed Project	22
Table 3-2: Summarized Applicable ESSs/PSs for the EIB Financed Project	31
Table 4-1: Government policies, laws, regulations, and environmental standards	49
Table 4-2: Harmonized environmental policies of WB/IFC and GOB	52
Table 4-3 Harmonised Social Policies of WB/IFC and GOB	57
Table 4-4: International environmental conventions relevant to the project activities	62
Table 4-5: Relevant occupational health and safety laws and rules	63
Table 4-6: Ambient Air Quality Standards	63
Table 4-7: Primary Water Quality Criteria for Designated-Best-Use-Classes	65
Table 4-8: Standards for Drinking Water	65
Table 4-9: Treated Sewage Discharge Guideline IFC	66
Table 4-10: Bangladesh standards for sound level (GoB, 2006)	66
Table 4-11: Noise Level Guidelines (Guidelines for Community Noise, WHO, 1999)	66
Table 4-12: Noise Limits for Various Working Environments	66
Table 4-13: OSHA Noise Exposure Limits for the Work Environment (in dBA)	67
Table 5-1: Number of each physical feature within a 100 m wide strip along the route of the proposed water transmission pipeline (Original Table 14)	73
Table 5-2: Summary of important features along the route of the distribution line (Original Table 15)	74
Table 5-3: Geo-coordinates of three soil and two sediment sampling locations were collected along the proposed raw water transmission route for SWTP Phase –III Project (Original Table 17)	80

Table 5-4: Heavy metal content of the soil and sediment samples collected from three locations along the proposed raw water transmission route for SWTP Phase –III Project (Original Table 18)	82
Table 5-5: Selected heavy metal contents of the settled sludge from the existing sludge drying beds inside the proposed WTP site. (Original Table 19)	82
Table 5-6: Summary characteristics of groundwater near the project area (Original Table 20)	83
Table 5-7: Water Quality Test Results from Meghna River at Haria, Baidder Bazar, Sonargaon, Narayanganj (Original Table 21)	85
Table 5-8: Pesticides contents of raw water sample collected from Meghna River at Haria intake location on 28 September 2013. (Original Table 22)	88
Table 5-9: Water Quality Test Results from water bodies within the project area (Original Table 23)	90
Table 5-10: Test Result of Kajla Khal	93
Table 5-11: GPS Coordinate of Noise Level Monitoring	94
Table 5-12: Night time Noise Level of Saidabad Water Treatment Plant Site (December 2022)	94
Table 5-13: Day Time Noise Level of Saidabad Water Treatment Plant Site(December 2022)	95
Table 5-14: Summary of daytime noise level measurement in the project area (Original Table 24)	95
Table 5-15: Bangladesh standards for sound level (GoB, 2006) (Original Table 25)	96
Table 5-16: Air quality at two locations at the project site (Original Table 26)	96
Table 5-17: Ambient Air Quality of the Saidabad Water Treatment Plant Site (Table prepared in 2023)	100
Table 6-1: Identified terrestrial fauna at three major sampling areas for the SWTP Phase III project. (Original Table 27)	105
Table 6-2: Identified aquatic fauna at three major sampling areas for the SWTP Phase III project. (Original Table 28)	107
Table 6-3: Identified terrestrial flora at three major sampling areas for the SWTP Phase III (Original Table 29)	113
Table 6-4: Identified terrestrial flora at three major sampling areas for the SWTPPP III (Original Table 30)	116
Table 6-5: List of Critically Endangered, Endangered and Vulnerable wildlife and fish fauna in the study area (Original Table 31)	117
Table 7-1: Distribution of households and Population	141
Table 7-2: Distribution of households and Population	142
Table 7-3: PAPs age composition by sex	142
Table 7-4: PAPs age composition by sex	143
Table 7-5: Marital Status by sex	144



Table 7-6: Marital Status by sex	144
Table 7-7: Education level of the PAPs	145
Table 7-8: Education level of the PAPs	145
Table 7-9 Income and expenditure of households at the raw water pumping station	146
Table 7-10 Income and expenditure of households along Demra-Jatrabari Road up to Middhabari Sluice Gate	146
Table 7-11: Principal occupation of the affected population in the Project area	147
Table 7-12: Principal occupation of the affected population in the Project area	147
Table 7-13: HH access to amenities	148
Table 7-14: HH access to amenities	149
Table 8-1: Details of FGDs for the proposed SWTP Phase –III Project.	153
Table 8-2: Details of FGDs for the Component-2 SWTP Phase–III Project, Dec. 2022-Jan. 2023	154
Table 8-3: Findings of FGDs	156
Table 8-4: Findings of FGDs from January 2023	160
Table 9-1: Different Options wise Raw Water Transmission Route Length (Original Table 41)	173
Table 9-2: Option Analysis in Consideration of Environmental and Social Aspects	174
Table 10-1: Evaluation of ecological impacts resulting from different project activities (Original Table 34)	191
Table 10-2: Consequence (Impact) Severity Ranking (Project Site Level) (Original Table 35)	192
Table 10-3: Likelihood ranking table (Original Table 36)	193
Table 10-4: Risk Assessment Matrix (Original Table 37)	193
Table 10-5: Summary of Ecological Risk Assessment Matrix (Original Table 38)	193
Table 10-6: Physicochemical impacts from activities associated with the construction and operation of Saidabad Water Treatment Plant Phase III (Original Table 39)	200
Table 10-7: Socio-economic impacts from activities associated with the construction and operation of Saidabad Water Treatment Plant Phase III (Original Table 40)	200
Table 10-8: Risk Assessment Analysis	203
Table 10-9: Risk Level Description	204
Table 10-10: Risk Rating Matrix	204
Table 11-1: Environmental and Social impact during construction phase and mitigation measures (Original Table 42)	209
Table 11-2: Environmental impact during operation phase and mitigation measures (Original Table 43)	222
Specific monitoring requirements for the environmental and social issues during construction phase listed in Table 11-1 are presented in Table 11-4. Please note full mitigation measures are listed in Table	

11-3:Environmental and Social impact during construction phase and mitigation measures (Original Table 42); listed items in below table should be monitored in full during construction phase of the project.	227
Table 11-4: Monitoring issues/ requirements during construction phase of the project (Original Table 44)	227
Table 11-5 Environmental (air quality and noise level) and Socio-economic monitoring during construction phase (Original Table 45)	233
Table 11-6: Monitoring issues/ requirements during operation phase of the project (Original Table 46)	234
Table 11-7: Environmental (water quality and sludge) and Socioeconomic Monitoring during operational phase of proposed WTP (Original Table 47)	235
Table 11-8: Preliminary cost estimates for monitoring and other mitigation activities during construction phase (Original Table 48)	237
Table 11-9: Preliminary cost estimates for monitoring and other mitigation activities during operational phase (Original Table 48)	237
Table 11-10: PAPs preferences for income and livelihood restoration	239



# ABBREVIATIONS

ADB	Asian Development Bank
AFD	French Agency for Development
BIWTA	Bangladesh Inland Water Transport Authority
BUET	Bangladesh University of Engineering and Technology
CSR	Corporate Social Responsibility (plan)
DANIDA	Danish International Development Agency
DBO	Design, Build, Operate
DBF	DANIDA Business Finance
DESWSP	Dhaka Environmentally Sustainable Water Supply Project
DND	Dhaka-Narayanganj-Demra canal
DMA	District Metering Area
DO	Dissolved Oxygen
DOE	Department of Environment
DPDC	Dhaka Power Distribution Company
DSC	Design and Supervision Consultants
DSCC	Dhaka South City Corporation
DSIF	DANIDA Sustainable Infrastructure Finance
DTW	Deep Tube Well
DWASA	Dhaka Water Supply and Sewerage Authority
DWSSDP	Dhaka Water Supply Sector Development Project
EIB	European Investment Bank
EMP	Environmental Management Plan
ESMP	Environmental and Social Management Plan
ESIA	Environmental and Social Impact Assessment
FIDIC	International Federation of Consulting Engineers (French)
FGD	Focused Group Discussion
FR/FS	Feasibility Report/ Study
GoB	Government of Bangladesh
GW	Ground Water
ICA	Instrumentation Control and Automation
IWM	Institute of Water Modelling
KfW	Kreditanstalt für Wiederaufbau
KII	Key Informants Interview
LGRDC	Local Government Rural Development and Cooperatives
l/c/d	Litres Per Capita per Day
MD	Managing Director
MI/d	Megalitres per Day
PD	Project Director
PGCB	Power Grid Company Bangladesh
PMC	Project Management Consultants
PMU	Project Management Unit
PS	Pumping Station
PWD	Public Works Department
REB	Rural Electrification Board

<b>RAP</b>	Resettlement Action Plan
<b>RHD</b>	Roads and Highways Department
<b>RWP</b>	Raw Water Pipeline
<b>RWPS</b>	Raw Water Pumping Station
<b>SCADA</b>	Supervisory Control and Data Acquisition
<b>SEP</b>	Stakeholder Engagement Plan
<b>SER</b>	Service Economique Régional - French Embassy in Dhaka
<b>SWTPPP III</b>	Saidabad Water Treatment Plant Project Phase III
<b>TCLP</b>	Toxicity Characteristic Leaching Procedure
<b>TOR</b>	Terms of Reference
<b>WHO</b>	World Health Organisation
<b>WTP</b>	Water Treatment Plant
<b>m<sup>3</sup>/d</b>	Cubic Metres per day

# 1 Introduction

## 1.1 Background

### **TEXT MODIFIED IN 2023**

This chapter contains technical details of the project which have developed since 2014. These changes are detailed in other documents which have been prepared by the PMC and DSC and the teams developing other projects. However, overall, the scope of the scheme remains the same and so this chapter has not been updated.

Dhaka Water Supply and Sewerage Authority (DWASA), entrusted with the responsibility to supply potable water to Dhaka Metropolitan City and adjacent areas, is facing significant challenges in its efforts to ensure water supply in adequate quantity and quality to the growing population of Dhaka throughout the year. The majority (about 75%) of DWASA water supply (about 1940 MLD) comes from about 660 deep tube wells (DTWs) installed in the upper Dupitila and deeper aquifers (100-350m). However, in recent years, the groundwater level has been declining rapidly. Studies conducted by the IWM have confirmed that water level in the upper aquifer is declining at a rate of 2-3 meters annually, causing a groundwater mining situation in Dhaka. It is noteworthy that up to 1994, the water level declination was only 0.55 meters per year, while in the last 15 years the groundwater declined by 3.52 meters per year. It has been observed that in recent years the production from the groundwater has not increased substantially in spite of the fact that the number of DTWs has increased quite significantly. This demonstrates that further abstraction from upper aquifer (100-350m) is no longer sustainable. In such a scenario, there will be scarcity of drinking water unless alternative sources are explored. To respond to this emerging scenario, DWASA has made a strategic decision to shift from groundwater source to conjunctive use of surface and ground water sources, as per the direction of the Government of Bangladesh.

The successful construction and commissioning of Phase I of Saidabad Water Treatment Plant (SWTP) in July 2002, with a capacity of 225 MLD, marked the beginning of a major surface water development program of DWASA. The SWTP accounts for the majority (over 90%) of the treated surface water supplied by the DWASA. In an effort to fully implement the strategic development plan prepared by the DWASA, a Joint Partnership Framework has been signed between the Government and the Development Partners. Based on the agreement, the Asian Development Bank (ADB) has already completed the feasibility study of "Dhaka Water Supply Improvement Plan" for a period up to the year 2025. As per Improvement Plan, rehabilitation of water supply network and feasibility study of Khilkhet surface water treatment plant has been commenced under the ADB assistance. In addition, Phase II of the Saidabad Water Treatment Plant with a capacity of 225 MLD has already been completed (in December 2012) under DANIDA financing. The aim is to develop the surface water capacity to meet 70% of the water demand of Dhaka city in future.

Widespread contamination of the peripheral rivers of the city by the indiscriminate disposal of untreated/ partially treated domestic sewage and industrial wastewater is a major impediment for the use of river water for water supply. Both Saidabad phase I and phase II water treatment plants derive raw water from Shitalakshya river through the intake at Sarulia. The water quality of Shitalakshya river is deteriorating day by day, particularly during the dry season, resulting in increased operational costs of the water treatment plants. In an effort to meet the increasing demand of safe and reliable water supply, the DWASA is

exploring the possibility of constructing more water treatment plants by drawing water from relatively distant surface water sources, such as from Padma and Meghna rivers, which provide better quality water throughout the year. One of the proposed treatment plants will be installed in Jashaldia village under Louhajong upazila in Munshiganj district, which will draw raw water from the Padma River at Jashaldia and have a capacity of 900 MLD to be constructed in two phases (450 MLD capacity plant under Phase I by 2015 and another 450 MLD capacity plant by 2020). Another treatment plant (to be installed at Khilkhet/Gandharbpur), will add 1000 MLD water to the supply system by the year 2030 (500 MLD capacity plant under Phase I by 2020 and another 500 MLD capacity plant by 2030) by drawing the raw water from the Meghna River at Bishnondi. The third treatment plant, termed as Saidabad phase III, will also withdraw water from Meghna River but at Haria which is several kilometres downstream from Bishnondi with a maximum capacity of 450 MLD.

The proposed Saidabad Phase III project will be installed at the site of the existing Saidabad phase I and phase II plants. In the event the Sarulia intake becomes inoperable (e.g., due to poor water quality of Shitalakshya river) for certain periods of the year, the proposed project will also have provisions for drawing the entire raw water (i.e. up to 950 MLD) from the Meghna River to feed the Saidabad phase I, II and III treatment plants.

The major activities associated with the implementation of the Saidabad phase-III project will be:

1. Construction of a 450 MLD surface water treatment plant at Saidabad site. The plant will include components such as clarifiers, rapid sand filtration units, storage and high lift pumping facilities for treated water as well as treated water primary. Works will include sludge treatment for the phases I, II and III.
2. Construction of twin primary transmission line for raw water from the proposed intake in the Meghna River to the SWTP at Saidabad.
3. Construction of main feeder lines from the SWTP at Saidabad to the injection points of the water distribution system.
4. Construction of about 61.8 km of distribution line.

The Saidabad Phase-III project is included in DWASA strategic Development Plan for the period 2004 – 2015. Likely sources of foreign assistance for this project include AFD, KfW, EIB and DANIDA. This feasibility study to address Saidabad Phase III project is being carried out by Egis Eau, funded by FASEP (Fonds d'Études et d'Aide au secteur Privé) of French Finance Ministry. Institute of Water Modelling (IWM), the local partner of Egis Eau, is carrying out activities related to the feasibility study.

A comparison of the water quality of Shitalakshya and Meghna River during the dry season showed that Shitalakshya river water doesn't comply with the water standard (including the raw water parameters set in the operator contract for Saidabad Ph-II) while the water quality of Meghna River has been found satisfactory (DWASA, 2013). It was also observed from preliminary studies that Meghna River had sufficient water to meet the requirement of the proposed WTP (DWASA, 2013). As a part of the feasibility study, different options were considered for the location of the intake and the raw water transmission route. Haria has been preliminarily selected as the most suitable option for intake location based on technical and implementation constraints. Also, after discussion with DWASA officials and preliminary assessment, the most advantageous option for raw water transmission route has been selected (from Haria to Saidabad SWTP site) taking into consideration technical and socio-economic constraints.

As a part of the feasibility study, a full-scale environmental impact assessment of the proposed project has been carried out. As per the Environmental Conservation Rules 2023 (GoB, 2023) of the GoB, the proposed project involving construction of raw water transmission line, water treatment plant, and treated water transmission line, falls under "RED category". Though construction of intake structure is not specifically mentioned in the ECR 2023, an intake structure is a major part of a surface water transmission and treatment plant, and preliminary assessment suggests that construction and operation of such an intake structure (including construction of raw water transmission line) may result in significant environmental impacts. Therefore, carrying out an Environmental and Social Impact Assessment (ESIA) in accordance with the Environment Conservation Act 1995 and the Environment Conservation Rules 2023 is mandatory.

The environmental and social impact assessment (ESIA) of the proposed project has been presented in this report. The ESIA has been carried out following the guidelines (GoB, 2023) of the Department of Environment (DoE) and relevant operational guidelines, e.g., those of the GoB, the World Bank ES Framework (Environmental and Social Standard), and IFC Performance Standards on Environmental and Social Sustainability followed by the AFD/KfW/EIB/DANIDA financed project.

## 1.2 Objective

As mentioned earlier, the proposed development project involves construction of a surface water treatment plant at Saidabad with a total capacity of 450 MLD by 2028. The raw water intake structure and transmission line will have a capacity to withdraw and transport up to 900 MLD of raw water from Meghna River.

The overall objectives of the ESIA of the proposed project were to identify potential significant environmental and social impacts, both positive and negative, during construction and operational phases of the project, recommend mitigation measures to avoid or reduce adverse environmental and social impacts and to enhance positive impacts, and to develop a comprehensive environmental and social management plan (ESMP), including monitoring requirements, for both construction and operational phases of the project. The specific objectives of the ESIA are:

1. to assess the existing environmental and social conditions surrounding the proposed locations of intake structure, treatment plant, and along the proposed routes of the raw water transmission line and treated water primary main up to the injection point in order to establish a baseline framework, against which potential environmental and social impacts due to the implementation of the project would be compared.
2. to identify and evaluate environmental and social impacts resulting from the project activities during both construction and operational phases of the project, and to suggest appropriate mitigation measures.
3. to carry out focus group discussions (FGDs) and public consultations in order to get views and concerns of local people and peoples' representatives regarding different aspects of the proposed project, and to address those in the ESIA; and
4. to develop a comprehensive Environmental and social Management Plan (ESMP), including monitoring plans, for both construction and operational phases of the proposed project.

## 1.3 Scope of Study

The detailed scope of the ESIA study is as outlined below:

- > Screening of the Subprojects are reviewed based on applicable reference framework based on reconnaissance survey and field-based assessment of World Bank Environmental and Social Standards (ESSs) and the IFC Performance Standards (PSs)<sup>1</sup> for Component-2 works as per DSC (led by COWI) ToR and EIB Standards for Component-1&3 (PMC, led by Mott MacDonald);
- > Scoping for the ESIA study by identifying the applicable ESSs/PSs;
- > Development of a regulatory, policy and administrative framework relevant to the Subproject;
- > Monitoring, analysis and reporting of the environmental and social baseline data of the study area including consultation with local communities and other stakeholders;
- > Assessment of the environmental impacts of the project in the study area;
- > Assessment of social impacts on the local community as well as subproject affected people (if any) and any other stakeholders, which have been identified during the social consultation process;
- > Identification of potential risks and hazards including environmental, socio-cultural, public health hazards due to the project development;
- > Planning and implementation of mitigation and monitoring,
- > Confirmation of the applicability of the Environmental and Social Standards /Performance Standards set forth by the World Bank/IFC following the TOR guidance.
- > Formulation of an Environment and Social Management Plan and associated/specific mitigation plans for identified impacts and effective risk management especially for the protection of the natural environment;
- > Formulation of Stakeholder Consultation and Grievance Redress Mechanism for the project.
- > Review the Resettlement Action Plan (RAP) of the project.

## 1.4 The ESIA Report

The ESIA report has been prepared and presented following the structure suggested by the Department of Environment (DoE, 1997) with some modifications to suit the needs of the present study.

The first Chapter of this ESIA report describes the background and objectives of the project. It also presents an outline of the methodology followed for carrying out the ESIA. Chapter 2 describes the specific project activities to be carried out during both construction and operation phases of the project. Chapters 3, 6 and 7 describe the existing baseline physical environment, the ecological environment, and the socio-economic environment, respectively, along the route of the transmission line and its surrounding areas. Chapter 8 presents the outcome of the public consultations carried out as a part of the social and environmental assessment. Chapter 10 presents an assessment of the potential social and environmental impacts of the proposed project, during both construction and operation phases. This Chapter also presents an evaluation of the possible impacts and suggests mitigation measures for enhancement of positive impact and for reducing or eliminating the negative

---

<sup>1</sup> In terms of E&S risk management, AFD/DSIF/KfW/EIB Group does not have specific E&S Standards (ESS) and applies World Bank Group Standards including the World Bank E&S Framework and IFC Performance Standards and the related Guidance and Interpretation Notes.

impacts. Chapter **Error! Reference source not found.** presents analysis of alternatives, which includes analysis of both alternative sites (intake point, treatment plant), alternative routes and alternative technologies. Chapter 11 presents the environmental and social management plan (ESMP), including the monitoring plans, for both construction and operational phases. The final Chapter (Chapter 12) of the ESIA report presents the conclusions of the environmental study and recommendations based on the study.

## 2 Project Description

### 2.1 General Features of the Project

As noted earlier, the proposed water treatment plant project involves construction of intake structure and associated facilities (e.g., raw water lift pump and raw water transmission line) to draw water from Meghna River, construction of a surface water treatment plant and ancillary facilities at Saidabad, and construction of treated water transmission line. This Chapter provides brief descriptions of the major infrastructure to be constructed under the proposed project and their locations and routes.

#### TEXT MODIFIED IN 2023

This chapter contains technical details of the project which have developed since 2014. These changes are detailed in other documents which have been prepared by the PMC and DSC. However, overall, the scope of the scheme remains the same and so this chapter has not been updated except where there are specific items, which are relevant to the ESIA. Pipe route changes are highlighted in Section 8.3.

#### 2.1.1 Water Source

As noted earlier, both Saidabad phase I (225 MLD) and phase II (225 MLD) water treatment plants derive raw water from Shitalakshya river through the Sarulia. However, water quality of Shitalakshya river deteriorates significantly during the dry season, resulting in operational difficulties and rise in treatment costs. Preliminary comparison of Shitalakshya and Meghna River water quality shows that Meghna River has a better water quality than Shitalakshya in terms of Dissolved Oxygen, Turbidity, Ammonia and Electrical Conductivity (DWASA, 2013). The Shitalakshya River does not comply with the water standard for raw water parameters set in the operator contract for Saidabad phase II in the dry season. An analysis of the dry season dependable flows at near the proposed intake site at Haria shows that the maximum possible withdrawal (i.e. 950 MLD) amounts to about 6.25% of the 80% dependable flow (DWASA, 2013). Since the environmental requirement is 40% of the 80% dependable flow, sufficient quantity of water would be available for extraction. Since the water quality of Shitalakshya River during the wet season is of acceptable quality, the feasibility study for Saidabad phase III project suggested a joint operation with the Sarulia intake at Shitalakshya during that period to meet the total demand of 950 MLD (see Figure 2-1).

Saidabad Phase	Maximum raw water flow (MLD)	Dry season (peak)			April	May	June	Wet Season (peak)			October	November	December
		January	February	March				July	August	September			
I	237	Meghna river only or Meghna river and Lakhya river at the same time, provided that water mixture quality is acceptable (especially in January and April) and justified by economic analysis in terms of operation					Lakhya River as long as raw water quality allows it (5 months)			Meghna river			
II	237												
III	475												
					Meghna river								

Figure 2-1: Water source selection depending on season (DWASA, 2013). (Originally Table 12)



### 2.1.2 Intake

Three locations were considered for the intake: these included Sarulia intake at Shitalakshya, Bishnondi and Haria at Meghna River. After carefully considering the relative merits and demerits of these locations (see details in Feasibility Study Report), the Haria site located 5 km upstream of Baidder Bazar, has been found to be most suitable. The Bishnondi site at Meghna river is already being considered as an intake site for another proposed water treatment plant at Char Gandharbpur (a separate project funded by ADB), and there was a provision in this project for constructing a separate pipeline to supply raw water to Saidabad phase III; it was nevertheless demonstrated that the water supply for Saidabad phase I, II and III can be secured more quickly from a separate intake at Haria. On the other hand, due to deterioration of water quality of Shitalakshya river, drawing additional water for phase III using the Sarulia intake is considered unfeasible. Figure 2-2 shows the proposed layout of transmission pipelines along with the intake locations.

The water is expected to flow by gravity from the intake up to pump sumps from where it will be pumped to water treatment facilities at Saidabad site. The raw water intake structure and various facilities will be designed to cater for the 100-year flood and dry season low levels in the Meghna watercourse. A pre-sedimentation chamber may be required to settle large solid particles before pumping the collected water through the projected transmission system; however, preliminary analysis of water quality data suggests that such sedimentation may not be required. An optional pre-chlorination system may be included to protect transmission line against organic growth. Two screens will also be provided, one coarse screen at the intake inlet works and a fine screen at the inlet of pumping facilities. The type of intake (submerged intake, canal intake or intake tower) has been selected by DWASA after discussion with consultants and relevant stakeholders.

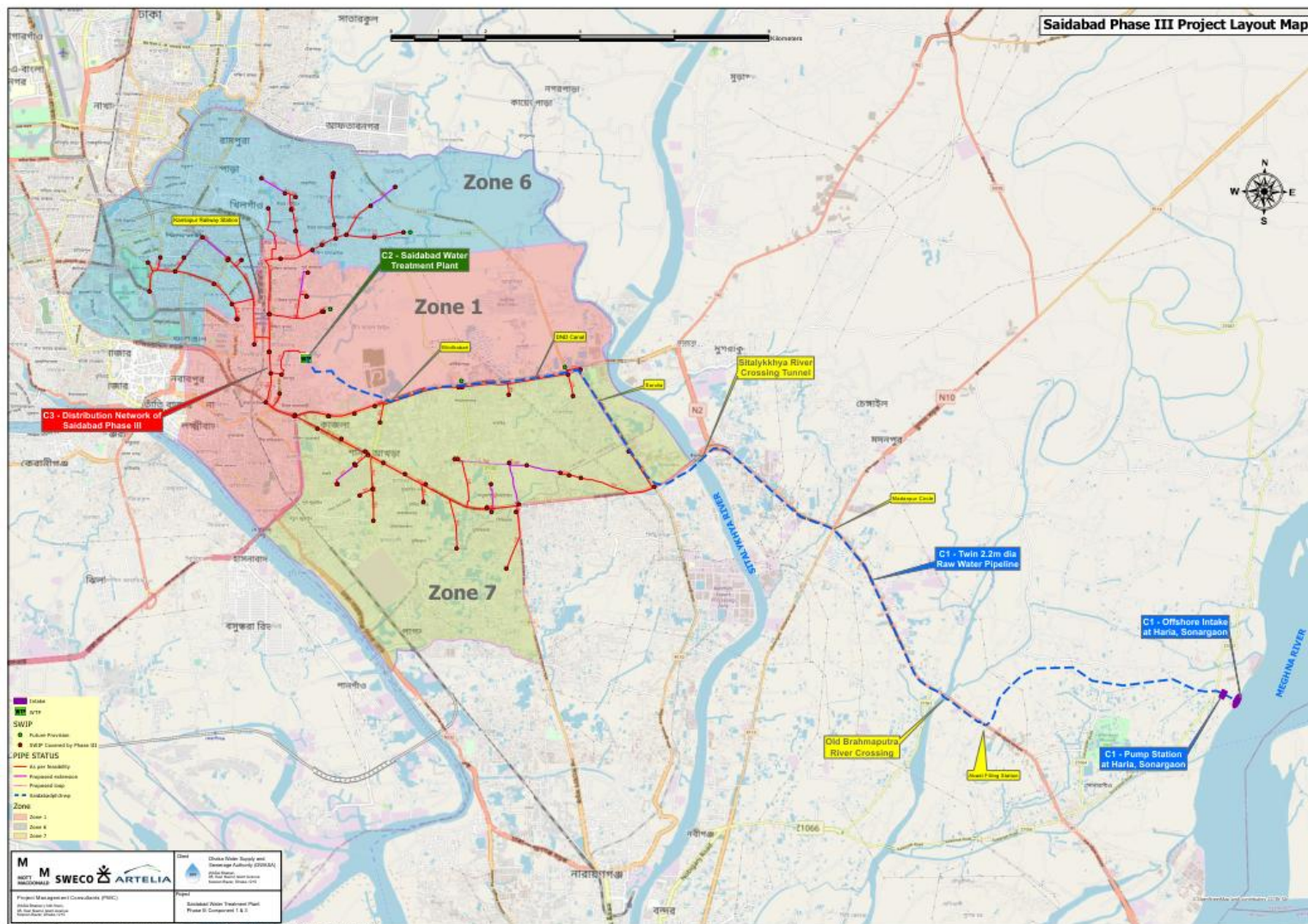


Figure 2-2: Project Base Map for Saidabad WTP Phase III (Updated from Figure 2)

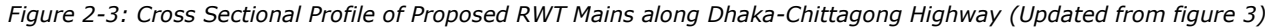
### 2.1.3 Raw Water Transmission Pipeline

The transmission system will consist of two pipes with minimum diameter of 2,200 mm, or the nearest optimized size, to be installed in parallel in order to carry a total raw water flow in the range of 950 MLD. The gap of 50 MLD between raw and treated water flow corresponds to losses generated by the raw water quality.

The transmission system immediately after the intake and pumping facilities starts with 6 km of alignment over open areas from intake point to Doriakandi bus station, which is mainly constituted of paddy fields to the north of the Heritage Area of Sonargaon. Around 6 ha of land for transmission line and a 2 ha of land for intake PS need to be acquired in this case. After Doriakandi bus station, the transmission pipeline follows a 13 km route along the Dhaka-Chittagong highway and the Dhaka-Sylhet highway until Tarabo Circle intersection where the transmission lines turn west to cross the Shitalakshya River. According to the latest information available regarding the upgrading of the existing Dhaka-Chittagong Highway, an additional 4-Lane Expressway is planned on the southern side of the existing Highway. For ensuring desired accessibility, the two raw water transmission pipelines in parallel may be installed along the southern side of the proposed Expressway's right of way. In this segment no land acquisition would be required as the pipelines will be installed within lands owned by the Roads and Highways Department. The twin pipelines will follow a route parallel to the Dhaka-Narayanganj-Demra (DND) conveyance canal under the projected expansion of the Jatrabari-Demra road and along the existing twin culvert towards the treatment plant site at Saidabad. The existing two cell culvert (2m × 1.5m each) which conveys the raw water for Saidabad phase I and II will not be able to cater to the additional flow for Saidabad phase III. Therefore, another single pipe (minimum 2200 mm diameter) would be constructed, and for this about 1 ha land needs to be acquired.

Wherever raw water transmission lines are running in parallel, interconnections with isolation valves will be provided to secure an uninterrupted raw water supply and an easy maintenance for the system. Clear space between pipelines will depend on land availability and costs. Such clearance will be of 1,000mm (minimum).

Along transmission line route from the intake to the treatment plant, crossing of two watercourses would be required: the old Brahmaputra River and the Shitalakshya River. Comparisons were made in the feasibility report regarding different methods of river crossing such as overhead crossing, trench laying method and jacking or tunnelling. The overhead crossing is the least advantageous option as it implies an additional pumping head at the raw water intake and some additional design restrictions for securing a minimum clearance between the maximum water level in the watercourse and the crossing structure. Moreover, the BIWTA (Bangladesh Inland Water Transport Authority) is not inclined to allow overhead crossings for navigable watercourses except in special cases such as bridges for highways. The pipe in trench crossing at river bottom will require additional protection measures against high velocity flow, scouring and erosion effects which may be difficult as scours are quite deep, unpredictable, and prone to damage by shipping activities. Therefore, jacking or tunnelling is being considered as a safe option, although it implies the use of special equipment which can make works more expensive in comparison with the trench laying option.



## 2.1.4 Water Treatment Process

The feasibility study of water treatment process was completed in 2014. However, by analysing the wet season water quality of the Meghna River at the Haria intake location, it can be seen that turbidity, suspended solids, Colour, faecal coliform and total coliform are the parameters which needs to be removed from raw water to make it suitable for drinking. It is suggested that a coagulation-flocculation-sedimentation followed by rapid filtration and chlorination would be sufficient to bring the water quality to drinking water standards. Also, as a safety measure, shock dosing of chlorination is under consideration at the intake location in order to avoid organic growth in transmission line. A flowchart of the treatment process is shown in Figure 2-4. The water treatment plant will be located on the DWASA-owned vacant land adjacent to Saidabad phase I and II treatment plants.

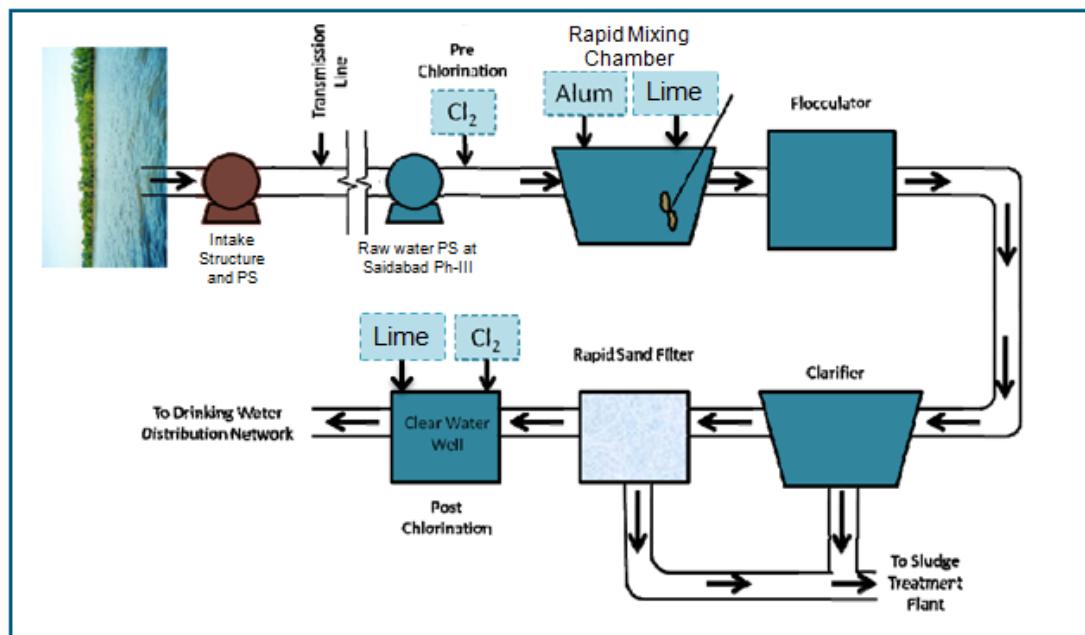


Figure 2-4: Treatment Process Flowchart for Saidabad Phase-III (Original Figure 4)

## 2.1.5 Sludge Management

The Saidabad phase III works include the construction of a mechanical dewatering sludge treatment unit that will replace the existing lagoons. Such a facility will free land for Saidabad phase III plant and reduce the sludge volume to be evacuated outside the plants. This new sludge treatment unit will be sized to cope with the sludge production of the 3 water treatment plants of Saidabad and will be designed for a total treated water flow of 900,000 m<sup>3</sup>/ day.

Figure 2-5 presents proposed layout of SWTP Phase III from the feasibility study report. The Outline Design Report prepared by DSC presents a possible layout option considering the review of the feasibility study and subsequent development of the Employer's Requirements for the D&B Contract.



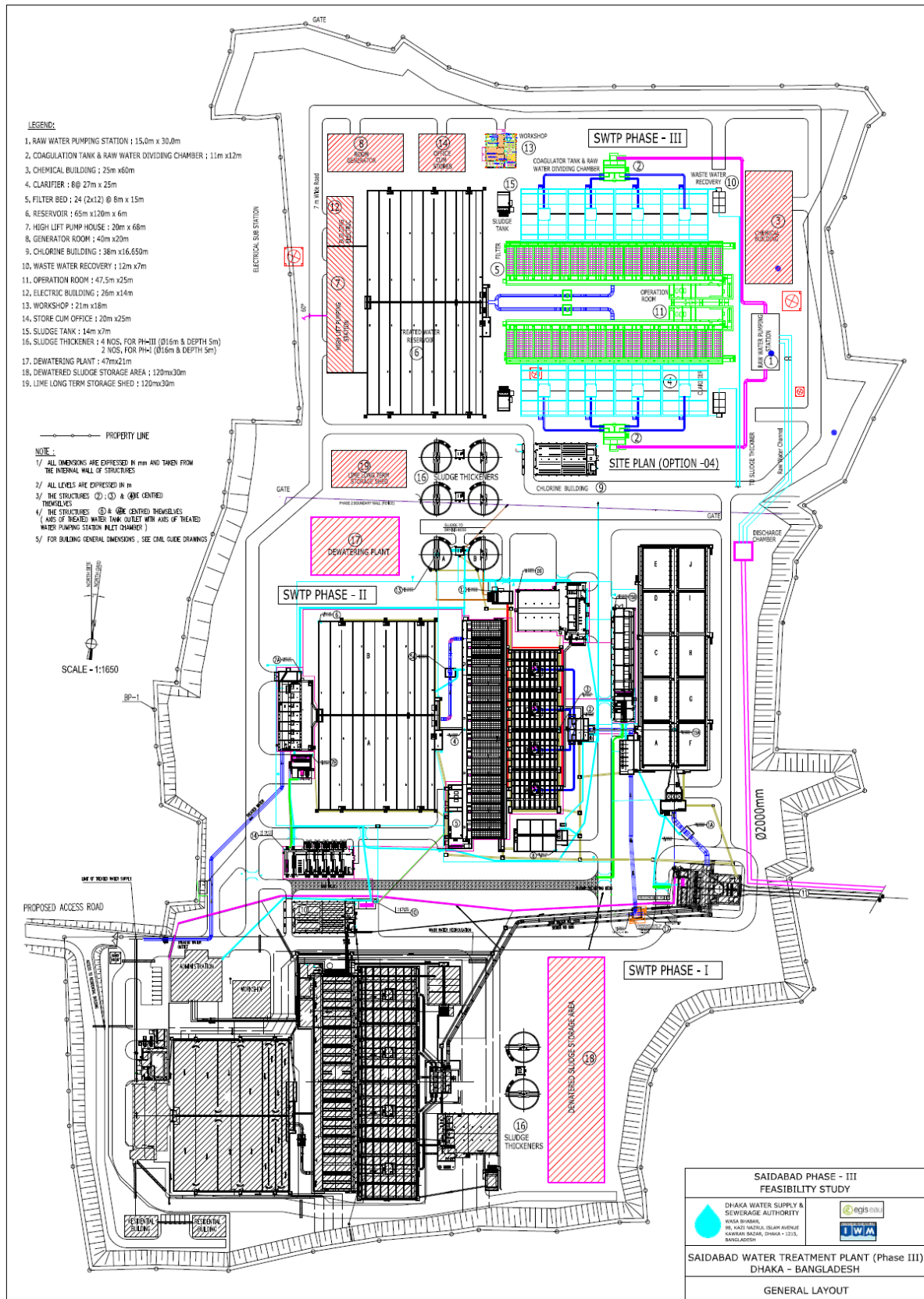


Figure 2-5 Proposed layout of Saidabad Phase-III Plant (DWASA, 2013) (Original Figure 5)

Sludge treatment works will comprise:

- > Sludge thickeners
- > Dewatering unit
- > Lime silos
- > Storage of dewatered sludge, if required.

Two Sludge thickeners are already used in Saidabad phase II. The proposed Saidabad phase III project will include such a layout. Moreover, Saidabad phase I plant will also have to be equipped with sludge thickeners for the purpose of sludge dewatering.

Therefore, 6 more sludge thickeners will be necessary to treat sludge resulting from Saidabad I and Saidabad III operation. Filter press solution, which is the most effective in terms of final volume of sludge to be cleared out, would generate around 30,000 m<sup>3</sup>/ year of 30% dried sludge, which would be equivalent to around 10 trucks per day. A proposed layout of the water treatment plant for Saidabad phase III is shown in Figure 2-5.

**TEXT MODIFIED IN 2023**

Whilst the overall scope of the sludge handling facilities remains largely as proposed by the 2014 Feasibility Study, the estimate of the quantity of sludge produced has been revised upwards. During periods of poor raw water quality, the number of sludge trucks leaving the site could be 15 to 20, with an equal number of empty truck movements returning to the site.

## 2.1.6 Treated Water Transmission Line

The map in Figure 2-6 shows the injection point for Saidabad phase III WTP into the distribution network. The distribution network primary mains will cover new areas of Saidabad East region.

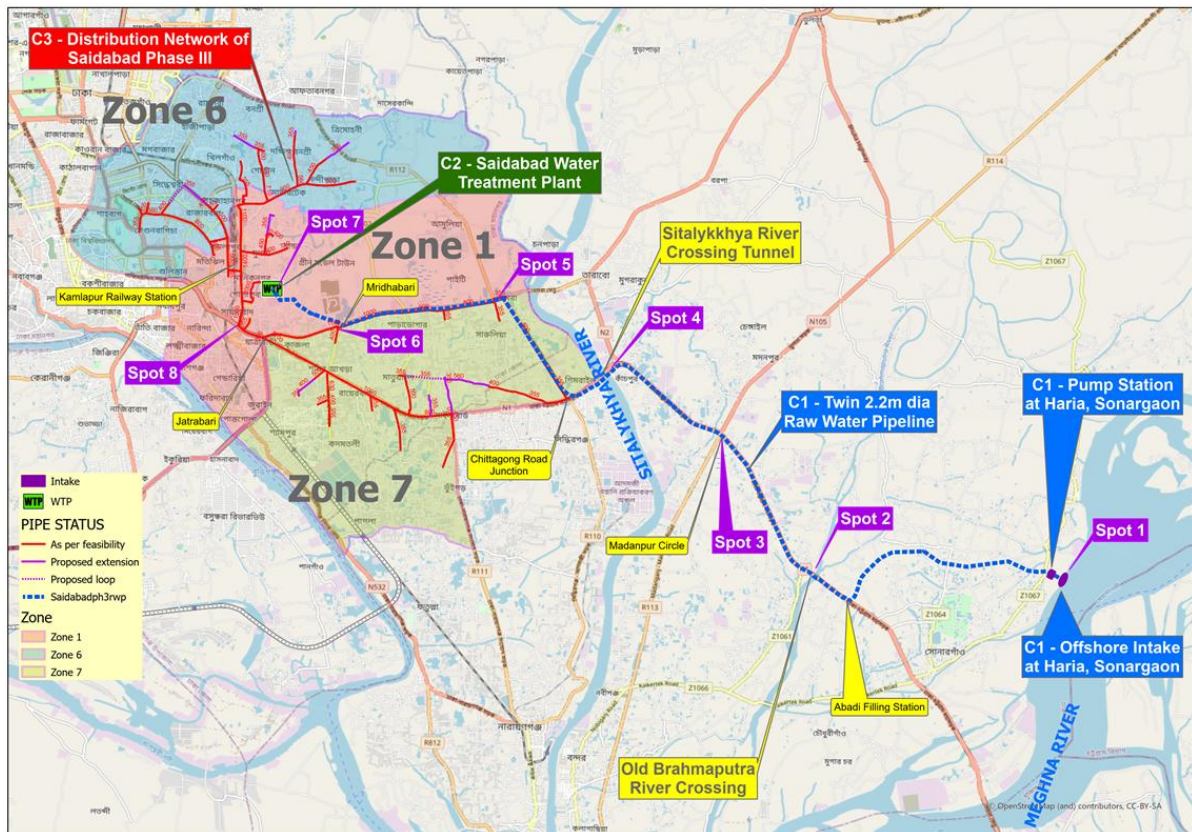


Figure 2-6: Injection Point of Saidabad Phase III in the Distribution Network (Updated Figure 6)

## 2.1.7 Existing Solid Waste Disposal Sites

Dhaka South City Corporation maintains the Matuail Landfill, within their jurisdiction which can be envisaged as a potential site for final disposal of dried sludge. Matuail landfill site is around 4km from Saidabad Water Treatment Plant Area (Figure 2-7). The city of Dhaka recently expanded the capacity of the Matuail landfill and upgraded the site into a sanitary landfill with leachate collection and treatment facilities designed to clean the water that percolates out of the landfill, and a gas venting system. It also modernized operations through construction of a weigh bridge, a truck-scale to weigh incoming waste; a carwash facility to avoid contamination of roads by vehicles leaving the landfill; and a waste compaction and monitoring facility. A Landfill Management Unit was created to monitor all activities at the landfills. Regular environmental monitoring is conducted to assess leachate, landfill gas, and surface water quality. Surveys also assess landfill impact on neighbouring communities. Data collection at the weigh bridge allows planners to adapt collection and transport plans to suit the city's needs. Matuail landfill is well managed and operated as a whole despite the fact that the most of LMU (landfill management unit) staffs are deputed or temporary employed.





Figure 2-7: Location of Landfill Site Operated by Dhaka South City Corporation (Updated Figure 7)

## 2.2 Project Activities During Construction Phase

The major project activities during construction phase include the following:

- > Acquisition of required land was completed as per the Acquisition and Requisition of Immovable Property Ordinance (ARIPO 1982) and Acquisition and Requisition of Immovable Property Act (ARIPA 2017), and World Bank's Environmental and Social Standard-5/IFC Performance Standard-5 on Land Acquisition, Restriction on Land uses and Involuntary Resettlement and getting permission from relevant organizations (e.g., RHD) for laying water transmission pipeline on land owned by them. Since 2017 Dhaka WASA has been the owner of the acquired land required for the first 6 km raw water transmission line through open area up to Doriakandi bus station: ~8 ha. Pipelines along Dhaka-Chattogram Road and in Demra area will be constructed within the government land.
- > Construction of intake structure and associated facilities, and raw water pumping station.
- > Construction of twin raw water transmission pipelines (nominal dia 2200 mm) from (i) Haria to Doriakandi bus stand (6 km) (ii) Doriakandi bus stand to Kanchpur bridge (~8.5 km) (iii) Kanchpur bridge circle to Chattogram Road Bus Stand by crossing the Shitalakshya river near the upstream side of Kanchpur Bridge (~1.75 km) (iv) Chattogram Road Bus to Demra circle (~2.5 km) and (iv) from Demra circle along the extension of Demra Highway up to the downstream endpoint of the DND conveyance canal near the existing twin box culvert.
- > Construction of a box culvert (or a single minimum 2000 mm diameter water transmission pipe) from the end of the twin pipeline to the water treatment plant; construction of sluice gates and associated facilities.
- > Construction of water treatment plant (WTP) including all treatment units and ancillary facilities (e.g., pre-chlorination unit, clarification units, rapid sand filter units, clear water reservoir, clear water pumping facilities, sludge thickening and dewatering facilities, administrative building, workshop building, generator room, guard room).

- > Installation of water transmission lines (minimum 2000 mm diameter twin steel pipes) across 2 water bodies (Old Brahmaputra and Shitalakshya rivers). Pipe jacking method has been proposed for the installation of water transmission lines across rivers. Pipe jacking is a technique for installing underground pipelines, ducts and culverts. Powerful hydraulic jacks are used to push specially designed pipes through the ground behind a shield at the same time as excavation is taking place within the shield. The method provides a flexible, structural, watertight, finished pipeline as the tunnel is excavated. Drives of several hundred meters either in a straight line or to a radius or a series of radii are readily achievable. A number of excavation systems are available including manual, mechanical and remote control. Pipes in the range 150mm to 3000mm, can be installed by employing the appropriate system.
- > Workforce during the Construction period would be around 2500-3000.

## 2.3 Project Activities During Operational Phase

During the operational phase, DWASA will be responsible for the operation and maintenance of intake channel, intake structure, water treatment plant and the water transmission lines. The important issues to be addressed during the operational phase include the following:

- > Stability of riverbank at intake site (*Please refer to Table 11-2 and Section 11.4.2 for detailed mitigation & monitoring measures and executive summary*)
- > Availability of raw water (*Please refer to Table 11-2 and executive summary for information*)
- > Raw water quality
- > Treated water quality
- > Proper operation of treatment plant
- > Public health and DWASA service facilities
- > Disposal of dewatered sludge
- > Safety of water distribution network
- > Disposal of additional volumes of wastewater that will be generated due to increased water supply in Dhaka city after completion of the project
- > Navigation in rivers and khals through which water transmission line has crossed
- > Site security.
- > Monitoring of environmental and social aspects (including monitoring of livelihood restoration from the resettlement (As per RAP report (Summary addressed in Subsection 6.5 of Section 6 this ESIA Report)).
- > Workforce during the Operational period would be around 100-150.

## 2.4 Project Schedule

### ***TEXT MODIFIED IN 2022***

The PMC contract provides following timelines for the delivery of the project:

- > Stage 1 – design: 11 months + 4 months grace (buffer)
- > Stage 2 – tendering: 8 months
- > Stage 3 – construction: 44 months + 8 months (flexibility)
- > Stage 4 – defects liability: 12 months
- > Total (including Stage 1 grace period and Stage 3 flexibility): 87 months

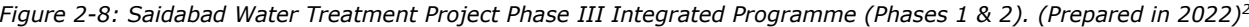
The key dates of the revised Baseline Programme (updated in November '21) is provided in Figure 2.8

### ***TEXT MODIFIED in 2023***

DSC contract provides following timelines for the delivery of the project:

- > Stage 1 – design: 11 months
- > Stage 2 – tendering: 8 months
- > Stage 3 – construction: 44 months
- > Stage 4 – defects liability: 12 months
- > Total: 75 months

Updated in April 2025



<sup>2</sup> Please note that the programme is subject to change.

## 3 Legislative, Regulatory and Policy Consideration

### 3.1 Literature Review

During the preparation of this report, pertinent references were consulted and reviewed. Many environmental legislative were reviewed that have implication to the project. Bangladesh has consented to be bound by the terms of some 21 of the 44 principal international conventions, treaties and protocols relating to the environment. Those with partial and indirect relevance to projects are the Paris convention of 1972 concerning the protection of the world cultural and natural heritage, convention concerning safety in the use of chemicals at work, Geneva 1990, Biodiversity convention, Rio-De-Janeiro 1992, convention concerning occupational health services, Geneva 1985 etc.

A wide range of laws and regulations related to social and environmental issues are effective in Bangladesh. Many of these are cross-sectoral and only partially related to environmental and social issues. The laws and regulations such as National Water Policy, 1999; Forest Act 1927 (modified up to 30th April 2000); National Forest Policy, 1994; National Conservation Strategy; National Environmental Management Action Plan (NEMAP); Environment Conservation Act 1995 (ECA 1995); Environmental Conservation Rules 2023; Environment Conservation (Amendment) Act (2002) and Draft Environment Conservation (Amendment) Act 2009; Coastal Zone Policy, 2005; Coastal Development Strategy, 2006; National Agricultural Policy, 1999; National Fisheries Policy, 1996; National Livestock Development Policy, 2007; Standing Orders on Disaster, 1999; Climate Change Strategy and Action Plan, 2009; National Plan for Disaster Management, 2008-2015; and Other Legislation are considered here.

Some of the most important legislation that have implication with the project activities:

- > Bangladesh Environmental Conservation Act (ECA), 1995
- > Environment Conservation Rules (ECR), 2023
- > National Water policy, 1999
- > National Safe Drinking Water Supply and Sanitation Policy 1998
- > National Fisheries Policy, 1996
- > National Agricultural Policy, 1999
- > National Livestock Development Policy, 2007
- > Others

The most important of these are the Environment Conservation Act, 1995 (ECA, 1995), and the Environment Conservation Rules (ECR, 2023). The ECA 1995 is primarily an instrument for establishing the Department of Environment (DoE), and for controlling industrial pollution. The Act also defines in general terms that if any particular activity is causing damage to the ecosystem, the person responsible will have to apply corrective measures. Until the appearance of ECR, 2023, enforcement of the Act was not possible, as many of the clauses refer to specifications spelled out in the Rules.

## 3.2 AFD Principles for Direct Financed Projects

AFD assists the project proponent in defining E&S performance targets and ensures their implementation throughout the life cycle of the project. To this end, all requests for AFD financing are subjected to the conduct of environmental and social due diligence. This makes it possible to assess whether the project is likely to be developed and implemented in accordance with AFD's environmental and social performance objectives. The E&S due diligence is integrated by AFD into the review and the monitoring of the project as a whole. The process is articulated around four main steps:

- > **Project categorization.** AFD's environmental and social due diligence is adapted to the nature and scale of the project and is proportional to the level of E&S risks and impacts. For this purpose, depending on the potential E&S risks, AFD classifies projects into the following four categories: **High risks (A), Substantial risks (B+), Moderate risks (B) or Low risks (C).**
- > **Review of the environmental & social assessment documentation.** Depending on the project category, AFD is involved in the scoping and evaluation of the environmental & social assessment documents and may carry out a mission in the area affected by the project activities in order to assess the E&S risks.
- > **Environmental and social commitments.** AFD makes its financing conditional to the implementation of an Environmental and Social Commitment Plan (ESCP) to be defined with the project owner, and which shall be monitored on a regular basis during the implementation of project activities.
- > **E&S monitoring.** During the project implementation phase, AFD reviews the findings of the environmental and social commitments monitoring. Upon completion of the operation, AFD oversees the ex-post evaluation mission, in partnership with the project owner.

### Environmental and Social Standards of AFD

AFD aims to promote sustainable and equitable development in all operations funded, by ensuring that these operations effectively contribute to the objective of sustainable development (combating poverty and ensuring the satisfaction of human needs, strengthening solidarity between human beings and between territories, preserving biodiversity, preserving habitats and natural resources, combating climate change).

All operations financed by AFD are required to comply with the national regulations of the country where the operation is implemented, including for environmental and social issues. However, as regulations in the countries where AFD operates are sometimes incomplete or under development, AFD uses as a reference a number of rules, good practices and directives produced by international standard-setting organizations and proven with more than 70 years of experience in the financing of development projects. This mainly concerns:

- > The World Bank Safeguard Policies for public sector financing;
- > The UN Principles for Responsible Investment (UNPRI);
- > The IFC Performance Standards; and
- > EIB's Standards.

The major international conventions ratified by the countries where AFD operates are also used as references, mainly:

- > The United Nations Universal Declaration on Human Rights;
- > The ILO fundamental conventions on labor law;
- > The United Nations Convention on the Elimination of All Forms of Discrimination against Women;
- > The OECD guidelines for multinational enterprises.

In terms of E&S risk management, AFD Group does not have specific E&S Standards (ESS) and applies World Bank Group Standards including the World Bank E&S Framework and IFC Performance Standards and the related Guidance and Interpretation Notes. The applicability of World Bank ESSs and IFC Performance Standards for the AFD/KfW/EIB/DANIDA financed project is summarized in Table 2 below.



Table 3-1: Summarized Applicable ESSs/PSs for the AFD/KfW /DANIDA Financed Project

Sl.	Environmental and Social Standards (ESS)/Performance Standard (PS) and Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
1	<b>Environmental and Social Standards (ESS)/ Performance Standard (PS) 1:</b> Assessment and Management of Environmental and Social Risks and Impacts	<ul style="list-style-type: none"> <li>&gt; To identify and evaluate environmental and social risks and impacts of the project.</li> <li>&gt; To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment.</li> <li>&gt; To promote improved environmental and social performance of clients through the effective use of management systems.</li> <li>&gt; To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately.</li> <li>&gt; To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.</li> </ul>	Yes	Yes	ESS1/PS1 is triggered in this project. This is an umbrella Standard as Assessment and Management of Environmental and Social Risks and Impacts are important in all projects with land-based activities (i.e., during construction, operation and decommissioning phases). The issues that may pose potential E&S risks and/or impacts include air emissions, water pollution, wastes and effluents and engagement of labour etc. These issues have to be assessed to determine the extent of the risks and impacts.



Sl.	Environmental and Social Standards (ESS)/Performance Standard (PS) and Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
2	<b>Environmental and Social Standards (ESS)/ Performance Standard (PS) 2: Labour and Working Conditions</b>	<ul style="list-style-type: none"> <li>&gt; To promote the fair treatment, non-discrimination, and equal opportunity of workers.</li> <li>&gt; To establish, maintain, and improve the worker-management relationship.</li> <li>&gt; To promote compliance with national employment and labor laws.</li> <li>&gt; To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain.</li> <li>&gt; To promote safe and healthy working conditions, and the health of workers.</li> <li>&gt; To avoid the use of forced labor.</li> </ul>	Yes	Yes	ESS2/PS2 is triggered in this project as during all phases of the project a labour force will be needed and mobilized to carry out various duties to construct and operate the project. It is therefore necessary for the Project to ensure maintenance of appropriate labour and working conditions.

Sl.	Environmental and Social Standards (ESS)/Performance Standard (PS) and Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
3	<b>Environmental and Social Standards (ESS)/ Performance Standard (PS) 3: Resource Efficiency and Pollution Prevention</b>	<ul style="list-style-type: none"> <li>&gt; To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.</li> <li>&gt; To promote more sustainable use of resources, including energy and water.</li> <li>&gt; To reduce project-related GHG emissions.</li> </ul>	Yes	Yes	<p>ESS3/PS3 is triggered in this project; as it will involve use of a lot of resources both raw, semi-manufactured, manufactured components and energy. Thus, pollutants will be produced and these need to be minimized to comply with standards; resources and energy conservation are also prime needs.</p> <p>Construction works generate waste streams during the construction phase. In addition, operational effluent discharges including associated emissions may have pollution potential. In addition, the project will depend on resources / raw material inputs such as natural and manufactured resources.</p>

Sl.	Environmental and Social Standards (ESS)/Performance Standard (PS) and Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
4	<b>Environmental and Social Standards (ESS)/ Performance Standard (PS) 4:</b> Community Health, Safety, and Security	<ul style="list-style-type: none"> <li>&gt; To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances.</li> <li>&gt; To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.</li> </ul>	Yes	Yes	ESS4/PS4 is triggered in the project. The area around the project site is already developed with treatment plant. There are a considerable number of households and local communities in the 3km impact zone around the site. With increased activities in the project area following construction of the treatment plant, there will be influx of workers and service providers, which will add to the local communities, who will be impacted by the activities in the treatment plant within the site. Although the project is likely to be beneficial to entrepreneurs and stakeholders, some beneficial impacts are also expected to the community e.g. employment and trading opportunities, as well as negative impacts e.g. security, GBVH, accidents, etc.

Sl.	Environmental and Social Standards (ESS)/Performance Standard (PS) and Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
5	<b>Environmental and Social Standards (ESS)/ Performance Standard (PS) 5:</b> Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	<ul style="list-style-type: none"> <li>&gt; To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs.</li> <li>&gt; To avoid forced eviction.</li> <li>&gt; To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.</li> <li>&gt; To improve, or restore, the livelihoods and standards of living of displaced persons.</li> <li>&gt; To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.</li> </ul>	Yes	No	<p>The land on which WTP project is located belongs to DWASA. The land has been earmarked for development for the treatment plant. There is no further land acquisition and involuntary resettlement for the C-2 component. Hence PS5 is not applicable to C-2.</p> <p>For the C-1 &amp; C-3 the three standalone Resettlement Action Plans (RAPs) are in place because of the land acquisition of the acquisition of its Intake, RWP and primary &amp; secondary distribution mains area. Summary of the RAP is shared in Subsection 6.5 of this ESIA report.</p> <p>DoE clearance has been received as well as renewing every year as per DOE rules and guidelines for the whole project.</p>

6	<b>Environmental and Social Standards (ESS)/ Performance Standard (PS)</b> <b>6: Biodiversity Conservation and Sustainable Management of Living Natural Resources</b>	<ul style="list-style-type: none"> <li>&gt; To protect and conserve biodiversity.</li> <li>&gt; To maintain the benefits from ecosystem services.</li> <li>&gt; To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.</li> </ul>	Yes	Yes	<p>ESS6/PS6 is triggered in the project as the issues involved are universal. The C-2 area is vacant field land with vegetation now. However, there are no ecologically critical areas at the vicinity of the C-2 project site. There are no significant biological or ecological issues in the WTP area, however, the existing land will be changed due to its development. No critical habitat assessment would be required for the C-2 component of this project.</p> <p>The RWP &amp; Intake site area of the C1&amp;C3 project component is mostly covered with agricultural land with vegetation/road crossing/river crossing etc. No threatened floral species have been identified in the project area. However, some threatened wildlife and fish species have been identified in the study areas which are considered threatened throughout the country as well. No Protected Areas exists near any of the proposed project sites, though an ancient city namely Panam city –exist near the water intake point at Sonargaon. There is no National Park, Game Reserves, Wildlife Sanctuaries exist at or near the proposed project sites. The raw water transmission pipeline will cross the Sitalakhya river which has been declared as an Ecologically Critical Area. T</p> <p>he river crossing at the Sitalakshya will be by deep tunnel which will not create any impact to the riverbank and River Water as a whole. So, no Critical Habitat Assessment for the C-1&amp; C-3 would be required under this project.</p>
---	--	--	-----	-----	---

Sl.	Environmental and Social Standards (ESS)/Performance Standard (PS) and Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
7	<b>Environmental and Social Standards (ESS)/ Performance Standard (PS)</b> 7: Indigenous Peoples	<ul style="list-style-type: none"> <li>&gt; To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples.</li> <li>&gt; To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.</li> <li>&gt; To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner.</li> <li>&gt; To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle.</li> <li>&gt; To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present.</li> <li>&gt; To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.</li> </ul>	No	No	ESS7/PS7 is not triggered in the project. There are no indigenous people in the impact zone of the project.

Sl.	Environmental and Social Standards (ESS)/Performance Standard (PS) and Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
8	<b>Environmental and Social Standards (ESS)/ Performance Standard (PS) 8: Cultural Heritage</b>	<ul style="list-style-type: none"> <li>&gt; To protect cultural heritage from the adverse impacts of project activities and support its preservation.</li> <li>&gt; To promote the equitable sharing of benefits from the use of cultural heritage.</li> </ul>	No	No	ESS8/PS8 is not triggered in the project. Based on current knowledge, there is no area with significant cultural heritage in and around the construction site areas. Earthwork and excavation during the construction phases of the industries in the project areas might expose buried Physical Cultural Resources (PCR). Subsequently, ESS8/PS8 is applicable to the proposed project. However, any chance find will be dealt with using standard procedure ( <b>Annex-E</b> ) and the ESS8/PS8 will be triggered.
9	<b>Environmental and Social Standards (ESS) 9: Financial Intermediaries</b>	<ul style="list-style-type: none"> <li>&gt; To set out how the FI will assess and manage environmental and social risks and impacts associated with the subprojects it finances.</li> <li>&gt; To promote good environmental and social management practices in the subprojects the FI finances.</li> <li>&gt; To promote good environmental and sound human resources management within the FI.</li> </ul>	No	No	ESS9 is not triggered in this project as because it is a direct financed project of AFD, KfW & EIB for the Components C-1 & C-3 and C-2 is a direct finance of DANIDA. (EIB funding water mains of C-1 only)

Sl.	Environmental and Social Standards (ESS)/Performance Standard (PS) and Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
10	<b>Environmental and Social Standards (ESS) 10:</b> Stakeholder Engagement and Information Disclosure	<ul style="list-style-type: none"> <li>&gt; To establish a systematic approach to stakeholder engagement that will help Borrowers identify stakeholders and build and maintain a constructive relationship with them, in particular project-affected parties</li> <li>&gt; To assess the level of stakeholder interest and support for the project and to enable stakeholders' views to be taken into account in project design and environmental and social performance.</li> <li>&gt; To promote and provide means for effective and inclusive engagement with project-affected parties throughout the project life cycle on issues that could potentially affect them.</li> <li>&gt; To ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible, and appropriate manner and format.</li> <li>&gt; To provide project-affected parties with accessible and inclusive means to raise issues and grievances and allow Borrowers to respond to and manage such grievances.</li> </ul>	Yes	Yes	ESS10 is triggered in this project. ESS10 applies to this project as it is supported by the EIB/AFD/KfW/DANIDA finance through Investment Project Financing. The DWASA engaged with stakeholders as an integral part of the project's environmental and social assessment and project design and implementation, as outlined in ESS1. For the purpose of this ESS, "stakeholder" refers to individuals or groups who: (a) are affected or likely to be affected by the project (project-affected parties); and (b) may have an interest in the project (other interested parties).



Table 3-2: Summarized Applicable ESSs/PSs for the EIB Financed Project

Sl.	EIB Environmental and Social Standards (ESS) Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
1	<b>Environmental and Social Standards (ESS)/ Standard 1:</b> Environmental and Social Impacts and Risks	<ul style="list-style-type: none"> <li>To identify and evaluate environmental and social risks and impacts of the project.</li> <li>To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment.</li> <li>To determine the Need for an Environmental and Social Impact Assessment.</li> <li>To promote improved environmental and social performance of clients through the effective use of management systems. Considering the findings of the ESIA process, the conclusions of any other relevant assessments/studies and the outcomes of the stakeholder engagement process, the DWASA shall develop and implement a set of measures to address the identified impacts and risks, as well as any opportunities for improvement of the project's environmental and social performance.</li> <li>To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.</li> </ul>	Yes	Yes	EIB ESS /Standard 1 is triggered in this project. This is an umbrella Standard as Assessment and Management of Environmental and Social Risks and Impacts are important in all projects with land-based activities (i.e., during construction, operation and decommissioning phases). The issues that may pose potential E&S risks and/or impacts include air emissions, water pollution, wastes and effluents and engagement of labour etc. These issues have to be assessed to determine the extent of the risks and impacts.

SI.	EIB Environmental and Social Standards (ESS) Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
2	<b>Environmental and Social Standards (ESS) / Standard 2: Stakeholder Engagement</b>	<ul style="list-style-type: none"> <li>Adopting an inclusive and systematic approach to engaging constructively with stakeholders, namely persons and/or communities who are directly or indirectly affected by a project, or those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively.</li> <li>Ensuring that stakeholders have timely access to information on the project's environmental, climate and/or social risks and impacts in a manner that is culturally appropriate and understandable to all stakeholders, including those needing special measures or assistance.</li> <li>Promoting and enabling the meaningful and free participation and input of stakeholders in project-related decision-making processes that may affect them, thereby seeking to build mutual trust and improving project outcomes.</li> <li>Providing rights-holders with effective means to raise grievances and access remedies and promoting organizational accountability and continuous learning and improvement.</li> </ul>	Yes	Yes	EIB ESS /Standard 2 is triggered in this project. Standard 2 applies to this project as it is supported by the EIB/AFD/KfW/DANIDA finance through Investment Project Financing. The DWASA engaged with stakeholders as an integral part of the project's environmental and social assessment and project design and implementation, as outlined in EIB ESS Standard 1. For the purpose of this ESS, "stakeholder" refers to individuals or groups who: (a) are affected or likely to be affected by the project (project-affected parties); and (b) may have an interest in the project (other interested parties).

SI.	EIB Environmental and Social Standards (ESS) Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
3	<b>Environmental and Social Standards (ESS) / Standard 3:</b> Resource Efficiency and Pollution Prevention	<ul style="list-style-type: none"> <li>To ensure an integrated approach to resource efficiency, pollution prevention and control of emissions to air, water and land, noise pollution, radiation, prevention of accidents, as well as waste management and the safe use of hazardous substances and pesticides, avoiding the shift of pollution from one environmental medium to another, ensuring consistency with the "Do Not Significant Harm" principle and thus contributing to the achievement of the "zero pollution".</li> <li>This Standard applies to a specific project when its relevance determined during the environmental impact assessment/environmental social impact assessment (EIA/ESIA) process (as outlined in Standard 1) and additionally to EIB-financed projects associated with modifications and/or extensions of existing activities/facilities where DWASA to determine the appropriate requirement.</li> </ul>	Yes	Yes	EIB ESS / Standard 3 is triggered in this project; as it will involve use of a lot of resources both raw, semi-manufactured, manufactured components and energy. Thus, pollutants will be produced and these need to be minimized to comply with standards; resources and energy conservation are also prime needs. Construction works generate waste streams during the construction phase. In addition, operational effluent discharges including associated emissions may have pollution potential. In addition, the project will depend on resources / raw material inputs such as natural and manufactured resources.

4	<b>Environmental and Social Standards (ESS) / Standard 4:</b> Biodiversity and Ecosystems	<ul style="list-style-type: none"> <li>To apply precautionary approach throughout the project life cycle to avoid or prevent irreversible impacts on biodiversity and ecosystems in cases where the consequences of damage or loss are potentially significant, and the knowledge needed to manage the risks and/or impacts is lacking.</li> <li>To ensure an ecosystem-based approach to assess biodiversity-related impacts and risks, ensuring that the interdependencies between people, biodiversity and ecosystems are recognized.</li> <li>To ensure appropriate sectoral, land use and marine spatial planning, the application of the mitigation hierarchy to avoid, or where unavoidable, minimize further losses, restore and, as a last resort, compensate for any residual impacts on biodiversity and ecosystems. This applies to all biodiversity and all ecosystems, regardless of their formal conservation status.</li> <li>To seek opportunities to enhance biodiversity and ecosystems whenever possible in line with broader area-based conservation efforts where the project is located and ensuring that mitigation and restoration strategies align with relevant conservation goals and do not solely address site-level impacts.</li> <li>To ensure sustainable management and use of living natural resources; and identify and assess the impacts and risks affecting biodiversity and ecosystems that are caused by its primary suppliers as part of the supply chain. Any mitigation measures identified through the assessment should ensure sustainable outcomes.</li> </ul>	Yes	Yes	<p>EIB ESS/ Standard 4 is triggered in the project as the issues involved are universal. The C-2 area is vacant field land with vegetation now. However, there are no ecologically critical areas at the vicinity of the C-2 project site. There are no significant biological or ecological issues in the WTP area, however, the existing land will be changed due to its development. No critical habitat assessment would be required for the C-2 component of this project.</p> <p>The RWP &amp; Intake site area of the C1&amp;C3 project component is mostly covered with agricultural land with vegetation/road crossing/river crossing etc. No threatened floral species have been identified in the project area. However, some threatened wildlife and fish species have been identified in the study areas which are considered threatened throughout the country as well. No Protected Areas exists near any of the proposed project sites, though an ancient city namely Panam city – exist near the water intake point at Sonargaon.</p> <p>There is no National Park, Game Reserves, Wildlife Sanctuaries exist at or near the proposed project sites. The raw water transmission pipeline will cross the Sitalakkhya river which has been declared as an Ecologically Critical Area. The river crossing at the Sitalakkhya will be by deep tunnel which will not create any impact to the Riverbank and River Water as a whole. So, no Critical Habitat Assessment for the C-1 &amp; C-3 components would be required under this project.</p>
5	<b>Environmental and Social Standards (ESS) / Standard 5:</b> Climate Change	<ul style="list-style-type: none"> <li>To detail DWASA responsibilities relevant to assessing, managing and monitoring project-related (i) GHG emissions and transition climate risks and (ii) physical climate risks.</li> </ul>	Yes	No	<p>EIB ESS/ Standard 4 is triggered in the project as the issues involved are universal. The Project has conducted a Climate change risk assessment for the Component 1. The risk analysis confirms</p>

		<ul style="list-style-type: none"> <li>• More specifically, assessing GHG emissions at the project level and the project's alignment with pathways to limit global warming to 1.5 °C above pre-industrial levels and options to reduce transition risks.</li> <li>• Assessing the project's resilience to physical climate risks, its alignment with climate-resilient development pathways, and the options to reduce physical climate risks to the project, its natural environment and the people that may be affected by it.</li> </ul>			<p>the very significant risk linked to flooding at a more distant horizon concerning the pumping station. The risk can be qualified as "extreme" on the horizon 2050-2100 according to the risk analysis tables in ESIA Report. The damages related to a strong flood, the problems of accessibility and those related to water quality make this a major issue, in connection with an increased frequency of these events in the coming decades. The intake site is designed above 1 in 100-year flood level of 8.14m. All the associated equipment will be designed above this level.</p> <p>The risks related to salinity are qualified as "low" in this analysis. The project is far enough away from the sea, even if in connection with saline intrusions, the risk of corrosion and degraded water quality remains to be monitored. Opportunities available to the project for reducing the potential GHG emission from the project interventions are to adopt Best Practices, Designing with a Low Carbon Approach in Mind, Reusing buildings instead of constructing new ones, Specify low-carbon concrete mixes, Limiting carbon-intensive materials, Choosing carbon sequestering materials, Reusing materials, Using high-recycled content materials, Maximizing structural efficiency, Using fewer finish materials, Minimizing waste, Using block instead of bricks, Using low carbon materials, Using durable materials for the facade and roof, Designing facade systems that are easy to maintain, Buying local materials, Reducing waste with prefabrication and modular elements, Being mindful when using finishes or decorative facade elements.</p>
6	<b>Environmental and Social Standards (ESS)/Standard 6:</b>	<ul style="list-style-type: none"> <li>• To avoid or, when unavoidable, minimise involuntary resettlement by exploring alternative projects, project designs and locations</li> </ul>	Yes	No	The land on which WTP project is located belongs to DWASA. The land has been earmarked for development for the

SI.	EIB Environmental and Social Standards (ESS) Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
	Involuntary Resettlement	<ul style="list-style-type: none"> <li>To avoid forced eviction.</li> <li>To improve displaced persons' livelihoods and/or living standards, or at least restore them to pre-project levels.</li> <li>To improve living conditions among displaced poor and other vulnerable groups to at least minimum living standards, promoting adequate housing and security of tenure</li> <li>To mitigate social and economic impacts from unavoidable involuntary resettlement by: (i) providing timely compensation for a loss of assets at the full replacement cost; (ii) ensuring that resettlement is designed, planned and implemented with the appropriate disclosure of information to those affected along with their consultation and informed participation; (iii) providing displaced persons with access to grievance mechanisms; and (iv) as a development opportunity enabling displaced persons to benefit directly from the project, as the nature of the project may warrant.</li> </ul>			<p>treatment plant. There is no further land acquisition and involuntary resettlement for the C-2 component. Hence PS5 is not applicable to C-2.</p> <p>For the C-1 &amp; C-3 the three standalone Resettlement Action Plans (RAPs) are in place because of the land acquisition of the acquisition of its Intake, RWP and primary &amp; secondary distribution mains area. Summary of the RAP is shared in Subsection 6.5 of this ESIA report.</p> <p>DoE clearance has been received as well as renewing every year as per DOE rules and guidelines for the whole project.</p>

SI.	EIB Environmental and Social Standards (ESS) Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
7	<b>Environmental and Social Standards (ESS) / Standard 7:</b> Vulnerable Groups, Indigenous Peoples and Gender	<ul style="list-style-type: none"> <li>To address inequalities, including those that are gender-based, and other factors contributing to vulnerability, marginalization and/or discrimination within the context of an EIB project, and to facilitate equitable access to effective mitigation and/or compensation measures as well as project benefits for project-affected individuals and groups</li> <li>To ensure that projects respect the rights and interests of vulnerable, marginalized or discriminated-against persons and groups, and Indigenous Peoples, including the right to non-discrimination and the right to equal treatment between women, men, non-binary or gender non-conforming persons</li> <li>Promote sustainable development gains and opportunities in a manner that is accessible, culturally appropriate and inclusive of vulnerable, marginalised or discriminated-against persons and groups, and Indigenous Peoples, and that enables them to benefit from the EIB-financed projects</li> <li>To ensure that the projects foster full respect for the rights, identity, culture, and livelihoods of Indigenous Peoples</li> <li>To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life cycle.</li> <li>To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present.</li> <li>To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.</li> </ul>	No	No	EIB ESS / Standard 7 is not triggered in the project. There are no indigenous people, vulnerable/marginalised groups in the impact zone of the project.

SI.	EIB Environmental and Social Standards (ESS) Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
8	<b>Environmental and Social Standards (ESS)/ Standard 8:</b> Labour Rights	<ul style="list-style-type: none"> <li>To ensure fair treatment, non-discrimination and equal treatment and opportunity of workers, especially vulnerable workers facing particular risks due to context-specific socioeconomic characteristics</li> <li>Zero tolerance for the use of forced labor and child labor</li> <li>To respect the principles of freedom of association and collective bargaining</li> <li>To protect and promoting safety and health at work</li> <li>To promote a sound worker-management relationship</li> <li>To ensure accessible and effective means to raise and address workplace concerns are available to workers.</li> </ul>	Yes	Yes	EIB ESS /Standard 8 is triggered in this project as during all phases of the project a labour force will be needed and mobilized to carry out various duties to construct and operate the project. It is, therefore, necessary for the Project to ensure maintenance of appropriate labour rights and working conditions.



SI.	EIB Environmental and Social Standards (ESS) Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
9	<b>Environmental and Social Standards (ESS) /Standard 9:</b> Health, Safety, and Security	<ul style="list-style-type: none"> <li>Promote, protect and monitor the health, safety and security of project workers (including third party workers) throughout the project life cycle, by ensuring a safe, healthy, and secure working environment and, where applicable, accommodation conditions, and effectively implementing a management system, or equivalent, commensurate to the risks and impacts associated with the project.</li> <li>Identify, assess, and manage risks to the health and safety of project-affected people and communities, (including to project-related gender-based violence risks including sexual harassment, exploitation and abuse) during the life cycle of the project.</li> <li>Require that the provision of private or public security to protect project workers, assets, communities, and suppliers is consistent with international human rights standards and principles.</li> <li>Provide that project workers and members of the public can effectively access the workers grievance mechanism and the project grievance mechanism, respectively, in cases of health, safety or security concerns, risks or violations commensurate to the risks and impacts associated with the project.</li> </ul>	Yes	Yes	<p>EIB ESS/Standard 9 is triggered in the project. The area around the project site is already developed with treatment plant. There are a considerable number of households and local communities in the 3km impact zone around the site. With increased activities in the project area following construction of the treatment plant, there will be influx of workers and service providers, which will add to the local communities, who will be impacted by the activities in the treatment plant within the site. Although the project is likely to be beneficial to entrepreneurs and stakeholders, some beneficial impacts are also expected to the community e.g. employment and trading opportunities, as well as negative impacts e.g. security, GBVH, accidents, etc.</p> <p>In addition, like requirements in EIB ESS / Standard 8, during all phases of the project, labour force will be needed and mobilized to carry out various duties to construct and operate. It is, therefore, necessary for the Project to ensure health and safety, security, and wellbeing of the workforce and third parties including supply chain.</p>

SI.	EIB Environmental and Social Standards (ESS) Title	Objectives	Triggered in the Project (Yes/No)		Explanations
			C-1 & C-3	C-2	
10	<b>Environmental and Social Standards (ESS)/ Standard 10:</b> Cultural Heritage	<ul style="list-style-type: none"> <li>To apply a precautionary approach to the management and sustainable use of cultural heritage.</li> <li>To protect cultural heritage from the potential adverse impacts of project activities.</li> <li>To ensure equitable sharing with local communities of financial and/or socioeconomic benefits derived from the commercialization of cultural heritage; and</li> <li>To promote awareness, appreciation, and enhancement of cultural heritage.</li> </ul>	No	No	EIB ESS/ Standard 10 is not triggered in the project. Based on current knowledge, there is no area with significant cultural heritage in and around the construction site areas. Earthwork and excavation during the construction phases of the industries in the project areas might expose buried Physical Cultural Resources (PCR). Subsequently, EIB ESS /Standard 10 is applicable to the proposed project. However, any chance find will be dealt with using standard procedure ( <b>Annex-E</b> ) and the EIB ESS / Standard 10 will be triggered.
11	<b>Environmental and Social Standards (ESS) /Standard 11:</b> Intermediated Finance	<ul style="list-style-type: none"> <li>To set out how the FI will assess and manage environmental and social risks and impacts associated with the subprojects it finances.</li> <li>To promote good environmental and social management practices in the subprojects the FI finances.</li> <li>To promote good environmental and sound human resources management within the FI.</li> </ul>	No	No	EIB ESS / Standard 11 is not triggered in this project as because it is a direct financed project of EIB (along with AFD, KfW) for the Components C-1 & C-3 and C-2 is a direct finance of DANIDA.

### 3.3 Government Policies, Laws, Regulations

The severe floods of 1987 and 1988, and the resurgence of concern about environmental issues have heightened in improving environmental conditions of the country through promulgation of numbers of policies and legislation in the country. All of the policies or legislation aimed at the conservation and protection of the environment. The existing policies and legislation, which are relevant to the environment, are described in the following sections.

#### 3.3.1 Industrial Policy 1991

The Industrial policy of 1991 contains the following clauses in respect of environmental protection:

- > To conserve ecological balance and prevent pollution during industrialization.
- > To take effective steps for pollution control and conservation of environment during industrialization.

To ensure embodying of necessary pollution control and preventive measures by industrial investment project endangering environment

#### 3.3.2 National Environmental Policy 1992

Bangladesh National Environmental Policy (GoB, 1992) was approved in May 1992, and sets out the basic framework for environmental action, together with a set of broad sectoral action guidelines. Key elements of the policy are:

- > Maintenance of the ecological balance and overall progress and development of the country through protection and improvement of the environment.
- > Protection of the country against natural disasters.
- > Identification and regulation of all types of activities which pollute and degrade the environment.
- > Ensuring sustainable utilization of all natural resources.
- > Active association with all environmentally related international initiatives.

The environmental policy contains the following specific objectives with respect to the industrial sector:

- > To adopt corrective measures in phases in industries that cause pollution.
- > To conduct Environmental Impact Assessments (EIAs) for all new public and private industries.
- > To ban the establishment of an industry that produces goods that cause environmental pollution, closure of such existing industries in phases and discouragement of the use of such goods through the development and/or introduction of environmentally sound substitutes.
- > To ensure sustainable use of raw materials in industries and to prevent their wastage.

### 3.3.3 National Safe Drinking Water Supply and Sanitation Policy 1998

National Safe Drinking Water Supply and Sanitation Policy (NSDWSSP, 1998) was drafted in 1998, and sets out the basic framework for the improvement of public health quality and to ensure improved environment, together with a set of broad sectoral action guidelines. The draft policy offered various objectives to achieve the goal, and these are:

- > To manage water supply and sanitation-related basic needs for all.
- > To bring the positive change in people's attitude, regarding water and sanitation.
- > To reduce the outbreak of water-borne diseases.
- > To increase the efficiency of the Local Government and associated community for handling more effectively the problems related to water supply and sanitation.
- > To improve sustainable water supply and sanitation system.
- > To ascertain proper conservation, management, and use of surface water, and to control water pollution due to the scarcity of underground water.
- > To take necessary steps to use and conserve rainwater.
- > To ascertain the rainwater disposal in the urban areas.

### 3.3.4 National Conservation Strategy 1992

National Conservation Strategy (GoB/IUCN, 1992) was drafted in late 1991 and submitted to the Government in early 1992. This approved in principle; however, the final approval of the document is yet to be made by the cabinet. Meanwhile, it underwent a number of modifications over the last five years and waiting for approval. For sustainable development in the industrial sector, the report offered various recommendations; some of those are as follows:

- > Industries based on non-renewable resources should be made to adopt technology which conserves raw materials, and existing industries should be given incentives to install technical fixes to reduce wastage rate.
- > All industries, especially those based on imported raw materials, should be subjected to EIA and adoption of pollution prevention/control technologies should be enforced.
- > No hazardous or toxic materials/wastes should be imported for use as raw material.
- > Import of appropriate and environmentally sound technology should be ensured.
- > Complete dependence on imported technology and machinery for industrial development should gradually be reduced, so that industrial development is sustainable with local skills and resources.

### 3.3.5 National Environmental Management Plan

National Environmental Management Action Plan, also referred to as NEMAP (GoB, 1995) is a wide-ranging and multi-faceted plan, which builds on and extends the statements set out in the National Environmental Policy. NEMAP was developed to address issues and management requirements during the period 1995 to 2005 and sets out the framework within which the recommendations of the National Conservation Strategy are to be implemented.

NEMAP has the broad objectives of:

- > identification of key environmental issues affecting Bangladesh.
- > identification of actions necessary to halt or reduce the rate of environmental degradation.
- > improvement of the natural and built environment.
- > conservation of habitats and biodiversity.
- > promotion of sustainable development.
- > improvement in the quality of life of the people.

One of the key elements of NEMAP is that sectoral environmental concerns are identified. In outline, the environmental issues of the industrial sector include the following:

- > Pollution arising from various industrial processes and plants throughout the country causing varying degrees of degradation of the receiving environment (Air, Water, and Land).
- > There is a general absence of pollution abatement in terms of waste minimization and treatment.
- > Low level of environmental awareness amongst industrialists and entrepreneurs.
- > Lack of technology, appropriate to the efficient use of resources and waste minimization leading to unnecessary pollution loading in the environment.
- > Economic constraints on pollution abatement and waste minimization such as the cost of new technology, the competitiveness of labor, and intensive production methods as compared to more modern methods.
- > The concentration of industry and hence pollution in specific areas which exacerbate localized environmental degradation and exceed the carrying capacity of the receiving bodies.
- > Unplanned industrial development has resulted in several industries located within or close to residential areas which adversely affects human health and quality of human environment.
- > Establishment of industries at the cost of good agricultural lands and in the residential areas.
- > Lack of incentives to industrialists to incorporate emission/discharge treatment plant in their industries.

### 3.3.6 National Water Management Plan

The Government commenced preparation of this National Water Management Plan, with the intention of operationalizing the directives given by Policy. In reflecting the objective of rationalizing and decentralizing management of the sector, the Plan is a framework plan within which line agencies and other organizations are expected to plan and implement their own activities in a coordinated manner. The Plan is presented in three phases: in the short-term (2000-05), it is considered a firm plan of ongoing and new activities; in the medium-term (2006-10) it is an indicative plan, and in the long-term (2011-25) a perspective plan. Implementation of the plan is to be monitored regularly and it will be updated every five years.

The National Water Management Plan has been prepared to respond to these challenges and paradigms, with three central objectives consistent with Policy aims and national goals.

These objectives are:

- > Rational management and wise-use of Bangladesh's water resources
- > People's quality of life improved by the equitable, safe and reliable access to water for production, health and hygiene
- > Clean water in sufficient and timely quantities for multi-purpose use and preservation of the aquatic and water dependent eco-systems

### 3.4 Conventions, Treaties and Protocols

Bangladesh has consented to be bound by the terms of some 21 of the 44 principal international conventions, treaties and protocols relating to the environment (Islam, 1996). Those with partial and indirect relevance to industrial projects are the Paris convention of 1972 concerning the protection of the World cultural and natural Heritage, Convention concerning safety in the use of chemicals at work, Geneva 1990, Biodiversity convention, Rio-de-Janeiro, 1992, Convention concerning occupational health services, Geneva 1985 etc.

#### 3.4.1 Environment Conservation Act 1995 Amended in 2000 & 2002

Provides for the conservation of the environment, improvement of environmental standards, and control and mitigation of environmental pollution. In line with these provisions of the act, the Environment Conservation Rules, 2023 have been framed. This act provides for (i) remedial measures for injury to the ecosystem; (ii) any person affected by environmental pollution to apply to DoE for remediation of the damage; (iii) discharge of excessive environmental pollutants; (iv) inspection of any activity or testing any equipment or plant for compliance to the environment act, including power to take samples for compliance; (v) power to make rules and standards with reference to the environment; and (vi) penalty for non-conformance to the Environment Act under the various sections.

The provisions of the act apply to the entire project interventions in the construction and operation stages.

**The main objectives of ECA '95 are:**

- > Conservation and improvement of the environment; and
- > Control and mitigation of pollution of the environment.

**The main strategies of the Act can be summarized as:**

- > Declaration of ecologically critical areas and restriction on the operations and processes, which can or cannot be carried/initiated in the ecologically critical areas;
- > Regulations in respect of vehicles emitting smoke harmful for the environment;
- > Environmental Clearance;
- > Regulation of the industries and other development activities' discharge permits;
- > Promulgation of standards for quality of air, water, noise and soil for different areas for different purposes;
- > Promulgation of a standard limit for discharging and emitting waste; and
- > Formulation and declaration of environmental guidelines.

Before any new project can go ahead, as stipulated under the rules, the project promoter must obtain Environmental Clearance from the Director General. An appeal procedure does exist for those promoters who fail to obtain clearance. Failure to comply with any part of this Act may result in punishment to a maximum of 3 years imprisonment or a maximum fine of Tk. 300,000 or both. The Department of Environment (DOE) executes the Act under the leadership of the Director General (DG).

#### **Bangladesh Environmental Conservation Act (Amendment 2000)**

This amendment of the Act focuses on: (1) ascertaining responsibility for Compensation in cases of damage to ecosystems, (2) increased provision of punitive measures both for fines and imprisonment and (3) fixing authority on cognizance of offences.

#### **Bangladesh Environmental Conservation Act (Amendment 2002)**

This amendment of the Act elaborates on: (1) restriction on polluting automobiles, (2) restriction on the sale and production of environmentally harmful items like polythene bags, (3) assistance from law enforcement agencies for environmental actions, (4) break up of punitive measures and (5) authority to try environmental cases

#### **The Environmental Conservation Act (Amendment 2010)**

The amendment of ECA '95 has been published on 5 October 2010 as Bangladesh Environmental Conservation Act, 2010. Some changes and inclusions has been made in different clauses particularly in defining the Ecological Critical Area, farming certain rules and conditions in cutting and/or razing hills, handling disposal of hazardous wastes, managing ship braking industries & wetlands, fixing responsibilities of environmental and safety management, obligations of obtaining and issuance of environmental clearance certificates and imposing penalties for violations including but not limited to filing cases for compensations, fixing fees and framing different rules under this Act.

#### **Environment Conservation Rules (ECR, 2023)**

Empowers the GoB to declare ecologically critical areas, classification of industries and projects into various categories, procedures for issuing the environmental clearance certificate, and determination of environmental standards. According to the Rule 5 (1) of the Environmental Conservation Rules 2023; for the purpose of issuance of Environmental Clearance Certificate (ECC), all industrial units or projects, in consideration of their site and impact on the environment, will be classified into the four categories and they are: Category I (green), Category II (Yellow), Category III (Orange) and Category IV (Red). Development or restoration or upgradation of Khal are not included in any of these categories.

#### **The Protection and Conservation of Fish Rules (1985)**

These are a set of rules in line with the overall objectives of the Fish Act. Section 5 of the Rules requires that "No person shall destroy or make any attempt to destroy any fish by explosives, gun, bow and arrow in inland waters or within coastal waters". Section 6 of the Rules states -"No person shall destroy or make any attempt to destroy any fish by poisoning of water or the depletion of fisheries by pollution, by trade effluents or otherwise in inland waters".

### 3.4.2 The Acquisition and Requisition of Immovable Property Ordinance, 1982

The principal legal instrument governing land acquisition in Bangladesh is the Acquisition and Requisition of Immovable Property Ordinance, 1982 (Ordinance II of 1982 with amendments up to 1994) and other land laws and administrative manuals relevant to land administration in Bangladesh. According to the Ordinance, whenever it appears to the Government of Bangladesh that any property in any locality is needed or is likely to be needed for any public purpose or in the public interest, the Government can acquire the land provided that no property used by the public for the purpose of religious worship, graveyard and cremation ground. The 1982 Ordinance requires that compensation be paid for (i) land and assets permanently acquired (including standing crops, trees, houses); and (ii) any other damages caused by such acquisition. The Deputy Commissioner (DC) determines (a) market value of acquired assets on the date of notice of acquisition (based on the registered value of similar property bought and/or sold in the area over the preceding 12 months), and (b) 50% premium on the assessed value (other than crops) due to compulsory acquisition. The 1994 amendment made provisions for payment of crop compensation to tenant cultivators. The law specifies methods for calculation of market value of property based on recorded prices obtained from relevant Government departments such as Registrar (land), Public Works Department (structures), Department of Forest (trees), Department of Agriculture (crops) and Department of Fisheries (fish stock). Given that people devalue land during title transfer to minimize tax payment, compensation for land paid by DC including premium largely remains less than the actual market price.

The Ministry of Land (MOL) is authorized to deal with land acquisition. The MOL delegates some of its authority to the Commissioner at Divisional level and to the Deputy Commissioner at the District level. The Deputy Commissioners (DCs) are empowered by the MOL to process land acquisition under the Ordinance and pay compensation to the legal owners of the acquired property. Khas (government owned land) lands should be acquired first when a project requires both khas and private land. If a project requires only khas land, the land will be transferred through an inter-ministerial meeting following the acquisition proposal submitted to DC or MOL as the case may be. The DC is empowered to acquire a maximum of 50 standard bigha (6.75 ha) of land without any litigation where the Divisional Commissioner is involved for approval. Acquisition of land more than 50 standard bigha is approved from the central land allocation committee (CLAC) headed by the chief executive of the Government of Bangladesh proposed by the MOL.

The landowner needs to establish ownership by producing record-of-rights in order to be eligible for compensation under the law. The affected person (AP) can also provide rent receipt or receipt of land development tax as evidence for their entitlement of compensations.

Saidabad Phase-III project's resettlement plans for Narayanganj and Dhaka districts were detailed in RAP-1 and RAP-2 respectively and the required private lands for Component-1 pipelines were acquired by Dhaka WASA under this ordinance, 1982. The District Commissioners' offices of Dhaka and Narayanganj have followed Acquisition and Requisition of Immovable Property Ordinance, 1982 to compensate the affected persons. The legal entitlement of acquired land was 1.5 times of mouza rate at the time of land acquisition. All the required land was acquired prior to the Acquisition and Requisition of Immovable Property Act, 2017 was effective. Since 2017, Dhaka WASA has been the owner of the acquired land and for more than six years the affected persons are using the acquired land. In DWASA's opinion, that is already an additional benefit provided to the affected persons excluding top-up. The RAP implementation consultant for Saidabad project will assess the exact amount of top-up in case by case in the coming months, prior to construction.



### 3.4.3 Acquisition and Requisition of Immovable Property Act (2017)

The basic principles for the compensation of property in Bangladesh are founded in Articles 42 and 47 of the Constitution. The current legislation governing land acquisition in Bangladesh is the Acquisition and Requisition of Immovable Property Act (ARIPA), 2017. The Acquisition and Requisition of Immovable Property Act, 2017 (henceforth, the Act 2017) repealed the Acquisition and Requisition of Immovable Property Ordinance 1982 (subsequent amendments of it up to 1994) and is used as the legal support for land acquisition and requisition in Bangladesh. The Act 2017 requires that compensation be paid for (i) land and assets permanently acquired (including standing crops, trees, houses); and (ii) any other damages caused by such acquisition. The Act 2017 provides certain safeguards for the owners and has provision for payment of “fair value” for the property acquired. The landowner can appeal against land acquisition within 15 (fifteen) days of notice under Section 4 of the Act 2017. The Act 2017, however, does not cover Project-affected persons without titles or ownership record, such as informal settler/squatters, occupiers, and informal tenants and leaseholders (without document) and does not ensure replacement value of the property acquired. The Act has no provision of resettlement assistance and transitional allowances for restoration of livelihoods of the non-titled project affected persons.

The Deputy Commissioner (DC) determines “market value” of acquired assets on the date of notice of acquisition served (under Section 4 of the Act 2017). The DC then adds 200% premium of the assessed value of land for cash compensation under law (CCL) for government acquisitions. The CCL paid for land is generally less than the “market value” as owners customarily report lower values during registration to avoid and/or pay fewer taxes. If acquired land has standing crops cultivated by tenant (bargadar) under a legally constituted written agreement, the law requires that part of the compensation money be paid in cash to the tenants as per the agreement. The DC adds 100% premium of the assessed value to pay as compensation for loss of structures, crops and trees. If there is a dispute regarding the amount of compensation, there is an option for arbitration and the procedures for such is in place. Places of worship, graveyard and cremation grounds are not to be acquired for any purpose, unless the acquisition of these places is deemed unavoidable for the best of interest of the people. The proponents will be allowed to acquire such areas given that it funds the replacement and rebuilding of such places.

Many “good practices” include but not limited to, (i) identification of all displaced persons and issuance of ID cards; (ii) cut-off date established by census; (iii) preparation of automated Loss Files and Entitlement Card (iv) Preparation of payment statement (v) compensation for losses irrespective of title to land; (vi) paying replacement cost of land and other assets; (vii) resettlement of the affected households; (viii) special provisions for assistance to poor women and vulnerable groups; (ix) training/livelihood programs for income and livelihood restoration; (x) project benefits for “host” villages; (xi) management information system for processing resettlement benefits, monitoring and evaluation; and (xii) involvement of NGOs in RAP implementation – which has influenced many other projects.

## 4 Compliance with DoE EIA guideline

DWASA should adopt a policy of compliance with all the requirements for environmental permission and clearance, regardless of whether the company might otherwise be able to obtain exemptions from some or all of the rules.

In this case, it will be necessary for DWASA to obtain only environmental clearance for this project. DWASA has prepared the EIA report in 2014 for this project following the approval ToR of DOE.

The DoE has issued EIA Guidelines for Industries (this document was released in February 2021) and addresses the IEE and EIA for several industrial sectors and development projects. Each Project Proponent shall conduct an EIA and is expected to consult and follow the DoE guidelines.

In this case, it will be necessary for DWASA to obtain only environmental clearance for this project.

After received the approval of ToR for EIA study to DoE for go ahead signal submit the EIA report consultant shall conduct EIA study following the approved ToR by DoE classified in the 'Red' category should be accompanied by the following documents:

- 1 Feasibility Study Report of the project;
- 2 EIA report including environmental management plan (EMP) and emergency response plan for the mitigation of adverse environmental impacts;
- 3 An NOC (No Objection Certificate) from the local authorities concerned;
- 4 Outline of relocation plans (where applicable) and;
- 5 Other information as deemed necessary

As per ECR 1997, Saidabad Water Treatment Plant Phase 3 project clearly falls under the red category of project. The Environmental Impact Assessment Report was prepared in 2014 and submitted to the DoE for the Environmental Clearance Certificate (ECC). The EIA report includes the prediction, evaluation and mitigation of environmental impacts caused, based on the characteristics of project, as well as an Environmental Management Plan (EMP). Following the DOE guidelines, DWASA has received the ECC from the DOE and renewing the ECC every year. The latest renewal of ECC is annexed in **Annex-J** of this ESIA report.

### 4.1.1 Environment Conservation Rules 2023

The rules outline the processes and requirements of environmental clearances for specific types of projects indicated therein and stipulates that "no industrial unit or project shall be established or undertaken without obtaining, in the manner prescribed by rules, an Environmental Clearance Certificate (ECC) from the Director General" of the Department of the Environment. Schedule 1 of the rules classify industrial units and projects into four categories according to their site and impact on the environment, namely (i) green, (ii) yellow, (iii) orange, and (iv) red. The rules specify the procedures for issuing ECC for the various categories of projects.

The Project is categorized as red and requires two stages of clearance, location clearance, and environmental clearance. All requisite clearances (LCC and ECC) from the DoE shall prior to being obtained commencement of civil works.

#### 4.1.2 Environment Court Act 2000 Amendment in 2010

Enacted to establish environment courts and make rules for protection against environmental pollution. Environment courts are situated at the district level, but the government may, by notification in the official Gazette, establish such courts outside the districts. Environment courts were given power to directly take into cognizance any offense relating to environmental pollution. Proceedings of this court will be similar to that of criminal courts. One important feature of this act is that it has been given retrospective effect on any crime committed against environmental laws; thus, any crime previously committed but not taken before any court can be taken before the environment court or any special magistrate.

Table 4-1 summarizes the applicable national and local laws, regulations, and standards for environmental assessment and management.

*Table 4-1: Government policies, laws, regulations, and environmental standards*

<b>Laws, Regulations, and Standards</b>	<b>Details</b>	<b>Relevance</b>
<b>Environment Conservation Act, 1995</b>	Provides for the conservation of the environment, improvement of environmental standards and control and mitigation of environmental pollution. In line with these provisions of the Act, the Environment Conservation Rules, 1997 have been framed. This Act provides for (i) remedial measures for injury to ecosystem; (ii) provides for any affected person due to environmental pollution to apply to DOE for remediation of the damage; (iii) discharge of excessive environmental pollutants; (iv) inspection of any activity for testing any equipment or plant for compliance to the environment act, including power to take samples for compliance; (v) power to make rules and standards with reference to environment; and (vi) penalty for non-conformance to environment act under the various sections.	The provisions of the act apply to the entire Project interventions in the construction and operation stages.
<b>Environment Conservation Rules (ECR), 2023</b>	The Rules outline the processes and requirements of environmental clearances for specific type of projects indicated therein and stipulates that "no industrial unit or project shall be established or undertaken without obtaining, in the manner prescribed by rules, an Environmental Clearance Certificate (ECC) from the Director General" of the Department of the Environment. Schedule 1 of the Rules classifies industrial units and projects into four categories according to their site and impact on the environment, namely (i) green, (ii) yellow, (iii) orange, and (iv) red. The Rules specify the procedures for issuing ECC for the various categories of projects. For Red Category: (i) completed application for ECC, and the appropriate fee; (ii) report on the feasibility of the project; (iii) report on the IEE for the project, and Terms of Reference for the EIA; or EIA report prepared on the basis of TOR previously approved by DOE, plus (in the case of an industrial project): layout plan showing location of ETP, process flow diagram, design	The project activities are categorized under this rule and as per categorization required environmental assessments were done as well as ECC (Annex-1) received.

Laws, Regulations, and Standards	Details	Relevance
	and time schedule of the ETP; (iv) report on the EMP; (v) no objection certificate from the local authority; (vi) emergency plan relating to adverse environmental impact and plan for mitigation of the effect of pollution; and (vii) outline of the relocation and rehabilitation plan (where applicable).	
Environment Court Act, 2000	Enacted to establish Environment Courts and make rules for the protection of environmental pollution. Environment Courts are situated at the district-level, but Government may by notification in the official Gazette, establish such courts outside the districts. Environment Courts were given power to directly take into cognizance any offense relating to environmental pollution. Proceeding of Environmental Courts will be similar to Criminal Courts. One important feature of this Act is that it has been given the retrospective effect of any crime committed under environmental laws and thus any crime previously committed but is not taken before any court can be taken before the Environment Court or any special Magistrate.	The Court has jurisdiction over, in accordance with the Act provisions, the trial of an offense or for compensation under an environmental law, imposing penalties for violation etc.
National Policy for Arsenic Mitigation, 2004	Provides a framework for the provision of water supply for areas/aquifers with high arsenic levels. Roles for agencies are specified for development of water supply systems, certification of arsenic removal technology, and disposal of treatment sludge. Arsenic-prone area also identified.	Considered in design and project preparation. Water supply is considered under this policy.
Pourashava Ordinance (Second Amendments) 1988; Municipal Administration Ordinance 1960	These ordinances have clearly assigned responsibilities to the LGIs to ensure urban health for their residents. It has given them the mandate to ensure and provide a wide range of primary and public health services including primary health care, sanitation, water supply, drainage, food and drink, birth and death registration, vector and infectious disease control, etc. As independent autonomous bodies, the LGIs, as necessary, may take all required actions to ensure good health for tourist and concerned population within its jurisdiction. They have the authority to address all related issues with their legal and administrative mandate.	The Project integrated community and workers health and hygiene at the construction stage, and this will be taken forward during the operation and maintenance of the infrastructure facilities for tourists, local community and other concerned peoples.
National Forestry Policy, 1994	Rules related to forest protection, often a domain of environmental management, are found in the Policy. Due to the death of forests, afforestation is actively pursued with targets to "implement programs of tree plantation and afforestation on fallow and hinterland, the bank of the pond and homestead land, which are under private ownership."	It is desirable to incorporate tree planting in the Project (Where it is practical).

<b>Laws, Regulations, and Standards</b>	<b>Details</b>	<b>Relevance</b>
Bangladesh Labor Act, 2006	The Act provides the guidance on employer's extent of responsibility and workers' extent of rights to compensation in case of injury by accident while working.	Provides for the safety of workforce during the construction period.
National Water Policy, 1999	The Policy explicitly states 6 main objectives: (i) address the use and development of groundwater and surface water in an efficient and equitable way; (ii) ensure the availability of water to all parts of the society; (iii) accelerate the development of public and private water systems through legal and financial measures and incentives, including appropriate water rights and water pricing rules; (iv) formulate institutional changes, encouraging decentralization and enhancing the role of women in water management; and (v) provide a legal and regulatory framework that encourages decentralization, consideration of environmental impacts, and private sector investment.	Water supply should be under this consideration
Bangladesh Standard Specification for Drinking Water, 1990	Formulation and revision of national standards. Now it is incorporated into the schedule of ECR 2023	Water supply should be under this consideration
National Agriculture Policy, 1999	The act deals with the programs related to make the nation self-sufficient in food through increasing production of all crops, including cereals, and ensure a dependable food security system for all	Ministry of Agriculture
The National Water Policy, 1999	Protection, restoration and enhancement of water resources;	Ministry of Resources
National Biodiversity Strategy and Action Plan (2004)	Conserve, and restore the biodiversity of the country for well-being of the present and future generations; Maintain and to improve environmental stability for ecosystems; Ensure preservation of the unique biological heritage of the nation for the benefit of the present and future generations; Guarantee the safe passage and conservation of globally endangered migratory species, especially birds and mammals in the country; and Stop introduction of invasive alien species, genetically modified organisms and living modified organisms.	Ministry of Environment and Forest Bangladesh Wild Life Advisory Board
The Protection and conservation of Fish Act 1950 subsequent	Deals with the protection/conservation of fishes in Government owned water bodies	Department of Fisheries

<b>Laws, Regulations, and Standards</b>	<b>Details</b>	<b>Relevance</b>
amendments in 1982		
The embankment and Drainage Act 1952	Describe the protection of embankment and drainage facilities	Ministry of Water Resources
Inspection and Enforcement Manual 2008	This manual has been written to provide national standard and uniformity environmental sampling for the inspections, investigations in the Department of Environment (DOE) in Bangladesh.	Will be considered at the time of environmental monitoring during the implementation of EMP
Acquisition and Requisition of Immovable Properties Ordinance 1982	The government made rules in the exercise of the powers conferred upon by section 46 of the acquisition and requisition of the immovable property ordinance, 1982 (Ordinance No. II of 1982). ARIPO sets the Government rules and regulations governing all cases of land acquisition.	If any acquisition is required, this will be considered

EIA = Environmental Impact Assessment, EMP = Environmental Management Plan, ETP = effluent treatment plant, IEE = Initial Environmental Examination, km = kilometer, LGI = Local Government Institution, TOR = terms of reference

## 4.2 Harmonization of Environmental and Social Policies of EIB/WB/IFC and GOB

### 4.2.1 Harmonization of environmental policies of EIB/WB/IFC and GOB

In Bangladesh, there are more than 200 laws and by-laws exist to tackle the challenges related to environmental issues/aspects. Strategies and policies are in place. The Government of Bangladesh (GOB) realizes that good public policy needs to be matched by investments to ensure implementation. Some comparative analysis has been drawn between EIB/WB/IFC policies and GOB policies, then Harmonized framework has been provided in Table 4-2.

Table 4-2: Harmonized environmental policies of WB/IFC and GOB

<b>Sl. No.</b>	<b>Aspect</b>	<b>EIB/World Bank/IFC Regulation</b>	<b>National Bangladesh Regulation</b>	<b>Identified gaps and Harmonized Framework</b>
1	Environmental Policy and Regulations	There are EIB/WB Environmental and Social Framework, Environmental and Social Policy and Environmental and Social Standards (ESSs) and IFC Sustainability Frameworks IFC	Environment Conservation Act 1995 is currently the main act governing environmental protection in Bangladesh, which replaced the earlier environment pollution control	In most of the cases national requirements and standards for environment quality are in match with EIB/WB/IFC Policy and Standards (For example, Environmental Assessment is compulsory for both requirements). However, there are some parameters when national and EIB/WB/IFC requirements and standards

		<p>uses the Sustainability Framework along with other strategies, policies, and initiatives to direct the business activities of the Corporation in order to achieve its overall development objectives applying the Performance Standards (PSs).</p>	<p>ordinance of 1992 and provides the legal basis for Environment Conservation Rules, 2023 (ECR'2023). The main objectives of ECA'95 are conservation of the natural environment and improvement of environmental standards, and control and mitigation of environmental pollution. According to Article-12 of Environment Conservation Act 1995, "<u>No industrial unit or project shall be established or undertaken without obtaining, in the manner prescribed by rules, an Environmental Clearance Certificate from the Director General</u>".</p> <p>The Ecologically Critical Area (ECA) is an environmentally protected zone where the ecosystem is considered to be endangered to reach a critical condition by the changes brought through various human activities. Section 2 of the Bangladesh Environment Conservation (Amendment) Act (2010) provides that "Ecologically critical Area" means such area which is rich in unique biodiversity or due to the importance of environmental perspective necessary to protect or conserve from destructive</p>	<p>are different (For example, National legislation does not require a preparation of separate EMP/ESMP or any other environmental documents/plans/checklists for project). In such cases more stringent provisions will be applied for the project.</p>
--	--	---	--	--

			activities. ECA also falls within the category of natural and cultural heritage.	
2	Screening and categorization	EIB/WB/IFC carries out project screening and categorization at the earliest stage of project preparation when sufficient information is available for this purpose. Risk classification under the ESF replaces three static categories (A / B / C) with four more readily adjustable categories (High / Substantial / Moderate / Low); this allows for greater precision and differentiation. It also builds on the risk classification system under the safeguard policies by better accounting for Borrower capacity and commitment as well as the specific context in which the project will be implemented. As the risk classification is reviewed on a regular basis and may be adjusted throughout the life of a project, risk management and allocation of resources and oversight by the Bank in exercising its due diligence may also change.	It is mandatory to obtain Environmental Clearance for each and every type of industry and project as per Bangladesh Environment Conservation Act, 1995 (Amended 2010). For the purpose of issuance of Environmental Clearance Certificate, the industrial units and projects shall, in consideration of their site and impact on the environment, be classified into the following four categories as per ECR 2023:  • Green • Yellow • Orange • Red.	EIB/WB/IFC and Bangladesh project categorization could be Harmonized by accepting the following principle:  EIB/WB/IFC category: (DoE High Risk: Category Red; Substantial Risk: Orange (mostly); Moderate Risk: Yellow; Low Risk: Green. The proposed subprojects can be Moderate Risk in accordance with EIB/WB ESS or IFC PSs. In the case where EIB/WB/ IFC and national categorization requirements differ, the more stringent requirement will apply.
3	Environmental and Social Impact Assessment Report	In accordance with Environmental and Social Policy (ESP of ESF 2016, The ESF subsequently became effective on October 1, 2018.), ESIA processes report for category	The EIA report has to include: (i) baseline data, (ii) project description, (iii) anticipated environmental impacts, (iv) waste management, (v) analysis of	The present ESIA has been prepared in fulfilling the national as well as EIB/WB/IFC requirements.



		<p>A projects include the following chapters: (a) description of the Project; (b) policy, legal and administrative framework, including the international and national legal framework applicable to the Project; (c) scoping, including stakeholder identification and consultation plan; (d) analysis of alternatives, including the "without Project" situation; (e) baseline environmental and social data; (f) evaluation of environmental and social risks and impacts; (g) public consultation and information</p>	<p>emergency situation, and (vi) and anticipated changes due to project implementation. Information on applicable laws and regulation usually is presented in "Introduction" part. For the projects of category Orange B, the EIA report is more simplified. For Green and Orange-A an EIA report is not required</p>	
4	ESMP	<p>ESMP should be prepared and should specify, along with the proposed mitigation activities, a monitoring plan and reporting requirements, institutional arrangements for ESMP implementation. For project of Moderate risk with medium impact ESMP checklist has to be filled.</p>	<p>National legislation on EIA requires to identify possible impacts, but it does not require a preparation of separate EMP or any other environmental documents/ plans/ checklists. There is no requirement on environmental monitoring with specification of monitoring parameters and location.</p>	<p>An ESMP has been prepared and included in the present ESIA.</p>
5	Public Consultations and Disclosure	<p>The Borrower is responsible for conducting at least one meaningful consultation for all Moderate Risk project to discuss the issues to be addressed in the ESMP or to discuss the draft ESMP itself</p>	<p>Conducting of public consultation is not mandatory. It may be conducted, if required at the time of the EIA (second stage of EIA). Notice to relevant agencies and no object clearance from the local Government</p>	<p>Public consultations have been carried out with the stakeholders, affected people, NGOs as part of the present ESIA, in line with the WB/IFC requirements. The feedback received from the Public Consultations has been used to finalize the present ESIA.</p>

			authority must be obtained.	
6	Biodiversity Conservation and Sustainable Management of Living Natural Resources	Based on the environmental and social assessment, the requirements of the ESS/PS-6 are applied to all projects that potentially affect biodiversity or habitats, either positively or negatively, directly or indirectly, or that depend upon biodiversity for their success. The borrower is responsible for preparing the Biodiversity Management Plan as per the risk on the biodiversity of the project.	Ecologically critical Area (ECA) means such area which is rich in unique biodiversity or due to the importance of environmental perspective necessary to protect or conserve from destructive activities. ECA also falls within the category of natural and cultural heritage. There are 13 ECA gazette by the DoE to conserve the biodiversity for sustainable management of living natural resources.	Ecological Studies as baseline study of the Environment have been carried out to assess the requirements of the Biodiversity Management Plan of this Project Study to comply with the national requirements as well as the EIB/WB/IFC suggestion for the sustainable management of living natural resources.
7	Requirements on Cultural Heritages	EIB/WB/IFC ESS/PS 8 requires development of Cultural Recourses field-based survey to conserve cultural resources and avoid destroying or damaging them under the Project	Department of Archaeology is the concerned authority for the preservation, presentation and promotion of our glorious cultural heritage. At present the department owns 448 heritage sites Article 24 of the constitution of Bangladesh says that the state shall adopt measures for the protection against disfigurement, damage or removal of all monuments, objects or places of special artistic or historic importance or interest. Bangladesh also has the Antiquities Act, 1968 that provides the modes of protection and preservation of things which are part of our national history and heritage.	Chance Find Procedures have been included in the ESIA as Annex-E.

## 4.2.2 Harmonization of Social Policies of EIB/WB/IFC and GOB

Harmonization of social policies of EIB/WB/IFC and GOB is listed in below Table 4-3. For the identified gaps, national standards will be followed as minimum, international standards will be implemented for compliance with EIB/WB/IFC guidelines. In case of no national standards present, international standards will be followed as a benchmark.

Table 4-3 Harmonised Social Policies of WB/IFC and GOB<sup>3</sup>

SI. No.	EIB/WB/IFC Social Policies	National Policies	Gaps with GOB
A. ESS/PS-1: Assessment and Management of Environmental and Social Risks and Impacts EIA Guidelines for Industries of Department of Environment (DOE), February 2021			
A-1	Identify any potentially adverse gender-specific risks and impacts.	Not defined in EIA guidelines of DOE or even in the policies.	Annex-B of EIA Guideline of DOE (Feb'2021) only mentioned the "gender discrimination issue" in the "Labor and employment issues" Sections.
A-2	Use gender-disaggregated baseline data and analysis	There is no guidance for the use of gender-disaggregated baseline data and analysis, and consider enhancing the design of the Project to promote equality of opportunity and women's socioeconomic empowerment, particularly with respect to access to finance, services, and employment.	Only Socioeconomic survey conducted following the EIA guideline.
A-3	Monitoring of gender-disaggregated data in the implementation period.	No gender-disaggregated data advised for monitoring and evaluation purposes for the implementation period.	Only Socioeconomic survey conducted following the EIA guideline.
A-4	Manage risks of Project-related Gender-based Violence (GBV)	Not defined the management of risks of Project-related Gender-based Violence (GBV) to Project-affected persons and communities and Project workers.	There is a section-14 in the Environmental Conservation Act 1995 about allowing appeal against the grievances to the appellate Authority. But no specific GBV mentioned in the ECA.
A-5	Health and Safety of Workers and Communities	No Specific EHSs and, as appropriate, industry-specific EHSs, to the Project.	Labor laws 2006 (as amended in 2013) are followed for the HS of Workers but no community issues are addressed in the laws.

<sup>3</sup> This table was prepared to undertake a gap analysis of social policy standards in Bangladesh with respect to international standards. WB/IFC's ESS/PS-1 covers stakeholder engagement. Therefore, EIB's stakeholder requirement is already included in Section A of Table 4.3.

A-6	Occupation Health and Safety	National Occupational Safety and Health Policy in 2013 and working towards implementation of the policy in every industrial sector but not for general HS guidelines.	It is Industry specific only. However, the government uses this approach as a standard practice.
A-7	Project induced Labor Influx	No assessment and appropriately management of risks of adverse impacts on communities that may result from temporary Project-induced labor influx addressed in national policies/EIA guidelines.	Annex-B of EIA Guideline of DoE (Feb'2021) only mentioned the "spread of diseases due to influx of migrant labor" but no assessment/management addressed.
<p><b>B. ESS/PS-5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement</b></p> <p><b>Acquisition and Requisition of Immovable Property Act, 2017 of Govt. of Bangladesh</b></p>			
B-1	Involuntary resettlement should be avoided wherever possible.	Not defined in the Act	Act 2017 does not deal with the minimization of involuntary resettlement. However, the government uses this approach as a standard practice.
B-2	Minimize involuntary resettlement by exploring project and design alternatives.	Not so clearly defined in the Act. Places of worship, graveyard and cremation grounds are not to be acquired for any purpose, unless the acquisition of these places is deemed unavoidable for the best of interest of the people.	Act 2017 does not deal with these issues and does not comply with EIB/WB/IFC ESS/PS-5, as the Act 2017 has no strong provision for minimizing adverse impacts on private property or common resources, and does not deal with alternate design. The RPF clearly mentions how to minimize the involuntary resettlement through proper alternate engineering design and adequate consultation with stakeholders.
B-3	Conducting census of displaced persons and resettlement planning	The Act 2017 spells out that upon approval of the request for land by the office of the deputy commissioner, the acquiring and Requiring body staff will conduct the physical inventory of assets and properties found in the land. The inventory form consists of the name of person, quantity and quality of land, asset assets affected, and the materials used in the construction of house. The cut-off date is the date of publication of notice that land is subject to acquisition, and that any alteration or improvement thereon will not be considered for compensation.	The Act 2017 does not require the coverage of the census survey. It only reflects the inventory of losses which is more in physical terms and only includes the names of the owners, etc. The EIB/WB/IFC policy spells out a detailed census through household surveys of displaced persons in order to assess the loss of income and vulnerability of the persons going to be affected by land acquisition but also population displacement and other entitlements as per the entitlement matrix. The RPF fills this gap by incorporating the need for a census survey for the displaced persons.

B-4	Carry out meaningful consultation with displaced persons and ensure their participation in planning, implementation, and monitoring of resettlement program.	Section 3 of the ordinance provides that whenever it appears to the DC that any property is needed or is likely to be needed for any public purpose or in the public interest, he shall publish a notice at convenient places on or near the property in the prescribed form and manner stating that the property is proposed for acquisition.	The Act 2017 does not directly meet EIB/WB/IFC ESS/PS-5. This section of the ordinance establishes an indirect form of information disclosure/public consultation. However, it does not provide for public meetings and project disclosure, so stakeholders are not informed about the purpose of land acquisition, its proposed use, or compensation, entitlements, and special assistance measures. The RPF deals with the proper consultation process, which involves all stakeholders (DPs, government department/line agencies, local community, NGO, etc.), and the consultation will be a continuous process at all stages of the project development, such as project formulation, feasibility study, design, implementation, and post-implementation, including the monitoring phase.
B-5	Establish grievance redress mechanism.	Section 4 allows the occupant of the land to raise objections in writing. These should be filed to the DC within 15 days of the publication. The DC will then hear the complaints and prepare a report and record of proceedings within 30 days following expiry of the 15-day period given to DPs to file their objections.	The section 4 provision is consistent with WB/IFC's grievance and redress policy. The RPF has a special provision for grievance procedures, which includes formation of a grievance redress committee, appointment of an arbitrator, and publication of the notice of hearings and the scope of proceedings. The APs can raise any grievances relating to LA&R issues.
B-6	Improve or at least restore the livelihoods of all displaced persons.	The Act 2017 does not address the issues related to income loss, livelihood, or loss of the non-titleholders. This only deals with the compensation for loss of land, structures, crops and trees, etc. for the legal titleholders.	Act 2007 does not comply with WB/IFC ESS/PS-5 as there is no provision to assess the impacts on incomes and livelihood from the loss of employment and business, or to restore lost incomes and livelihoods. The RPF keeps the provision for a census survey that will have the data on the loss of income and livelihood, and the same will be compensated as per the entitlement matrix for both physically and economically displaced persons.
B-7	Land-based resettlement strategy	The Act 2017 does not address these issues.	The Act 2017 does not meet the requirement of WB/IFC ESS/PS-5. The RPF proposes the land-for-land compensation as its priority if feasible.  Attempt will be made to find alternative land for the loss of land in case it is available and if it is

			feasible, looking at the concurrence of host community and land value. However, this option may be a difficult proposition, considering the urban development projects in Bangladesh.
<b>B-8</b>	All compensation should be based on the principle of replacement cost.	The Act 2017 states that the deputy commissioner (DC) determines the amount of compensation by considering: (i) the replacement cost of the property based on the average sale value of last 12 months preceding the publication of 1st notice of acquisition; (ii) the damage to standing crops and trees; (iii) damage by severing such property from the other properties of the person occupying the land; (iv) adverse effects on other properties, immovable or movable, and/or earnings; and (v) the cost of change of place of residence or place of business. The DC also awards a sum of 50% on the replacement cost of the property to be acquired.	Act 2017 is largely consistent with WB/IFC ESS/PS-5. However, there are differences in the valuation of land and prices of affected assets, where EIB/WB/IFC prescribes the use of current market rates in the project area. Act 2017 does not ensure replacement cost or restoration of pre-project incomes of the displaced persons. The RAP addresses all these issues and spells out a mechanism to fix the replacement cost by putting in an independent evaluator who will be responsible for deciding the replacement cost, taking into consideration the Current Market Price and titling cost of the land.
<b>B-9</b>	Provide relocation assistance to displaced persons.	If DC considers that the structure can easily be transferred, he/she will give relocation cost but not cash compensation under law.	The Act 2017 does not define the additional relocation assistance to displaced persons, other than the compensation for the direct loss of land and property. Hence, Act 2017 does not comply with EIB/WB/IFC ESS/PS-5. The RAP provides the eligibility and entitlement for the relocation of the displaced persons in the form of relocation assistance, which includes shifting allowances, right to salvage materials, and additional transitional assistance for the loss of business and employment.
<b>B-10</b>	Ensure that displaced persons without titles to land or any recognizable legal rights to land are eligible for resettlement assistance and compensation for loss of non-land assets.	The Act 2017 does not have this provision.	The Act 2017 is not consistent with the requirements of WB/IFC ESS/PS-5. This is a major difference in the national law/policy compared to that of EIB/WB/IFC. The Act 2017 only takes into consideration the legal titleholders and ignores the non-titleholders. The objective of the RPF is to ensure that compensation and assistance is provided to all displaced persons, whether physically displaced or economically displaced, irrespective

			of their legal status of land on which the structure is built. The end of the census survey will be considered to be the cut-off date, and displaced persons listed before the cut-off-date will be eligible for assistance.
<b>B-11</b>	Disclose the resettlement plan, including documentation of the consultation in an accessible place and a form and languages understandable to affected persons and other stakeholders.	The ordinance only ensures the initial notification for the acquisition of a particular property.	There is no requirement under the Act, of disclosure of the RPF, whereas the EIB/WB/IFC ESS/PS-5 requires disclosure. This RPF will ensure that the resettlement plan for each project, along with the necessary eligibility and entitlement will be disclosed to the DPs in the local language (Bangla), in the project location and concerned government offices, and the same resettlement plan will also be disclosed on the executing agency's website and on the website of AFD/DSIF.
<b>B-11</b>	Conceive and execute involuntary resettlement as part of a development project or program. Include the full costs of resettlement in the presentation of project's costs and benefits.	The Act 2017 has a provision to include all the costs related to land acquisition and compensation of legal property and assets. However, it does not take into account the costs related to other assistance and involuntary resettlement.	The Act 2017 partially meets the requirement of WB/IFC ESS/PS-5 as it only deals with the compensation pertaining to land acquisition. The Resettlement Action Plan provides the eligibility to both titleholders and non-titleholders with compensation and various kinds of assistance as part of the resettlement packages, and the entire cost will be the part of the project cost.
<b>B-12</b>	Pay compensation and provide other resettlement entitlements before physical or economic displacement.	The Act 2017 has the provision that all the compensation will be paid prior to possession of the acquired land by EA.	The Act 2017 meets the requirement of EIB/WB/IFC ESS/PS-5.
<b>B-13</b>	Monitor and assess resettlement outcomes, and their impacts on the standards of living of displaced persons.	This is not so clearly defined in the Act 2017.	The Act 2017 does not comply with EIB/WB/IFC ESS/PS-5. The RAP has a detailed provision for a monitoring system within the executing agency. The executing agency will be responsible for proper monitoring of the resettlement plan implementation, and the internal monitoring will also be verified by an external monitoring expert.
<b>C. ESS/PS-7: Indigenous Peoples</b>			

C-1	Preparation of an Indigenous Peoples Plan (IPP)	No IPP is addressed in ECA/ECR	Annex-B of EIA Guidelines for Industries of DOE (Feb'2021) only mentioned the "Indigenous people rights and/or minority rights issues".
C-2	Special Considerations in Consultations	For IP nothing specifically addressed in the EIA national guidelines	A broader perspective of Stakeholder engagement processes/Public consultation and participation has addressed in the EIA guidelines of DoE.
C-3	Project-level Grievance Redress Mechanism (GRM)	Not clearly defined the GRM in the ECA/ECR.	There is a section-14 in the Environmental Conservation Act 1995 about allowing appeal against the grievances to the appellate Authority. But no specific GRM process/method mentioned in the ECA.

### 4.3 International Conservations, Treaties and Protocols

The following are the International Environmental Conservations, Treaties, and Protocols:

- > Rio Declaration, Convention on Biological Diversity, Rio De Janeiro, 1992 (Ratified 1994)
- > RAMSAR, 1971(Ratified 1992)
- > International Plant Protection Conservation, Rome, 1951 (Ratified 1978)
- > Basel Convention, Basel, 1989 (Ratified 1993)
- > United Nations Framework Conservation on Climate Change, New York, 1992 (Ratified 1994)
- > Montreal Protocol, 1987 (Ratified 1994)
- > World Heritage Convention, 1972 (Ratified 1983)

Among them, Table 4-4 summarizes the relevant to this project activity.

Table 4-4: International environmental conventions relevant to the project activities

International	Details	Relevance
Rio Declaration 1992	United Nations Conference on Environment and Development (UNCED) adopted the global action program for sustainable development called 'Rio Declaration' and 'Agenda 21 'Principle 4 of the Rio Declaration', 1992, to which Bangladesh is a signatory along with a total of 178 countries.	No sensitive species are located in the project area. There is no threat to the conservation of flora or fauna.
Convention on Wetland of International Importance Especially as Waterfowl Habitats, Ramsar (1972)	The Ramsar Convention was adopted on 2 February 1971 and entered into force on 21 December 1975. Bangladesh ratified the Convention on 20 April 2002. Bangladesh has two Ramsar Sites (i) parts of Sundarban Reserved Forest (Southwest of Bangladesh), and (ii) Tanguar Haor Northeast of Bangladesh).	No impact



## 4.4 Relevant Occupational Health and Safety Laws and Rules

During construction, the Project will conform to the occupational and health-related rules as outlined in Table 4-5 below.

Table 4-5: Relevant occupational health and safety laws and rules

Title of Laws and Rules	Descriptions
Social Security under the Act, 1923 and an amendment in 1980	According to the Act social impact assessment includes the processes of analyzing, monitoring and managing the intended and unintended social consequences, both positive and negative of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions.
The Employer's Liability Act, 1938	The Act declares that the doctrine of common employment and of assumed risk shall not be raised as a defense in suits for damages in respect of employment injuries. Under the Maternity Benefit Act, 1939, the Maternity Benefit Act, 1950, the Mines Maternity Benefit Act, 1941, and finally the rules framed thereunder, female employees are entitled to various benefits for maternity, but in practice, they enjoy leave of 6 weeks before and 6 weeks after delivery.
Public Health (Emergency Provisions) Ordinance, 1994	The ordinance calls for special provisions with regard to public health. Whereas an emergency has arisen, it is necessary to make special provision for preventing the spread of human disease, safeguarding public health and providing them adequate medical service and other services essential to the health of respective community and workers in particular during the construction related work.
The Employees State Insurance Act, 1948	It has to be noted that health, injury and sickness benefit should be paid to people, particularly respective workers at workplace under the Act.
Bangladesh Factory Act, 1979	The Act requires every workplace including small or large scale construction where women are employed to have an arrangement of childcare services. Based on this Act and Labor Laws - medical facilities, first aid and accident and emergency arrangements are to be provided by the authority to the workers at workplaces.
Water Supply and Sewerage Authority Act, 1996	The Act specifies WASA's responsibility to develop and manage water supply and sewerage systems for the public health and environmental conservation.

## 4.5 Applicable Environment Standards

### 4.5.1 Ambient Air Quality Standards

The ambient air quality standards shall be applicable only during the construction phase of the subproject and the wastewater discharges from the subproject during both construction and operation phases shall be as per the general discharge standards as sector specific standards are not available for this subproject. Standards for Ambient Air Quality shall be applicable for construction phase only as no air major polluting process is expected during operation phase of the subproject. Ambient Air Quality Standards (AAQS), as notified under Air Pollution (Control) Rules 2022 are given in Table 4-6.

Table 4-6: Ambient Air Quality Standards

Pollutant	Time Weighted Average	Concentration in Ambient Air	
		National Industrial, Residential, Rural and other Areas ( $\mu\text{g}/\text{m}^3$ ) (ECR'97)	WHO Guideline Value in $\mu\text{g}/\text{m}^3$
Sulfur Dioxide ( $\text{SO}_2$ ), $\mu\text{g}/\text{m}^3$	24 hrs.	80 $\mu\text{g}/\text{m}^3$	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	1 hrs	250 $\mu\text{g}/\text{m}^3$	500 (guideline)
Nitrogen Dioxide ( $\text{NO}_2$ ), $\mu\text{g}/\text{m}^3$	Annual	40 $\mu\text{g}/\text{m}^3$	40 (guideline)
	1 hr.	80 $\mu\text{g}/\text{m}^3$	200 (guideline)
Particulate Matter (size less than 10 $\mu\text{m}$ ) or $\text{PM}_{10}$ , $\mu\text{g}/\text{m}^3$	Annual	50 $\mu\text{g}/\text{m}^3$ <sup>(ii)</sup>	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24 hrs.	150 $\mu\text{g}/\text{m}^3$ <sup>(iii)</sup>	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter (size less than 2.5 $\mu\text{m}$ ) or $\text{PM}_{2.5}$ , $\mu\text{g}/\text{m}^3$	Annual	35 $\mu\text{g}/\text{m}^3$	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24 hrs.	65 $\mu\text{g}/\text{m}^3$	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone ( $\text{O}_3$ ), $\mu\text{g}/\text{m}^3$	8 hrs.	100 $\mu\text{g}/\text{m}^3$	160 (Interim target-1) 100 (guideline)
	1 hr.	180 $\mu\text{g}/\text{m}^3$	
Lead ( $\text{Pb}$ ), $\mu\text{g}/\text{m}^3$	Annual	0.25 $\mu\text{g}/\text{m}^3$	
	24 hrs	0.50 $\mu\text{g}/\text{m}^3$	

Carbon Monoxide (CO), mg/m <sup>3</sup>	8 hr.	05 mg/m <sup>3</sup>	
	1 hr.	20 mg/m <sup>3</sup>	

## 4.5.2 Water Quality Standards

The designated best use classification as prescribed by DoE for surface water is as given in Table 4-7. Table 4-8 and Table 4-9 highlight standards for drinking water and IFC treated sewage discharge guideline.

Table 4-7: Primary Water Quality Criteria for Designated-Best-Use-Classes

Parameters	Unit	Inland Surface Water Quality Standards
Temperature	°C	40
Biological Oxygen Demand (BOD <sub>5</sub> ) at 20°C	mg/L	50
Chemical Oxygen Demand (COD)	mg/L	200
Dissolve Oxygen (DO)	mg/L	4.5-8
Total Dissolved Solids (TDS)	mg/l	2,100
pH	-	6-9
Suspended Solid (SS)	mg/L	150
Nitrate	mg/L	10.0
Arsenic	mg/L	0.2
Lead	mg/L	0.1
Chloride	mg/L	600
Iron	mg/L	2
Manganese	mg/L	5
Copper	mg/L	0.5
Oil & Grease	mg/L	10

Source: ECR'2023, Schedule-10

Table 4-8: Standards for Drinking Water

Parameters	Unit	DoE (Bangladesh) Standard for drinking water
pH	-	6.5-8.5
Hardness (as CaCO <sub>3</sub> )	mg/L	200-500
Iron	mg/L	0.3-1.0
Chloride	mg/L	150-600
Arsenic	mg/L	0.05
Residual chlorine	mg/L	0.2
Total Coliform	n/100mL	0
Fecal Coliform	n/100mL	0

Ammonia	mg/L	0.5
Nitrate	mg/L	10
Phosphate	mg/L	6

Source: ECR'2023, Schedule-3

Table 4-9: Treated Sewage Discharge Guideline IFC

Sl. No.	Parameter	Guideline Value
1	pH	6-9
2	BOD <sub>5</sub>	30 mg/l
3	COD	125 mg/l
4	Total Nitrogen	10 mg/l
5	Total Phosphorus	2 mg/l
6	Oil and Grease	10 mg/l
7	Total Suspended Solids	50 mg/l
8	Total Coliform bacteria	400 MPN/100 ml

Notes: M PN = Most Probable Number

### 4.5.3 Ambient Noise Standards

Table 4-10 and Table 4-11 shows the Bangladesh noise level standards and the World Health Organization noise level guidelines for community noise (Environmental, Health, and Safety General Guidelines, 2007), respectively, during daytime and night time for various types of areas. Table 4-12 and Table 4-13 shows the noise limits for various working environments according to Environmental, Health, and Safety General Guidelines and OSHA, respectively.

Table 4-10: Bangladesh standards for sound level (GoB, 2006)

Locations	Noise level (dBA)at day	Noise level (dBA)at night
Silent zone	50	40
Residential area	55	45
Mixed area	60	50
Commercial area	70	60
Industrial area	75	70

(Ref: Noise Pollution Control Rules, 2006)

Table 4-11: Noise Level Guidelines (Guidelines for Community Noise, WHO, 1999)

Receptor	One Hour LAeq (dBA)	
	Daytime (07:00 – 22:00)	Nighttime (22:00 – 7:00)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Note: For acceptable indoor noise levels for residential, institutional, and education settings refer to WHO (1999)

Table 4-12: Noise Limits for Various Working Environments

Location/ activity	Equivalent Noise	Maximum
--------------------	------------------	---------

	<b>LAeq, 8h</b>	<b>LAmx, fast</b>
Heavy Industry (no demand for oral communication)	85 dB(A)	110 dB(A)
Light Industry (decreasing demand for oral communication)	50 – 65 dB(A)	110 dB(A)
Open offices, control rooms, service counters or similar	45 – 50 dB(A)	--
Individual offices (no disturbing noises)	40 – 45 dB(A)	--
Classrooms, lecture halls	35 – 40 dB(A)	--
Hospitals	30 – 35 dB(A)	40 dB(A)

Note: For acceptable indoor noise levels for residential, institutional, and education settings refer to WHO (1999)

Table 4-13: OSHA Noise Exposure Limits for the Work Environment (in dBA)

<b>Noise Levels</b>	<b>Permissible Exposure</b>	<b>Noise Levels</b>	<b>Permissible Exposure</b>
85	16 hrs	111	26 min
87	12 hrs 6 min.	114	17 min
90	8 hrs	115	15 min
93	5 hrs 18 min	118	10 min
96	3 hrs 30 min	121	6.6 min
99	2 hrs 13 min	124	4 min
102	1 hr 30 min	127	3 min
105	1 hr	130	1 min
108	40 min		

Note: Exposure above or below the 90 dBA limit have been time weighted to give what OSHA believes are equivalent risks to a 90 dBA 8 hr. exposure (Marsh, 1991, p.322).

## 5 Baseline Environment: Physicochemical

### 5.1 Introduction

As a part of the environmental assessment of the proposed project (which has been carried out along with the feasibility study of the project), an environmental baseline survey has been carried out in areas surrounding the proposed locations of intake and water treatment plant, and along the route of the proposed water transmission line.

The specific objectives of the baseline study were:

- > To document the existing condition of physical and biological environment and prevailing socio-economic condition of the project areas,
- > To identify the significant environmental and social aspects that are likely to be affected by the proposed project activities; and
- > Setting of baseline parameters in order to identify possible adverse and beneficial impacts due to the proposed project activities.

This Chapter describes the baseline physical environment of project areas based on the findings of the baseline surveys. The descriptions of baseline ecological environment and baseline socio-economic environment have been presented in Chapter 4 and Chapter 5, respectively.

### 5.2 Physical Features of the Study Area

#### 5.2.1 Topographic Survey

As a part of the baseline survey, a topographic survey was carried out along the route of the proposed transmission line from the proposed intake location at Haria to water treatment plant site at Saidabad in Dhaka. For topographic survey, temporary benchmarks (TBM) were established from National First Order BM Grid. Following establishment of benchmark (BM), locations of various features in the project areas, such as roads, drainage channels, water bodies, rivers, filling stations, electric poles, human settlement, and other permanent structures were recorded. The topographic survey was conducted utilizing satellite based RTK GPS instruments, high precision total stations, along with handheld GPS to locate the existing features in the project areas. The major activities performed are summarized below.

A temporary benchmark (TBM) network was established in a project area using the reference benchmark (BM) available in the proximity of the study area. TBM or Temporary control points were established at roughly 1 km interval within the project areas by conventional fly levelling. The position of each TBM was taken by DGPS.

Spot level survey was conducted along the entire route (about 24.69 km) of the proposed water transmission line from the raw water intake location at Haria up to the water treatment plant site at Saidabad. The survey was conducted using electronic total station. As note earlier, a major part of the route of the proposed transmission line runs along the existing roads (Dhaka- Chittagong and Dhaka-Sylhet highways), and spot levels were taken at 100 m intervals along the road covering 70 m on the eastern side of the road centreline (along which the water transmission line has been proposed to be laid).

Along the route of the proposed raw water transmission line, spot levels have been taken at 100 m interval over a 100 m wide strip. Across the pipeline alignment, spot levels have been taken at 5m interval on slope and at 10 m interval on flat land. At the proposed sites of water treatment plant and intake structure, spot levels have been taken at 20 m x 20 m grid spacing. Alignment survey of the proposed transmission line route(s) was carried out from the selected intake location to the probable locations for the construction of the SWTP. The survey was conducted using Pro-XR GPS with RECON data logger along the proposed trunk main line. During the survey, detailed information regarding features like land use, homestead and existing infrastructures were recorded in the data logger. Surveys for determining cross-sections of rivers have been carried out at 2 locations (Old Brahmaputra and Shitalakshya rivers). Cross-sections were taken at 20 m intervals. Figure 5-1 shows the locations of the cross-sectional surveys along the route of the proposed transmission line from the intake at Haria to SWTP site.

Maps of the project areas have been developed from the survey data using ArcGIS software; the maps show all major features identified and recorded during the survey. Topographic maps of the proposed locations of intake structure, water treatment plant, and river crossings have been prepared; while strip maps of the proposed route of water transmissions line have been prepared showing spot levels and major features recorded during the survey. A sample alignment map from the intake at Haria to proposed water treatment plant site at Saidabad is shown in Figure 5-1 and a topographic map of the proposed site for WTP at Saidabad is shown in Figure 5-3.

### 5.2.2 Physical Features of Haria Intake Site

The land at the intake site is owned by DWASA. The plot is located between Aman Group's industrial sites on the west bank of the River Meghna at Haria. The riverbank consists of natural slope. Access to the site is restricted and secured with boundary walls on all three sides. The soil is predominantly sandy with grass cover.

### 5.2.3 Physical Features along Route of Water Transmission Line

[2023 – Previously numbered 3.2.1]

Strip maps for the raw water transmission line from the intake point at Haria to Saidabad treatment plant site were prepared from the topographic survey as a part of the feasibility study. Physical features such as trees, electric poles, dumping stations, markets, passenger sheds, petrol pumps and CNG stations, building and homesteads, graveyard, mosques, ponds and other water bodies etc. within ~100 m wide strip along the proposed route of the raw water transmission line have been identified on the maps.

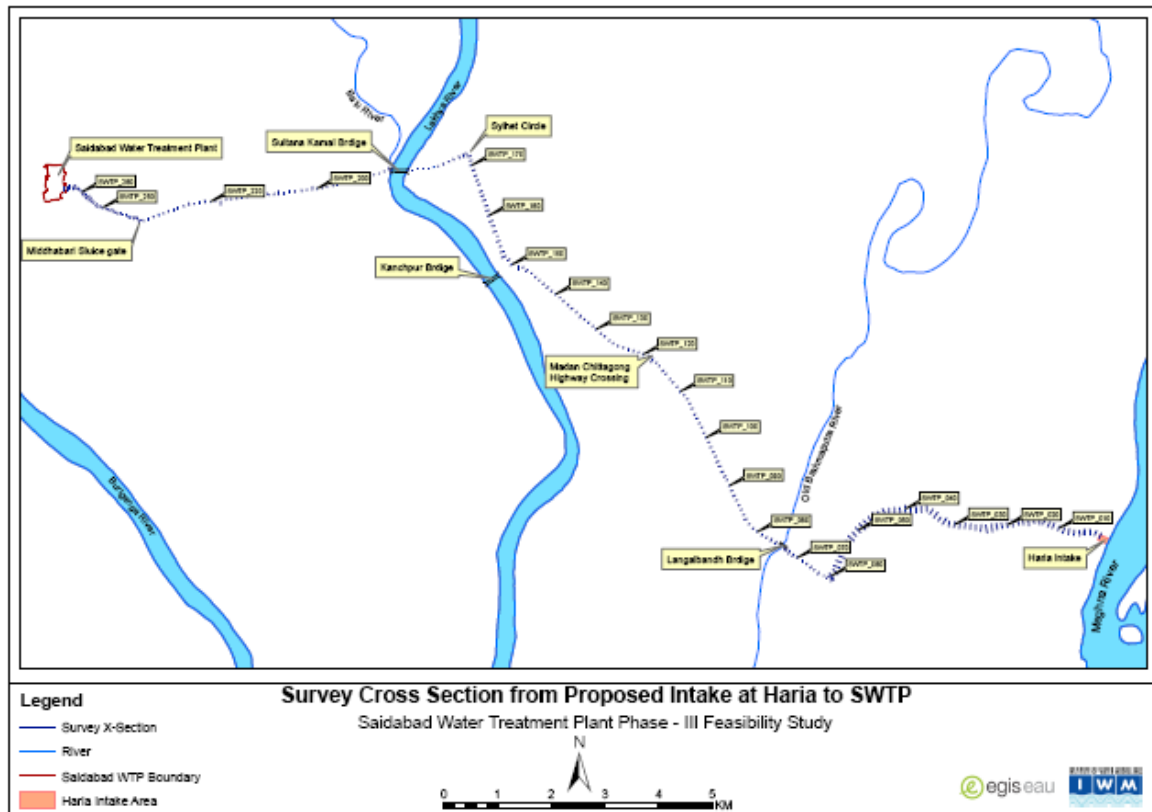


Figure 5-1: Cross-sectional Survey Locations from Proposed Intake at Haria to SWTP

The proposed location of the pumping station at the bank of the Meghna River is a 100m x 200m land, which is currently not being used for any specific purpose. The first strip map near the intake location with a at the bank of the Meghna River is shown in Figure 5-2 which shows the proposed location of the pumping station as well as different identified physical features. The full set of strip maps is available in the feasibility report.

The proposed 6 km route of the water transmission line from the intake location at Haria through the village area up to the Doriakandi bus station passes through a number of tin shed houses, homesteads, electrical poles, trees and ponds. The different physical features which could be directly or indirectly affected by construction works related to transmission lines along a ~100m wide strip of the proposed raw water transmission route are summarized in Table 5-1. Among these features 35 trees (17 litchi trees, 4 mango trees, 13 rain trees, 1 jackfruit tree), 1 tin-shed building, 6 homesteads, 4 electric poles and 2 ponds would have to be permanently removed as they are located directly on the proposed 6 km x 20m strip of land to be acquired for the construction of transmission lines.



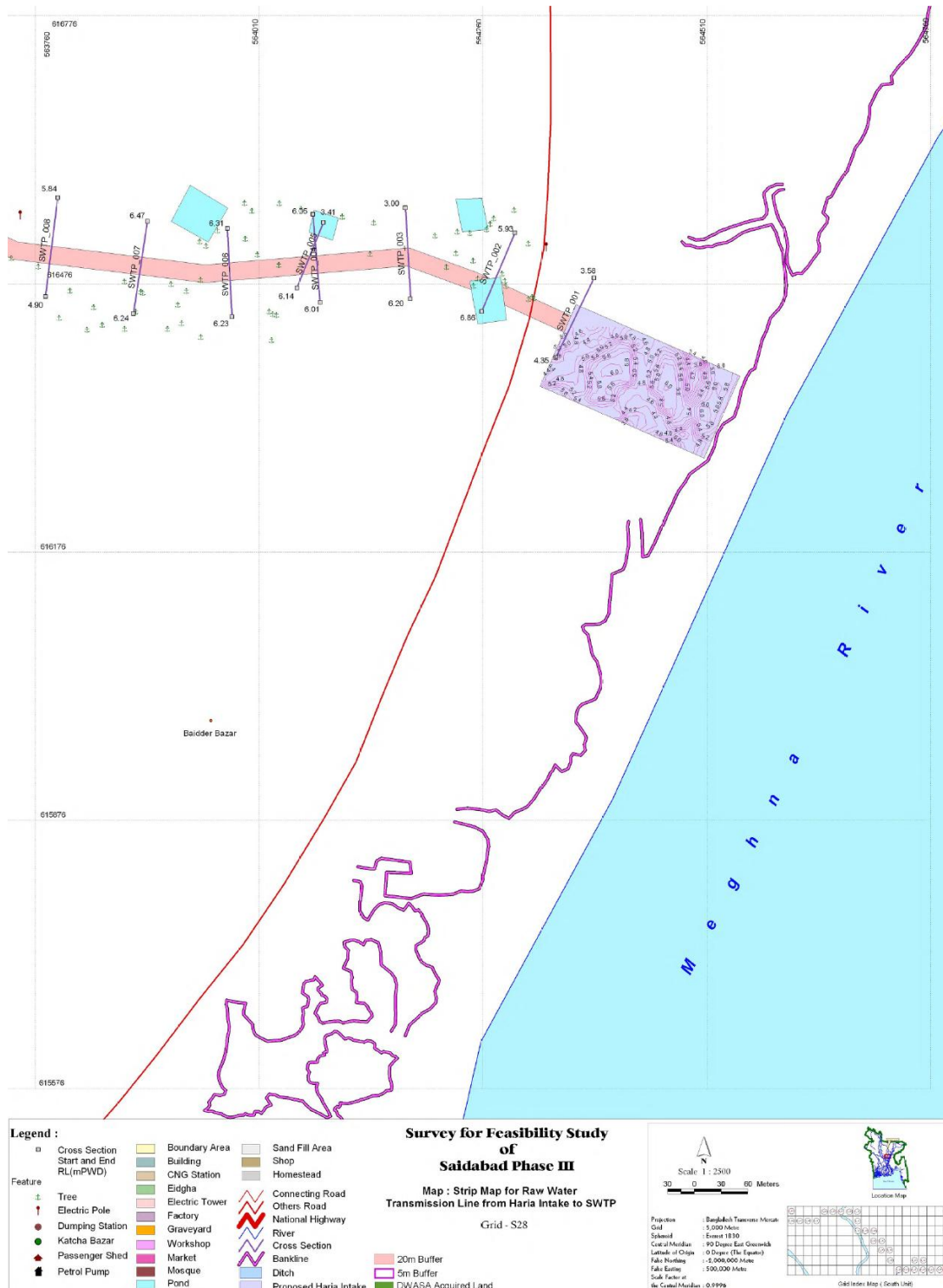


Figure 5-2: Strip map of the Intake Structure at Haria and part of the proposed route of the water transmission pipeline. (Original Figure 10)

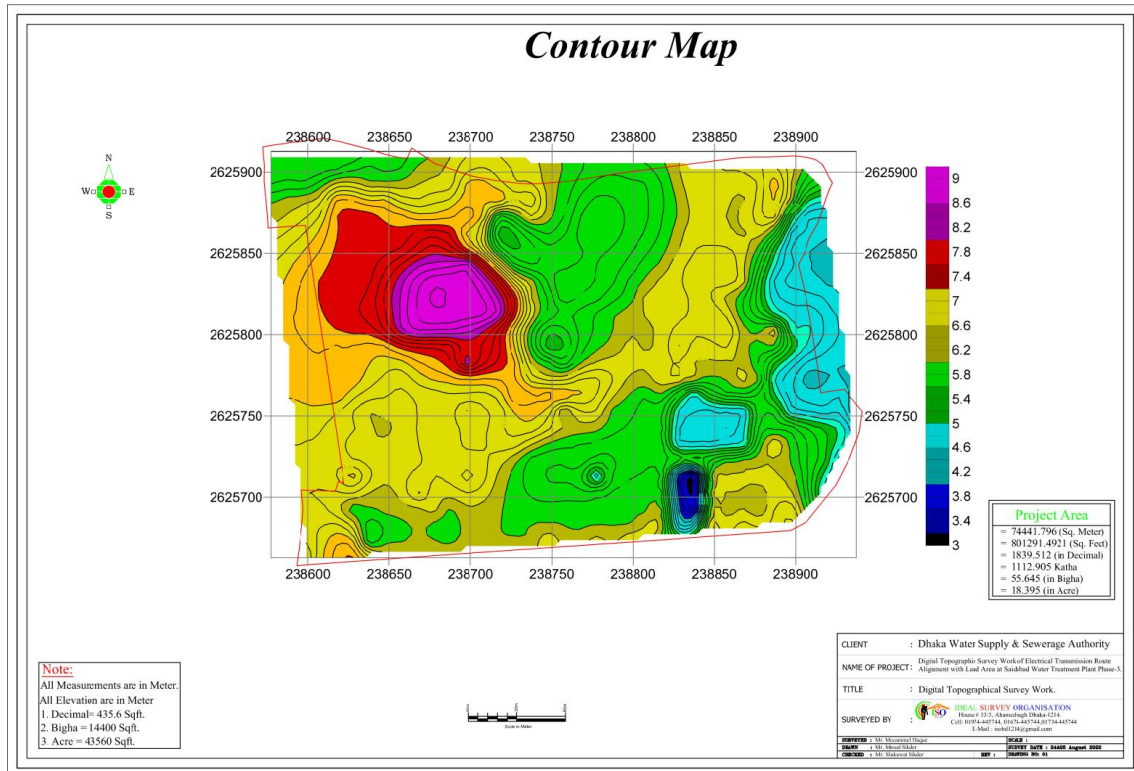


Figure 5-3: A contour map of the proposed Saidabad WTP Site (DWASA, 2023) (Replaces original Figure 11)

Along Dhaka-Chittagong Road, Dhaka-Sylhet Road, the twin water transmission pipeline has been proposed to be laid along the western side of the road. Along and around this proposed route, there are trees, electric poles, dumping stations, markets, passenger sheds, petrol pumps and CNG stations, buildings, shops, factories, markets, ponds and other water bodies (see Table 5-1). Within this stretch, the two raw water transmission pipelines in parallel may be installed along the southern side of the proposed 4-lane expressway's right of way in the roadside borrow pit, which is owned by the RHD (see Figure 2-3). Hence no land acquisition will be required; however, permission from the RHD will be required for laying the pipeline. From the Sylhet circle, the transmission pipeline will be laid along the proposed extension of the Demra-Jatrabari road up to the Mridhabari Sluice gate, which is also the endpoint of the DND conveyance canal.

Table 5-1: Number of each physical feature within a 100 m wide strip along the route of the proposed water transmission pipeline (Original Table 14)

Physical Features	Intake area pumping station and 6km route of transmission line up to Doriakandi bus station	Proposed route alongside Dhaka-Chittagong, Dhaka-Sylhet and Dhaka-Demra-Jatrabari road up to Mridhabari sluice gate	Proposed route beside existing twin culvert from Mridhabari sluice gate to Saidabad WTP site
Tree	224	40	
Electric Pole	21	414	
Dumping		1	
Kacha Bazar		3	
Passenger		11	
Petrol Pump		4	
Building	7	11	14
CNG Station		2	
Eidgha	1		
Electric		1	2
Factory		7	2
Graveyard	2		
Workshop			
Market		11	7
Mosque			4
Pond	15	105	
Sand Fill			
Shop		4	
Homestead			2
River		2	

From this point one of the pipelines will be connected to the existing box culvert conveying the water to the Saidabad treatment plant while the other pipeline will continue parallel to the box culvert. A 1.5 km × 5m strip of land needs to be acquired for this purpose. The area along and around this 5m strip has a number of buildings, mosques, markets, factories and electric poles. Two workshops/ factories, 6 buildings, 1 electrical pole, 1 semi-pucca building and 1 semi-pucca shop needs to be permanently removed as they are located directly on the 5 m strip of land.

#### 5.2.4 Physical Features of Existing Water Treatment Plant Site

The proposed site for Saidabad Phase-III extension is located within the exiting water treatment site. Phase-I and Phase-II plants are operational for 450 MLD water production. Phase-III extension space is allocated on the northern part of the secured site. Existing sludge drying beds are located within the footprint of the proposed Phase-III area. A high voltage overhead electricity transmission line also crosses above the proposed location.

#### 5.2.5 Physical Features along Route of Water Distribution Line

The areas along the alignment of the proposed water supply distribution network have been divided into three zones as follows: Physical Features along Route of Water Distribution Line. The areas along the alignment of the proposed water supply distribution network have been divided into three zones as follows:

- > Zone 1: 1000mm diameter pipeline will follow along the Maniknagar Road and will meet Atish Diponkar Road. Near Mostafa Kamal Stadium the line will follow Kamlapur Road. In front of Kamlapur Rail Station the pipeline will be divided into two sub-mains. One will follow the outer circular road and will be connected to existing 600mm diameter pipe at Shahjahanpur Circle, near Eastern boundary of Rajarbagh Police Line. The second sub-main will follow the Kamlapur Road and will meet the inner circular road. This line will continue to run up to Kakrail Mosque. At Kakrail Mosque the diameter of the main will be reduced to 600mm. This line will distribute water to several distribution nodes.
- > Zone 2: 1400 mm diameter pipe will follow WASA road and meet with new Dholpur road and will continue up to Jatrabari Circle. Here, it will be divided into two sub-mains. One sub-main of dia 1200mm pipeline will be laid along the Demra road and continue up to Demra Circle near Shitalakshya river. Near Demra circle the diameter of the pipe will be of 500mm. The other sub-main of dia 1200mm will follow Dhaka-Chittagong Road and will continue up to Dhaka-Narayanganj crossing. The diameter of the pipe at Dhaka-Narayanganj crossing will be reduced to 600mm. This line will distribute water to the adjacent areas through several distribution nodes.
- > Zone 3: 1000mm diameter pipe will follow WASA road and continue up to Basabo and then the line will follow Basabo-Madartek-Nandipara road. On way to Nandipara, the water will be distributed to Khilgaon, Goran, Madartek, Banasree other adjacent areas through several distribution nodes. The diameter of the last end of the main will be of 500mm.

Salient features of project influence areas along the route of the distribution line are summarized in Table 5-2. Temporary impacts on these features during construction phase are listed in Section 9 Impact Evaluation.

Table 5-2: Summary of important features along the route of the distribution line (Original Table 15)

Sl. No.	Parameter	Description
1	Ecologically Critical Area	No Ecologically critical areas were found
	Reserve/Protected	No reserve or protected forests area were found
2	Predominant Geological Formations	Dhaka is situated at the southern tip of a Pleistocene terrace of the Madhupur Tract. Two characteristic geological units cover the city and surroundings, the Madhupur clay of the Pleistocene age and alluvial deposits of recent age.
	Topography	Most of the area has an elevation of four to six meters. The highest elevation was observed in the northern part of the area. The lowest elevation was observed in the western part along the side of the Balu River.
	Major Physiographic Units	The area falls into Physiographic unit of Madhupur Tract. It comprises central part of Dhaka the course of Brahmaputra –Jamuna Floodplain.
	Major Soil Type	The soil in mainly of red Coloured and mottled clays. Soils in the valleys are dark general belongs to a Pleistocene terrace consisting grey heavy clays. They are strongly acidic in reaction with low status of organic matter, low moisture holding capacity and low fertility level.
3	Principal crops	Like other cities of Bangladesh, agriculture is important in parts of urban fringe of the Dhaka city. Rice is the most important crop.

Sl. No.	Parameter	Description	
		Wheat and potatoes are also important. Others agricultural products include fruits, in particular mango, banana and pineapple.	
4	Major Water Bodies	Zone-1	Shegunbagicha Khal
		Zone-2	Dholai Khal, Zirani-Nandipara khal, Manda Khal, DND Khal, Balu River, Shitalakshya River
		Zone-3	Khilgoan-basaboo khal, Zirani khal, Balu River, Shitalakshya River
5	Flooding	The area is more prone to flood than the other area of Dhaka city. The area is generally flooded by the ingress from the backwater flow of the Dhaleswari, Meghna Rivers, Shitalakshya and Balu Rivers.	
6	Seismicity	The project area falls in the earthquake Zone-2 of the seismic map of Bangladesh. This zone refers medium intensity of seismic effects	
7	Environmental Hotspots	Zone-1	School (11 nos.), Madrasha (10 nos.), College (5 nos.), University (2 nos.) Baitul Mokarram Masjid, Mosque (51 nos.) Hospital (48 nos.), Park/open space, Temple/Church (2 nos.), Bank Branch (7 nos.) fire station, Post office and police out post etc.
		Zone-2	Schools (31 nos.), Colleges (7 nos.), Madrasha (11 nos.), Graveyard, playground, Parks, Club and post office etc.
		Zone-3	School & College (50 nos.), University (1 no.), Madrasha (12 nos.), Hospital/ clinic (98 nos.), Mosque (100 nos.), Temple/Church (5 nos.), Graveyard, Post office (1 no.) and Police out post (6 nos.) etc.
8	Major Settlement	Zone-1, Zone-2, Zone-3,	Residential area, Commercial area, Slums and Squatters, Bus terminals, Institutional etc.
9	Major Industries/Business Entrepreneurs	Zone-1, Zone-2, Zone-3,	Textile Mill, Steel Mill, Paint Industry, Food Processing Industry, Re-rolling mill, Tube mill, Agro-Engineering Industry, Metal Industry and Garments Industry, Few workshop, carpenter store, small milling etc.

## 5.3 Physicochemical Environment

### 5.3.1 Climate

Bangladesh is located at the central part within the Asiatic monsoon region where the climate is tropical. Relatively small size of the country and generally low-lying area cause moderate spatial variation of temperature, precipitation, relative humidity, wind speeds and other climatic variables. However, the climate of Bangladesh exhibits pronounced temporal variability. This is because of the moisture-laden monsoon winds flowing predominantly from the south-west during summer and the comparatively dry and colder north-western winds during winter.

Three seasons are generally recognized: a hot, muggy summer from March to June; a hot, humid and rainy monsoon season from June to November during which more than 85% of the total annual rainfall occurs; and a moderately cold, dry winter from December to February. The beginning of the rainy season varies from year to year; heavy rains may

commence anywhere between mid-April and early June and may end anywhere between the end of September and mid-November. Usually, the winter season is dry with occasional rains. The early summer season is considered from March-April. During summer, the air becomes hot with very low humidity. Early summer is also dominated by Baishakhi cyclone and rains.

The Bangladesh Meteorological Department monitors different climatic variables from 35 stations in Bangladesh. Among them, the Agargaon station at Dhaka appears to be the closest to the project site and therefore, the meteorological parameters recorded at this station can be used to represent the general climate of the study area. This section summarizes the different meteorological data monitored during the period 2001-2012.

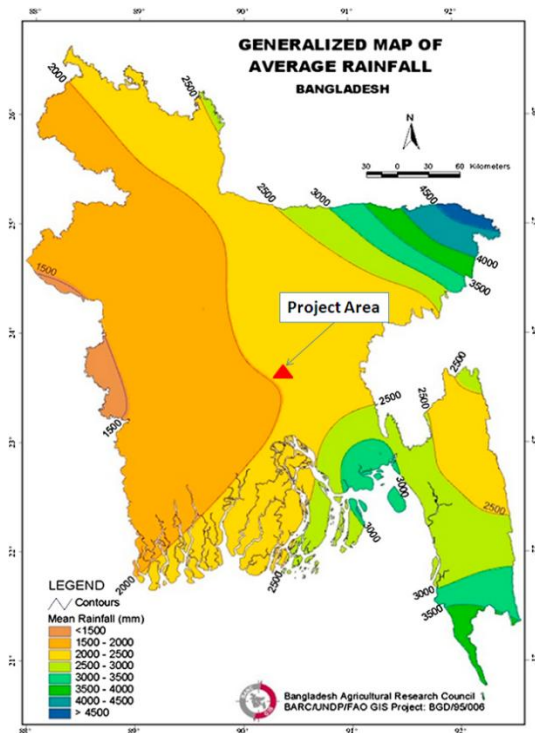


Figure 5-4: Location of the Study Area on the Rainfall Map of Bangladesh (map source: [www.banglapedia.org](http://www.banglapedia.org)) (Original Figure 12)

## Temperature

The temperature of the country is related to the period of rainfall. In general, cool seasons coincide with the period of lowest rainfall. Figure 5-5 shows the monthly average mean, maximum and minimum temperature of the study area. Maximum average temperature over the year is usually observed in April - August and minimum average temperature in January.

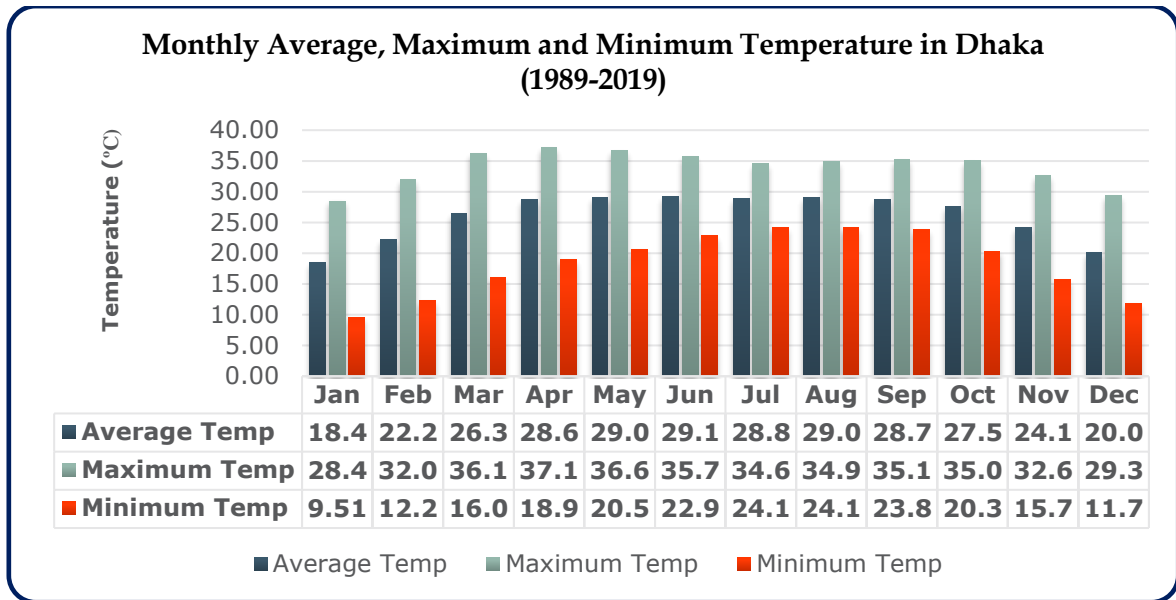


Figure 5-5: Monthly Temperature at the Dhaka BMD Station, 1989-2019 (Replaces Original Table 16)

### Relative Humidity (RH)

The analysis of Dhaka BMD station's Relative Humidity (RH) data from 1988 to 2017 indicates that the average RH varies seasonally from a minimum of 61% in March and a maximum of 83% in July. The mean monthly RH data for the last 30 years (1988-2017) is shown in Figure 5-6.

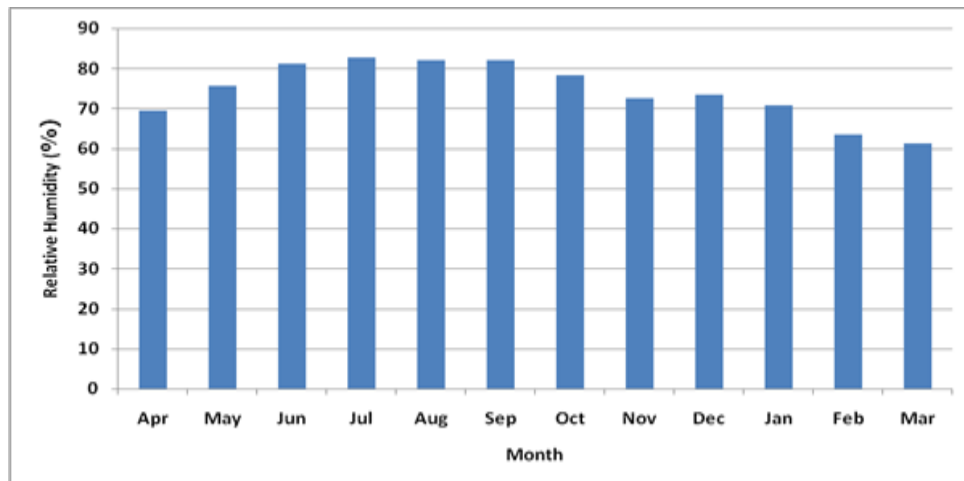


Figure 5-6: Monthly Relative Humidity at Dhaka BMD station (1988-2017)

Source: Dhaka BMD station (1988-2017)

### Rainfall

The monthly maximum and average rainfall data of the last 30 years (1988-2017) was collected, analysed and is shown in Figure 5-7. The data analysis shows that the monthly average rainfall varies from 178.96 mm to 384.26 mm in monsoon, and the area received a maximum of 836 mm of rainfall in September 2004. The historical maximum annual rainfall of this station was recorded as 2892 mm in 2017, and the minimum was 1169 mm in 1992. The annual rainfall of this period is shown in Figure 5-8.



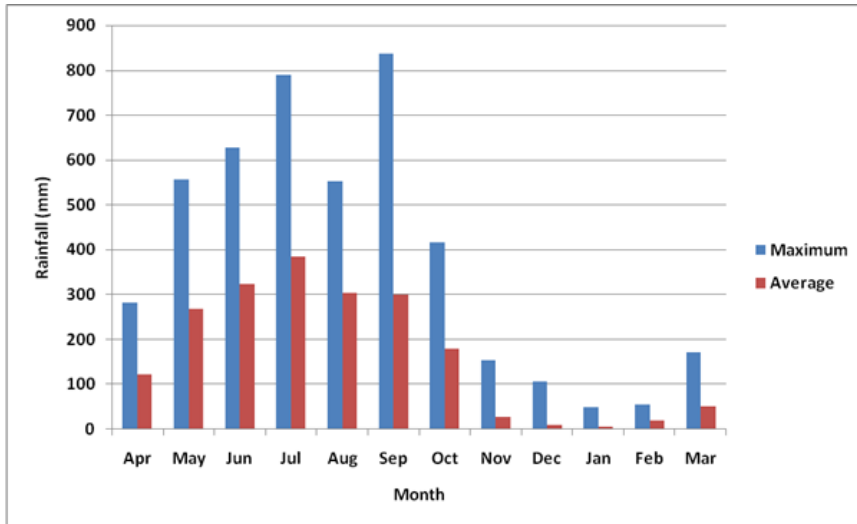


Figure 5-7: Monthly maximum and average Rainfall at Dhaka BMD station (1988-2017)

Source: Dhaka BMD station (1988-2017)

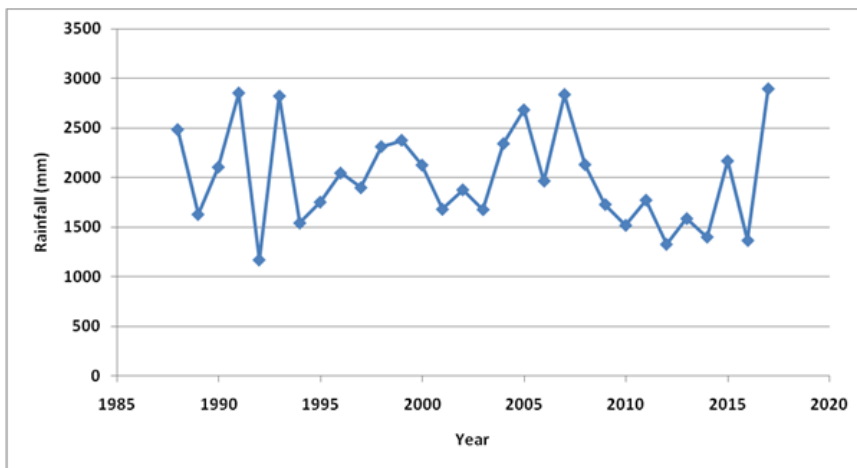


Figure 5-8: Annual Rainfall at Dhaka BMD station (1988-2017) Source: Dhaka BMD station (1988-2017)

The general pattern of precipitation (which consists entirely of rain) follows the monsoon pattern with the cooler, drier months of November to March, increasing rains in April and May, and highest rainfall in the summer months of June to September when the prevailing wind direction from the southwest brings moisture-laden air from the Bay of Bengal. The winter period (November to February) is dry with very little rainfall. Even though the temporal pattern of rainfall is pretty much similar throughout the country, there is pronounced spatial variation of rainfall over the country with the north-eastern and south-eastern part of the country receiving relatively higher amount of rainfall compared to the western part. The project area receives around 2500 mm rainfall annually (Figure 5-8), which is close to the average annual rainfall of the country.

### Solar Radiation and Evaporation

The average incident solar radiation is comparatively higher during the period between February to May than the other months of the year. Consequently, the amount of evaporation is also higher during that period.



### 5.3.2 Geology and Seismicity

Geology of Bangladesh is generally dominated by poorly consolidated sediments deposited over the past 10,000 to 15,000 years (Holocene age). It is mostly characterized by the rapid subsidence and filling of a basin in which a huge thickness of deltaic sediments was deposited as a mega-delta outbuilt and progressed towards the south. The delta building is still continuing in the present Bay of Bengal and a broad fluvial front of the Ganges-Brahmaputra-Meghna River system gradually follows it from behind.

#### Soil Characteristics

The soil formation in Bangladesh is remarkably homogeneous in appearance, both vertically and laterally. It comprises layer of unconsolidated clay, about 10m thick near Dhaka, but apparently thinner to the east and possibly much thicker in the west of the Rajshahi district. The sand mineralogy in this area is broadly similar to that of the tertiary hill sediments. Mineral contents of the soil are high in quartz, relatively low in feldspar and mica, and with zircon, tourmaline, kyanite, staurolite, sillimanite, and epidote dominating the heavy mineral fractions. The content of easily weatherable minerals ranges from 4 to 9%. The soil of Bangladesh can broadly be classified into seven tracts: (1) Madhupur Tract or Red Soil Tract, (2) Barind Tract, (3) Tista Silt, (4) Brahmaputra Alluvium, (5) Gangetic Alluvium, (6) Coastal Saline Tract, and (7) Hill Tracts. Figure 5-9 shows the location of the project area on the soil tract map of Bangladesh.

The soil formation of the SWTP phase-III project area falls under the Brahmaputra floodplain. The dominant soil texture is sandy loam. The soils are acidic in character and the pH ranges from 5.5 to 6.8. The soils are naturally fertile and are recharged every year by fresh deposition by the floodwaters.

#### Seismicity

In the north and northeast of Bangladesh, there are areas of high seismic activity and some of the major earthquakes originating in these areas have affected the adjacent regions of the country. The whole of Bangladesh is divided into three seismic zones. The northern part of the country that includes the greater districts of Rangpur, Mymensingh, and Sylhet are in the Zone-I where earthquake shock of maximum intensity of IX of the Modified Mercalli Scale is possible. The Zone-II includes the greater districts of Dinajpur, Bogra, Dhaka and Chittagong and the shocks of intensity of VIII are possible. The southern part of the country, the least active region, where the maximum intensity is not likely to exceed VII, is in the Zone-III. The SWTP project area falls under Zone II on the earthquake zone map (Figure 5-9), which implies that earthquakes of moderate intensities are expected here.

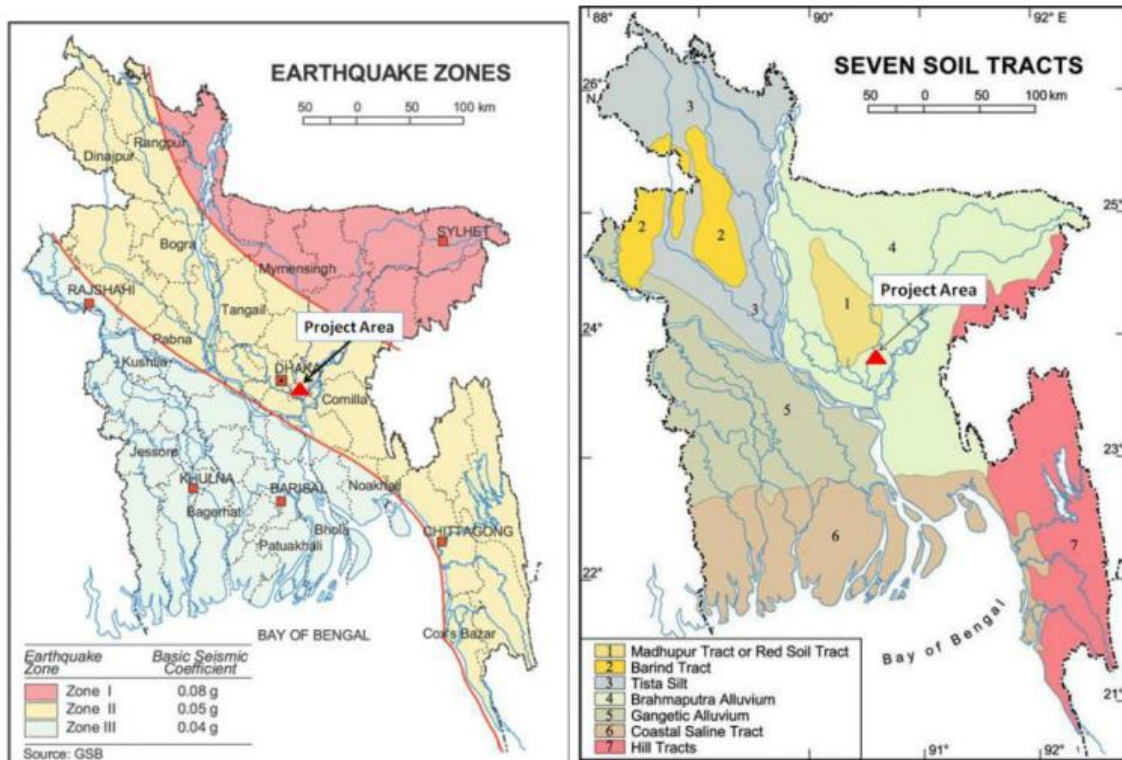


Figure 5-9: Project area on Seismic Map (left) and Soil Tract Map (right) of Bangladesh (map source: [www.banglapedia.org](http://www.banglapedia.org)) (Original Figure 13)

There is a new version of Bangladesh National Building Code published in 2020 which updates the seismic zones presented in the feasibility study report. Updated information about the seismicity of Bangladesh is compiled in the *Outline Design Report* prepared by DSC.

### 5.3.3 Soil Quality

To assess the heavy metal contents of the natural soil in the project areas, several soil samples were collected from 3 locations (see Table 5-3 and Figure 5-10) for sampling locations) from about 0.15 m depth below the top of the original soil layer, using a split spoon. A total extraction of heavy metal from soil samples following the USEPA guidelines has been performed to determine the selected heavy metal contents and the results are presented in Table 5-4, along with the typical concentrations of different heavy metals usually found in natural soils. It can be seen that the heavy metal contents of soil are within usual limits of such metals found in natural soil. Lead concentrations have been found to be slightly higher than the average value especially near the Dhaka-Chittagong and Demra-Jatrabari roads. This probably indicates higher particulate matter pollution in these areas from vehicles. Also, the sediment quality of the Old Brahmaputra and Shitalakshya rivers were also assessed at transects near the river-crossing locations. It can be seen from Table 5-5 that the heavy metal concentrations in the sediments are not significantly different from those of the soil samples.

Table 5-3: Geo-coordinates of three soil and two sediment sampling locations were collected along the proposed raw water transmission route for SWTP Phase –III Project (Original Table 17)

	GPS Location (dd mm ss)	Location
--	-------------------------	----------

Sample ID	Longitude	Latitude	
SS1	90 36 36.0	23 39 42.2	Billia Dige (within the 6 km segment of pipeline route from the intake location, within the village area)
SS2	90 33 24.0	23 40 36.2	Jangal Bus Stand (within Dhaka-Chittagong highway)
SS3	90 29 12.7	23 43 07.9	Dallia (within Demra-Jatrabari road)
SD1	90 34 29.6	23 39 29.6	Old Brahmaputra River sediment
SD2	90 31 4.6	23 42 9.52	Shitalakshya River sediment

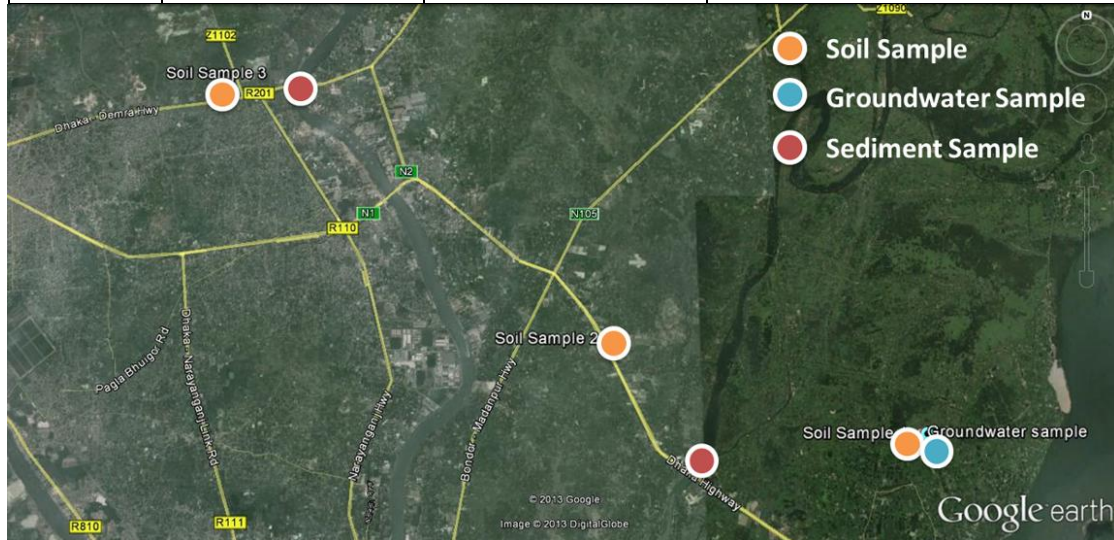


Figure 5-10: Map Showing Soil, Sediment and Groundwater Sampling Locations (Original Figure 14)

Table 5-4: Heavy metal content of the soil and sediment samples collected from three locations along the proposed raw water transmission route for SWTP Phase –III Project (Original Table 18)

Sl. No	Parameters	Unit	Concentration Present					Typical content in natural soil
			SS1	SS2	SS3	SD1	SD2	
1	Lead, Pb	mg/kg	35.8	52.4	88.4	47.6	54.5	2 – 200 (avg 10)
2	Cadmium, Cd	mg/kg	0.2	0	1.2	0	0.2	0.1 – 0.7 (avg 0.6)
3	Chromium, Cr	mg/kg	39.1	43.6	33	29.9	43.4	1 – 1000 (avg 100)
4	Nickel, Ni	mg/kg	32.3	41	21.7	31.4	33.2	-
5	Iron, Fe	mg/kg	26548	28885	21941	-	-	-
6	Copper, Cu	mg/kg	17.9	41	21.7	20.7	47.1	2 – 100 (avg 30)

<sup>a</sup> USEPA Office of Solid Waste & Emergency Response, Hazardous Waste Land Treatment, SW-874 (April 1983, Page 273)

The sludge drying beds, which are used to dewater the sludge generated from Saidabad Phase I and II and currently exist in the proposed site for WTP for Saidabad phase III, will be removed during construction of the proposed Phase III treatment plant. Therefore, it would be important to monitor the quality of the excavated material. Table 5-5 provides an analysis of selected heavy metals (applying total extraction technique) from a sample collected from the sludge drying beds. As expected, the sample was found to be rich in Aluminium, while all other metal constituents were found to be within usual limits of such metals found in natural soil.

Table 5-5: Selected heavy metal contents of the settled sludge from the existing sludge drying beds inside the proposed WTP site. (Original Table 19)

Sl. No	Parameters	Unit	Concentration Present
1	Lead, Pb	mg/kg	47.9
2	Cadmium, Cd	mg/kg	0
3	Chromium, Cr	mg/kg	28.8
4	Zinc, Zn	mg/kg	149.8
5	Aluminium, Al	mg/kg	75,100
6	Copper, Cu	mg/kg	55.5
7	Mercury, Hg	mg/kg	2.8
8	Arsenic, As	mg/kg	43.8

### 5.3.4 Water Quality

As a part of the baseline survey, efforts were made to collect available information on surface water and groundwater quality in and around the project areas. A groundwater sample was collected from a handpump tube-well in the village area (GPS N 23° 39' 43.0" and E 90° 36' 39.4", see Table 5-6) near the 6 km segment of the proposed transmission line from the Haria intake. Table 5-6 shows results of groundwater quality analysis. The groundwater quality has been found to be very good with all drinking water parameters satisfying the Bangladesh Standards.

Table 5-6: Summary characteristics of groundwater near the project area (Original Table 20)

Water Quality Parameters	Unit	Concentration 2014	WHO Guideline values 2004	Bangladesh Standard for Drinking Water (ECR'97)
pH	-	6.97	6.5 - 8.5	6.5 - 8.5
Turbidity	NTU	0.62	5	10
Colour	Pt. Co Unit	7	15	15
Total Hardness as CaCO <sub>3</sub>	mg/L	206	500	200 - 500
Iron, Fe	mg/L	0.06	0.3	0.3 - 1.0
Manganese, Mn	mg/L	1.63	0.5	0.1
Arsenic, As	µg/L	5.87	10	50
Chloride, Cl <sup>-</sup>	mg/L	71	250	150 - 600
Total Dissolved Solids, TDS	mg/L	347	1000	1000
Total Coliform, TC	# / 100 ml	0	00 TC / 100 ml	00 TC / 100 ml
Faecal Coliform, FC	# / 100 ml	0	00 FC / 100 ml	00 FC / 100 ml

Source water quality of Meghna River is periodically being assessed as part of the feasibility study and for the purpose of treatment process model studies. So far three batches of water samples were collected from the Meghna River at the Baidder Bazar Intake, Haria, Sonargaon, Narayanganj on 13th July, 24th August and 28th September 2013 which were used for batch experiments in the laboratory for development of treatment processes.

#### **TEXT MODIFIED IN 2022**

For the understanding of the current baseline of the intake area of Meghna River one sample was collected for the laboratory on 19th May 2022 during the update of this ESIA report (see Table 5-7). The water quality characteristics of these samples provide the baseline water quality at the intake point of the proposed WTP.

Sampling location was about 100 - 150 ft from the riverbank water line. Sampling was done from about one metre below the water surface to avoid the presence of floating impurities. Separate sampling bottles and containers were used for water samples for physical and chemical water quality analysis, bacteriological water quality analysis, metal concentration analysis (acidified sample using HNO<sub>3</sub> acid), and process model studies.



During each sampling, in-situ measurements were done for the dissolved oxygen, pH, temperature, and turbidity of the water sample. Detailed laboratory analysis has been conducted on the three collected water samples to determine the water quality. The results of the in-situ and laboratory analysis of the three samples are presented in Table 5-7 along with Bangladesh inland surface water quality standard (ECR' 97).

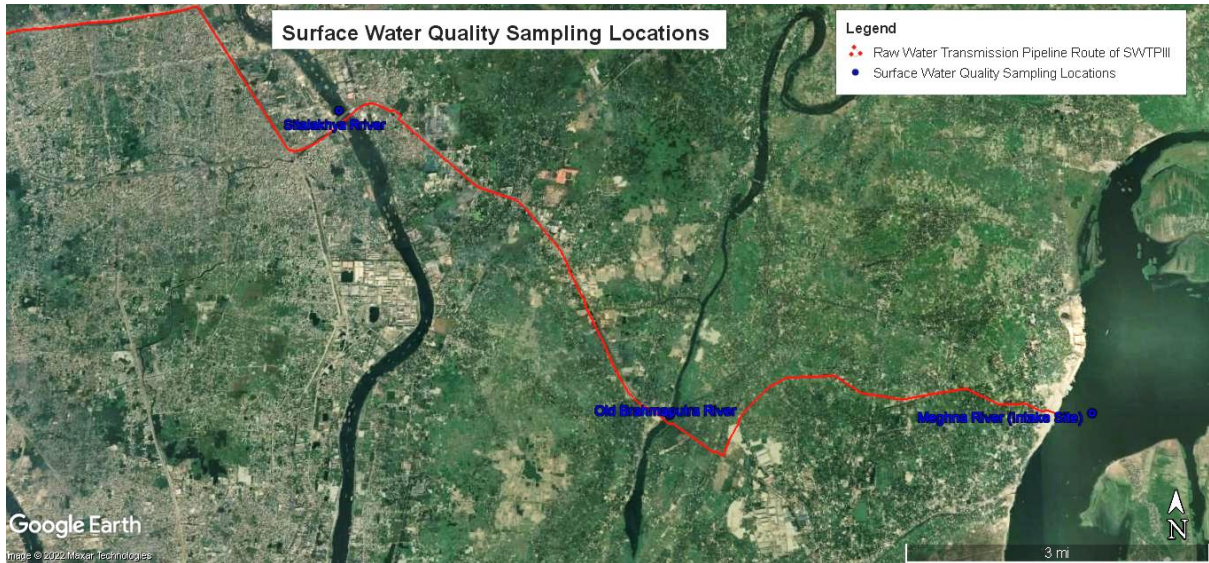


Figure 5-11: Surface Water Sampling Locations (Prepared in 2022)

**AMENDED IN 2022**

Table 5-7: Water Quality Test Results from Meghna River at Haria, Baidder Bazar, Sonargaon, Narayanganj (Original Table 21)

Sl. No.	Water Quality Parameter	Unit	Concentration present				Inland Water Quality Standard (Schedule-3 (A) & Schedule-10 of ECR'97)
			Sample Collected during ESIA update (19th May 2022)	First Sample (collected 13th July 2013)	Second Sample (collected 24th August 2013)	Third Sample (collected 28th September 2013)	
1	pH	-	7.81	7.03	7.26	6.92	6.5-8.5
2	Colour (Apparent)	Pt-Co		62	159	85	--
3	Colour (True)	Pt-Co	29.2	13	19	15	--
4	Turbidity	NTU	11.7	6.87	17.1	13	--
5	Total Hardness	mg/L as CaCO <sub>3</sub>		16	20	36	--
6	Chloride (Cl <sup>-</sup> )	mg/L		10	7	7	--
7	Total Dissolved Solids (TDS)	mg/L	94	35	20	27	2100
8	Iron (Fe)	mg/L		0.38	0.44	0.32	--
9	Total Coliform (TC)	CFU/100 mL		390	20	134	≤ 50a,
							≤ 200b,
							≤ 1000f,
							≤ 5000c, e
10	Faecal Coliform (FC)	CFU/100 ml		210	20	110	--
11	Electrical Conductivity (EC) at 25°C	µS/cm	87.9	58	53	68	1200
12	Dissolved Oxygen (DO)	mg/L	6.74	7.6	6	5.25	,
							4.5-8.0

SI. No.	Water Quality Parameter	Unit	Concentration present				Inland Water Quality Standard (Schedule-3 (A) & Schedule-10 of ECR'97)
			Sample Collected during ESIA update (19th May 2022)	First Sample (collected 13th July 2013)	Second Sample (collected 24th August 2013)	Third Sample (collected 28th September 2013)	
13	Alkalinity	mg/L as CaCO <sub>3</sub>		21	25	30	--
14	Nitrate (NO <sub>3</sub> -N)	mg/L	<3	0.4	0.2	0.4	10
15	Ammonium (NH <sub>4</sub> -N)	mg/L		0.230	0.354	0.274	--
16	Ammonia (NH <sub>3</sub> -N)	mg/L	0.65	0.001	0.004	0.001	5
17	Phosphate (PO <sub>4</sub> )	mg/L	0.68	0.067	0.081	0.121	--
18	Sulphate (SO <sub>4</sub> )	mg/L	8.82	8.6	<7	<7	--
19	Total Suspended Solids (TSS)	mg/L	57	11	13	24	150
20	Temperature	°C		30.2	30.3	30.8	--
21	Chemical Oxygen Demand (COD)	mg/L	4.7	8	7	8.5	200
22	Biochemical Oxygen Demand (BOD <sub>5</sub> )	mg/L	1.78	1	0.4	0.6	≤ 2a, ≤ 3b,
							≤ 6c, d, ≤ 10e, f
23	Chlorophyll-a	µg/L		--	2.7	0.3	--
24	Lead (Pb)	mg/L		<0.01	0.034	0.032	--0.1
25	Cadmium (Cd)	mg/L		0.002	0.002	0.001	--0.5
26	Chromium (Cr)	mg/L		0.005	0.005	0.003	--0.5
27	Zinc (Zn)	mg/L		0.051	0.028	0.017	--5
28	Mercury (Hg)	mg/L		<0.0001	<0.0001	<0.0001	--0.01



Sl. No.	Water Quality Parameter	Unit	Concentration present				Inland Water Quality Standard (Schedule-3 (A) & Schedule-10 of ECR'97)
			Sample Collected during ESIA update (19th May 2022)	First Sample (collected 13th July 2013)	Second Sample (collected 24th August 2013)	Third Sample (collected 28th September 2013)	
29	Oil & Grease	mg/L	<2	-	-	-7.1	10

a: to be usable as a source of water supply only after disinfection; b: to be usable for recreational activity

c: to be usable as a source of water supply after conventional treatment; d: to be usable for fisheries

e: to be usable for various process and cooling industries; f: to be usable for irrigation

Table 5-8: Pesticides contents of raw water sample collected from Meghna River at Haria intake location on 28 September 2013. (Original Table 22)

Sl. No.	Pesticide	Unit	Concentration Present	Bangladesh Drinking Water Standard (ECR1997)
1	α-BHC	µg/L	Not Detectable	-
2	γ-BHC	µg/L	Not Detectable	-
3	β-BHC	µg/L	Not Detectable	-
4	Heptachlor	µg/L	Not Detectable	-
5	Aldrin	µg/L	Not Detectable	-
6	Heptachlor Epoxide Isomer	µg/L	Not Detectable	-
7	Dieldrin	µg/L	Not Detectable	-
8	4,4'-DDE	µg/L	Not Detectable	-
9	Endrin	µg/L	Not Detectable	-
10	2-4-DDD	µg/L	Not Detectable	-
11	4,4'-DDT	µg/L	Not Detectable	-
12	4,4'-DDD	µg/L	Not Detectable	-
13	2,4'-DDT	µg/L	Not Detectable	-

#### TEXT MODIFIED IN 2022

As expected, the surface water samples have been found to contain high concentrations of both TC and FC, common for most surface waters in Bangladesh.

Considering the usability as a source for water supply after conventional treatment, the Meghna River water quality satisfies the criteria as per Bangladesh standards for inland water quality as per ECR 1997. It needs to be mentioned that in 2013 the samples were collected in the full monsoon season when the water quality of surface water sources was not the most critical; in comparison the current baseline was conducted in pre-monsoon season i.e. May 2022 where changes are prominent. Additional sampling during the dry season would be required to assess the worst possible condition in terms of water quality.

Oil and grease content of the river water sample collected during the third batch of sampling was found to be 7.1 mg/L in 2013 and in the recent testing is less than 2 which are within the Bangladesh inland surface water quality standards (10 mg/L) (ECR'97).

Most of the parameters of the 2022 baseline study returned to be higher in comparison to the baseline data of 2013 but still complies with the inland surface water quality standards of ECR'97. The changes are in colour (True) (86%), EC (47%) TSS (256%), TDS (244%), Ammonia (226%) and BOD (167%). These changes are due to the influence of season.

#### TEXT MODIFIED IN 2023

A more comprehensive review of water quality measurements from the River Meghna at the Haria intake is provided in the document *DSCJV-HYD-RP-CMP2-0022 Raw Water Monitoring and Contingency Report*. Risks to pollution in the river are detailed in the report which draws following conclusions:

1. At present, water quality of the Meghna River at the proposed Haria intake point is suitable for the abstraction of drinking water.

2. The proposed WTP process is suitable (in conjunction with upstream and downstream control measures) for controlling the risks to drinking water quality at the current levels of raw water quality including some allowance for deterioration.
3. The proposed WTP is one component in the drinking water supply system. For the system to provide a sustainable public water supply the other components of the system must also operate effectively. These include:
  - > The River Meghna Master Plan to regulate activities in the catchment to safeguard raw water quality
  - > The Haria intake and raw water transfer main
  - > The treated water distribution system
4. Ongoing development in the catchment means that the water quality at the proposed abstraction point is vulnerable to pollution from municipal, industrial, and agricultural sources.
5. Comparison of several sets of water quality data, including sampling and testing carried out by DSC, does not show a clear trend of water quality to date. However, modelling carried out for the draft master plan shows clearly the likely future deterioration if no action is taken and the benefit of implementing the plan.
6. The robust implementation of the 38 actions comprising the draft River Meghna Master Plan is absolutely necessary in order to safeguard the source water quality into the future. This includes regulatory control of industrial discharges, development of municipal sanitation and treatment schemes and ongoing monitoring of water quality.
7. DWASA's main obligation under the master plan is to assist DoE with implementing action PPS-7, which requires ongoing monitoring of river water quality at points upstream and downstream of the Haria and Bishondi intakes. This is aligned with current plans to monitor water quality at the Haria intake into the future.
8. It is not clear at present who will interpret the raw water monitoring data and advise what, if any action DWASA should take in response.
9. In addition to the long-term monitoring described above, on-line raw water quality instruments will be installed at the Haria intake and at the delivery point to the plant. These instruments will provide a continuous signal for a limited number of indicator parameters and raise a warning if a pre-defined threshold is approached, and a high-level alarm in the event that it is exceeded.
10. Treated water quality will be monitored continuously via on-line instruments covering a limited number of indicator parameters with appropriate warning and high-level alarms. The on-line monitoring will be supplemented by a suite of tests to be carried by the WTP operator according to a daily, weekly, and monthly schedule. The same tests will be carried out on a less frequent basis by an independent laboratory to validate the accuracy of the operator's results.
11. The WTP will not shut down automatically in response to a raw water quality alarm. The WTP operator will decide on the appropriate action and communicate with DWASA management in accordance with the pre-prepared communication plan.
12. As well as the threat to drinking water quality arising from deterioration of the source water, contamination can also be introduced through the treatment chemicals.

13. Should an event occur which requires a reduction in WTP output then, in the absence of system storage, DWASA has the option of making up the shortfall by feeding the network from existing deep tubewells or cross feeding from Padma or Gandharbpur (subject to connectivity). Failing that, demand reduction measures for bulk users should be brought into play.
14. Should an event occur, which will cause the treated water quality to fall below the required standard, DWASA will need to provide public information in accordance with the communication plan.

### TEXT MODIFIED IN 2022

Water samples were also collected from Old Brahmaputra River and DND canal (which conveys the water from Shitalakshya river to Saidabad phase I and II) on 31 St October 2013 and were analysed for selected water quality parameters. Raw water transmission lines will cross Old Brahmaputra and Shitalakshya rivers and the baseline water quality scenario of these rivers need to be determined to assess the impact (if any) due to construction activities related to river-crossing.

The current baseline study of the Old Brahmaputra and Shitalakshya Rivers were conducted in May 2022.

Table 5-9: Water Quality Test Results from water bodies within the project area (Original Table 23)

Sl. No.	Water Quality Parameter	Unit	Concentration present						Inland Water Quality Standard (ECR'97)
			Old Brahmaputra River			DND Conveyance canal/Shitalakshya river			
			May'22	Sep'22	Oct'13	May'22	Sep'22	Oct'13	
1	pH	-	7.43	7.24	7.09	7.27	7.02	7.22	6.5-8.5
2	Colour (True)	Pt-Co	40.8	81.9	28	13.2	149	19	--
3	Turbidity	NTU	1.61	4.78	4.11	0.94	79.5	9.52	--
4	Total Dissolved Solids (TDS)	mg/L	310	214	119	212	141	139	2100
5	Electrical Conductivity (EC) at 25oC	µS/cm	518	731	210	354	308	238	1200
6	Dissolved Oxygen (DO)	mg/L	4.65	1.32 <3	4.79	1.48	2.67	4.55	≥ 5b, d, e, f, ≥ 6a, c
7	Nitrate (NO3-N)	mg/L	3.46		0.7	6.28	<3	1.8	10
8	Ammonia (NH3-N)	mg/L	1.5	2.11	0.35	0.75	1.11	0.28	5
9	Phosphate (PO4)	mg/L	1.88	1.23	0.333	1.82	1.16	0.464	--
10	Sulphate (SO4)	mg/L	47	18.2	11.4	21.4	14.3	9.4	--

Sl. No.	Water Quality Parameter	Unit	Concentration present						Inland Water Quality Standard (ECR'97)
			Old Brahmaputra River			DND Conveyance canal/Shitalakshya river			
			May'22	Sep'22	Oct'13	May'22	Sep'22	Oct'13	
11	Total Suspended Solids (TSS)	mg/L	67	144	10	23	198	10	150
12	Chemical Oxygen Demand (COD)	mg/L	12.2	22.5	9	28.2	9.8	7	200
13	Biochemical Oxygen Demand (BOD5)	mg/L	5.79	8.5	1.2	12.6	3.85	3.8	≤ 2a, ≤ 3b,
									≤ 6c, d, ≤ 10e, f
14	Oil & Grease	Mg/L	<2	<2	-	<2	<2	-	10

*a: to be usable as a source of water supply only after disinfection; b: to be usable for recreational activity*

*c: to be usable as a source of water supply after conventional treatment; d: to be usable for fisheries*

*e: to be usable for various process and cooling industries; f: to be usable for irrigation*

Table 5-9 summarizes the water quality of these rivers of the year 2013 and 2022. The water quality has changed with progress of time though there are some seasonal impacts. Current baseline is pre-monsoon but the 2013 baseline was post monsoon. In particular DO of Shitalakshya river has deteriorated compared to 2013 data. The major changes of Shitalakshya river water quality are Colour (44%), TDS (53%) EC (49%) Ammonia (168%) TSS (130%) COD (303%) and for Old Brahmaputra River are Colour (46%), TDS (161%) EC (147%) Ammonia (329%) TSS (570%) COD (36%) but the concentrations of the parameters are within the Inland surface water quality standards of ECR'97.

#### **TEXT MODIFIED IN 2023**

As a baseline data of the Saidabad Water Treatment Plant Site, the Kajla Khal's (nearby surface waterbody) water quality was tested. The water sampling location of the Kajla khal is at 23° 43.349'N; 90° 26.548'E. Location is shown in the Satellite image below.



Figure 5-12: Kajla Khal Surface Water Sampling Location (Prepared in 2023)

The water quality of the Kajla Khal was found to be poor in comparison to the national inland water quality standard. Dissolved oxygen is very low in the water. Ammonia, BOD and TSS exceed the limits of the inland surface water quality standard of ECR'97. Table 5-10 listed the concentration of the surface water of Kajla Khal.

Table 5-10: Test Result of Kajla Khal

Sl. No.	Water Quality Parameter	Unit	Concentration present (Kajla Khal (Canal))	Inland Water Quality Standard (ECR'97) Schedule-3 (A) & 10
			December'22	
1	pH	-	7.03	6.5-8.5
2	Turbidity	NTU	27.4	--
3	Total Dissolved Solids (TDS)	mg/L	526	2100
4	Dissolved Oxygen (DO)	mg/L	0.48	$\geq 5^b, d, e, f$
				$\geq 6^a, c$
5	Ammonia (NH <sub>3</sub> -N)	mg/L	29.4	5
6	Total Suspended Solids (TSS)	mg/L	526	150
7	Chemical Oxygen Demand (COD)	mg/L	176	200
8	Biochemical Oxygen Demand (BOD <sub>5</sub> )	mg/L	70.8	$\leq 2^a, \leq 3^b$
				$\leq 6^c, d, \leq 10^e, f$
9	Oil & Grease	Mg/L	<2	10

<sup>a</sup> to be usable as a source of water supply only after disinfection

<sup>b</sup> to be usable for recreational activity

<sup>c</sup> to be usable as a source of water supply after conventional treatment

<sup>d</sup> to be usable for fisheries

<sup>e</sup> to be usable for various process and cooling industries; <sup>f</sup>: to be usable for irrigation

### 5.3.5 Ambient Noise Level

As a part of the baseline study, noise level measurements were carried out near the proposed intake location at Haria, at different points along the proposed raw water transmission route in proximity to the Dhaka-Chittagong, Dhaka-Sylhet and Demra-Jatrabari highways/roads and also at the proposed treatment plant site at Saidabad. Sound level measurements were taken on November 2013 during daytime. To gather the current baseline of the project, 10 locations noise level monitoring were conducted on 24th May 2022 (See Figure 5-13, Figure 5-14, Figure 5-15, Figure 5-16, and Figure 5-17, the photographs of Noise Monitoring). Summary location of noise measurements are shown in Table 5-11. Current noise level data show that at Dhaka-Chittagong highway crossing, Langalbandh bridge, Madanpur bus station, Kanchpur circle and DND Canal Road the maximum sound levels recorded were 86.4, 89.8, 83.9, 82.7 and 103.7 dBA. This is expected as these are very busy areas with high volume of traffic which generates high levels of noise. The 1-minute equivalent noise levels (Leq) in most of these locations exceeded the noise level standards in Bangladesh for Mixed to Commercial areas (see Table 5-14). Current baseline of noise level is changes 0-18% in compared to the 2013 noise level data. To update of the WTP site baseline another set of Noise monitoring was conducted in the proposed WTP site in late December 2022. This monitoring was conducted both day and night time to assess the overall baseline noise level information of the project site. Table 5-12 and



Table 5-13 shows the Noise level data of the Saidabad Water Treatment Plant site. However, in the rural areas (area near the proposed intake at Haria) and at the proposed WTP site, the measured noise levels are mostly lower and are within the noise level standards for residential areas.



Figure 5-13: Noise Monitoring at the Water Treatment Plant Site (Dec'22)

Table 5-11: GPS Coordinate of Noise Level Monitoring

GPS Coordinates			
Northwest Corner (NWC)	Southwest Corner (SWC)	Northeast Corner (NEC)	Southeast Corner (SEC)
Latitude: 23°43'22.54"N	Latitude: 23°43'14.91"N	Latitude: 23°43'22.40"N	Latitude: 23°43'15.51"N
Longitude: 90°26'9.38"E	Longitude: 90°26'10.67"E	Longitude: 90°26'19.70"E	Longitude: 90°26'19.92"E

Table 5-12: Night time Noise Level of Saidabad Water Treatment Plant Site (December 2022)

Sl.No.	Noise	GPS Coordinates			
		Northwest Corner (NWC)	Southwest Corner (SWC)	Northeast Corner (NEC)	Southeast Corner (SEC)
		Latitude: 23°43'22.54"N	Latitude: 23°43'14.91"N	Latitude: 23°43'22.40"N	Latitude: 23°43'15.51"N
		Longitude: 90°26'9.38"E	Longitude: 90°26'10.67"E	Longitude: 90°26'19.70"E	Longitude: 90°26'19.92"E
		Noise level (dB)			
1	1 min-L	47.68	48.74	47.96	48.167
2	Max	52.3	54.0	52.2	52.3
3	Min	44.8	44.0	44.8	44.6



Table 5-13: Day Time Noise Level of Saidabad Water Treatment Plant Site(December 2022)

Sl.No.	Noise	GPS Coordinates			
		Northwest Corner (NWC)	Southwest Corner (SWC)	Northeast Corner (NEC)	Southeast Corner (SEC)
		Latitude: 23°43'22.54"N	Latitude: 23°43'14.91"N	Latitude: 23°43'22.40"N	Latitude: 23°43'15.51"N
		Longitude: 90°26'9.38"E	Longitude: 90°26'10.67"E	Longitude: 90°26'19.70"E	Longitude: 90°26'19.92"E
		Noise level (dB)			
1	1 min-L	54.73	49.86	49.24	41.48
2	Max	59.90	59.90	56.10	44.20
3	Min	48.70	48.20	46.10	40.20

Table 5-14: Summary of daytime noise level measurement in the project area (Original Table 24)

SL. No.	GPS Coordinate		Time	Location	Noise Level (dBA)					
	(dd mm ss)				May-22			Nov-13		
	Latitude	Longitude			L <sub>MAX</sub>	L <sub>MIN</sub>	1 min-L <sub>eq</sub>	L <sub>MAX</sub>	L <sub>MIN</sub>	1 min-L <sub>eq</sub>
1	23 39 35.3	90 37 49.2	Day	Proposed Intake Point at Haria	53.3	44.7	47.6	67.5	54.2	58.3
2	23 39 40.3	90 37 39.5	Day	Lichu Garden	62.9	41.6	47.3	51.7	43.9	47.71
3	23 39 09.2	90 34 47.1	Day	Dhaka-Chittagong Highway Crossing	89.1	62.9	85.2	86.4	68.7	78.2
4	23 39 30.1	90 34 14.5	Day	Old Brahmaputra (Langalbandh Bridge)	90.8	52.3	79.3	89.8	65.5	77.4
5	23 41 24.3	90 32 48.4	Day	Madan Bus Station	96.9	69.7	83.4	83.9	65.2	74.7
6	23 42 20.3	90 31 23.3	Day	Kanchpur Circle	83.9	61.2	77.5	82.7	68.6	75.6
7	23 41 52.5	90 30 33.2	Day	Chattogram Road Bus Stand	88.1	68.9	79.1			
8	23 43 09.4	90 29 26.5	Day	Staff Quarter (DND Canal)	91.6	68.4	80.7	103.6	69.2	86.4
9	23 42 49.3	90 27 09.7	Day	Middhabari Sluice Gate	66.1	57.2	62.1	62.8	53.8	57.3
10	23 43 15.3	90 26 10.8	Day	SWTP III Site	57.3	46.7	54.3	66.2	45.5	53.5

[Note: The equivalent level is the level (Leq) of a hypothetical steady sound that would have the same energy (i.e., the same time-averaged mean square sound pressure) as the actual fluctuating sound observed. The equivalent level represents the time average of the fluctuating sound pressure and is close to the maximum level observed during the measurement period. For the fluctuating noise scenario, the equivalent noise level (Leq) is generally used for more complete noise sample and is calculated as follows:

$$L_{eq} = 10 \log_{10} \left[ \sum_{i=1}^n P_i 10^{L_i/10} \right]$$

Where, Pi is the probability of the noise level lying in the i-th measurement interval and Li is the mid-point of that interval.]

Table 5-15: Bangladesh standards for sound level (GoB, 2006) (Original Table 25)

Locations	Noise level (dBA) at day	Noise level (dBA) at night
Silent zone	50	40
Residential area	55	45
Mixed area	60	50
Commercial area	70	60
Industrial area	75	70

[Note: Noise Levels are defined as 1-minute Leq]

### 5.3.6 Air Quality

As a part of the environmental assessment of the proposed project, ambient air quality measurement was carried out at two locations: (a) near the intake location (inside the village area), and (b) at a location along the proposed route of the raw water transmission line beside the Dhaka-Chittagong highway. Concentration of Suspended Particulate Matter (SPM) and PM10 were measured using a high-volume sampler; while concentrations of selected gaseous pollutants (O<sub>3</sub>, NO<sub>2</sub>, NO, SO<sub>2</sub>, CO) were measured using a Gray Wolf Pack monitoring system. To gather the current baseline of the project, the Ambient Air Quality monitoring in two locations were conducted by PMC team on 18th and 19th May 2022. The concentration values are reported in Table 5-16.

Table 5-16 shows that SPM concentration near the Haria intake location inside the village is relatively lower compared to that recorded beside the Dhaka-Chittagong highway, while the PM10 concentrations were relatively similar. This may be due to high vehicular movements in the Dhaka-Chittagong highway. Both the SPM and PM10 concentrations exceeded the national ambient air quality standards.

High particulate matter concentrations in the ambient air are a common characteristic during dry season in Bangladesh. The May'22 data was very low compared to the national standard as because of the pre-monsoon prevailed. Measured concentrations of CO, O<sub>3</sub> and NO<sub>x</sub> at the two locations were below the corresponding national standards of ambient air quality. Measured concentrations of SO<sub>2</sub> were relatively high and marginally exceeded the national standards (0.14 ppm) in both the locations.

#### TEXT MODIFIED IN 2022

Table 5-16: Air quality at two locations at the project site (Original Table 26)

Air Quality Parameter	Unit	Location: Near Haria intake (N23°39'38.2'', E90°37'36.2'')		Location: Beside Dhaka-Chittagong Highway (N23°40'10.9'', E90°33'36.3')		Ambient Air Quality Standards for Bangladesh (GoB, 2005)
		May'22	Dec'13	May'22	Dec'13	
SPM	µg/m <sup>3</sup>	-	389	-	1383	200 µg/m <sup>3</sup> (8-hr avg.)
PM10	µg/m <sup>3</sup>	12	235	33	215	50 µg/m <sup>3</sup> (Annual Avg)
						150 µg/m <sup>3</sup> (24-hr Avg)
PM2.5	µg/m <sup>3</sup>	10	-	26	-	65 µg/m <sup>3</sup> (24-hr Avg)

O <sub>3</sub>	ppm	0	0.01	0	0.02	0.12 ppm (1-hr Avg)
						0.08 ppm (8-hr Avg)
NO <sub>X</sub>	ppm	0	0.04	0	0.03	0.053 ppm (Annual Avg)
SO <sub>2</sub>	ppm	0	0.2	0	0.2	0.03 ppm (Annual Avg.)
						0.14 ppm (24-hr Avg)
CO	ppm	0	0	0	0	9 ppm (8 hr avg)
						35 ppm (1 hr avg)



Figure 5-14: Ambient Air Quality Monitoring at Intake and at D-C Highway respectively



Figure 5-15: Briefing to PMC about Ambient Air Quality Monitoring Testing at Intake

### **TEXT MODIFIED IN 2023**

The ambient air quality of the Saidabad Water Treatment Plant Site was monitored at the end of December 2022. It was monitored at the southeast corner of the proposed treatment plant site. The monitoring of Ambient Air quality was conducted for about 8 hrs to understand the baseline Air quality of the site. The location of the Air Quality Monitoring is shown in Figure 5-16.



Figure 5-16: Air Quality Monitoring Location at the Water Treatment Plant Site (Dec'22) (Figure Prepared in 2023)

The particulate matters ( $PM_{2.5}$ ) of the ambient air of the treatment plant site exceeds the national standard. But the  $PM_{10}$  found within the national standard of Bangladesh. **Error! Reference source not found.** shows the presentation of changes of the  $PM_{10}$  &  $PM_{2.5}$  of the treatment plant Site. Table 5-17 shows the ambient Air quality of the Saidabad Water treatment Plant Site.

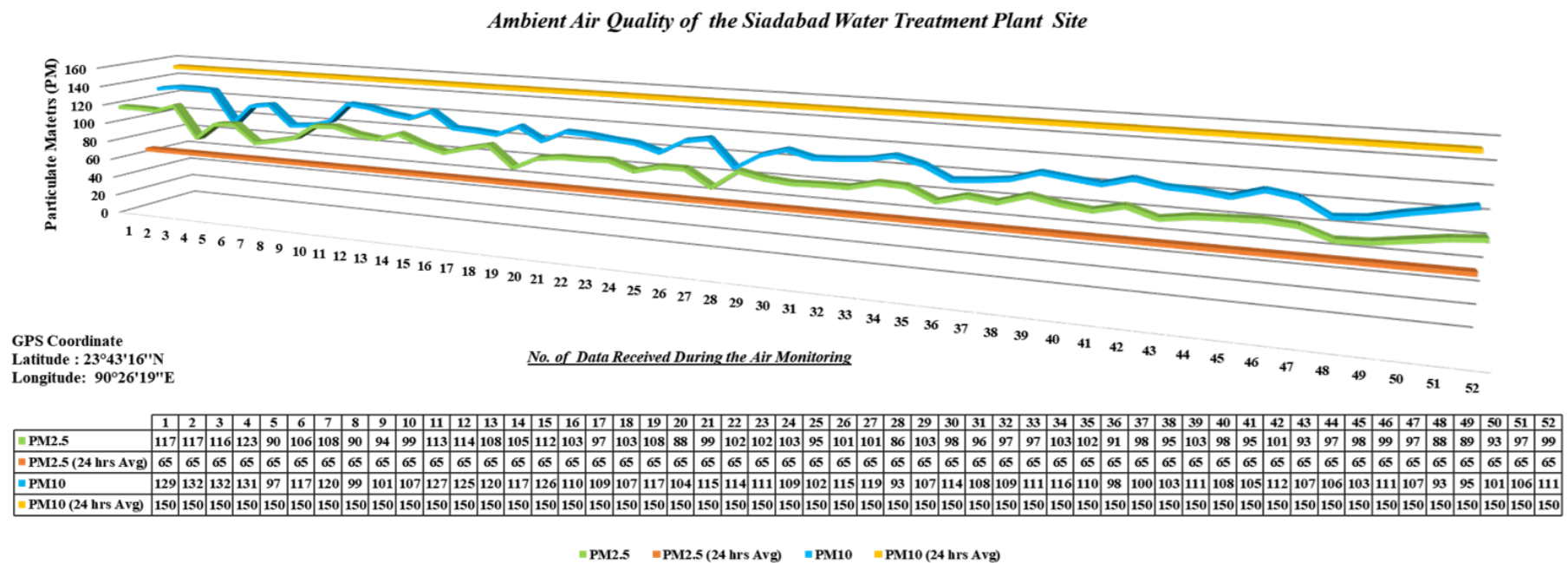


Figure 5-17: Particulate Matters (PM10 & PM2.5) at the Saidabad Water Treatment Plant Site (Figure Prepared in 2023)



Table 5-17: Ambient Air Quality of the Saidabad Water Treatment Plant Site (Table prepared in 2023)

Air Quality Parameter	Unit	Concentration (December 2022) (24-hr. Avg.)	Ambient Air Quality Standards for Bangladesh (GoB, 2022)
PM10	µg/m3	110.71	50 µg/m3 (Annual Avg)
			150 µg/m3 (24-hr Avg)
PM2.5	µg/m3	100.52	65 µg/m3 (24-hr Avg)
NOX	ppm	0	0.053 ppm (Annual Avg)
SO2	µg/m3	0	250 (Annual Avg.)
			80 (24-hr Avg)
CO	ppm	0	5 ppm (8 hr avg)
			20 ppm (1 hr avg)

### 5.3.7 Traffic Survey

Traffic survey was conducted at the access route of the Saidabad Water Treatment Plant. The access route of the SWTP site is a single road which is exclusive for the SWTP staffs and personnel. This road has finally ended at the gate of the SWTP. There is no branch road of this access road of the treatment plant. Some shops were evident on both sides of this road. The traffic trend is similar like other routes of the capital. Figure 5-18 shows the traffic survey point on the Google satellite image. During the traffic survey on 25th of December 2022, 370 vehicles were recorded for 8 hours among which 218 vehicles were moving towards the SWTP and 152 were outward moving. Rickshaw/Cycle/Van are the predominant means of transportation which comprised of around 66% of all vehicles. Altogether 249 Rickshaw/Cycle/Van were counted during the survey. The traffic volume almost shows a similar trend for both the directions. During the morning the traffic volume is comparatively low and it gradually increases as the day goes on. During the afternoon especially between 12:00 and 14:00 the traffic in the area reaches its peak and gradually the volume drops down after 17:00. Apart from the Rickshaw/Cycle/Van considerable numbers of Motorcycle and Pick up Van were observed. Heavy vehicles like truck and covered van, private car, CNG were rarely seen. Figure 5.18 and 5.19 shows the traffic of Saidabad Access Road.



Figure 5-18: Location of Traffic Survey near the SWTP access route

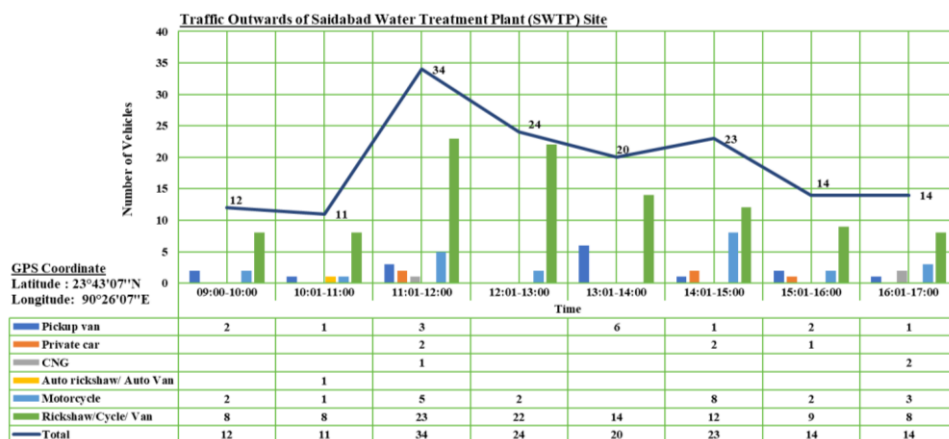


Figure 5-19: Traffic of Saidabad Access Route (Outwards SWTP) (Dec'22)

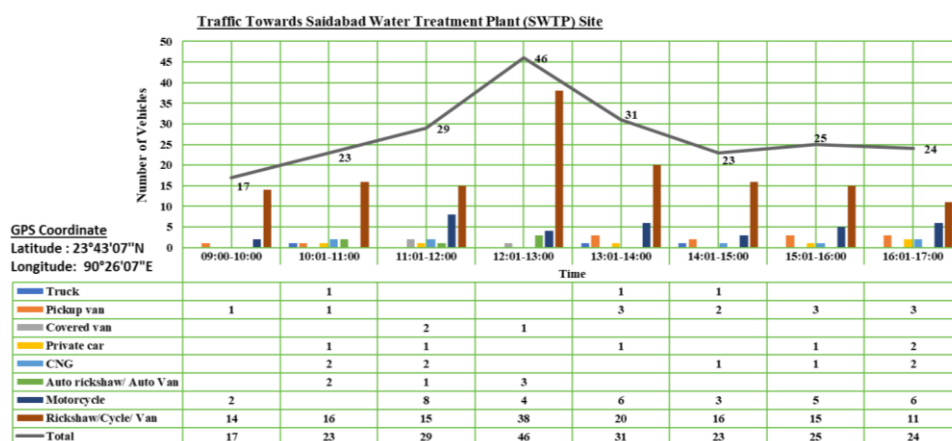


Figure 5-20: Traffic of Saidabad Access Route (Towards SWTP) (Dec'22)

## 6 Baseline Environment: Ecological

### 6.1 Introduction

This Chapter describes the present status of the ecological features of areas within and surrounding the sites/locations of the proposed project. It covers both flora and fauna including fish of the proposed project sites. The baseline ecological survey sought to determine the diversity and distribution of the flora and fauna, and the extent to which that may be impacted due to the proposed project activities. As noted earlier, the water transmission pipeline of the proposed project may cross some water bodies, and therefore, possible impact of construction activities on aquatic environment of these water bodies is of particular interest in the environmental assessment. A team led by the ecologist of the ESIA team visited the proposed project sites in September 2013 to collect first-hand data on floral and faunal diversity<sup>4</sup>. The study was conducted only in daytime. Herpeto-faunal and mammalian survey was done through visual search and also through discussion with local people and literature review. Aural and visual searching was the main survey method for ornithological survey. Information on fisheries was collected through interviewing fishermen as well as survey of local fish market. Rapid field survey and discussion with local people was the main method for floral survey. The collected data were cross-checked through literature review. The areas that were surveyed for this ecological assessment are: Baiddherbazar, Haria, Nakatibhangha, Ulukandi, Mamrukpur, Damdorodi under Sonargaon Union; Villages of Musapur Union at Madan Circle, Roadside areas along the Dhaka -Chittagong highway, Demra area and existing Saidabad water treatment plant site at Dhaka. This baseline information has been used in the relevant section of this report to identify and assess impact of the proposed project on the ecological resources, and finally, to suggest mitigation measures. The desktop analysis undertaken by the ESIA team and didn't identify significant changes in the flora and fauna baseline data, and therefore this section has not been modified.

### 6.2 Ecological Perspective of Project Area

Bio-ecologically the entire project site falls under the Brahmaputra-Jamuna Floodplain. As noted earlier, the proposed project has three major components viz. (a) water intake, (b) water transmission pipeline, and (c) water treatment plant. The ecological characteristics of water intake location, route of transmission pipeline and treatment plant differ from each other. The water intake point is located beside the Meghna River at Haria, Sonargaon, Narayanganj. This area has some villages with planted vegetation that provides supportive habitat for certain type of fauna. Land filling activities were observed in the area. Thus, the existing ecological features of the area are changing gradually. Apart from anthropogenic influence, the ecological features generally fluctuate seasonally due to the environmental reasons. Ecological features along the route of the raw water transmission line have already changed by the previous development works (e.g., road construction, other infrastructure development, etc), and a new ecosystem has evolved there to support local adaptive biodiversity. The route of the proposed water transmission pipeline runs along a 6 km stretch

---

<sup>4</sup> ***The desktop analysis undertaken by the ESIA team during this ESIA report review & update and didn't identify significant changes in the flora and fauna baseline data, and therefore this section has not been modified***



from the Haria intake point through the village areas, fallow lands and agricultural lands that support diversified floral and faunal species. On the other hand, the site for the proposed water treatment plant is currently a vacant piece of land beside the existing SWTP (Phase-I and Phase-II) site. This area has been raised by land filling; the nearby areas are inundated seasonally and act as a seasonal wetland during rainy season for up to 6 months. Throughout the year, the area provide habitat for aquatic and terrestrial flora and fauna including numerous freshwater fish species. The surrounding wetland serves as the grazing ground for fish and other aquatic animals in rainy season. The changes in the physical characteristics of land (project site and its surrounding areas) have direct impacts on its dependent flora and fauna. As stated in the 2013 ESIA Report, it should be noted that the area is low lying private land and not a designated wetland. Local people/children sometimes use the low-lying areas for fishing for fun within the private land during monsoon or after heavy rain when the area is inundated. In our assessment, there is no threatened species in this area. Thus, no significant impact on social aspects is anticipated.

## 6.3 Ecological Features

For the purpose of this study, the macro ecological features of the study area are considered that primarily consists of floral and faunal diversity including fish species. Descriptions of these ecological features are presented in this Section.

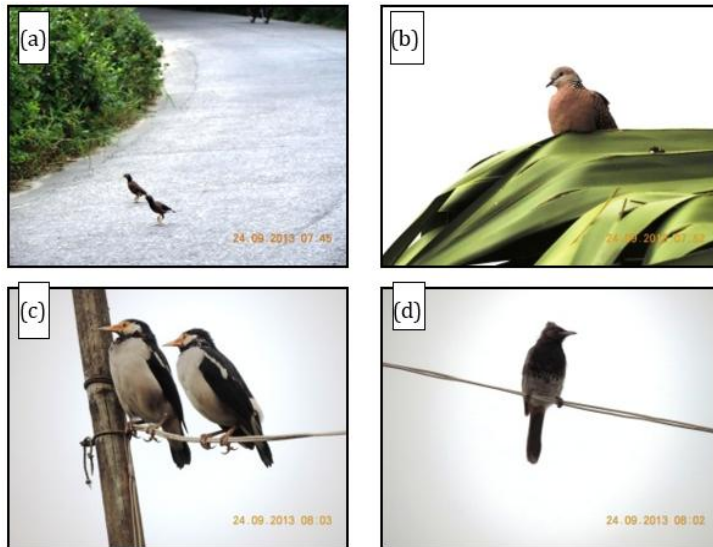
### 6.3.1 Faunal Diversity

The project areas have various assemblages of animal communities. Some species use the areas as permanent habitats while others as temporary / migratory habitats. On the basis of habitats, the faunal species found in the project areas have been divided into two major categories viz. (a) terrestrial fauna, and (b) aquatic fauna.

#### **(a) Terrestrial fauna**

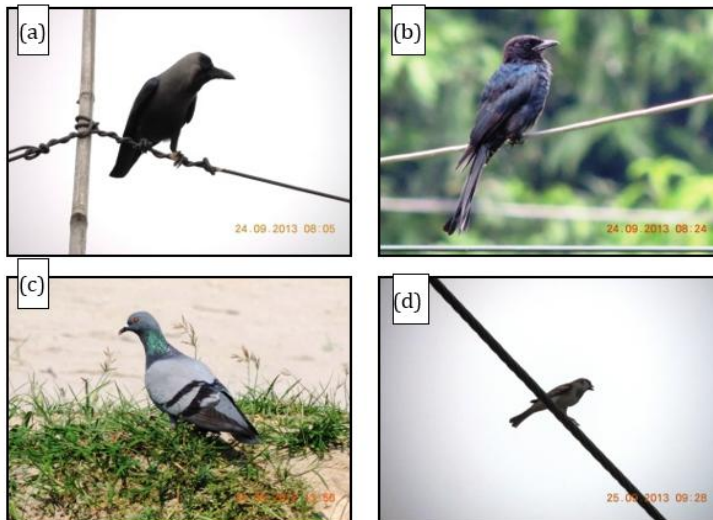
Terrestrial environment dependent wildlife is known as terrestrial fauna. They fully or partially depend on terrestrial environment to live or to get food, shelter, nest, breed, and produce offspring. Several species of amphibia, reptile, bird and mammal are the main component of terrestrial fauna (Figure 6-1 to

Figure 6-3: Terrestrial fauna at Madan Circle and nearby areas (Original Figure 17)). The project areas have different types of lands, e.g. agricultural dry land, seasonal wetland, homestead land, fallow land, roadside low land, as well as rivers, canals, ditches, which provide moderate environment for terrestrial habitat. Terrestrial wildlife is divided into 4 major group viz. mammal, bird, reptile and amphibia. A total of 62 faunal species have so far been identified in the project areas and a breakdown of the subspecies is shown in Figure 6-5. This indicates that the area is rich in faunal species. A complete list of terrestrial faunal species is given Table 6-1.



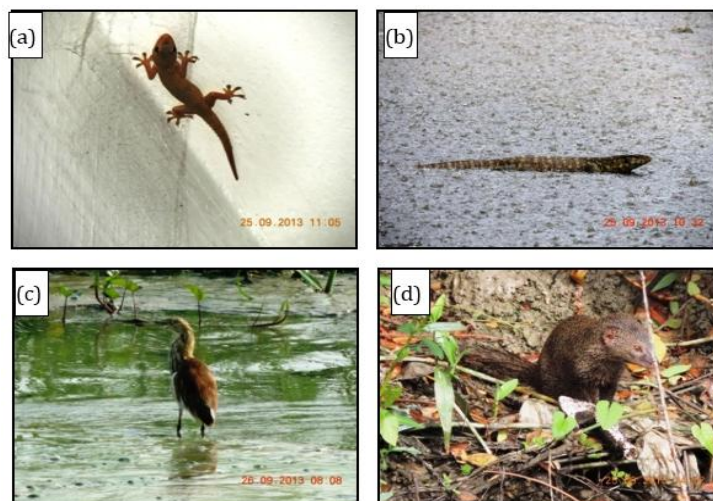
- (a) Common Myna crossing a local road, (b) Spotted dove taking rest on a leaf of a palm tree,
- (c) Pied Myna resting on an electric line, and
- (d) Red Vented Bulbul looking for insect from an electric line.

Figure 6-1: Terrestrial fauna at Haria, Sonargaon, Narayanganj (Original Figure 15)



- (a) House Crow in a position to fly away,
- (b) Black Drongo looking for insect from an electric line,
- (c) Rock Pigeon walking along the bank of Meghna River, and
- (d) House Sparrow taking rest

Figure 6-2: Terrestrial fauna at Baidherbazar, Sonargaon, Narayanganj (Original Figure 16)



- a) House Lizard on the wall of Musapur Union office,
- (b) Yellow Monitor crossing a field inundated by a sudden heavy rainfall,
- (c) Pond Heron searching for food in a wetland, and
- (d) Small Indian Mongoose waiting to catch fish from a water body beside the Dhaka - Chittagong Highway.

Figure 6-3: Terrestrial fauna at Madan Circle and nearby areas (Original Figure 17)

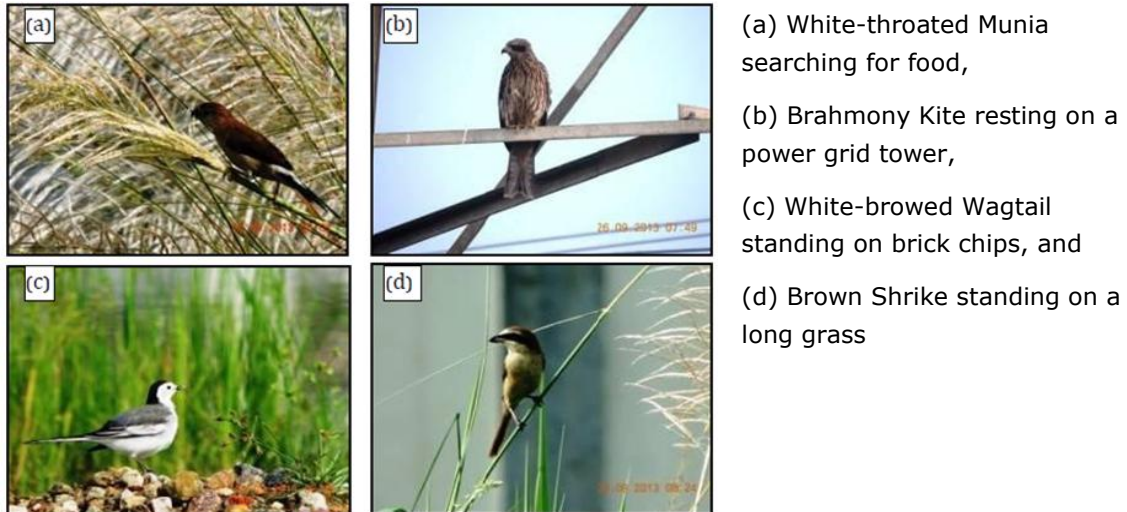


Figure 6-4: Terrestrial fauna adjacent to Saidabad water treatment plant area (Original Figure 18)

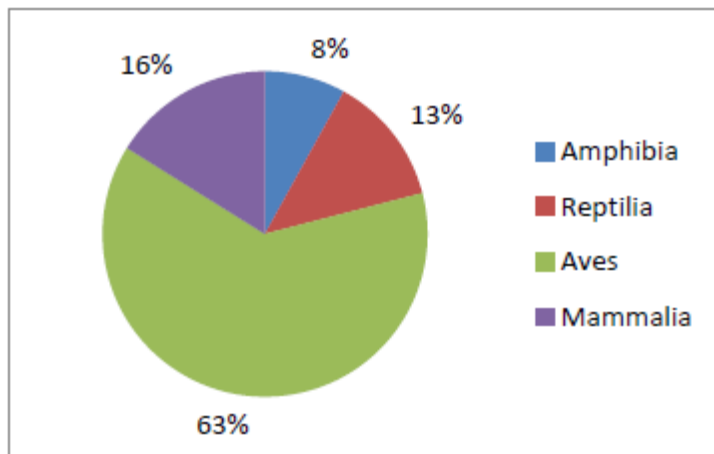


Figure 6-5: Distribution of terrestrial fauna in the project areas (Original Figure 19)

Table 6-1: Identified terrestrial fauna at three major sampling areas for the SWTP Phase III project.  
(Original Table 27)

Class	Family	English Name	Scientific Name	Survey Areas*		
				1	2	3
Amphibia	Bufonidae	Common Toad	Bufo melanostictus	✓	✓	✓
	Rhacophoridae	Maculated Tree frog	Polypedates maculatus	✓		
	Ranidae	Bull frog	Hoplobatrachus tigerinus	✓	✓	✓
		Cricket frog	Limnonectes limnocharis	✓	✓	✓
		Boulenger's Frog	Rana alticola	✓		
Reptilia	Scincidae	Common Skink	Mabuya carinata	✓		✓
	Gekkonidae	Common House Lizard	Hemidactylus flaviviridis	✓	✓	✓
		Common House Lizard	Hemidactylus brooki	✓		

Class	Family	English Name	Scientific Name	Survey Areas*		
				1	2	3
	Agamidae	Common Garden Lizard	Calotes versicolor	✓	✓	✓
	Varanidae	Grey Monitor Lizard	Varanus bengalensis	✓		
		Yellow Monitor Lizard	Varanus salvator	✓	✓	
	Dipsadidae	Common Wolf Snake	Lycodon aulicus	✓		
	Colubridae	Rat Snake	Coluber mucosus	✓		
Aves	Scolopacidae	Fantail Snipe	Gallinago gallinago	✓		
	Alcedinidae	Common Kingfisher	Alcedo atthis	✓	✓	✓
		White-throated Kingfisher	Halcyon smyrnensis	✓		✓
	Meropidae	Green Bee Eater	Merops orientalis	✓		
	Megalaimidae	Lineated Barbet	Megalaima lineata	✓		
	Apodidae	Asian Palm Swift	Cypsiurus balasiensis	✓		
	Psittacidae	Rose ringed Parakeet	Psittacula krameri	✓		
	Jacanidae	Bronze-winged Jacana	Metopidius indicus	✓		
	Laniidae	Brown Shrike	Lanius cristatus	✓		
	Dicruridae	Black Drongo	Dicrurus macrocercus	✓	✓	✓
	Pycnonotidae	Red-vented Bulbul	Pycnonotus cafer	✓	✓	✓
	Motacillidae	White-browed Wagtail	Motacilla alba	✓		
	Ardeidae	Indian Pond heron	Ardeola grayii	✓	✓	✓
		Cattle Egret	Bubulcus ibis	✓		
		Little Egret	Egretta garzetta	✓		
	Centropodidae	Indian Cuckoo	Cuculus micropterus	✓		
	Columbidae	Spotted Dove	Streptopelia chinensis	✓		✓
		Rock Pigeon	Columba livia	✓		
	Laridae	Common Tern	Sterna hirunda	✓		
	Rostratulidae	Greater Painted-Snipe	Rostratula bengalensis	✓		
	Accipitridae	Brahminy Kite	Haliastur Indus			✓
	Passeridae	House Sparrow	Passer domesticus	✓	✓	✓
		Baya Weaver	Ploceus philippinus	✓	✓	
		Paddy field Pipit	Anthus rufulus	✓		
	Sulviidae	Striated Grassbird	Megaurus palustris	✓		✓
		Common Tailorbird	Orthotomus sutorius	✓	✓	✓
		Common Babbler	Turdoides caudatus	✓		
	Nectariniidae	Purple Sunbird	Nectarinia asiatica	✓		
	Corvidae	House crow	Corvus splendens	✓	✓	✓
		Rufous Tree Pie	Dendrocitta vagabunda	✓		✓
	Sturnidae	Asian Pied Starling	Sturnus contra	✓	✓	✓

Class	Family	English Name	Scientific Name	Survey Areas*		
				1	2	3
		Common Myna	Acridotheres tristis	✓	✓	✓
	Irenidae	Common Iora	Aegithina tiphia	✓	✓	✓
	Laniidae	Long-tailed Shrike	Lanius schach	✓		
	Ploceidae	White throated Munia	Lonchura malabarica			✓
	Oriolidae	Black-headed Oriole	Oriolus xanthornus	✓		
	Picidae	Black-rumped Flamback	Dinopium benghalense	✓		
	Muscicapidae	Oriental Magpie Robin	Copsychus saularis	✓	✓	✓
		White-throated Fantail	Rhipidura albicollis	✓		
	Mammalia	House Mouse	Mus musculus	✓	✓	✓
		Common House Rat	Rattus rattus	✓	✓	✓
		Bandicoot Rat	Bandicota indica	✓	✓	✓
		Indian Field Mouse	Mus booduga	✓	✓	✓
		Indian mole Rat	Bendicota bengalensis	✓	✓	✓
	Soricidae	Grey Musk Shrew	Suncus murinus	✓	✓	✓
	Felidae	Fishing cat	Prionailurus bengalensis	✓		
	Pteropodidae	Flying Fox	Pteropus gigantius	✓		
	Herpestidae	Small Indian Mongoose	Hervested auropunctatus	✓	✓	✓
	Vespertilionidae	Indian Pipistrelle	Pipistrellus coromandra	✓	✓	✓

[\*Note: 1 = Sonargaon and adjacent areas, 2 = roadside and adjacent areas of Dhaka – Chittagong Highway, 3 = adjacent areas of existing Saidabad water treatment plant]

## (b) Aquatic fauna

Some species of amphibia, reptile, bird, mammal and freshwater fish are the main components of the aquatic fauna (

Figure 6-6 and Figure 6-7). The reproduction, breeding and multiplication of aquatic fauna is finely tuned and adjusted to the rhythm and amplitude of monsoon flooding. Aquatic wildlife is divided into 4 major group viz. mammal, bird, reptile and amphibia. A total of 30 aquatic faunal species have so far been identified and a breakdown of the subspecies is provided in Figure 6-7: Aquatic fauna at Baiddherbazar, Sonargaon and adjacent areas (Original Figure 21)

. This indicates that the area is also rich in aquatic fauna. A complete list of aquatic faunal species is given in Table 6-2.

Table 6-2: Identified aquatic fauna at three major sampling areas for the SWTP Phase III project. (Original Table 28)

Class	Family	English Name (Status)	Scientific Name	Survey Areas*		
				1	2	3
Amphibia	Ranidae	Skipper frog	Euphlyctis cyanophlyctis	✓	✓	✓

Class	Family	English Name (Status)	Scientific Name	Survey Areas*		
				1	2	3
Reptilia	Bataguridae	Indian Roofed Turtle	Kachuga tecta	✓		
	Natricidae	Checkered Keelback	Xenochrophis piscator	✓		
	Homalopsidae	Common Smooth Water Snake	Enhydrys enhydrys	✓		
Aves	Anhingidae	Darter	Anhinga melanogaster	✓		
	Phalacrocoracidae	Little Cormorant	Phalacrocorax niger	✓		✓
	Dendrocygnidae	Brown Crake	Amaurornis akool	✓		
		White-breasted Waterhen	Amaurornis phoenicurus	✓	✓	
		River tern	Sterna albiformis	✓		
Mammalia	Platanistidae	Ganges River Dolphin	Platanista gangetica	✓		
Fresh water Fish/ Osteichthyes	Claridae	Magur	Clarius batrachus	✓	✓	✓
	Gobiidae	Tank Goby	Glossogobius giuris	✓	✓	✓
		Bumblebee Goby	Brachygobius nunas	✓	✓	✓
	Clupeidae	Hilsa	Tenuulosa ilisha*	✓		
		Indian River Shad	Gudusia chapra	✓		
	Nanidae	Mottled Nandus	Nandus	✓		
	Polynemidae	Indian Threadfish	Polydactylus indicus	✓		
	Belontiidae	Sunset Gourami	Colisa sota	✓		
	Heteropneustidae	Stinging Catfish	Heteropneustes fossilis	✓	✓	✓
	Ariidae	Gagora catfish	Arius gagora	✓		
		Soldier Catfish	Osteogeneiosus militaris	✓		
	Channidae	Asiatic Snakehead	Channa orientalis	✓	✓	✓
		Spotted Snakehead	Channa punctatus	✓	✓	✓
	Pangasidae	Pungus (cultured)	Pangasius	✓		
	Cyprinidae	Catla	Catla catla	✓		
		Rohu	Labeo rohita	✓	✓	
		Mrigal	Cirrhinus mrigala	✓	✓	
		Ticto / Firefin Barb	Puntius ticto	✓	✓	✓
		Swamp/ Chola Barb	Puntius chola	✓	✓	✓
	Mastacembelidae	Tire-trak Spinyeel	Mastacembelus armatus	✓	✓	✓
		One-stripe Spinyeel	Macrognathus aculeatus	✓	✓	✓
	Polynemidae	Indian Threadfish	Polydactylus indicus		✓	✓
	Anabantidae	Climbing Perch	Anabas testudineus	✓	✓	✓
	Bagridae	Tengra Mystus	Mystus tengara	✓	✓	✓
		Long-whiskered Catfish	Aorichthys aor	✓	✓	
	Chacidae	Indian Chaca	Chaca chaca	✓		



Class	Family	English Name (Status)	Scientific Name	Survey Areas*		
				1	2	3
	Notopteridae	Grey Featherback	Notopterus notopterus	✓		
	Synbranchidae	Gangetic mudeel	Monopterus albus	✓		
	Cyprinidae	Indian carplet	Amblypharyngodon microlepis	✓		

[\*Note: 1 = Sonargaon and adjacent areas, 2 = roadside and adjacent areas of Dhaka - Chittagong Highway, 3 = adjacent areas of existing Saidabad water treatment plant]



- (a) Little Cormorant searching for food in a pond,
- (b) Skipper Frog at shallow water,
- (c) A pond used for fish culture
- (d) Fish in a local pond.

Figure 6-6: Aquatic fauna at Sonargaon and adjacent areas (Original Figure 20)



- (a) Fishing net used to catch river fish from the Meghna River, very close to the proposed water intake point,
- (b) local fishermen fishing in Meghna River by a non-mechanized local country,
- (c) Fish market at Baiddherbazar, Sonargaon that operate everyday afternoon, and
- (d) Varieties of native fish observed in a local market.

Figure 6-7: Aquatic fauna at Baiddherbazar, Sonargaon and adjacent areas (Original Figure 21)

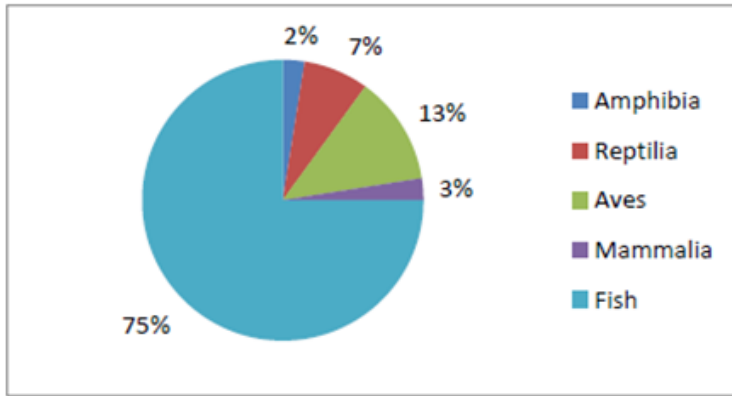


Figure 6-8: Distribution of aquatic fauna (Original Figure 22)

### 6.3.2 Floral diversity

Plant species that grows in the wild in a habitat for a particular period is known as flora. It plays a vital socio-economic and ecological role in a particular habitat or ecosystem. Some flora develops adaptive features to survive in particular types of habitats. Some plants are habituated with soil, some are with water and some are with both soil and water for their normal growth and development. On the basis of habitats, the floral species found in the project areas have been divided into two major categories viz. (a) aquatic flora, and (b) terrestrial flora.

#### (a) Terrestrial flora

There are several villages along the 6 km alignment of the water transmission line from the intake point (Haria) up to Dhaka-Chittagong highway; these villages have planted terrestrial flora that have economical value to the society. The terrestrial plant species make a complex ecosystem in which wildlife has direct relationship through their ecological niche. Commercial fruit garden and vegetable plantation were observed at Sonargaon. Common terrestrial flora are Mango - *Mangifera indica*, Betelnut - *Areca catechu*, Coconut - *Cocos nucifera*, Rain tree - *Samanea saman*, etc. Scattered terrestrial flora was observed beside the Dhaka-Chittagong highway and few terrestrial flora were observed at Saidabad and adjacent areas. Three types of terrestrial plant habit e.g. trees, shrubs and herbs exist in the project areas (Figure 6-9 and Figure 6-10). Except herbs and shrubs, few natural trees (naturally originated) exist in the project area. Most of the plants particularly the trees and shrubs are planted and cultivated. 68 floral species have so far been identified in the project areas of which 34 are tree species, 25 are herb species and the rest are shrubs. Percentage of identified terrestrial flora is given in Figure 6-11 and a complete list of floral species is given in Figure 6-11: Distribution of terrestrial floral habit in the project areas (Original Figure 24)



Table 6-3.

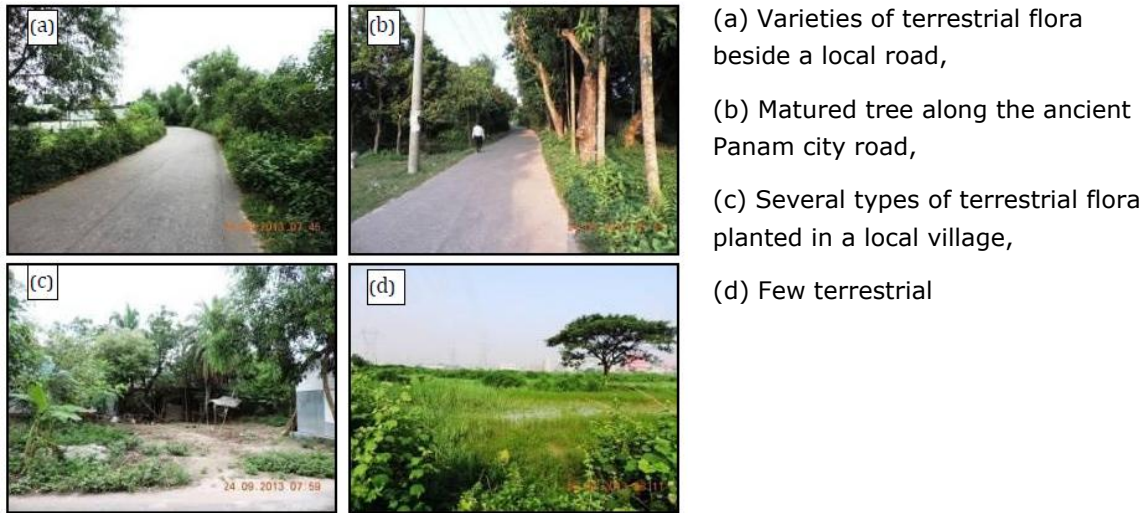


Figure 6-9: Terrestrial flora at project sites and adjacent areas (Original Figure 23)

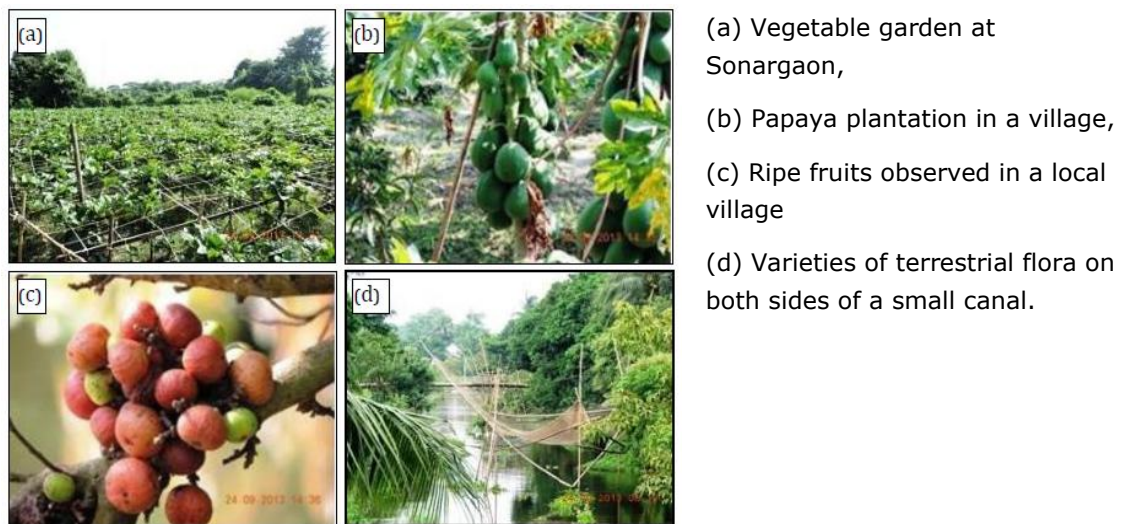


Figure 6-10: Terrestrial flora in the project sites and adjacent areas (Original Figure 24)

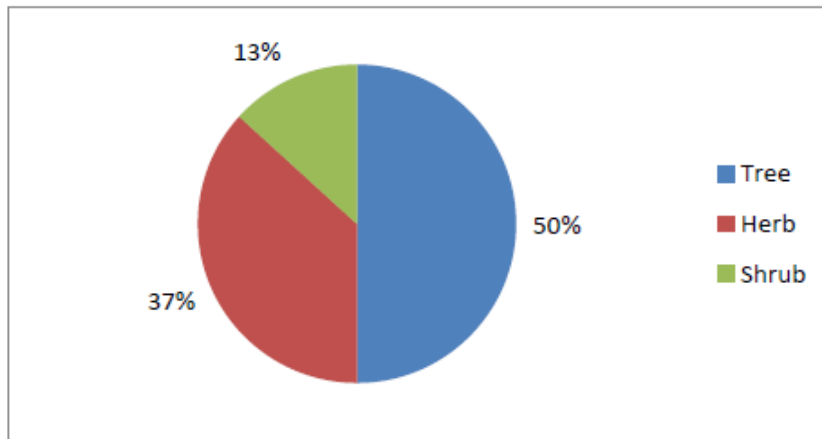


Figure 6-11: Distribution of terrestrial floral habit in the project areas (Original Figure 24)

Table 6-3: Identified terrestrial flora at three major sampling areas for the SWTP Phase III (Original Table 29)

Name			Habit	Study Areas		
Scientific	Family	Native		1	2	3
Zizyphus mauritiana	Rhamnaceae	Boroi, Kul	Tree	✓	✓	✓
Datura metol	Solanaceae	Dhuttra	Herb		✓	
Azadirachta indica	Meliaceae	Neem	Tree	✓		
Clerodendrum viscosum	Verbinaceae	Vat	Herb	✓	✓	
Litchi chinensis	Sopindaceae	Lichee	Tree	✓		
Spondias dulcis	Anacardiaceae	Golden Apple /Amra	Tree	✓		
Calotropis procera	Asclepiadaceae	Seto/Gedla Akonda	Tree	✓		
Calotropis gigantean	Asclepiadaceae	Akonda	Tree	✓		
Averrhoa carambala	Averrhoaceae	Kamranga	Tree	✓		
Basella rubra	Basellaceae	Pui Shak	Shrub	✓		
Chrysopogon aciculate	Gramineae	Chore kata	Herb		✓	
Acacia auriculiformis	Leguminosae	Akashmoni	Tree	✓	✓	
Acacia mangium	Leguminosae	Mangium	Tree	✓		
Erythrina variegata	Leguminosae	Mandar	Tree	✓	✓	
Tamarindus indica	Leguminosae	Tetul	Tree	✓		
Centella asiatica	Hydrocotyleaceae	Thankuni	Herb	✓		
Solanum indicum	Solanaceae	Titbegun	Shrub	✓	✓	✓
Ficus glomoretta	Moraceae	Jagadumur	Shrub	✓	✓	
Eucalyptus citriodora	Myrtaceae	Eucalyptus	Tree	✓	✓	
Albizia procera	Leguminosae	Koroi	Tree	✓	✓	
Diospyros embryteris	Ebenaceae	Gab	Tree	✓		
Anthocephalus chinensis	Rubiaceae	Kadam	Tree	✓	✓	
Dalbergia sissoo	Leguminosae	Sisu	Tree	✓		
Musa spp	Musaceae	Kala	Herb	✓	✓	
Barringtonia acutangula	Lecythidaceae	Hijal	Tree	✓	✓	
Aegle marmelos	Rutaceae	Bel	Tree	✓		
Blumea lacera	Compositae	Sheyalmutra	Herb	✓	✓	✓
Areca catechu	Plamae	Supari	Tree	✓		
Leonurus sibiricus	Libiatae	Raktadrone	Herb	✓		✓
Carica papaya	Caricaceae	Pape	Shrub	✓	✓	
Bombix cliba	Bombacaceae	Simul	Tree	✓	✓	
Cynodon dactylon	Gramineae	Durbaghas	Herb		✓	✓
Solanum nigrum	Solanaceae	Phutibegun	Herb		✓	
Acacia nilotica	Leguminosae	Babla	Tree	✓	✓	

Name			Habit	Study Areas		
Scientific	Family	Native		1	2	3
Mikania cordata	Compositae	Assamlata	Herb	✓	✓	✓
Samanea saman	Leguminosae	Rendi	Tree	✓	✓	
Lindernia procumbens	Scrophulariaceae	Bakpuspa	Herb	✓		
Bambusa spp	Gramineae	Bansh	Tree	✓		
Mangifera indica	Anacardiaceae	Am	Tree	✓		
Coccinia indica	Cucurbitaceae	Telakucha	Herb	✓	✓	✓
Ricinus communis	Euphorbiaceae	Reri, venna	Shrub	✓	✓	✓
Polygonum hydropiper	Polygonaceae	Bishkatali	Herb	✓		✓
Ipomoea fistulosa	Convolvulaceae	Dhokalmi	Herb	✓	✓	✓
Alstonia scholaris	Apocynaceae	Chatim	Tree	✓	✓	
Delomix regia	Leguminosae	Krishnachura	Tree	✓		
Alternanthera sesilis	Amaranthaceae	Haicha	Herb	✓	✓	✓
Clerodendrum vellosum	Verbinaceae	Bhant	Herb	✓	✓	
Heliotropium indicum	Boraginaceae	Hatisur	Herb	✓	✓	✓
Swietenia mahagoni	Meliaceae	Mehagini	Tree	✓	✓	
Ficus benghalensis	Moraceae	Bot	Tree	✓	✓	
Clematis gouriana	Ranunculaceae	Chagalbati	Herb		✓	
Cocos nucifera	Palmae	Narikel	Tree	✓	✓	
Lagerstroemia speciosa	Lythidaceae	Jarul	Tree	✓		
Phoenix sylvestris	Palmae	Khejur	Tree	✓		
Phyllanthus reticulatus	Euphorbiaceae	Chitki	Shrub	✓		
Ficus hispida	Moraceae	Kakdumur	Shrub		✓	
Artocarpus heterophyllus	Moraceae	Kathal	Tree	✓	✓	
Casuarina equisetifolia	Casuarinaceae	Jhau	Tree	✓		
Borassus flabellifer	Palmae	Tal	Tree	✓		
Ocimum sanctum	Labiatae	Tulsi	Herb		✓	
Hyptis suaveolens	Labiatae	Tokma	Herb		✓	
Centella asiatica	Hydrocotyleaceae	Than kuni	Herb	✓		
Saccharum spontaneum	Gramineae	Kash	Herb	✓	✓	✓
Ocimum sanctum	Labiatae	Tulsi	Herb		✓	
Chrysopogon aciculatus	Gramineae	Chore Kanta	Herb		✓	✓
Hyptis suaveolens	Labiatae	Tokma	Herb	✓		
Molocanna bambusoides		Muli bansh	Shrub	✓		
Pteris vittata		Dhekishak	Pteridophytes	✓	✓	✓

[\*Note: 1 = Sonargaon and adjacent areas, 2 = roadside and adjacent areas of Dhaka – Chittagong Highway, 3 = adjacent areas of existing Saidabad water treatment plant]

### (b) Aquatic flora

The project area has low land / seasonal wetland with varieties of aquatic flora. The aquatic flora is divided into three major types, viz. tree, shrub and herb. These floral species grow in ponds, canals, ditches, river, seasonal wetland and low-lying agricultural lands as submerged, free-floating, or rooted floating states (Figure 6-12). The common aquatic floral species in the project area include Sada Shapla - *Nymphaea* sp, Kachuripana - *Eichhornia crassipes*, Khudipana - *Lemna perpusilla*, Helencha- *Enhydra flactuans*, Kalmi - *Ipomoea aquatica* etc. A total of 24 aquatic floral species have been identified of which two are trees, 21 are herbs and the rest are shrubs. Figure 6-13 shows their relative abundance and Table 6-4 provides a complete list of floral species.

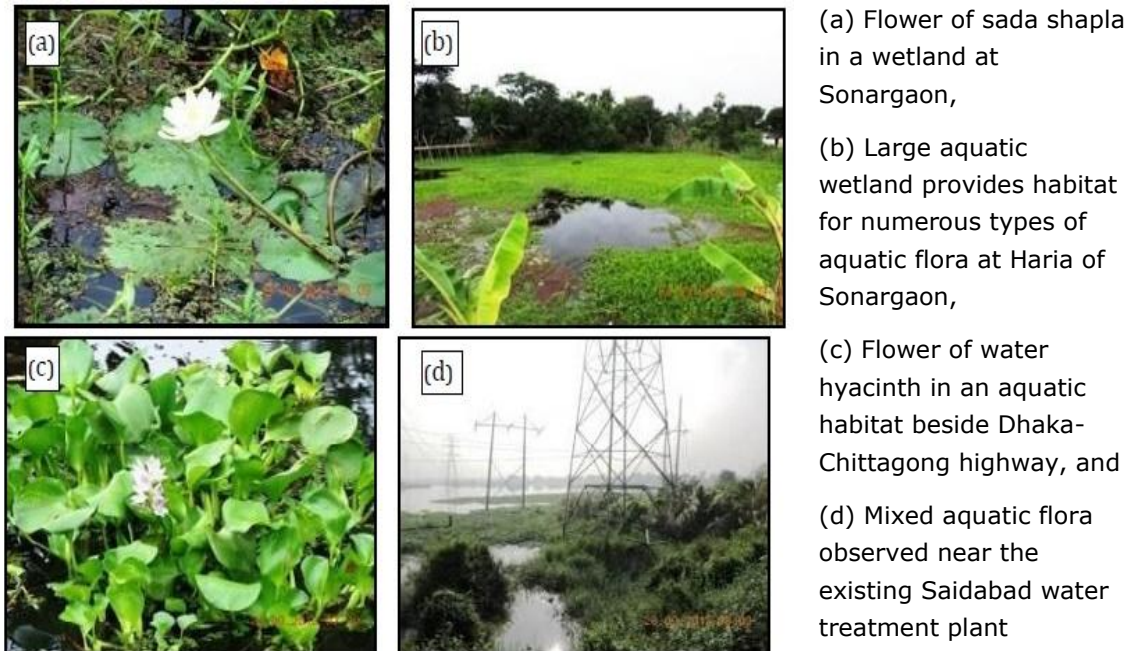


Figure 6-12: Aquatic flora in the project sites and adjacent areas (Original Figure 25).

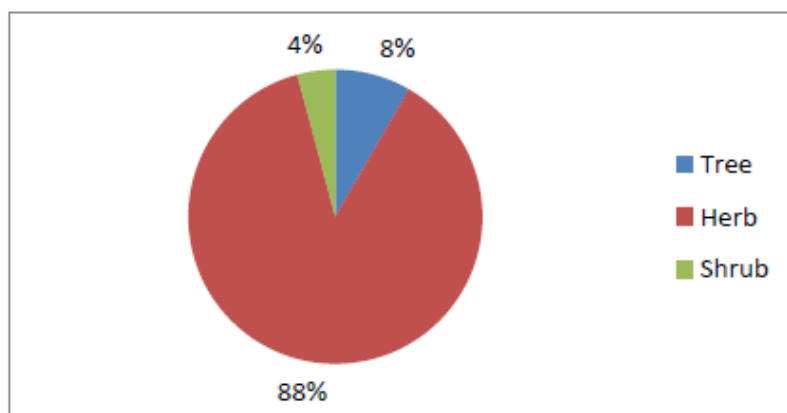


Figure 6-13: Distribution of aquatic floral habit in the project areas (Original Figure 26)

Table 6-4: Identified terrestrial flora at three major sampling areas for the SWTPPP III (Original Table 30)

NAME			HABIT	STUDY AREAS*		
Scientific	Family	Native		1	2	3
<i>Nymphaea nouchali</i>	Nymphaeaceae	Sada shapla	Herb	✓	✓	
<i>Clynogyne dichotoma</i>	Marantaceae	Sitalpati	Herb	✓		
<i>Vallisneria spiralis</i>	Hydrocharitaceae	Patajhanghi	Herb	✓	✓	
<i>Utricularia aurea</i>	Utriculariaceae	Jhanghi	Herb	✓	✓	
<i>Hygroryza aristata</i>	Gramineae	Phutki janglidhan	Herb		✓	✓
<i>Ipomoea aquatica</i>	Convolvulaceae	Kalmi	Herb	✓	✓	✓
<i>Lemna perpusilla</i>	Limnaceae	Khudipana	Herb	✓	✓	✓
<i>Pistia strateotes</i>	Araceae	Topapana	Herb	✓	✓	✓
<i>Salvinia cuculata</i>	Salviniaceae	Indurkanipana	Herb	✓	✓	
<i>Eichhornia crassipes</i>	Pontederiaceae	Kachuripana	Herb	✓	✓	✓
<i>Hydrilla verticillata</i>	Hydrocharitaceae	Janjhi, Kurcli	Herb	✓		
<i>Dillenia pentagyna</i>		Hargoza	Shrub	✓		
<i>Scirpus articulatus</i>	Cyperaceae	Chechra	Herb	✓		
<i>Alternanthera philoxeroides</i>	Amaranthaceae	Helencha	Herb	✓	✓	✓
<i>Ceratophyllum demersum</i>	Ceratophytaceae	Jhanjhi	Herb	✓	✓	
<i>Barringtonia acutangula</i>	Lecythidaceae	Hijal	Tree	✓	✓	
<i>Crataeva nurvala</i>	Capparidaceae	Barun, banny	Tree	✓		
<i>Colocasia esculenta</i>	Araceae	Katchu	Herb	✓	✓	✓
<i>Ipomoea fistulosa</i>	Convolvulaceae	Dholkalmi	Herb	✓	✓	✓
<i>Enhydra fluctuans</i>	Compositae	Helencha	Herb	✓	✓	
<i>Aponogeton natans</i>	Aponogetonaceae	Ghenchu	Herb	✓		
<i>Calamus sp</i>	Palmae	Bet	Herb	✓		
<i>Fagopyrum hydropiper</i>	Polygonaceae	Biskhtali	Herb	✓		
<i>Monochoria vaginalis</i>	Pontederiaceae	Sarkachu	Herb		✓	

[\*Note: 1 = Sonargaon and adjacent areas, 2 = roadside and adjacent areas of Dhaka – Chittagong Highway, 3 = adjacent areas of existing Saidabad water treatment plant]

## 6.4 Threatened Flora and Fauna

Specific scientific criteria is followed to declare a specie as threatened (critically endangered, endangered etc). It is declared by the World Conservation Union (IUCN) for each country. Floral or faunal species that exist in threatened condition are generally known as threatened species. Currently, 147 wildlife and 54 freshwater fish species are threatened in Bangladesh; 40 plant species are also threatened in Bangladesh. No threatened floral species have been identified in the project area. However, some threatened wildlife and fish species have been identified in the project areas (Table 6-5) which are considered threatened throughout the country as well. A systematic research work in different seasons of the year will provide a

complete and more accurate status of the threatened wildlife and fish fauna of the study areas.

*Table 6-5: List of Critically Endangered, Endangered and Vulnerable wildlife and fish fauna in the study area (Original Table 31)*

Biological Class	English name	Scientific name	O	CE	E	V	CT	T	DD
Reptilia	Grey Monitor Lizard	Varanus bengalensis				√			
	Yellow Monitor Lizard	Varanus salvator			√				
	Common Wolf Snake	Lycodon aulicus				√			
Mammalia	Ganges River Dolphin	Platanista gangetica			√				
Osteichthyes	Mottled Nandus	Nandus				√	√		
	Asiatic Snakehead	Channa orientalis				√	√		
	Ticto / Firefin Barb	Puntius ticto				√	√		
	Tire-trak Spinyeel	Mastacembelus armatus			√		√		
	One-stripe Spinyeel	Macrognathus aculeatus				√	√		
	Long-whiskered Catfish	Aorichthys aor				√	√		
	Indian Chaca	Chaca			√				
	Grey Featherback (V)	Notopterus				√	√		
	Gangetic mudeel (V)	Monopterusuchia				√	√		

[Legend: O = Observed, CE = Critically Endangered, E = Endangered, V = Vulnerable, CT = Commercially T = Threatened, DD = Data Deficient].

## 6.5 Protected Areas, National Park, Game Reserves, Wildlife Sanctuaries and ECA

### Protected Area (PA)

An area of land and/or ocean especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means is referred to as "Protected Area (PA)". Such an area is predominantly a natural area established and managed in perpetuity, through legal or customary regimes, primarily to conserve their natural resources. No PA exists near any of the proposed project sites, though an ancient city namely Panam city –exist near the water intake point at Sonargaon.

### National Park (NP)

A National Park (NP) is a reserve land, usually declared and owned by a national government, protected from most human development activities and pollution. No NP exists at or near the proposed project sites.

### Game reserve (GR)

A Game Reserve (GR) is an area of land set aside for maintenance of wildlife for tourism or hunting purposes. No GR exists at or near the proposed project sites.



### **Wildlife Sanctuary (WS)**

A Wildlife Sanctuary (WS) is an area that assures the natural conditions necessary to protect nationally significant species, groups of species, biotic communities, or physical features of the environment where these require specific human manipulation for their perpetuation. No WS exists at or near the proposed project sites.

### **Ecologically Critical Area (ECA)**

It is an environmental protection zone, defined by the Government of Bangladesh under the Bangladesh Environment Conservation Act, 1995, where ecosystem is considered to be threatened. The raw water transmission pipeline will cross the Shitalakhya river which has been declared as an ECA (see Annex C). The declaration states restrictions on hunting, fishing, all activities that could result in the destruction of floral or faunal habitats, activities that could destroy natural characteristics of water and soil, activities detrimental to fishery, installation of polluting industrial units, and discharge of domestic/ industrial liquid waste into Shitalakhya river.



## 7 Baseline Environment: Socio-Economic

### 7.1 Introduction

This Chapter describes the baseline socio-economic conditions of project areas of the proposed Saidabad Water Treatment Plant Phase III project sites. As a part of ESIA, a social baseline study was carried out, which included baseline socio-economic survey, FGDs and meetings. The specific objectives of the social baseline survey were to gather information on the existing social environment surrounding the proposed project sites. The social survey primarily focused on identifying the status of important economic and social factors / circumstances / attributes of the project areas. Possible impacts of the proposed project activities have to be evaluated against these baseline socio-economic attributes, and later, mitigation measures have to be suggested to reduce/eliminate the significant adverse impacts. This Chapter describes the baseline socio-economic condition of the project areas based on the questionnaire survey as well as secondary information. Findings of the FGDs and meetings have been presented in Chapter 6 of this report.

### 7.2 Approach And Methodology

As a part of the ESIA, an assessment of the baseline of socio-economic conditions / attributes of the areas surrounding the proposed project sites was made. The social study covered an area of about 5 km radius surrounding the project sites. Efforts were made to identify the socio-economic attributes that may be impacted due to the proposed project activities. The main purposes of the baseline socio-economic study were to understand:

- > people's socio-economic condition,
- > extent of people's access to basic services; and
- > people's perception regarding the proposed project.

The proposed project will run over the Sonargaon Upazila of Narayanganj District and Demra Thana of Dhaka District. Some basic features of the social environment of both areas are available in the Population and Housing Census 2011 of Bangladesh Bureau of Statistics (BBS, 2012). Besides this, a socio-economic survey was conducted in September 2013 and May 2022 and January 2023. To collect first-hand information on socio-economic attributes, the members of survey team visited the project sites (Figure 7-1), conducted field study, questionnaire survey (Annex-A), meetings (both formal and informal) and focus group discussions (FGDs).

Again, a social survey has been conducted for the Component 2 in January 2023 to collect primary data and information while a total of 60 people had been interviewed through a questionnaire survey, 86 people participated in the 9-Focus Group Discussions (FGD) in different locations close to WTP C2 and a total of 5-Key Informants Interview (KII). More than 601 people have been directly interacted during the study (including survey, FGD, KII of May 2022 and January 2023); the questionnaire survey covered 272 respondents, 334 people participated in the 27 FGDs, and others participated in the formal/informal meetings.

The questionnaire used for the socio-economic survey (see Annex A) covered five major themes. These included:

- > Socio-economic background
- > Access to basic services
- > Education level and educational institutions
- > Economic situation, and
- > Attitude toward the proposed project.



*Survey of Sep'13*



*Survey of May'22*





*Survey of Jan'23*

*Figure 7-1: Surveyors filling out questionnaire sheets by interviewing local people in the study areas. (Original Figure 27)*

### 7.3 Socio-Economic Perspective of the Study Areas

As noted earlier, the proposed project will run over the Sonargaon Upazila of Narayanganj District and Demra Thana of Dhaka District. The basic socio-economic features of Sonargaon Upazila and Demra thana are summarized below (BBS, 2012):

**Sonargaon Upazila:** It is situated in the eastern part of Dhaka district. Total area is about 171.67 sq. km. Population density is 2332 per sq. km. It has 398 villages under 10 Unions and 1 Paurashava that have 9 Wards. A total of 400,358 people live in this area of which around 51% male and 49% female. More than 59% male and around 67% female are married. Human population growth rate is 2.7 per year. Most of the people live in the rural environment. Only about 8.19% of total population lives in the urban environment. Total number of households (HH) is 89,565 of which only about 8% exists in urban environment. Floating HH number is 476. Average HH size is 4.4. Most of the HH structure (64%) is not strong enough (i.e. Katcha / non-concrete structure). About 93% HH have tube well from where they get water for their various purposes. Almost 97% HH have electricity. More than 77% HH have their own house. Average literacy rate is 54.6%. School attendance (5 - 24 years) rate is 48.9%. Around 24% of total population is under 30 - 49 age structure class. More than 96% population is Muslim.

**Demra Thana:** It is situated in the eastern side of Dhaka city. It has 29 villages under 3 Unions. A total of 226,679 people live in this area of which around 54% male and 46% female. More than 58.5% male and around 67.3% female are married. Human population



growth rate is -6.07 per year. All people live in the peripheral urban environment. Total number of households (HH) is 52,982. Floating HH number is 21. Average HH size is 4.2. Some HH structure (around 15%) is not strong enough (i.e. Katcha / non-concrete structure). Around 78.7% HH have Tap water line from where they get water for their various purposes. Almost 98.8% HH have electricity. More than 28.4% HH have their own house while 70.1% have rented houses. Average literacy rate is 73.1%. School attendance (5 - 24 years) rate is 52.4%. Around 26% of total population is under 30 - 49 age structure class. More than 97% population is Muslim.

Agro-ecologically the proposed project site falls under Young Brahmaputra–Jamuna Floodplain (BARC/UNDP/FAO, 1995). Human settlement began here more than several hundred years back. The area has non-calcareous grey / dark grey floodplain soil which provides suitable environment for growing essential foods for human consumption. The proposed water intake point, and route of water transmission pipeline have rural and semi urban social settings. Areas surrounding the water treatment plant have urban environment. Remains of an ancient city, known as Panam city, exist near to the water intake point at Haria. The Panam city is also a tourist spot and is managed by the Archaeological Department of Bangladesh Government. Outside this ancient city, most areas are lowlands / seasonal wetland that are utilized by the local village people for their livelihood i.e. fishing, agriculture etc. A significant portion of these lands are now being converted into highlands (through land filling) for various purposes like commercial fruit garden (e.g. Lychee, Papaya) and residential plots. The soil in the village area close to the intake point is very fertile, which helps the growth of agro-products (mainly rice) in plenty. Local people use the area for cultivation during the winter season. During monsoon season, most of the area becomes inundated, and people practice carp and exotic fish culture in some areas. Local fishermen have been catching natural fish from that area during monsoon over generations. Highlands are used for vegetables cultivation, cattle rearing, poultry farming, and the products are traded in the local markets as well as in Dhaka. Agricultural products, cattle and wetland fish are some of the prime economic assets to the local people. Apart from these, few small industries were also observed in the area.

On the other hand, the areas surrounding the route of the water transmission line along Dhaka-Chittagong highway has urban/peri-urban characteristics. The areas around the proposed water treatment plant at Saidabad have urban characteristics with all types of urban facilities. Figure 7-2 shows some photographs of the project sites.

## 7.4 Baseline Social Attributes from Questionnaire Survey

The existing socio-economic characteristics of areas surrounding the project site have been described below based on the results of the questionnaire survey under five thematic areas:

### **(A) Socioeconomic Survey of September 2013**

#### **Theme 1: Socio-economic background**

The parameters considered under socio-economic conditions included respondents' gender, age, marital status, family size, occupation, and duration of living in the area. These parameters provide an understanding of people's background in areas surrounding the project sites and their lives and livelihood.

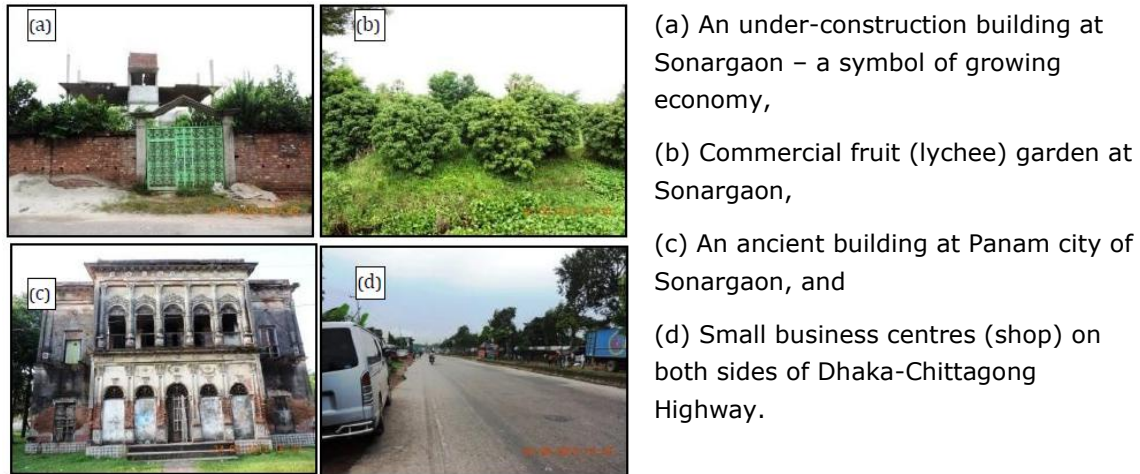


Figure 7-2: Some photographs of the project sites (Original Figure 28)

Most of the respondents (92%) of the questionnaire were male; this is primarily due to their availability, willingness and social custom. All respondents were Bengali, no tribal respondent was found in the project areas. Muslims dominate the study area (96% respondents) followed by Hindus. Most of the respondents' ages are in between 35 – 44 years (35% of respondents). Also 96% of the respondents were married with family size varying from 4 to 6, which indicates that the family planning program is moderately accepted by the local community.

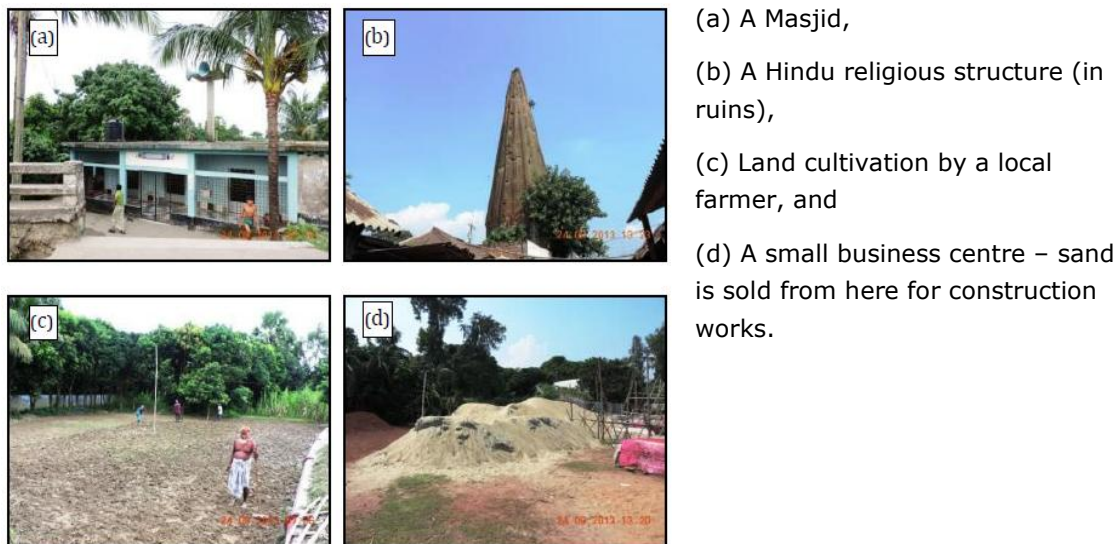


Figure 7-3: Some photographs from Sonargaon (Original Figure 29)

More than half of total respondents have been living in Sonargaon and adjacent Dhaka Chittagong Highway areas for a very long time, exceeding 25 years. As majority of the respondents have been staying in the area for a long period of time, it means that they have most likely developed many kinds of social and economic ties with other people living in that area. Therefore, any displacement would affect not only their income but also other social and economic relationships. However, it should be noted that majority of lands by the side of the Dhaka-Chittagong highway are owned by Road and Highway Department (RHD) of GoB and no land acquisition would be required for laying of water transmission pipeline along the highway. Nearly half of the respondents of the Sonargaon and adjacent Dhaka-Chittagong Highway areas are migrants from various parts of the country, who came here mainly in search of a better and secured life (Figure 7-4a). While the respondents are engaged in

different occupations (Figure 7-4b), majority of the respondents (44%) are engaged in small businesses (Figure 7-4b).

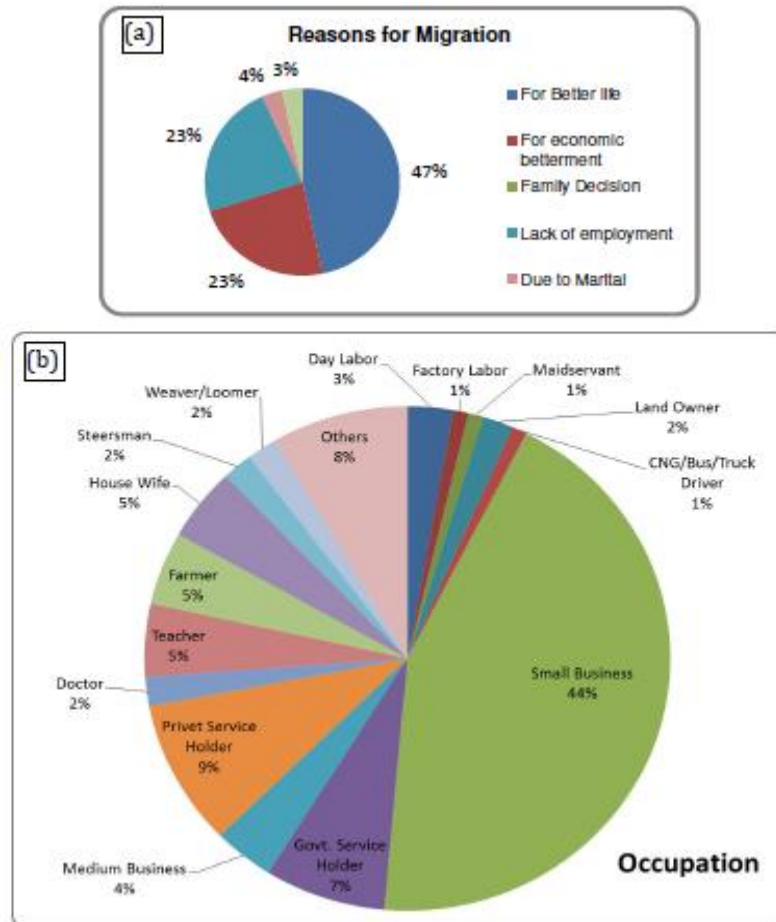


Figure 7-4: Questionnaire findings: (a) Respondents' reason for migration and (b) Occupation pattern of respondents. (Original Figure 30)

According to the respondents, the overall environment in Sonargaon is good in terms of comfort of living. The population of this area largely lives above the international and national poverty line, and have access to social protection systems, basic services and sufficient economic resources and livelihoods. The area is not prone to natural disaster. Most respondents reported experiencing of one earthquake in 2013.

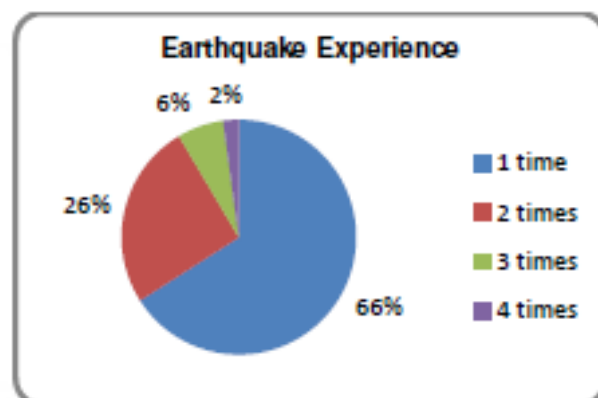


Figure 7-5: Respondents' experience with earthquake from questionnaire survey (Original Figure 31)

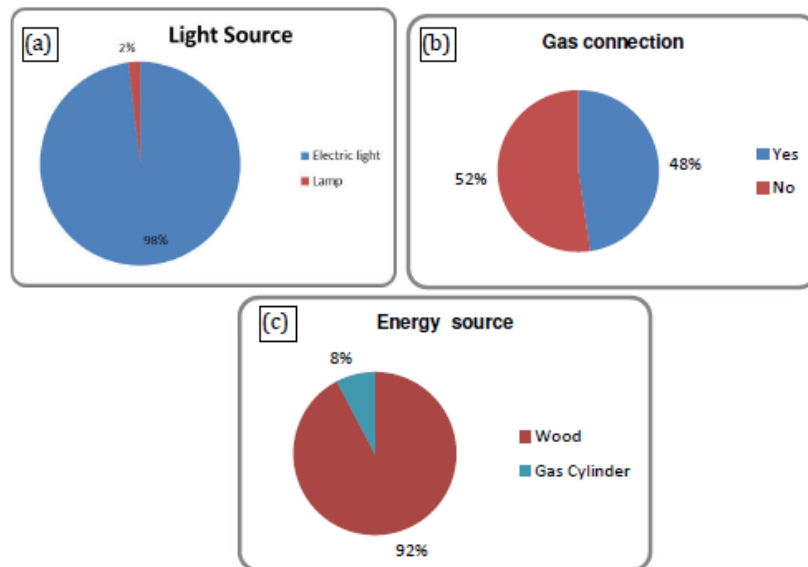


Figure 7-6: Questionnaire finding: Respondents' access to (a) source of light, (b) natural gas supply, and (c) source of energy used for cooking. (Original Figure 32)

## Theme 2: Access to Basic Services

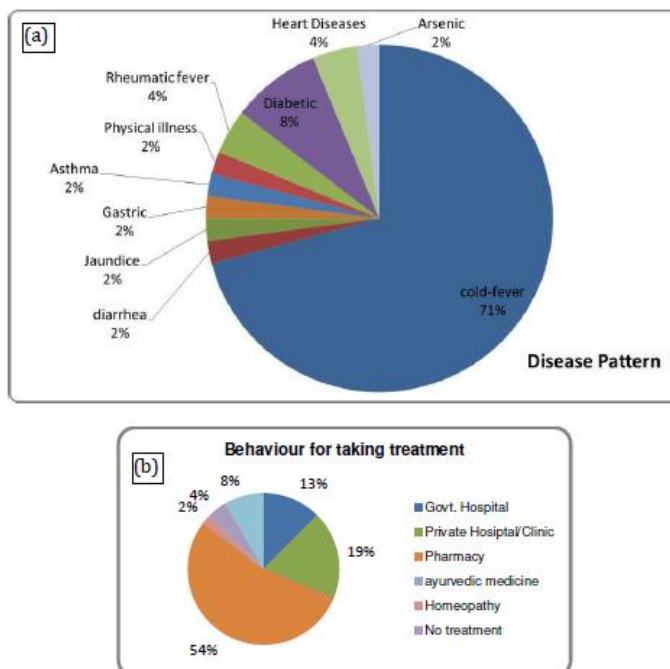


Figure 7-7: Questionnaire Findings: Respondents' (a) Disease pattern, and (b) Pattern of getting (Original Figure 32)

The parameters considered under "basic services" included access to electricity, fuel for cooking, water, sanitation / sewerage system, and health services.

The area is covered by the national grid and most respondents have access to electric supply, though they suffer from frequent load-shedding, especially during the summer. At

that time, most electricity-dependent activities are hampered seriously. Students suffer a lot during examination. Natural gas supply is available in the area, and almost half of all respondents use natural gas for cooking or other uses. Other respondents use wood / cow-dung for everyday cooking. Almost all respondents have their own tube wells. The study area does not seem to be an arsenic contaminated area.

Among the respondents, most have modern toilet or slab / RCC toilet, which indicates that respondents are habituated with the modern sanitation system. Poor people also use pit latrine. More than one third of respondents (39%) have access to the sewerage system though most of the time it does not work properly.

Less than 50% respondents or their immediate family members have suffered from common diseases (e.g. fever) within the last six months. Access to pure drinking water, good health and hygiene practice, ability to avail better treatment has significant implications for the overall health. During health problems, most respondents prefer to go to the nearby pharmacy, followed by private clinic. Most respondents are aware of the health-care services at Government Hospitals, but it is not satisfactory to them. In case of emergency, most respondents prefer to go to the nearby reputed government hospital of Dhaka city. Most respondents or their immediate family members did not fall in an accident in the last six months.

### Theme 3: Education, transport system and religious and social establishments

The parameters considered under this theme included respondents' education, educational

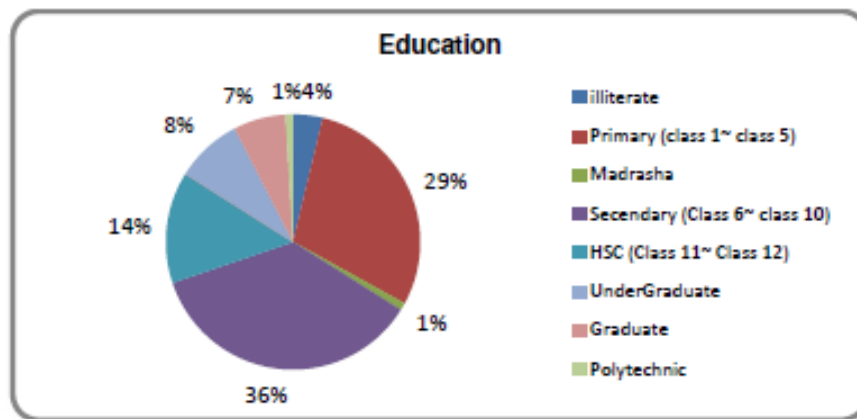


Figure 7-8: Questionnaire Findings: Education level of respondents in the study areas (Original Figure 32)

facilities/institutions, religious establishments and social organizations. Areas surrounding the project sites have schools, madrasas and colleges. Most respondents are quite happy with the overall quality of educational facilities available in their localities. Education level varies among the respondents. More than one third of all respondents reported completing secondary level education. All respondents who have children reported that their children are admitted into the local schools.

Road transportation system is well-developed available in the study area. Most respondents are quite happy with road networks, while others wanted expansion of existing roads. Some village roads need carpeting. To carry human and goods from one place to another, people prefer to use road network.





Figure 7-9: Educational institutions in the study area: (a) a local high school, and (b) a local madrasa (Islamic educational institution). (Original Figure 33)

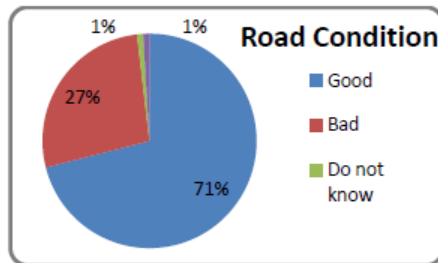


Figure 7-10: Questionnaire Findings: Status of road condition – respondents' opinions (Original Figure 34)

There are mosques, temple and few clubs in all areas surveyed; no pagoda, church were identified within the surveyed area. The ancient Panam city is a historical establishment in the study areas. No playing field was identified in the study area and children usually use open areas in the vicinity of their homes to play games.



Figure 7-11: (a) a Hindu religious establishment and (b) the ancient Panam city conserved by Archaeological Department of GOB. (Original Figure 35)

#### Theme 4: Economic Situation

The parameters considered under this theme included income and associated issues. In general, economic condition of the respondents appears to be relatively good. Respondents have mixed income range. Two third respondents reported income in between Taka five to fifteen thousand. They have access to bank accounts and around 60 percent of the respondents have bank accounts. Respondents also borrow money from local business institutions (e.g. NGO operated financial institutions) for expansion of business.

Most respondents are not involved with cultivation. Rather they are primarily involved with other types of income generating profession such as businesses. Respondents who are

involved with cultivation prefer to cultivate paddy during winter season; during monsoon, they prefer fishing.

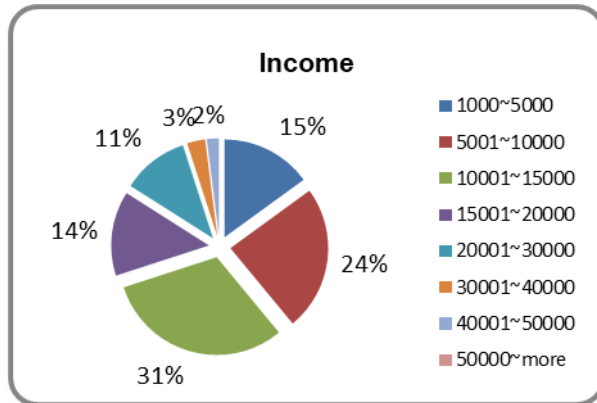


Figure 7-12: Questionnaire Findings: Respondents' income pattern (Original Figure 35)



Figure 7-13: Small businesses in the study area: (a) Wood shop for furniture making, and (b) A small shop beside a local road. (Original Figure 36)

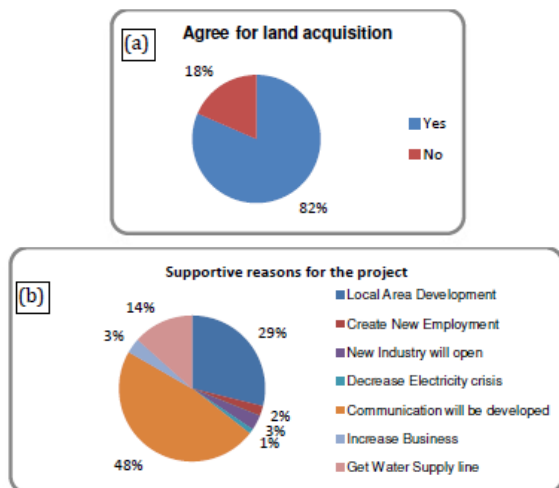


Figure 7-14: Questionnaire findings regarding respondents' opinion on: (a) land acquisition, and (b) reasons for supportive attitude for the proposed project. (Original Figure 36)

Cattle rearing and poultry farming is a good source of income for local people. In the low laying areas, fodder is available throughout the year. Cattle rearing are carried out within the house premises for both domestic and commercial purposes; the milk produced is primarily sold in Dhaka city. Rearing of domestic fowl and duck is a common practice in the study areas. The egg and meat of these animals supply nutrition to the local community. Few commercial poultry firms were also observed.

## **Theme 5: Reasons for supporting the project**

Overall socio-economic environment, population trend and people's perception regarding the proposed project site were considered under this theme. According to the respondents, current local population is increasing slowly due to the growth of local economy. All respondents expressed their supportive attitude for the proposed project if it does not bring any harm to them. The primary reason for their support is the potential overall development of the area due to project activities. About 82% of respondents expressed their support for land acquisition for the project but emphasized that the compensation should be provided according to current market price.

### ***TEXT MODIFIED IN 2022***

#### **(B) Socioeconomic Survey of May 2022**

A sample social survey was carried out in May 2022 for 5-days from Haria of Sonargaon Upazila of Narayanganj district and ended at the Nandi Para. A total of 18 (eighteen) locations were visited where a sample questionnaire survey including FGDs, and interviews were conducted. The specific objective of the social sample survey was to gather information on the existing social environment surrounding the proposed project sites. The social survey primarily focused on identifying the status of important economic and social factors / circumstances / attributes of the project areas. A total of one hundred habitants have been interviewed in a prescribed questionnaire with a professional group of field researchers.

The respondents also raised concerns related to disruption during construction of the pipelines as the neighbourhood will be affected by noise/sound-dust pollution, contractor's working area and presence of construction staff which will affect usual movement of girls and women. So, the remedial measures must be addressed in the contract to reduce this disturbance.

Another observation is that the small businessmen, vendors, and floating shops will also be affected by the construction work for the time being within the RAP3 boundary. The Social Expert team of PMC discussed this with KMC, the RAP team who will identify issues specific to each location and suggest remedial measures accordingly in the final RAP.

A case example: Applicant 1 and her brother-in-law are going to lose their living houses; although they received compensation as per government regulations, they informed that it is not sufficient to build a new house to their standard as the construction materials cost has increased. Also, they have to move from the locality and lose the social connections with neighbourhood and relatives. They requested to re-route the pipeline in front of their house. Also, other people interviewed and present in the FGDs said that the new pipeline of DWASA from the Meghna River has passed over their land and trees.

There is also positive feedback - the employment opportunity will be increased for the local poor people as day labour and unskilled labour as well. Local women will also get work for the engagement of cooking, water carrying, caretaking, earth work, etc.

Another finding is that 52% of respondents have access to DWASA supply system while 48% uses tube well, private line or pond water. The people have access to DWASA connection, most of them have a complain about quality of water and/or insufficient of water, specifically during Ramadan they suffered a lot. So, they have earnest request to DWASA to provide good quality of water and sufficient water who already have connections and ensure new connections to the households who do not have access to quality water as per their need.

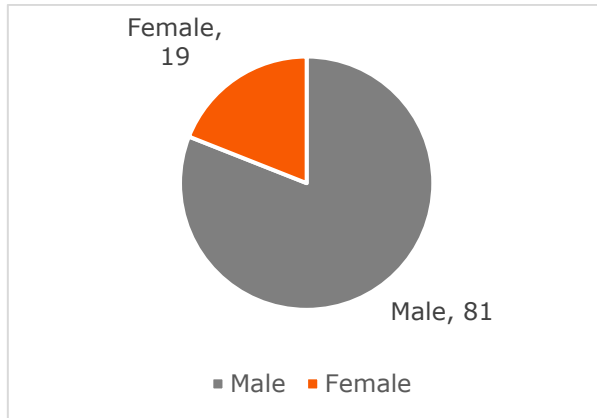
Another important finding is about fuel consumption. A total of 77% of households have a gas line connection and 18% use Cylinder gas while only 5% use firewood. They anticipate that during construction of DWASA pipeline, their gas line will be affected, and they will lose their source and would be difficult to be reconnected. The local people demanded to have legal connection of gas line as they are spending money for it.

The findings and analysis as per survey design and questions are summarized below:

#### **Respondent of Social Questionnaire Survey:**

A total of 100 people has been interviewed and data shows that 81 are male while 19 are female. This is also same as 81% male and 19% female. These people are head of household, service holders, businessmen, small traders, Farmers, housewives, women entrepreneurs, etc.

In 2013 survey, most of the respondents (92%) of the questionnaire were male and only 8% were female. In 2022 survey, 81% respondents were male, and 19% were female; that means a meaningful number of women were the respondents in the latest survey.



*Figure 7-15: Respondent by Sex*

#### **Affected people Interviewed**

A total of 100 people interviewed who were selected randomly as a sample basis from the different categories of stakeholders. Out of them 20 were affected people by the project where 2 of them are women. 18 of the respondents lost land where 2 are women; 7 lost houses where 2 are women and one lost commercial structure who is man.

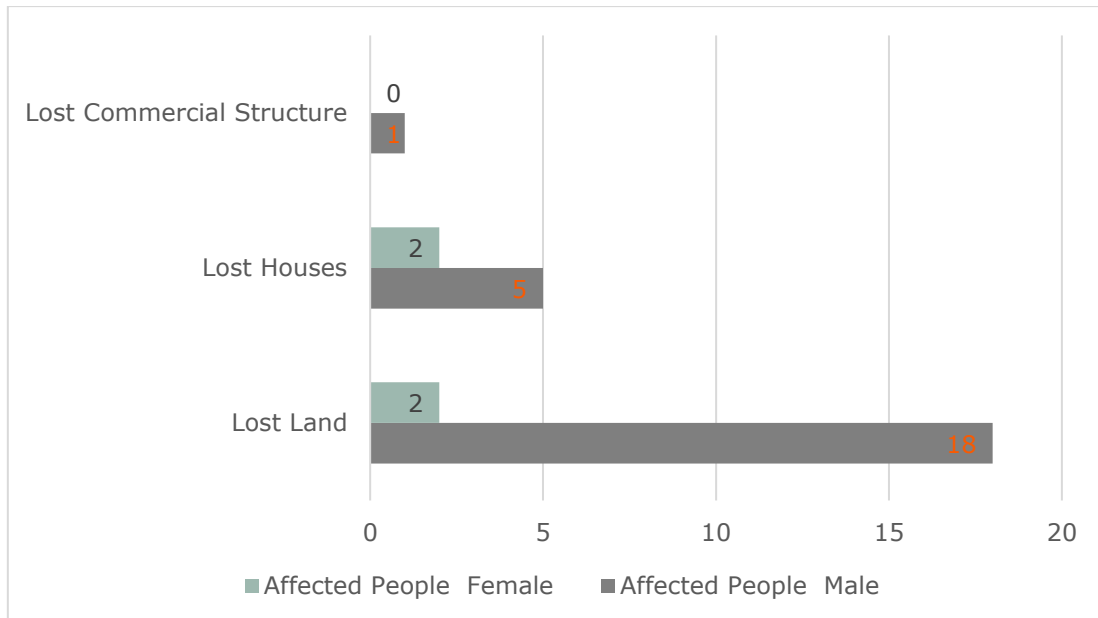


Figure 7-16: Affected People by Sex

### Received Compensation from DC Office

A total of 18 people informed that they received compensation. Most of them are happy about their payment. Some of them mentioned that they did not get yet the full amount of compensation from DC office for land and no compensation received for structures, trees, and moveable items. Hence, we refer it to KMC RAP team to find out and suggest for necessary actions as per grievance redress procedure.

The respondents' concerns during the Focus Group Discussion (FGD), as part of 2014 ESIA update, were also relayed to Dhaka WASA for grievance recording and future necessary actions. The grievance mechanism, defined in RAP-1 (December 2018) and RAP-2 (May 2019) reports, will be implemented under RAP Implementation by KMC. Above findings during FGD are more appropriate to report via the grievance mechanism rather than the ESIA report itself. Notably, the number of affected households and their legal entitlements for land acquisition were resolved under the "Acquisition and Requisition of Immovable Property Ordinance, 1982". The District Commissioners' (DC) offices of Dhaka and Narayanganj have already compensated the project-affected persons following the land acquisition ordinance of 1982.

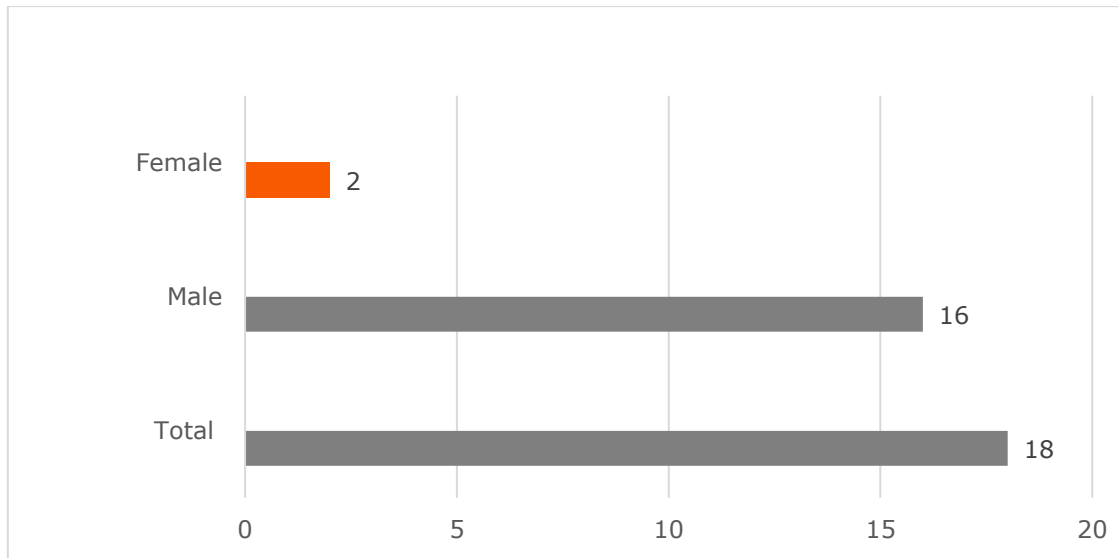


Figure 7-17: Received Compensation from DC Office

### Household head by Sex

A total of 12 households are women out of 100 people interviewed during social survey that means 12% head of households are women in these surveyed locations.

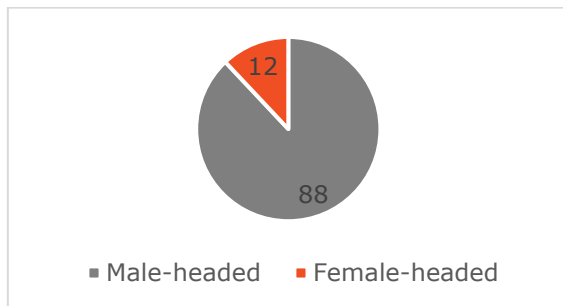


Figure 7-18: Gender of the household head

This is a significant number that 12% households head are women out of the interviewed 100 people. Women headed households need more attention during construction work as they are more vulnerable than others.

### Number of Household by Occupations

It was noticed during survey that people from various occupations are living in the surveyed locations. The most dominating occupation is small business; The findings shows that gradually people are moving to small business and service as the 50% people are doing business (in 2013, 44%); service holders are 18% now while it was only 9% in 2013; only 3% are housewives while 5% were in 2013 and daily labourers are 2%. People are moving to the workforces and try to earn money for better life; they expect to have employment opportunity from the project work. The following chart showed the main occupations of the people interviewed.

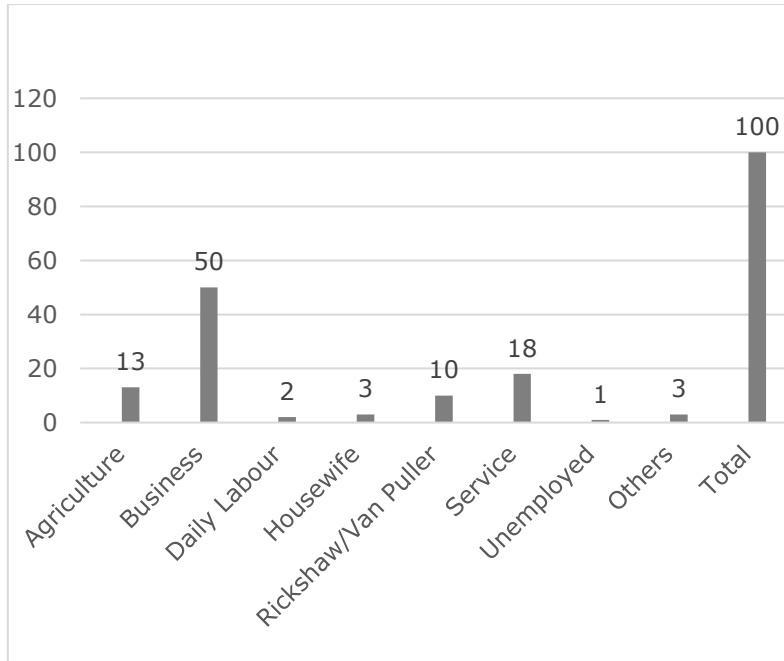


Figure 7-19: No. of Households as per Occupations

### Number of Household by Health Services

In these locations people are going to different institutions for health services. They don't have any specific complain against this service and not very aware of good health services.

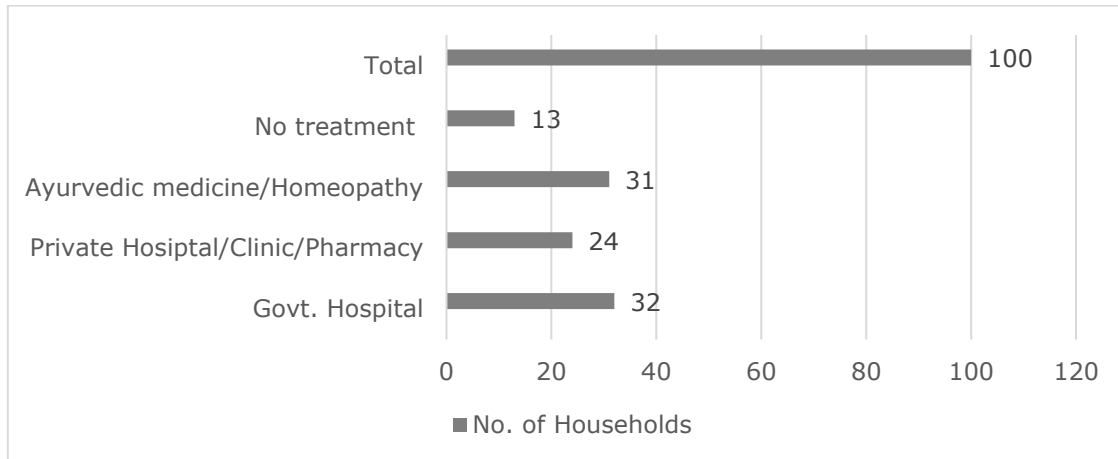


Figure 7-20: Health service from various Institutions

These findings show that people are more concerned about health services and go for treatment compared to previous data. Now it seems they go to government hospital then before due to better service and free medicine. In 2022 survey shows 32% goes to government hospital while in 2013 survey report said only 13% went to government hospital. Similarly, 19% to 24% increase in the context of private hospital or clinic. Ayurvedic and homeopathy dramatically increased 6% to 31% from 2013 to 2022.

### Number of Household by Source of Utilities

In this area, people have utilities and good connections for their improved lifestyle. The electricity connections are 100% obtained.



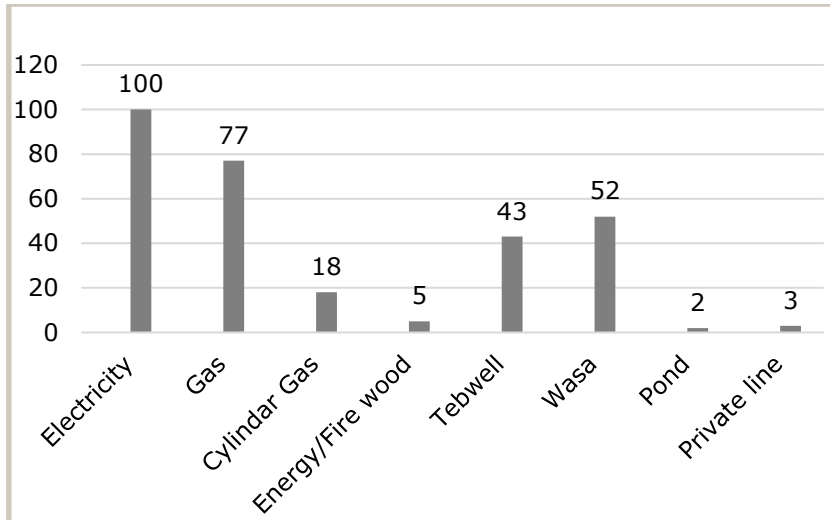


Figure 7-21: Sources of Utilities as per Households

Significant change observes in 2022 for energy and utilities as it shows that 100% are covered by electricity (in 2013, 98%); Gas including Cylinder gas covered 95% households (in 2013, 8% only) and firewood only 5% which was previously 92% in 2013. Although gas lines are mostly illegal connection provided by the local influential people. The local people demanded to have legal connection of gas line as they are spending money for it. Regarding water 52% have access to DWASA supply system while 43% uses tube well, 3% uses private line and 2% uses pond water. The people have access to DWASA pipeline water most of them have complain about quality of water and/or insufficient of water. They have earnest request to get good quality of water and sufficient water as per their need.

#### Number of Household by level of Education

Based on respondent's information it is noticed that 15% people have no education neither went to school; but on average education rate is good. **There is no big difference of data of the survey 2013 and 2022.**

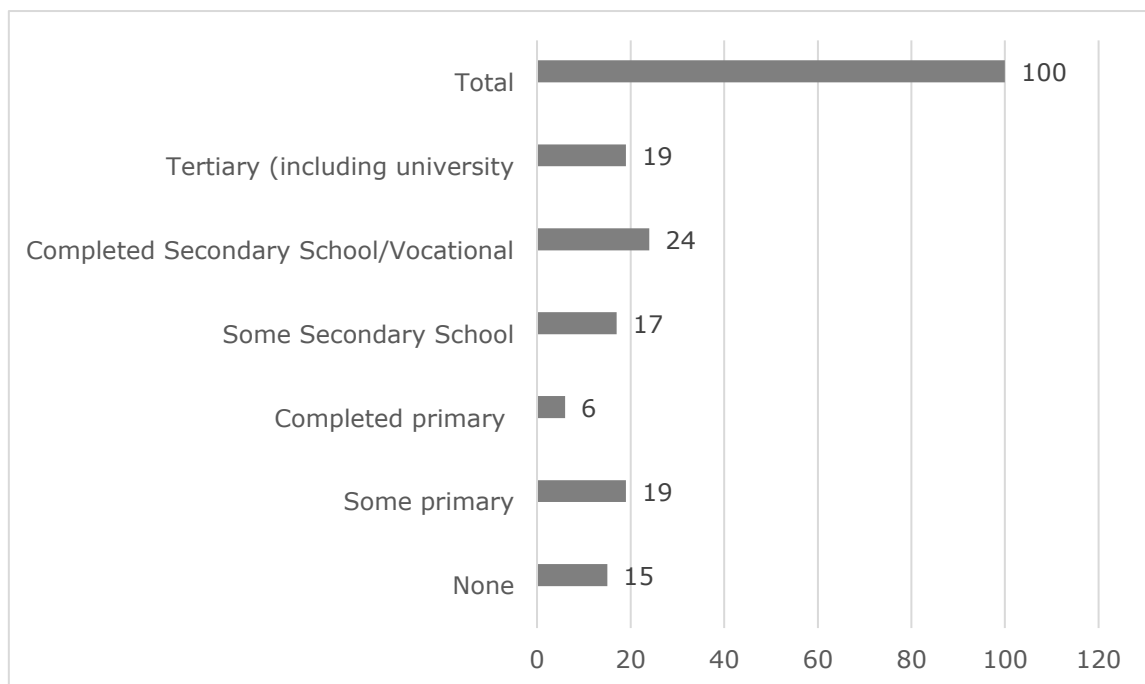


Figure 7-22: Level of Education of Respondent

**TEXT MODIFIED IN 2023**

**(C) Social Survey of January 2023**

In January 2023 a social survey has been carried out for 9-days at the surrounding locations of WTP for Component-2 from Mridhabari, Samad Nagar, Manda to Saidabad area and ended at the East Maniknagar just behind the WTP location. A total of 60 (sixty) people were interviewed as questionnaire survey, 5 (Five) key informants' interviews (KII) and 9 (nine) Focus group Discussion (FGD) were conducted. The specific objective of the social survey was to gather information on the existing social environment surrounding the proposed component-2 sites and its approach roads. The social survey primarily focused on identifying the status of important economic and social factors / circumstances / attributes of the project areas. A total of sixty habitants have been interviewed in a prescribed questionnaire with a professional group of field researchers.

As the required amount of land, for WTP Component-2, already belongs to DWASA so the respondents had no concern about loss of land, houses, trees, commercial structures, loss of business due to construction of WTP. But the people are living close to the boundary have the concern of concerns related to disruption and potential damages during construction and post construction while they requested to minimize as much as possible. The neighborhood assumes to be affected by noise/sound-dust pollution, contractor's materials storage area and carrying pathway of materials may affect usual movement of school going children. So, the remedial measures must be addressed in the contract to reduce this disturbance. The suggestions made by them are to carry the materials preferably at night and avoid the school hours. This may also affect that roadside small businessmen, vendors, and floating shops which needs prior notice to prevent their livelihood disturbance.

The Social Expert team of DSC had a meeting at the DWASA office with the RAP team of KMC who is responsible for preparing RAP for the project. Accordingly, they have prepared and finalized RAP-1 and RAP-2 but RAP-3 preparation is ongoing to identify issues specific to each location and suggest remedial measures. After a discussion it is confirmed by the KMC team and DWASA representative that no land acquisition, relocation or resettlement issues are applicable for the Component-2 so no RAP is needed and no RAP for Component-2 has been prepared.

The respondents of the social survey have some positive views about the employment of local people, and they are hoping that there will be an opportunity for the local unemployed and poor people during construction as skilled or unskilled labourers. It is also an expectation that the local poor women will get work for the engagement of cooking, water carrying, caretaking, earth work, etc. as and when required by the contractor's office and construction site.

**Other major findings are that:**

- > 100% of respondents have access to DWASA supply system and some of them are happy with the quality of water but many of them have a common complain about quality of water and/or insufficient of water, specifically during dry season they suffered a lot. So, they have whole-hearted appeal to DWASA to provide good quality of water and sufficient water to the households and commercial connections.
- > 77% households have natural gas line connection and 20% use Cylinder gas while only 3% use firewood.
- > 100% of respondents have access to the power grid for electricity supply at the households or commercial units.

- > 38% households have private sanitary latrine while 62% households and commercial units have to share the sanitary latrines among the community.
- > Out of 60 households (HHs) 14 are Medium, 16 HHs are lower medium, 25 HHs are poor and 5 HH are vulnerable as per income and expenditure level information received from the respondents during the social survey held in January 2023.

The findings and analysis as per survey design and Social Questionnaire Survey held are summarized in the following section:

#### (i) Respondent by Sex

The Social Survey at the neighbourhood locations of WTP Component-2 sites held in January 2023, the data shows that 50 are male while 10 are female out of a total of 60 people that had been interviewed during the survey. This meant 83% male and 17% female were interviewed.

Out of total 60 respondent, 59 (98.4%) persons are Muslim and only one person (1.6%) is Hindu. One respondent had physical disabilities out of 60 respondents (1.6% respondent).

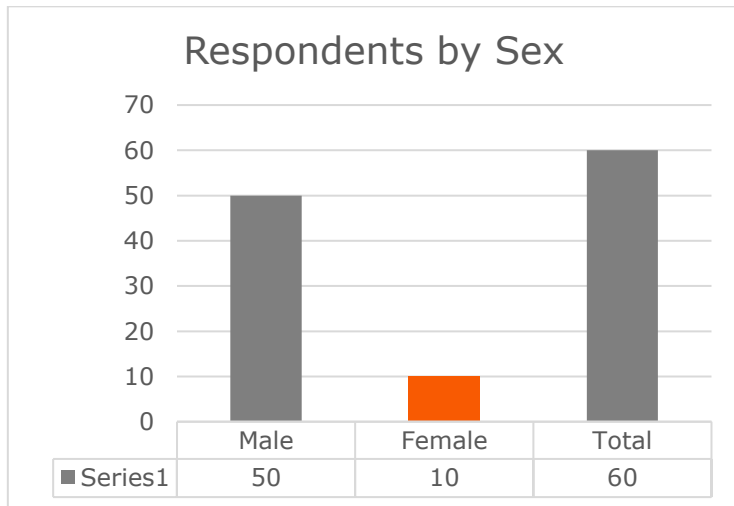


Figure 7-23: Respondent by Sex

#### (i) Household head by Sex

Although it was observed that most of the women from low-income families are involved for livelihood activities including shopkeepers but not treated as head of the household.

However, a total of 5 households head are women out of 60 people interviewed during this social survey held in January 2023 that means 8% head of households are women and 92% head of Households are men of the respondents.

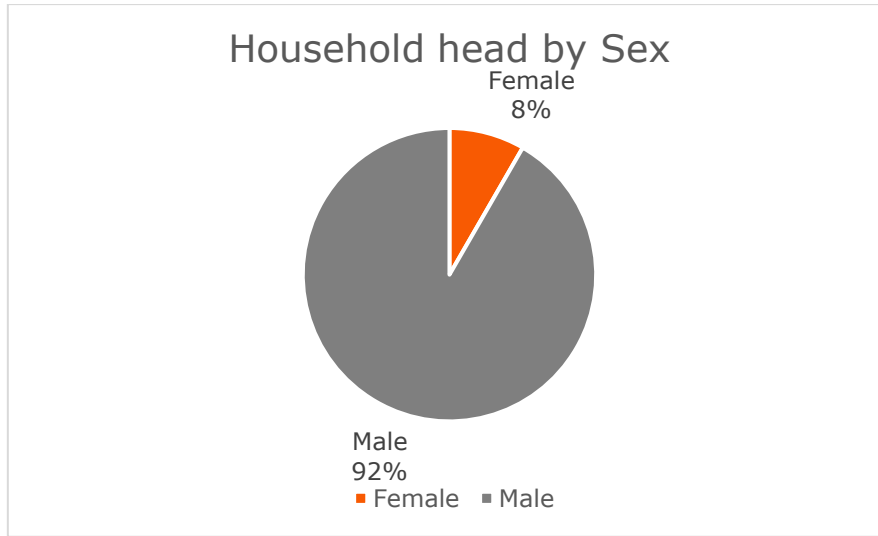


Figure 7-24: Household head by Sex

#### (i) Household by Occupations

It is observed that people from different types of occupations are living in the surveyed locations. The most dominating occupation is small business; then day labour, service holders, business and Rickshaw/Van-puller. There are 3% remittance shows that people are moving to the workforces and try to earn money for better life; they expect to have employment opportunity from the project work. This chart showed the main occupations of the people interviewed.

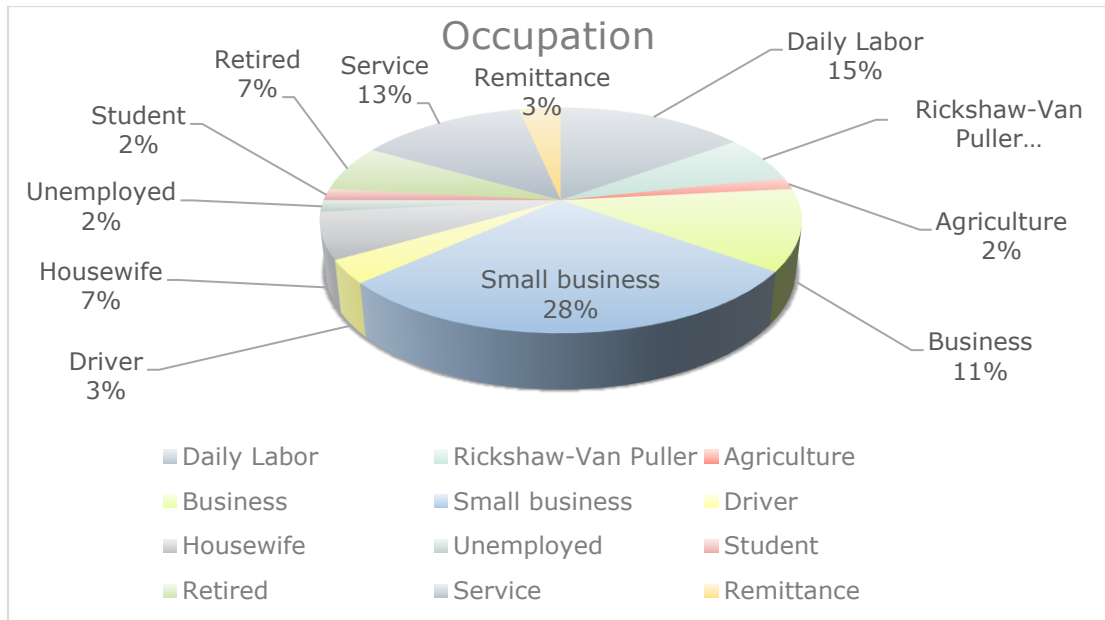


Figure 7-25: Households by Occupations

(i) Household by Source of Utilities

In this area, people have utilities and good connections for their improved lifestyle. The electricity connections are 100% obtained. The natural gas including cylinder gas now covers 97% of households (8% in 2013, & 95% in 2022) and firewood only 3% (92% in 2013 & 5% in 2022). Regarding water, 100% have access to DWASA supply system and most of them are happy about the quality of water.

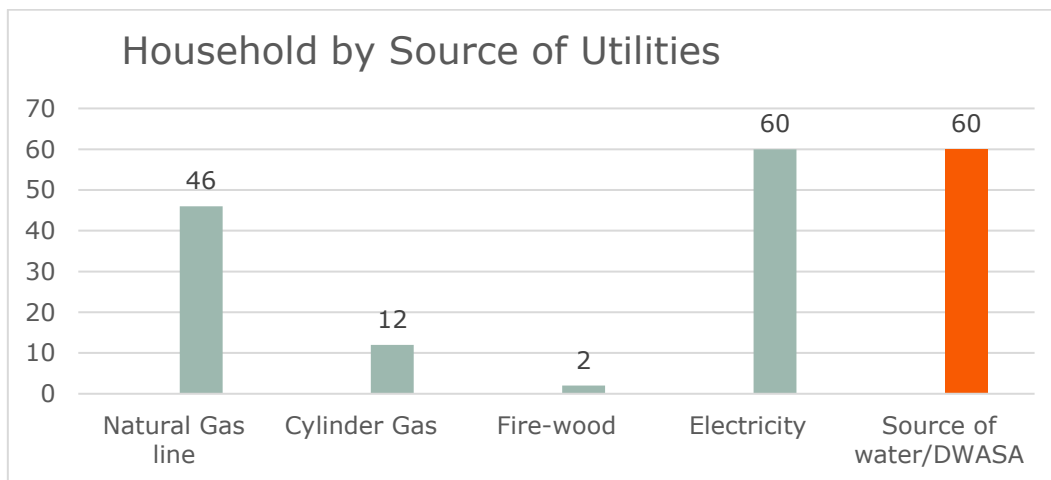


Figure 7-26: Sources of Utilities by Households

(i) Household by level of Education

The current data showed that 10 (17%) people have no education neither went to school; but on average education rate is good. There is a negative change of data of the survey held in 2022 was 15% and now in 2023 is 17% people have no education.

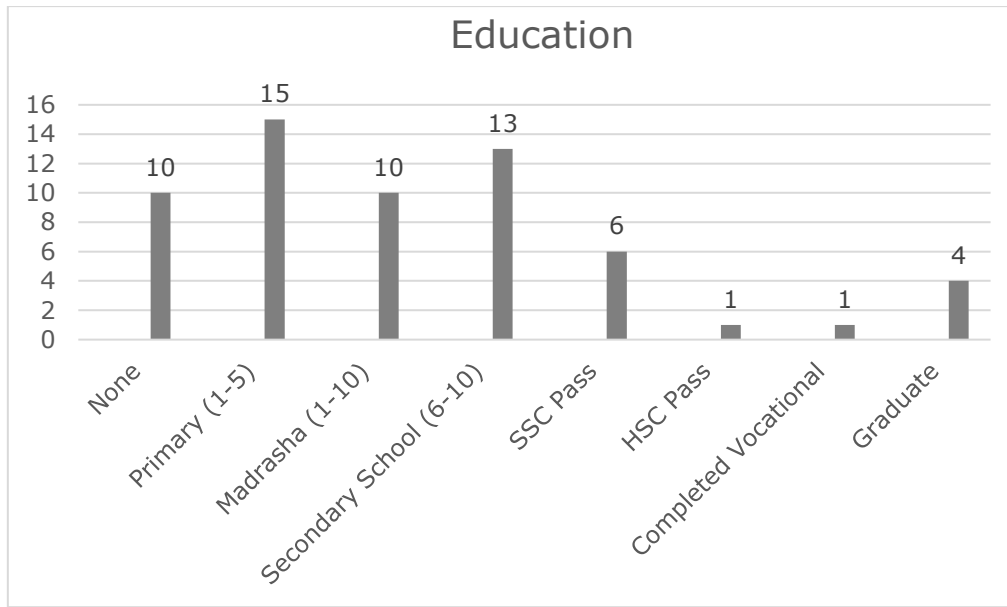


Figure 7-27: Level of Education of Respondent

#### (i) Household by Health Services

Generally, people are going to different institutions for health and medical services. Most of them have no specific complain against this service and seemed they are aware of good health services and concerned about health services and more go for treatment compared to earlier times.

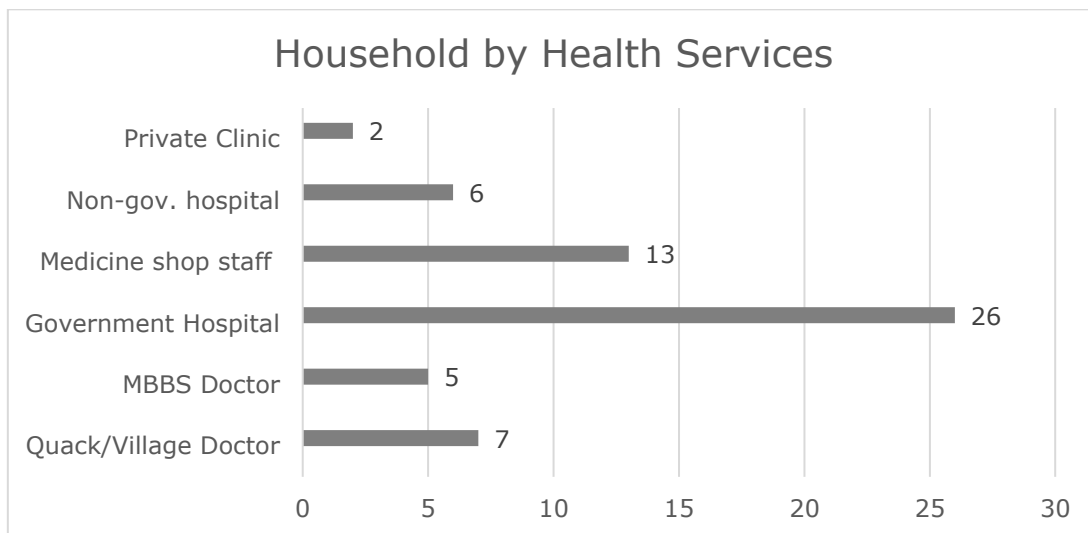


Figure 7-28: Number of Households by Health Services

#### (i) Household using Sanitary Latrine

The observations and data shows that 100% respondent's household use sanitary latrine while 38% households have private sanitary latrine and 62% households (and commercial units) have to share the sanitary latrines among the community.

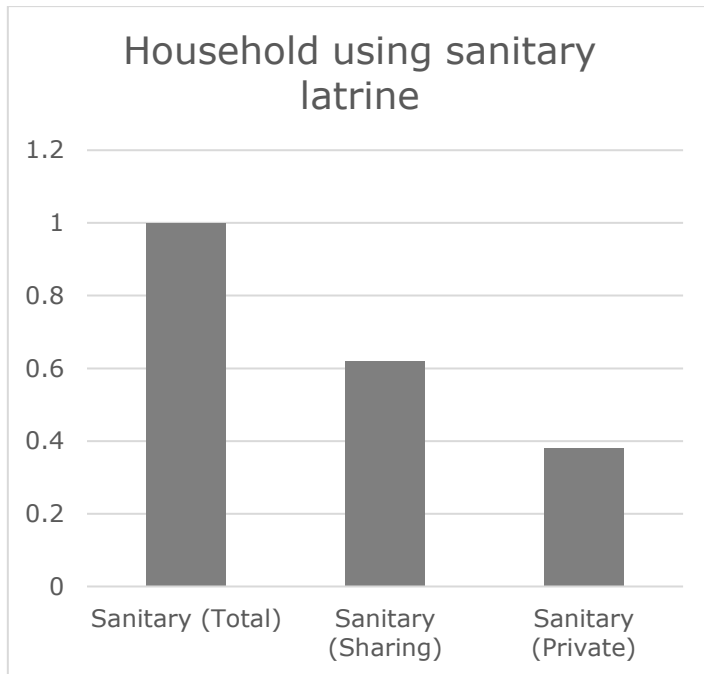


Figure 7-29: Households using sanitary Latrine

#### (i) Household by Income

Out of 60 households (HHs) 14 are Medium, 16 HHs are lower medium, 25 HHs are poor and 5 HH are vulnerable as per income and expenditure level information received from the respondents during the social survey held in January 2023.

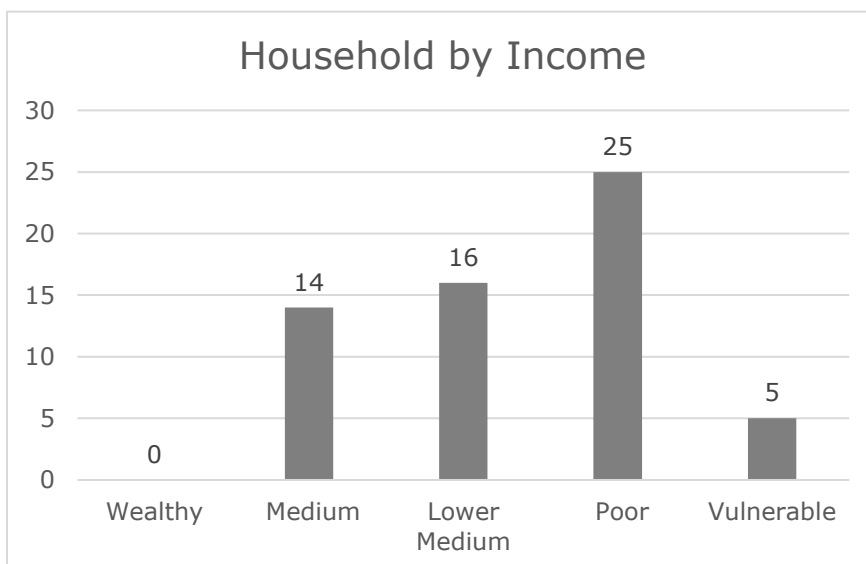


Figure 7-30: Households by Income

#### (i) Household affected by common diseases

The survey data shows that waterborne diseases have been reduced but coldness affected many of them as this year the temperature became lower than previous years and the social survey was done during winter season.



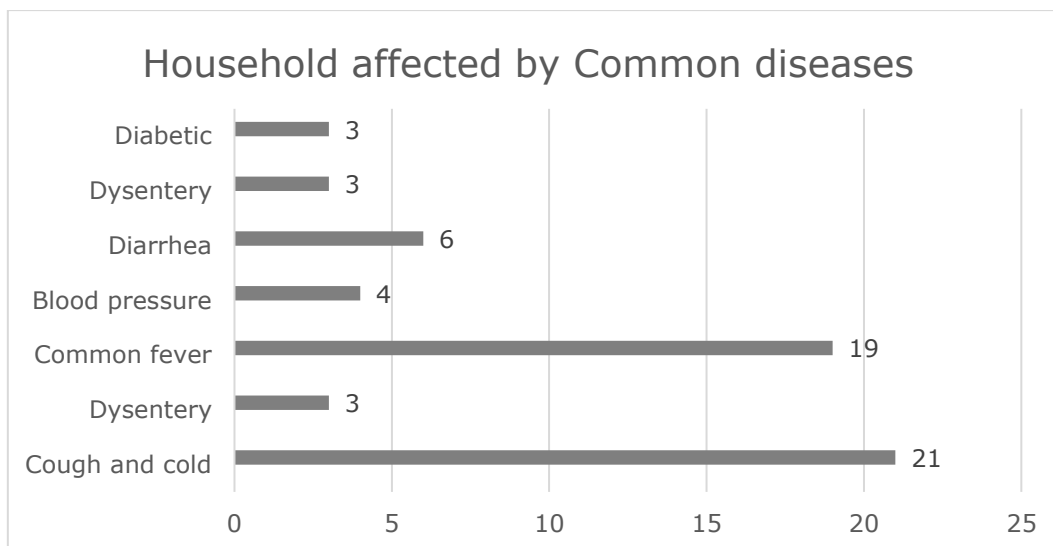


Figure 7-31: Households affected by Common diseases

## 7.5 Socioeconomic Profile of Affected Households

### 7.5.1 Demographic Characteristics in Project Affected Area

(A) Raw water pumping station to near Darikandi Bus stand of Dhaka- Chittagong Highway (6.00 km)

The total project affected unit is 56 (including CPR) of them the Households number is 52. Plain landowners are not surveyed since they will be finally identified by the DC office based on record of rights. The people who will be finally identified by the DC office as landowners and paid compensation as per law, additional compensation will be paid to them by DWASA. The total number of PAPs identified during survey are 232 of the affected HHs. The male population is higher than that of the female. In percentage ratio, 57% are male and (132 no.) 43% are female (100 no.) found in the HH census. This ratio is like the national male-female ratio (109:100). The average household size among the affected people is 4.46. It is noted that there is no ethnic minority in the project area. Besides, all the affected households in the project area recognized as Bengali.

Table 7-1: Distribution of households and Population

Area	Total Affected Unit	HH	Male		Female		Total Population		HH Size
		No	No	%	No	%	No.	%	
Total Alignment of the sub project	56	52	132	57	100	43	232	100	4.46

Source: Census and IOL survey, October 2017

(B) Along Demra-Jatrabari Road up to Middhabari Sluice Gate (6.5 km.)

The total project affected unit is 54 (including 1 Dhaka WASA structure), of that the Households number is 53. Plain landowners are not surveyed since they will be finally identified by the DC office based on record of rights. The people who will be finally identified by the DC office as landowners and paid compensation as per law, additional compensation will be paid to them by DWASA. The total number of PAPs identified during survey are 53 of the

affected HHs. The male population is higher than that of the female. In percentage ratio, 52% are male and (117 no.) 48% are female (110 no.). The average household member size is 4.28. It is noted that there is no ethnic minority in the project area. Besides, all of the affected households in the project area recognized as Bengali.

Table 7-2: Distribution of households and Population

Area	Total Affected Unit	HH	Male		Female		Total Population		HH Size
		No	No	%	No	%	No.	%	
Total Alignment of the sub project	54	53	117	51.54	110	48.46	227	100	4.28

Source: Census and IOL survey, February 2019

## 7.5.2 Distribution of Household Head

(A) Raw water pumping station to near Darikandi Bus stand of Dhaka- Chittagong Highway (6.00 km)

In the perspective of Bangladesh, men are predominantly heading the household. It is observed that among the total HHs, the percentage of male headed households is 88 % while female headed household is 12%. Female-headed households will be eligible for a special grant as per the Resettlement Policy Framework (RPF) of this project.

(B) Along Demra-Jatrabari Road up to Middhabari Sluice Gate (6.5 km.)

In the perspective of Bangladesh, men are predominantly heading the household. In case of the project affected area, no female HH was identified.

## 7.5.3 Age Composition

(A) Raw water pumping station to near Darikandi Bus stand of Dhaka- Chittagong Highway (6.00 km)

According to National demography, there are 109 males for every 100 females in Bangladesh (BBS 2011). This area is also following the regular trend of Bangladesh and male population is higher in almost all age groups. About 5.17 of the people (3.88% male and 1.17% female) were recorded as being over 60 years old, which is almost similar to the national percentage of 5.74% (BBS 2011). The survey also identified about 22% are children (age 1-14) and about 12% are adolescent (age 15-18) of the total population.

Table 7-3: PAPs age composition by sex

Age group	Male		Female		Total	
	No	%	No	%	No	%
Age (1 - 14)	30	12.93	21	9.05	51	21.98
Age (15 - 18)	16	6.90	11	4.74	27	11.64
Age (19 - 20)	3	1.29	5	2.16	8	3.45
Age (21 - 30)	24	10.34	26	11.21	50	21.55
Age (31 - 40)	16	6.90	15	6.47	31	13.36
Age (41 - 50)	22	9.48	14	6.03	36	15.52

Age (51 - 60)	12	5.17	5	2.16	17	7.33
(Age 60+)	9	3.88	3	1.29	12	5.17
Total	132	56.90	100	43.10	232	100.00

Source: Census and IOL survey, October 2017

(B) Along Demra-Jatrabari Road up to Middhabari Sluice Gate (6.5 km.)

According to National demography, there are 109 males for every 100 females in Bangladesh (BBS 2011). This area is also following the regular trend of Bangladesh and male population is higher in almost all age groups. About 7.93 of the people were recorded as being over 60 years old, which is higher than the national percentage of 5.74% (BBS 2011). The survey also identified about 26% are children (age 1-14) and about 8% are adolescent (age 15-18) of the total population.

Table 7-4: PAPS age composition by sex

Age group	Male		Female		Total	
	No	%	No	%	No	%
Age (1 - 14)	29	12.39	31	14.09	60	26.43
Age (15 - 18)	10	4.27	9	4.09	19	8.37
Age (19 - 20)	2	0.85	4	1.82	6	2.64
Age (21 - 30)	20	8.55	20	9.09	40	17.62
Age (31 - 40)	14	5.98	16	7.27	30	13.22
Age (41 - 50)	13	5.56	17	7.73	30	13.22
Age (51 - 60)	17	7.26	7	3.18	24	10.57
(Age 60+)	12	5.13	6	2.73	18	7.93
Total	117	50.00	110	50.00	227	100.00

Source: Census and IOL survey, February 2019

## 7.5.4 Marital Status

(A) Raw water pumping station to near Darikandi Bus stand of Dhaka- Chittagong Highway (6.00 km)

The following table shows the marital status of the population (HH members). It is found that about 61% are married among which only 1.29% females are found married in the age below 18 years of old. It means child marriage is not so much available in the project area. About 38% are unmarried and about 2% are widow/widower.

Table 7-5: Marital Status by sex

Marital Status	Total	%	Male	%	Female	%
Married( <18 Years)	3	1.29	0	0	3	1.29
Married( >18 Years)	138	59.48	75	32.33	63	27.16
Unmarried	87	37.50	57	24.57	30	12.93
Widow/widower	4	1.72	0	0	4	1.72
Total	232	100	132	56.90	100	43.10

Source: Census and IOL survey, October 2017

(B) Along Demra-Jatrabari Road up to Middhabari Sluice Gate (6.5 km.)

The table shows the marital status of the population (HH members). It is found that about 51% are married (male 26% and female 25%) among which only 0.91% female are found married in the age below 18 years of old. It means child marriage is not so much available in the project area. About 44.93% are unmarried, about 3.52% are widow/widower and 0.44% separated.

Table 7-6: Marital Status by sex

Marital Status	Total	%	Male	%	Female	%
Married (<18 Years)	1	0.44	0	0.00	1	0.45
Married(>18 Years)	115	50.66	60	25.64	55	25.00
Unmarried	102	44.93	56	23.93	46	20.91
Widow/widower	8	3.52	0	0.00	8	3.64
Separated	1	0.44	1	0.43	0	0.00
Total	227	100.00	117	50.00	110	50.00

Source: Census and IOL survey, February 2019

## 7.5.5 Household by Religion

The census identified that all the affected PAPs are Muslim by religion. The population influx is very low at the sub project area. The people living at the area for a long time who are Muslim by religion. So that no population affected from other religion even from Hindu religion which is reverse to the National Population Survey.

## 7.5.6 Education

(A) Raw water pumping station to near Darikandi Bus stand of Dhaka- Chittagong Highway (6.00 km)

The education level in the project-affected area (about 90%) is higher than the National average (62.7%, Bangladesh Economic review, 2017). The SE survey revealed that only 9 % (male 5% and female 4%) of all PAPs were illiterate. The survey also identified that the education level above SSC level is very minimum.

Table 7-7: Education level of the PAPs

Education	Total		Male		Female	
	No	%	No	%	No	%
Illiterate	21	9.05	11	4.74	10	4.31
Can sign only	34	14.66	20	8.62	14	6.03
Can read and write	3	1.29	2	0.86	1	0.43
Primary	62	26.72	31	13.36	31	13.36
Below SSC	73	31.47	39	16.81	34	14.66
SSC	21	9.05	16	6.90	5	2.16
HSC	12	5.17	9	3.88	3	1.29
Graduate	3	1.29	2	0.86	1	0.43
Above Graduate	3	1.29	2	0.86	1	0.43
Total	232	100.00	132	56.90	100	43.1

Source: Census and IOL survey, October 2017

(B) Along Demra-Jatrabari Road up to Middhabari Sluice Gate (6.5 km.)

The education level in the project-affected area (about 90%) is higher than the National average(62.7%, Bangladesh Economic review, 2017). The SE survey revealed that only 9 % (male 5% and female 4%) of all PAPs were illiterate. The survey also identified that the education level above SSC level is satisfactory.

Table 7-8: Education level of the PAPs

Education	Total		Male		Female	
	No	%	No	%	No	%
No Schooling	21	9.25	13	5.56	8	3.64
Only signature	12	5.29	4	1.71	8	3.64
Primary	44	19.38	21	8.97	23	10.45
Below SSC	41	18.06	19	8.12	22	10.00
SSC or equivalent	36	15.86	13	5.56	23	10.45
HSC or equivalent	35	15.42	21	8.97	14	6.36
Degree or equivalent	19	8.37	12	5.13	7	3.18
Master or equivalent	19	8.37	14	5.98	5	2.27
Total	227	100.00	117	50.00	110	50.00

Source: Census and IOL survey, February 2019

## 7.5.7 Income and Expenditure of HHs

(A) Raw water pumping station to near Darikandi Bus stand of Dhaka- Chittagong Highway (6.00 km)

Based on Bangladesh Bureau of Statistics (BBS 2011) and yearly inflation (average 6.50% per year) as of 2018, the poverty line of the affected HHs has been considered up to BDT 10000 per month for the HHs size of 4.46 people. The survey identified that about 33% HHs

are below poverty line, and which is higher than the National extreme poor poverty of 12.1% (Bangladesh Economic Review 2017). These poor HHs will be eligible for special support as per RAP of the project.

*Table 7-9 Income and expenditure of households at the raw water pumping station*

Range	Income		Expenditures	
	No.	%	No.	%
Up to 10,000	17	33	17	33
10,001-20,000	29	56	29	56
20,001-30000	3	6	4	8
Above 30,001	3	6	2	4
Total	52	100	52	100

*Source: Census and IOL survey, October 2017*

(B) Along Demra-Jatrabari Road up to Middhabari Sluice Gate (6.5 km.)

Based on Bangladesh Bureau of Statistics (BBS 2011) and yearly inflation (average 6.50% per year) as of 2018, the poverty line<sup>5</sup> of the affected HHs has been considered up to BDT 10000 per month for the HHs size of 4.28 people. The survey identified that there is no PAP below poverty line. Survey also identified that 64.15% (above BDT 30001) income level is highest where upto 10,001-20,000 is 18.87% and upto 20,001-30000 is 16.98.

*Table 7-10 Income and expenditure of households along Demra-Jatrabari Road up to Middhabari Sluice Gate*

Range	Income		Expenditures	
	No.	%	No.	%
Up to 10,000	0	0	0	0
10,001-20,000	10	18.87	10	18.87
20,001-30000	9	16.98	10	18.87
Above 30,001	34	64.15	33	62.26
Total	53	100.00	53	100.00

*Source: Census and IOL survey, February 2019*

## 7.5.8 Occupation Pattern

(A) Raw water pumping station to near Darikandi Bus stand of Dhaka- Chittagong Highway (6.00 km)

Among the affected people, businesses and agriculture appears to be the main occupations. Among the male population, most of the eligible and capable members are involved in income generating activities. Female are mostly housewife and also involved in allied

---

<sup>5</sup> According to Bangladesh Bureau of Statistics (BBS) the upper poverty line for HH size of 4.72 in 2011 for Dhaka region was BDT 6,458.86 per HH/month. Acknowledging the national inflation rates by BBS based on consumer price for the country (Average 6.5% per year for 8 years up to 2018) and an average HH size for the affected population being 4.28, BDT 9,691 say 10,000 income per HH/month has been adopted as the 2018 poverty line for the project.

activities focusing on maintaining the home and families. As per the socioeconomic survey, 5.17 male are found to be totally unemployed. Income and livelihood restoration program can enhance capacity of the people particularly female and vulnerable people for doing more income generating activities.

*Table 7-11: Principal occupation of the affected population in the Project area*

Occupation of member	Total	%	Male	%	Female	%
Agriculture	26	11.21	26	11.21	0	0
Business	28	12.07	28	12.07	0	0
Housewife	67	28.88	0	0.00	67	28.88
Carpenter	1	0.43	1	0.43	0	0
Child	14	6.03	10	4.31	4	1.72
Day labor	10	4.31	10	4.31	0	0
Mason	4	1.72	4	1.72	0	0
Motor driver	1	0.43	1	0.43	0	0
Service (Private/Government)	10	4.31	8	3.45	2	0.86
Student	57	24.57	32	13.79	25	10.78
Unemployed	12	5.17	12	5.17	0	0
Others	2	0.86	1	0.43	1	0.43
Total	232		132	56.90	100	43.10

*Source: Census and IOL survey, October 2017*

(B) Along Demra-Jatrabari Road up to Middhabari Sluice Gate (6.5 km.)

Among the affected people, businesses. Housewife and student appears to be the main occupations. Among the male population, most of the eligible and capable members are involved in income generating activities. Females are mostly housewife and also involved in allied activities focusing on maintaining the home and families. As per the socioeconomic survey, 2.14 % male are found to be totally unemployed. Income and livelihood restoration program can enhance capacity of the people particularly female and vulnerable people for doing more income generating activities.

*Table 7-12: Principal occupation of the affected population in the Project area*

Occupation of member	Total	%	Male	%	Female	%
Business	49	20.97	48	20.51	1	0.45
Housewife	62	28.18	0	0.00	62	28.18
Child	17	7.43	11	4.70	6	2.73
Day labor	1	0.43	1	0.43	0	0.00
Service (Private /Government)	12	5.16	11	4.70	1	0.45
Student	74	32.68	35	14.96	39	17.73
Unemployed	5	2.14	5	2.14	0	0.00
Retired	7	3.02	6	2.56	1	0.45
Total	227	100	117	50.00	110	50.00

*Source: Census and IOL survey, February 2019*

## 7.5.9 Economic Activities of PAPs

The survey identified that business and agriculture are the main occupation of the PAPs. On the other hand, the Figure 7-32 below shows that business and agriculture are also the allied/secondary income sources of the affected people whereas women are also connected to such activities along with household chores.

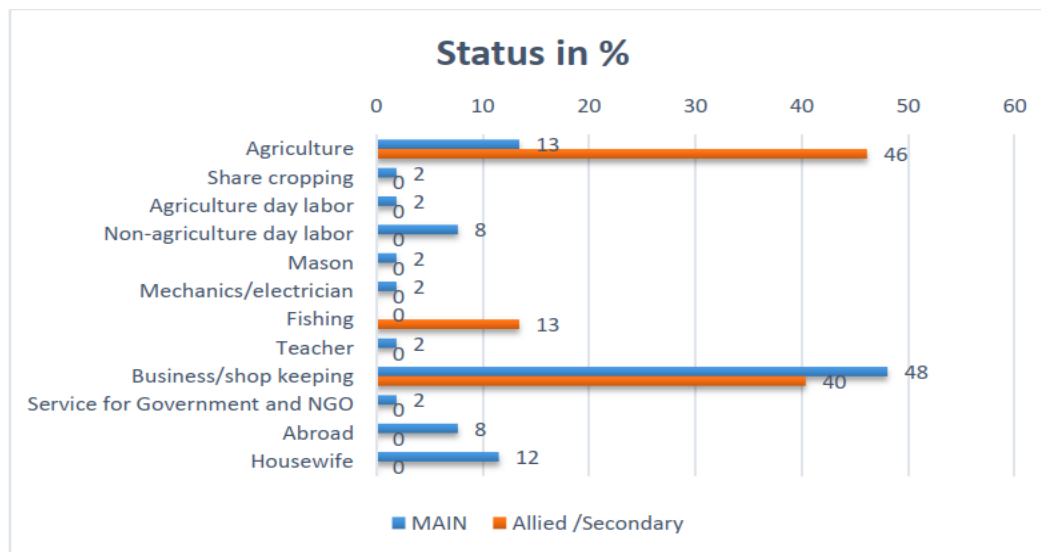


Figure 7-32: Economic Activities of Eligible PAPs  
Source: Census and IOL survey, October 2017

## 7.5.10 Status of Access to Different Amenities

(A) Raw water pumping station to near Darikandi Bus stand of Dhaka- Chittagong Highway (6.00 km)

The survey indicates that 81% of APs use slab latrine and 29% use sanitary latrine. The data also shows that 100% HHs use gas for cooking. In case of sources of lighting about 98% HH use electricity and only 2% don't have any access to electricity.

Table 7-13: HH access to amenities

Sl. No	Types of Amenities	No.	%
A	Type of Toilet		
A1	Sanitary	15	28.85
A2	Slab latrine	42	80.77
A3	TOTAL	52	100.00
B	Fuel for cooking		
B1	Gas	52	100
B2	TOTAL	52	100
C	Sources of lighting		
C1	Electricity	51	98.08
C2	Diesel/Kerosene	1	1.92
C3	TOTAL	52	100.00



Source: Census and IOL survey, October 2017

(B) Along Demra-Jatrabari Road up to Middhabari Sluice Gate (6.5 km.)

The survey indicates that 7.55% of APs use slab latrine and 92.45% use sanitary latrine. The data also shows that 94.34% HHs use gas and 5.66 use wood for cooking. In case of sources of lighting about 100% HH use electricity.

Table 7-14: HH access to amenities

Sl. No	Types of Amenities	No.	%
<b>A</b>	Type of Toilet		
<b>A1</b>	Sanitary	49	92.45
<b>A2</b>	Slab latrine	4	7.55
<b>A3</b>	TOTAL	53	100.00
<b>B</b>	Fuel for cooking		
<b>B1</b>	Gas	50	94.34
<b>B2</b>	Wood	3	5.66
<b>B3</b>	TOTAL	53	100.00
<b>C</b>	Sources of lighting		
<b>C1</b>	Electricity	53	100
<b>C2</b>	Diesel/Kerosene	0	0
<b>C3</b>	TOTAL	53	100.00

Source: Census and IOL survey, February 19

## 7.6 Grievance Redress Mechanism

The Grievance Redressal Procedure (GRP) for the planned construction works aims to provide a structured approach for addressing and resolving grievances related to the works. This procedure ensures that individuals or organizations affected by the construction activities have a fair and transparent mechanism to express their concerns and seek resolution.

The GRP applies to all stakeholders, including local communities, residents, employees, contractors, and any other party directly or indirectly affected by the proposed works.

Grievances will include, but are not limited to, the following categories:

- Water quality/pollution issues.
- Temporary interruptions or disruptions during construction.
- Environmental concerns.
- Health and safety issues.
- Resettlement matters.
- Communication and public relations matters.

The Contractor shall be responsible for assisting the Employer in all aspects related to the grievance redressal process of the relevant sections of the construction work packages.

Individuals or organizations with grievances shall be advised to follow the following steps:

- a) Submit a written grievance to the designated Grievance Redress Official (GRO) at PMU's office within 30 days of the incident or concern.
- b) The grievance should include the following details:
- c) Name and contact information of the complainant.
- d) Date, time, and location of the incident.
- e) Description of the grievance, including relevant supporting documents or evidence.
- f) Desired resolution or outcome sought by the complainant.
- g) The grievance can be submitted via email, physical mail, or an online portal established for this purpose.

### 7.6.1 Grievance Redressal Official (GRO)

The Project Management Unit (PMU) of Saidabad Water Treatment Plant Phase-3 will be accountable for the overall implementation of the project-level grievance mechanism (GM) to ensure that all grievances and/or objections (raised by affected stakeholders or communities) are received, acknowledged and addressed as per the GM procedure as set out below. The contractor shall support implementation of the GM procedure.

PMU will appoint a qualified and impartial GRO responsible for handling and overseeing the grievance redress process. The GRO will acknowledge the receipt of the grievance within three working days and provide a unique reference number for tracking purposes.

### 7.6.2 Grievance Evaluation and Investigation:

The GRO will assess the grievance, investigate if necessary, and collect all relevant information from relevant departments or individuals. The investigation process should be completed within 15 working days from the date of grievance submission. If the investigation requires more time, the GRO should inform the complainant of the delay, providing an estimated timeline for resolution.

### 7.6.3 Grievance Resolution

Based on the findings of the investigation, the GRO will propose a resolution or action plan to address the grievance. The proposed resolution will be communicated to the complainant in writing, along with the reasons for the decision.

If the complainant accepts the proposed resolution, the GRO will ensure its implementation within a reasonable timeframe.

If the complainant does not accept the proposed resolution, they can request a review of the decision by submitting a written request to the GRO within ten working days.

#### Review and Appeal:

The GRO will review the request for a review within ten working days and reconsider the proposed resolution in light of additional information provided by the complainant.

The revised decision will be communicated to the complainant within ten working days.

If the complainant remains dissatisfied with the outcome, they may appeal to the senior management authority of Dhaka WASA.

The senior management authority, led by the Deputy Managing Director (Development) will conduct an independent review of the grievance and provide a final decision within 20 working days.

## 8 Public Consultation and Communication

**TEXT MODIFIED IN 2022**

### 8.1 Introduction

Both PMC and DSC have prepared construction work package specific Stakeholder Engagement Plan (SEP) for the wider scheme. Stakeholder identification and assessment as described in SEP have been followed in this updated ESIA. As noted earlier, social survey, Focus Group Discussions (FGDs) and public consultations (formal and informal meetings) were carried out for documenting the existing socio-economic condition in the project areas and for assessment of social impact of project activities. The FGDs were conducted involving major stakeholders. The public consultations were carried out in public places within the project areas for documenting views, opinions, and concerns of the local people. This Chapter presents the major findings from the FGDs and public consultations. The outcomes of the social survey have been presented in Chapter 5.

### 8.2 Methodology

#### **May 2022:**

A total of 15 Focus Group Discussions organized in different locations of project area during the ESIA report update period. To get people's view on various issues a total of 140 local people were consulted through group discussions and noted their opinions. One questions they raised about the compensation rate as they learned the rate is 3-times of actual price of land. In this case our response was that if the assessment and formalities done before the declaration of new compensation rate then they are not eligible for this. Further Resettlement NGO need to check this issue before finalized the compensation list and amount by the DC office if that did not finalize yet.



Figure 8-1: Focus Group Discussions

Table 8-1: Details of FGDs for the proposed SWTP Phase –III Project.

Sl. No.	Date	Time	Meeting Place	Attendees
1	12.05.2022	10.45-11.45	Gazi Bari, Haria, Baidhar Bazar, 2 No Union, Sonargaon, Narayanganj	10
2	12.05.2022	11.50-01.10	Aminpur Union, Ward No. 1, Dorpat, Sonargaon, Narayanganj	11
3	12.05.2022	12.30-02.00	Dorpat, Thotaliya, Sonargaon, Narayanganj	10
4	13.05.2022	09.30-10.30	Joshna Begum Bari, Noyanagar, Ramdi, Sonargaon, Narayanganj	12
5	13.05.2022	11.20-12.15	Hazi Md Jashim Uddin Bari, Noyanagar, Ramdi, Sonargaon, Narayanganj	11
6	13.05.2022	12.30-01.40	Dorpat Tea stall, Sonargaon, Narayanganj	11
7	14.05.2022	10.40-11.50	Maddhay Nandi para, Sabujbagh, Dhaka	10
8	14.05.2022	12.30-01.50	Rusulbagh, 24 Feet, Kadamtoli, Dhaka	11
9	14.05.2022	12.30-01.40	Abdul Hannan Tea stall, Jatrabari, Dhaka	10
10	15.05.2022	09.20-10.30	Hazinagar tea stall, Demra, Dhaka	13
11	15.05.2022	10.30-11.20	Dakkhin hajinagar, Demra, Dhaka	12
12	15.05.2022	11.20-12.30	Nandipara, Khilgaon, Dhaka	10
13	16.05.2022	10.30-11.30	Golden Convention Centre, Zia Sarni Road, Kadomtoli, Dhaka	11
14	16.05.2022	12.30-01.30	Dakkhingaon, Sabujbagh, Dhaka	9
15	16.05.2022	01.30-02.30	Purbo basabo Patwary Goli, Sabujbagh, Dhaka	12

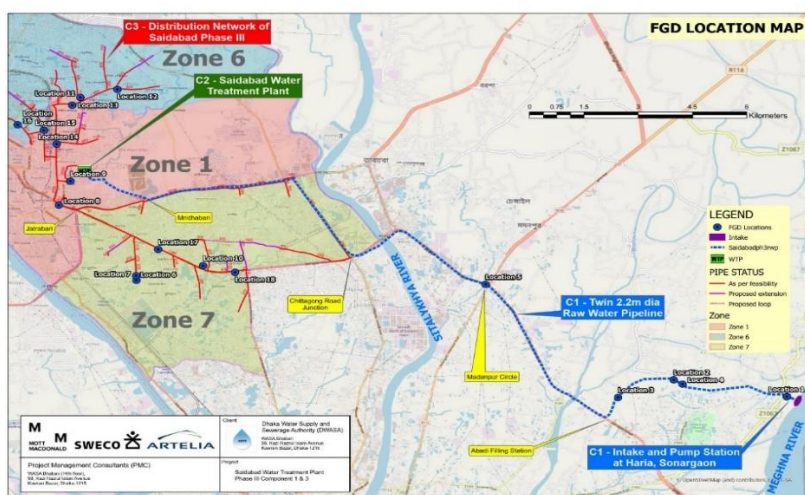


Figure 8-2: Location Map of FGDs

### January 2023

A total of 9 (nine) Focus Group Discussions organized in different locations of neighbourhood locations of WTP Component-2 construction area for updating the ESIA report. To get people's view on various issues a total of 140 local people were consulted through group discussions and noted their opinions. In Mridhabari area, the people raised a question about the compensation rate as they learned the rate is 3-times of actual price of land acquired. We reviewed some of their papers of land-case and noticed that was done for C1 & C3 not for C2 so we informed that the survey we are doing now is not related to the land acquisition as the WTP C2 construction will be held on the DWASA land owned for long years. Even though, if the assessment and formalities done before the declaration of new compensation rate (2017) then they are not eligible for the new rate of land price.

As the required amount of land, for WTP Component-2, already belongs to DWASA so the respondents of other locations had no concern about loss of land, houses, trees, commercial structures, loss of business due to construction of WTP. But the people are living close to the boundary have concerns related to disruption and potential damages during construction and post construction which they requested to minimize as much as possible. The neighbourhood assumes to be affected by noise/sound-dust pollution, contractor's materials storage area and carrying pathway of materials may affect usual movement of school going children. So, the remedial measures must be addressed in the contract to reduce this disturbance. The suggestions made by them are to carry the materials preferably at night and avoid the school hours. This may also affect that roadside small businessmen, vendors, and floating shops which needs prior notice to prevent their livelihood disturbance.

Table 8-2: Details of FGDs for the Component-2 SWTP Phase-III Project, Dec. 2022-Jan. 2023

Sl. No.	Date	Meeting Place	Participants		
			Total	Male	Female
1	29.12.2022	M/S Rahmat Traders, Kajlar par, Shahid Muzaffar Sarok, Ward No. 63, DSCC, Jatrabari, Dhaka	10	10	-
2	30.12.2022	East Kajla Samad Nagaor, Crossroad, Ward No. 63, DSCC, Jatrabari, Dhaka	11	9	2
3	30.12.2022	East Maniknagar first lane, Ward No. 7, DSCC, Mugda, Dhaka	8	8	-
4	31.12.2022	Jalal er Bari (Close to DWASA North boundary wall - Women-only FGD), East Maniknagar, Mugda, Dhaka	10	-	10
5	31.12.2022	Bappi store, Dholpur, WASA Gate, Ward No. 49, DSCC, Jatrabari, Dhaka	10	9	1
6	31.12.2022	Tea Stall (Morer chha dokan), Dholpur, WASA Road, Ward No. 49, DSCC, Jatrabari, Dhaka	8	8	-
7	31.12.2022	Tea stall Kajla Halot par, Ward No. 63, DSCC, Jatrabari, Dhaka	10	10	-
8	01.01.2023	53/4, 19 katha goli, East Maniknagar, Ward No. 7, DSCC, Mugda, Dhaka	9	5	4
9	01.01.2023	Shofikul islam's Rickshawa garage, East Maniknagar, Ward No. 7, DSCC, Mugda, Dhaka	10	7	3





Figure 8-3: Pictures from FGDs/other meetings of January 2023

### 8.3 Key Findings from FGDs and Key Informant Interview May 2022

During the FGDs, efforts were made to get feedback from people on the nature of impacts and their suggestions about ways to mitigate the adverse impacts and enhance beneficial impacts. People who participated in the public consultations were found enthusiastic in sharing their views. The participants expressed their opinions regarding different issues including their knowledge about the proposed project, socio-economic condition of people in their localities, possible impact of the proposed project on the environment and in their localities, and mitigation measures to address adverse impacts. The major findings of the FGDs are summarized below in Table 8-3.

Table 8-3: Findings of FGDs

Source of Income	Source of water	Electricity	Energy/Gas	Education	Health	NGO service	Impact of DWASA work
<ul style="list-style-type: none"> <li>&gt; The source of income is litchi garden.</li> <li>&gt; Most of the men in the area go to Dhaka to work. They go in the morning and come in the afternoon.</li> <li>&gt; There is a service general hospital and a family health clinic in Haria Chowdhury Para where some local people have master roll basis employment</li> <li>&gt; There is a market in Anandabazar and every morning they can buy fresh vegetables and other needful things.</li> <li>&gt; Everything you need is available there.</li> </ul>	<ul style="list-style-type: none"> <li>&gt; There are deep tube wells as the only source of water in the village near the Meghna River.</li> <li>&gt; All the work including bathing and cooking is done in the water of the tube well.</li> <li>&gt; A total of 6 people in their family, including 2 daughters, have been using tube-wells for 2 years, there is no arsenic in the water but there is iron in the water.</li> </ul>	<ul style="list-style-type: none"> <li>&gt; 100% of the locality surveyed have electricity connections</li> <li>&gt; In the rural part they pay the electricity bill by card or meter and their electric connect is legal.</li> <li>&gt; There is a power line, the bill comes through the meter.</li> <li>&gt; The bill increased during summer season which is 3 times more</li> </ul>	<ul style="list-style-type: none"> <li>&gt; There is illegal gas line. They don't pay monthly bill; every 2/3 years the authority cut the line then ask for a certain amount i.e. 5000 to 10000 taka per household for reconnection of the illegal connections.</li> <li>&gt; They paid 80,000 per households for the first-time connection without any money receipt;</li> </ul>	<ul style="list-style-type: none"> <li>&gt; The people are aware of education and send their children to schools or madrasahs.</li> <li>&gt; Girls' education rate is good, and mothers are concerned for their daughters' education.</li> <li>&gt; Suraiya Akhter said there are several kindergartens and madrasas in the area.</li> <li>&gt; Donia University College, A.K. High School and College, Shampur Model School and College,</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Local people are aware of health care and go to doctors for treatment.</li> <li>&gt; Most of them go to government hospital as that is free and give medicine for free of cost.</li> <li>&gt; The people are better in economic condition, they go to private clinics for good services.</li> <li>&gt; There is a clinic in Darpat where medicine is also provided free of cost.</li> <li>&gt; Gynaecologists come here on</li> </ul>	<ul style="list-style-type: none"> <li>&gt; NGOs work are not very popular here.</li> <li>&gt; NGOs have not much welfare programs here except micro-credit.</li> <li>&gt; The NGOs are working here named ASA, BRAC, Social Islami Bank, Palli Mangal, PROSHIKA, and some more but they could not give the names just said several NGOs work here.</li> <li>&gt; Necessary consumer goods are available in</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Many of the houses, crops, lands, plants and gardens will be damaged due to the DWASA water supply pipeline from Sonargaon to Dhaka.</li> <li>&gt; The amount of money for land we have received from the government is much less than the local market price.<sup>6</sup></li> <li>&gt; That amount of we received that cannot be used to buy new land in the same locality as because now the price of land is higher than before.</li> <li>&gt; So, we want the government to</li> </ul>

<sup>6</sup> These PAPs were eligible and will receive top-up after RAP implementation consultant's assessment.



Source of Income	Source of water	Electricity	Energy/Gas	Education	Health	NGO service	Impact of DWASA work
<ul style="list-style-type: none"> <li>&gt; Some of them have fish farms &amp; and raises cows.</li> <li>&gt; An auto driver can earn 10/15 thousand taka per month.</li> <li>&gt; Nazrul Islam is earning Taka 8,000 to 10,000 a month who is a van driver.</li> <li>&gt; Some have poultry farms, some have cattle farms, litchi gardens and agriculture farming.</li> <li>&gt; Many people work in agriculture. Paddy, maize etc. are cultivated. There is also income from litchi garden.</li> <li>&gt; The people here mostly run small businesses, some have jobs, many have house owners who earn by renting the houses.</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Few cases have Deep tube well.</li> <li>&gt; Some people use ponds while collect drinking water from the Masjid's deep tube well.</li> <li>&gt; In the market area and the urban sides, they have access to DWASA pipelines connections but complain about water quality.</li> <li>&gt; During last Ramadan they suffered due to scarcity of water. They received water at midnight of</li> </ul>	<ul style="list-style-type: none"> <li>of winter season.</li> <li>&gt; Frequent load shading is a big problem which disturb daily life mostly children's education.</li> </ul>	<ul style="list-style-type: none"> <li>they said your gas line is the receipt for you.</li> <li>&gt; Many of the households use cylinder gas but it is very expensive for them.</li> <li>&gt; Some of them has no gas line or Cylinder who is firewood in the traditional mud-cooker.</li> <li>&gt; In some cases, they have Improved Cook Stove while less consumption of firewood that reduce the cost.</li> <li>&gt; Some of them use Cylinder gas during</li> </ul>	<ul style="list-style-type: none"> <li>Barnamala Adarsh High School.</li> <li>&gt; There are primary schools, secondary schools, and madrasas.</li> <li>&gt; The area has primary schools, secondary schools and madrasas and kindergartens.</li> <li>&gt; There are schools and madrasas in the village.</li> <li>&gt; The old people are mostly illiterate, more specifically old women are not literate.</li> </ul>	<ul style="list-style-type: none"> <li>Tuesdays and Wednesdays.</li> <li>&gt; There is also a doctor here every day</li> <li>&gt; There are some pharmacies in the local market and in the village, there are also family clinics.</li> <li>&gt; The treatment is not good, there are some local clinics.</li> <li>&gt; The biggest problem is to take the patient to Narayanganj city or Dhaka.</li> <li>&gt; The medical system is not so good. There are drug pharmacies.</li> </ul>	<ul style="list-style-type: none"> <li>the rural market, and they can by instalments basis, so they do not bother about NGO service.</li> <li>&gt; NGOs loan is high interest and every week they come for kisti (instalments) so unless emergency they do not like to take loan from NGOs.</li> </ul>	<ul style="list-style-type: none"> <li>give us some more money.</li> <li>&gt; The people present in the meeting said that the new pipeline of DWASA for fetching water from the Meghna River has passed over their houses. They must move from the locality and loose the social connections with neighbourhood and relatives.</li> <li>&gt; There is WASA pipeline connections exists but sometimes water comes less, dirty water also comes with bad smell.</li> <li>&gt; We want good quality water from new connections.</li> </ul>

Source of Income	Source of water	Electricity	Energy/Gas	Education	Health	NGO service	Impact of DWASA work
	every alternative day which was not sufficient for them.		emergency but mostly cook by firewood.				

### **January 2023**

During the FGDs, efforts were made to get feedback from people on the nature of impacts and their suggestions about ways to mitigate the adverse impacts and enhance beneficial impacts. People who participated in the FGDs and the public consultations were found enthusiastic in sharing their views. The participants expressed their opinions regarding different issues including their knowledge about the proposed project, socio-economic condition of people in their localities, possible impact of the proposed project on the environment and in their localities, and mitigation measures to address adverse impacts. The major findings of the FGDs are summarized below in Table 8-4.

Table 8-4: Findings of FGDs from January 2023

Source of Income	Source of water	Electricity	Energy/Gas	Education	Health	NGO service	Impact of DWASA work
<ul style="list-style-type: none"> <li>&gt; Hardware business.</li> <li>&gt; Income from house rent</li> <li>&gt; Daily wage labourers.</li> <li>&gt; Rickshaw Pullers</li> <li>&gt; Van Drivers</li> <li>&gt; Renting the shops</li> <li>&gt; Owner of a grocery store</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Main source of water is supply water from DWASA (100%)</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Main source of light is Electricity (100%)</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Main source of energy is gas line, cylinder gas and firewood for cooking purposes (100%)</li> </ul>	<ul style="list-style-type: none"> <li>&gt; The people are aware of education and send their children to schools or madrashas.</li> <li>&gt; Girls' education rate is good, and mothers are concern for their daughter's education.</li> <li>&gt; There are primary schools, secondary schools, madrasas and kindergartens.</li> <li>&gt; The old people are mostly illiterate, more specifically old women are not literate.</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Water-borne disease is not seen very much now</li> <li>&gt; The people are better in economic condition, they go to private clinics for good health services.</li> <li>&gt; Medium income people are also aware of health care and go to private doctors for treatment.</li> <li>&gt; Most of the low-income and poor people m go to government hospital as that is free and also give medicine for free of cost.</li> <li>&gt; There are some pharmacies in the local area and poor people go there and buy medicine as per their suggestions</li> <li>&gt; Some poor people also go to Quack or buy medicine by themselves without any consultations of the doctors.</li> </ul>	<ul style="list-style-type: none"> <li>&gt; NGOs are working here but not very popular.</li> <li>&gt; NGOs have not much welfare programs here except micro-credit.</li> <li>&gt; The NGOs are working here named Sajeda Foundation, ASA, BRAC, Social Islami Bank, PROSHIKA, and some more NGOs work here.</li> <li>&gt; NGOs loan is high interest and every week they come for kisti (instalment) so unless emergency they do not want to take loan from NGOs.</li> </ul>	<ul style="list-style-type: none"> <li>&gt; There is WASA pipeline connections exists but sometimes water quality is not good, and flow is not sufficient, dirty water also comes with bad smell in few cases.</li> <li>&gt; There will be no direct effect of the local people or their property as there is no land acquisition, but other problems can be occurred due to construction work and temporary use of land for construction materials storage</li> <li>&gt; They requested to take measures properly to reduce the problems that may be happened.</li> </ul>

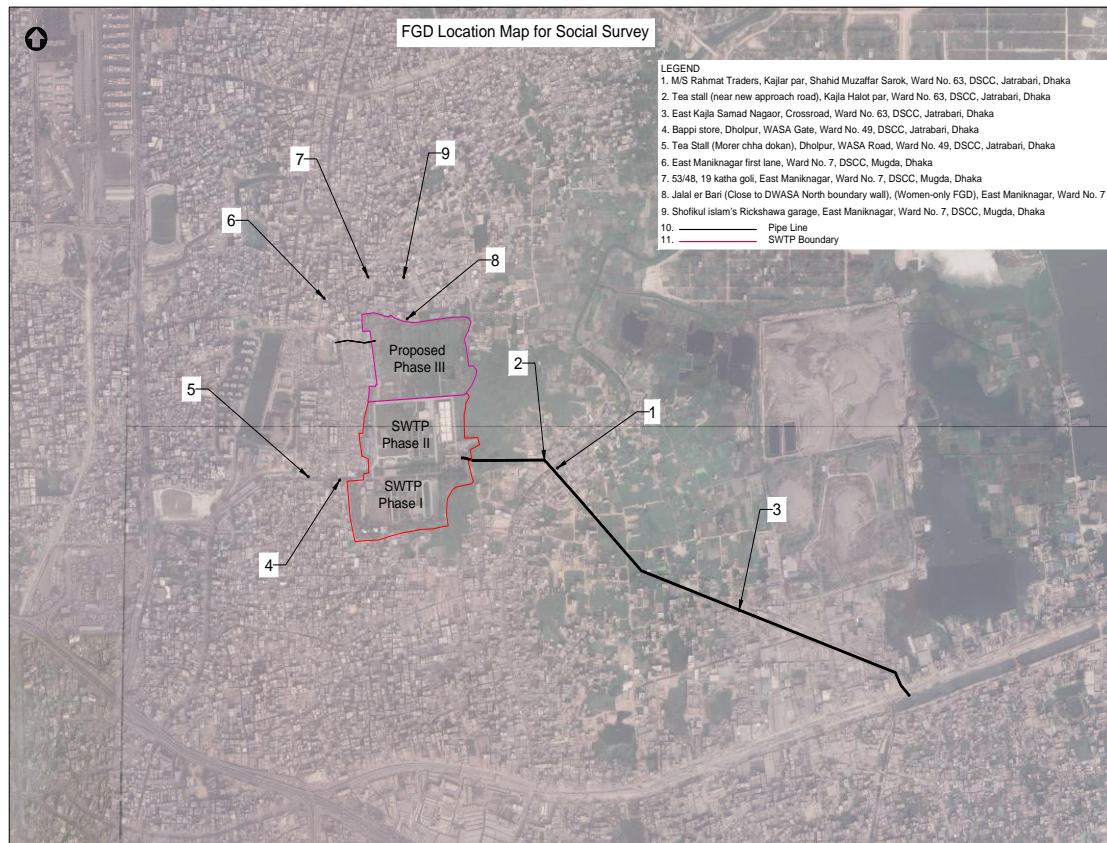


Figure 8-4: FGDs Location Map of January 2023

## 8.4 Concluding Remarks

### May 2022

The purpose of the stakeholder identification and analysis is to understand potential impacts on stakeholders and to clarify who should be involved in the ESIA process and how. This is done by listing all relevant stakeholders – based on any existing stakeholder analysis developed during the project design process and on general knowledge about the project context and its main stakeholders and elaborating the following:

- > stakeholders' interests in and expectations from the project,
- > how they might influence the project (positively or negatively),
- > a first appraisal or estimation of how their livelihoods could be impacted by the project (positively or negatively), and
- > how they should be involved in the ESIA based on the information in the three items above.

The identified stakeholders should be disaggregated between men and women where relevant and feasible. It is useful to present the key findings of the stakeholder analysis in a matrix. The stakeholder analysis is considered a work in progress that should be adjusted as more information becomes available during the ESIA process and beyond.

The benefit of positive impact and the risk/assumptions of negative impact of project interventions have been discussed with the local people and stakeholders during

consultations and get their feedback. All findings are recorded and clearly mentioned in the ESIA report for future reference.

**The major findings are mentioned below:**

The significant findings are narrated by the respondents where they are very much concerned about loss of land, houses, trees, commercial structures, loss of business due to construction of DWASA pipelines. Similar findings are that during construction of the pipelines the neighbourhood will be affected by noise/sound-dust pollution, land (that was not acquired) will be used for keeping and carrying the equipment to the sites; crowded the locality by strangers which will affect usual movement of girls and women. So, the required measurements must be taken by the authority to reduce this disturbance. Another observation is that the small businessmen, vendors, and floating shops will also be affected by the construction work for the time being. We discussed this with KMC, the RAP team who can identify the specific problems as per locations and suggest remedial measures in the final RAP (KMC is contracted to prepare and finalize the RAP for all length of the demarcation area).

Applicant 1 and her brother-in-law (Case study with pictures is given in later section of this report as 6.5) are going to lose their living houses, although they received compensation for that but is not sufficient to build a new house as the construction materials cost is very high now compared to their houses built. Both requested to save their living house and use their land which is Infront of their houses, without further compensation. Also, other people interviewed and present in the FGDs said that the new pipeline of DWASA for fetching water from the Meghna River has passed over their houses. They have to move from the locality and loose the social connections with neighbourhood and relatives which cannot be priced.

There are also positive comments - employment opportunity will be increased for the local poor people as day labours and unskilled labours as well as the local women will also get work for the engagement of cooking, water carrying, caretaking, earth work, etc. The local people's expectation is that they will get mitigations measures of all negative impacts and will have more positive impacts like opportunities for employment, entrepreneurship, supply of good quality water, proper maintenance of the services will be provided.

As regards Applicant 1 request, a review of the pipe alignment was conducted to check if any adjustments could be done to save the property. It was evident that for such large pipes, the requirement to move the pipe alignment laterally by a few meters would necessitate shifting the pipe alignment well over 30m on either side of the line of shift. This degree of lateral shift would then affect several other households many of whom are currently outside the pipe corridor. Based on the evidence available, saving applicant's property would unlikely be possible without causing much larger disruption to multiple properties.

**January 2023**

The purpose of the stakeholder identification and analysis is to understand potential impacts on stakeholders and to clarify who should be involved in the ESIA process and how. This is done by listing all relevant stakeholders – based on any existing stakeholder analysis developed during the project design process and on general knowledge about the project context and its main stakeholders and elaborating the following:

- > stakeholders' interests in and expectations from the project,
- > how they might influence the project (positively or negatively),

- > a first appraisal or estimation of how their livelihoods could be impacted by the project (positively or negatively), and
- > how they should be involved in the ESIA based on the information in the three items above.

The identified stakeholders need to be disaggregated between men and women where relevant and feasible. It is useful to present the key findings of the stakeholder analysis in a matrix. The stakeholder analysis is considered a work in progress that should be adjusted as more information becomes available during the ESIA process and beyond.

The benefit of positive impact and the risk/assumptions of negative impact of project interventions have been discussed with the local people and stakeholders during consultations and get their feedback. All findings from all the surveys held in different times, are recorded and clearly mentioned in the ESIA report for future reference.

**The major findings of the social survey held on January 2023 are mentioned below:**

The Social Expert team of DSC had a meeting at the DWASA office with the RAP team of KMC who is responsible for preparing RAP for the project. Accordingly, they have prepared and finalized already RAP-1 and RAP-2 but RAP-3 preparation is ongoing to identify issues specific to each location and suggest remedial measures. It is confirmed by the discussion that none of the RAP has impact on Component-2 rather all 3-RAPs are prepared for Component-1 and for Component-3.

Afterwards details discussion among the meeting participants, it is confirmed by the KMC team and DWASA representative that there is no land acquisition or relocation, or resettlement issues are applicable for the Component-2 so no RAP is needed for Component-2 and not even prepared.

Similarly, as the required amount of land, for WTP Component-2, already belongs to DWASA so the respondents concern about loss of land, houses, trees or commercial structures due to construction of WTP is not relevant for Component-2. But the people are living close to the northern boundary wall have the concerns related to disruption and potential damages could be held during construction and post construction period while they requested to minimize the consequences as much as possible. The neighbourhood assumes to be affected by noise/sound-dust pollution, contractor's materials storage area and carrying pathway of materials may affect usual movement of school going children. So, the remedial measures must be addressed in the contract to reduce this disturbance. The suggestions made by them are to carry the materials preferably at night and avoid the school hours. This may also affect that roadside small businessmen, vendors, and floating shops which needs prior notice to prevent their livelihood disturbance.

The participants of the FGDs have some affirmations about the employment of local people and they are requesting to open opportunity for the local unemployed group of people during construction as skilled or unskilled labourers. It is also an expectation that the local poor women will also get work for the engagement of cooking, water carrying, caretaking, earth work, etc. as and when required by the contractors.

Other significant findings are narrated by the respondents that during construction of the WTP C-2 the neighbourhood will be affected by noise/sound-dust pollution, land (that was not acquired) will be used for keeping and carrying the equipment to the sites; crowded the locality by strangers which may affect usual movement of children, adolescent girls and vulnerable women. So, the required measurements must be taken by the authority to reduce this disturbance of adjacent locality and inhabitants.



## 9 Analysis of Alternatives

### 9.1 Introduction

The Chapter provides an assessment of alternative sites for the location of the intake and alternate raw water transmission routes for Saidabad Phase III project. For completeness, the “no project” scenario has also been discussed in this Chapter. This Chapter also presents a discussion on alternative technology options for crossing of rivers by raw water transmission pipelines.

### 9.2 Alternate Intake Location

Three alternate locations for the raw water intake for Saidabad phase III were considered:

- > The existing raw water intake at Sarulia along the Shitalakshya River (i.e. using the Shitalakshya river water for Saidabad phase III)
- > A common intake at Bisnondi along the Meghna River to supply raw water to Saidabad phase III WTP as well as the proposed water treatment plant at Char Gandharbpur
- > A separate intake at Haria along the Meghna River.

#### 9.2.1 Intake at Sarulia

The use of the existing raw water intake at Sarulia (after expansion with necessary facilities for additional pumping) was considered as an intake option to provide the raw water for Saidabad phase III. This option continues to use the Shitalakshya River as a water source as well as makes the best use of the investment already made for Saidabad phase I and II. The DND conveyance canal, which conveys the raw water from Sarulia intake up to the junction with the double cell transfer box culvert inlet to Saidabad plants, is wide enough to carry a total flow in the range of 1,000 MLD with acceptable head loss all through for the time being. In this option, the whole pumping facilities including motors, electric cabinet, power transformers should be resized, and new equipment should be installed to provide the additional head needed for the increased flow. Also, the existing two cell box culvert (sizing 2m x 1.50m each) which conveys the raw water from the downstream end of the DND canal to the treatment plant site is currently not adequate to cater to the expected total flow of 1000 MLD. Therefore, an additional culvert of adequate size should be provided between DND and the treatment plant.

The capital investment associated with this option is significantly lower compared to other options, yet the intake at Sarulia is not going to be a feasible option due to the following reasons:

The areas around the DND canal are developing day by day and the open canal is being subjected to the surrounding urban pressure and has become prone to pollution by discharge of wastewater and solid waste. It is generally not advisable to transfer raw water for drinking water treatment plant in open type canal in urban areas. Since the future prospect of DND canal as a reliable water conveyance canal is uncertain, it would be unwise to rely on this to convey raw water to Saidabad WTPs.

The most important factor in favour of rejecting this option is the poor source water quality. The water quality from the Shitalakshya River is irremediably deteriorating over the years mainly in the dry season (ammonia content for instance is far beyond the fixed target of 15mg/l and has reached 22mg/l this year) and is no longer deemed as a reliable source of water supply throughout the year. Although according to the recently prepared DWASA Sewerage Master Plan, the raw water quality of Shitalakshya River could be improved by implementing the program for construction of sewage treatment plant at Dasherbandi to avoid domestic and industrial pollution in the upstream of the intake & by implementing necessary steps to treat domestic and industrial waste of DND area, these measures would require more time as well as funds. Since the pollution load in the Shitalakshya river is increasing and has become a threat to the operation of Saidabad phase I and II, shifting the intake has become a matter of great necessity. Any investments relying on the water of the Shitalakshya River will not be wise under the current scenario.

### 9.2.2 Intake at Bisnondi

The proposed treatment plant at Char Gandharbpur will derive raw water from Meghna River at Bisnondi, approximately 14 km upstream of Haria, and the possibility of getting raw water for both treatment plants from a common intake (see Figure 2-2 ) was explored. The raw water transmission lines from the intake point at Bisnondi will run along a 30 m wide and 17 km wide long land (~ 53 ha, which needs to be acquired) which can be used to convey the raw water for both plants up to Dhaka-Sylhet highway. After this point pipelines may follow separate paths to reach the respective treatment plants. Investment for the Char Gandharbpur plant is already approved by the GoB for civil structure at Bisnondi and acquisition of a 30m wide and 17km long land strip to lay raw water transmission mains. In this case two independent sets of pumps should be used at intake: one set will be used for Saidabad plant and another one for Char Gandharbpur plant. Although the water quality parameters of Meghna River at Bisnondi have been found to be acceptable for easy treatment and the riverbank has been found to be stable and relatively erosion-free, using a common intake point at Bisnondi by sharing the intake facilities may not be a feasible option for a number of reasons, as listed below:

- > In terms of capital and operation costs, the intake at Haria is preferable to that of Bisnondi as (1) Transmission lines will be around 4 km shorter in the Haria intake option and (2) Bisnondi option will require 15% more pumping head compared to the Haria option.
- > Land acquisition in open areas will be limited to a 6 km land strip in the Haria option, which is only 30% of the land acquisition requirement for the Bisnondi option. In addition to providing a cheaper land acquisition capital cost, an intake at Haria will be safer in terms of administrative process and will minimize the probability of delay. In the Haria intake option, most part of the raw water transmission route will be located in the Right of Way of Roads & Highways Department.
- > There is also an implementation constraint if the Bisnondi intake option is adopted. Works for the Char Gandharbpur plant is expected to start in January 2014 and to be completed by December 2019. If the same intake is used both Gandharbpur and Saidabad water treatment plants, then commissioning of the proposed Saidabad water treatment plant may have to wait beyond the year 2019. With a separate intake at Haria, works from Haria to Saidabad will not depend on work progress for Bisnondi intake and Gandharbpur WTP. Thus, water supply to Saidabad I, II & III can be secured

more quickly from Haria than from Bisnondi. This is important because there is an urgent need to secure a reliable and alternate source of water as the existing Phases-I & II are already facing operational problems during dry season due to poor quality of water from Shitalakshya river.

- > It is safer for DWASA to operate multiple independent intakes instead of relying on a single intake for several treatment plants. It is estimated that adopting a separate intake in Meghna River at Haria will increase the water security by 33% (DWASA, 2013).

### 9.2.3 Intake at Haria

At Haria, the water quality parameters of Meghna River have been found to be acceptable for easy treatment, the riverbank has been found to be stable and relatively erosion-free and enough water has been found to be available throughout the year. But apart from these factors, as discussed above (8.2.2), an intake at Haria for the proposed Saidabad water treatment plant would be advantageous for several reasons. The major advantages are as follows:

- > For the intake at Haria, the raw water transmission lines will be around 4 km shorter (compared to Bisnondi option); an intake at Haria will also require 15% less pumping head compared to the Bisnondi option.
- > Land acquisition required for the intake at Haria is only about 30% of that required for a common intake at Bisnondi.
- > With a separate intake at Haria, water supply to Saidabad I, II & III can be secured more quickly.

## 9.3 Alternate Raw Water Transmission Route

Five options have been considered to transmit raw water from Demra circle to the treatment plant.

**Option 1:** The raw water transmission mains will follow the Dhaka-Demra Road up to Mridhabari, and then one transmission main will be connected to existing connecting box culvert from DND to Saidabad treatment plant. This transmission main will supply raw water for Saidabad Phase- I & II. The second transmission main for Saidabad phase-III will go through the acquired land available after construction of the connecting box culvert (see **Error! Reference source not found.**).

**Option 2:** The first transmission main will be connected to DND canal near Demra circle, and this will provide raw water for Saidabad phase-I & II from the river Meghna during dry season. During wet season, raw water will be supplied from Sarulia intake pump station. The second transmission main will follow the Dhaka-Demra Road up to Mridhabari near the connecting culvert and will reach Saidabad phase-III site following the acquired land available after construction of the connecting box culvert (see **Error! Reference source not found.**).

**Option 3:** The first transmission main will follow the Dhaka-Demra Road up to Mridhabari, and then it will be connected to existing connecting culvert from DND to Saidabad treatment plant. The second main will go about 720 m along Demra-Amulia-Rampura Road from Demra circle and then it will reach the connecting culvert following DWASA-owned land. Finally, it

will reach the Saidabad treatment plant phase-III site following the acquired land available by the side of the connecting box culvert (see **Error! Reference source not found.**).

**Option 4:** Both the transmission main will follow about 720 m along Demra-Amulia-Rampura road from Demra circle, and then they will reach to the connecting culvert following DWASA-owned land. The first one will connect to the culvert at this point and the other one will reach Saidabad treatment plant phase-III site through acquired land available after construction of the connecting box culvert (see **Error! Reference source not found.**).

**Option 5:** The first transmission main will be connected to DND canal near Demra circle, and this will provide raw water for Saidabad phase-I & II from the river Meghna during dry season. During wet season raw water will be supplied from Sarulia intake pump station. The second transmission main will go to the connecting box culvert from Demra circle, following about 720 m of Demra-Amulia-Rampura Road and DWASA acquired land. From this culvert it will reach the Saidabad phase-III site through the available acquired land by the side of the culvert (see **Error! Reference source not found.**).

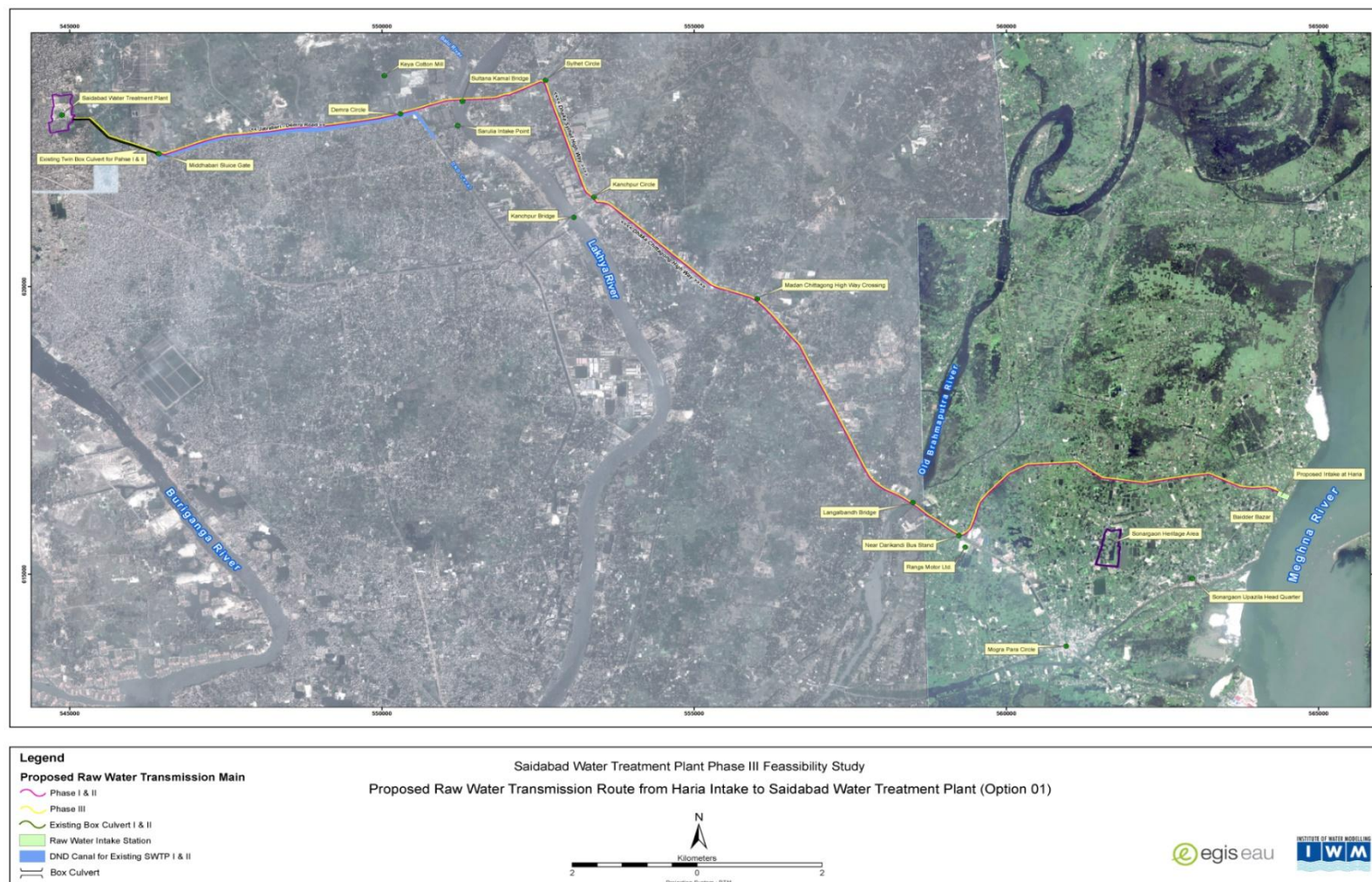


Figure 9-1: Proposed Raw Water Transmission Route from Haria to SWTP (Option 1) (Original Figure 40)



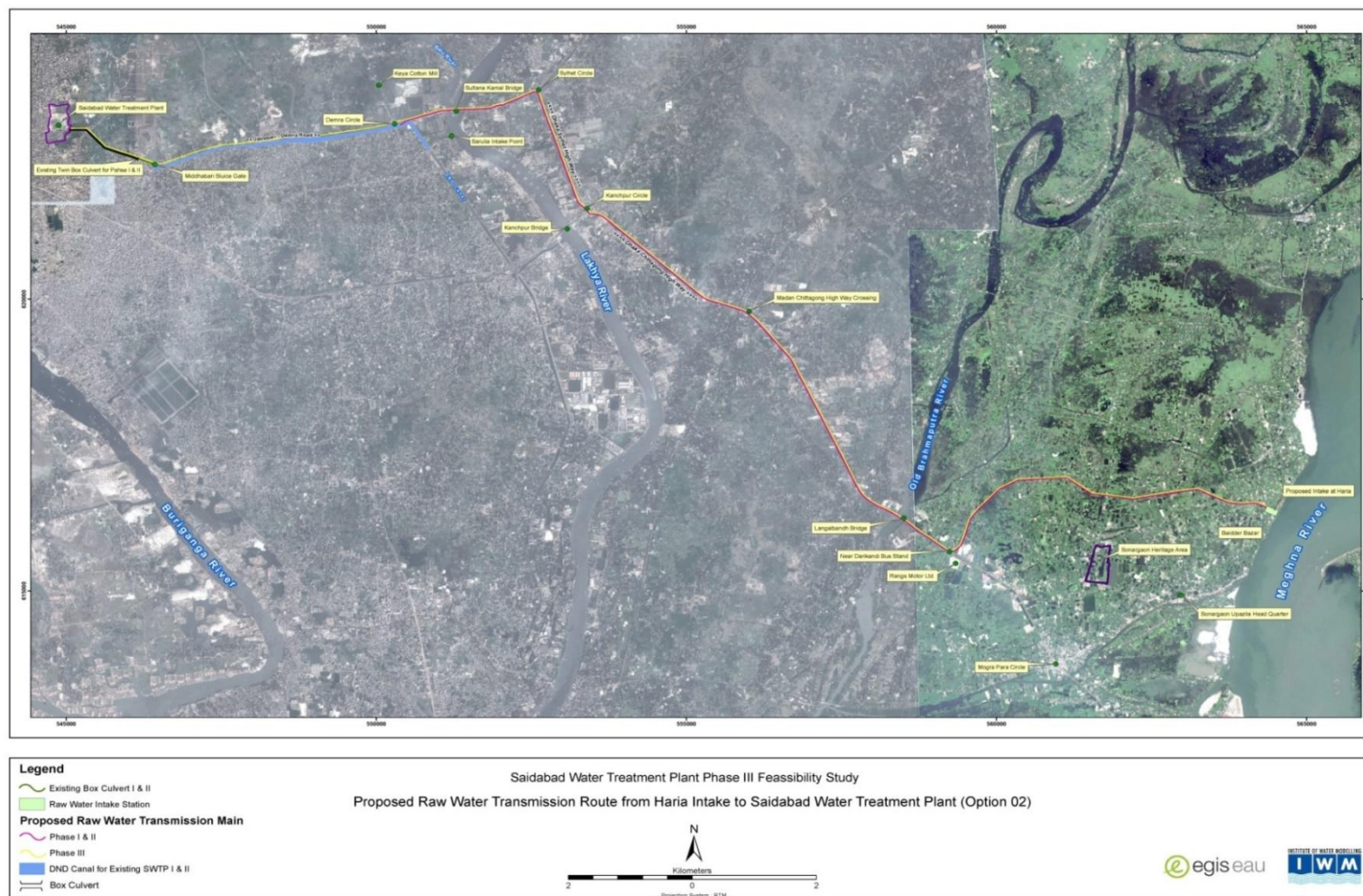


Figure 9-2: Proposed Raw Water Transmission Route from Haria to SWTP (Option 2) (Original Figure 41)

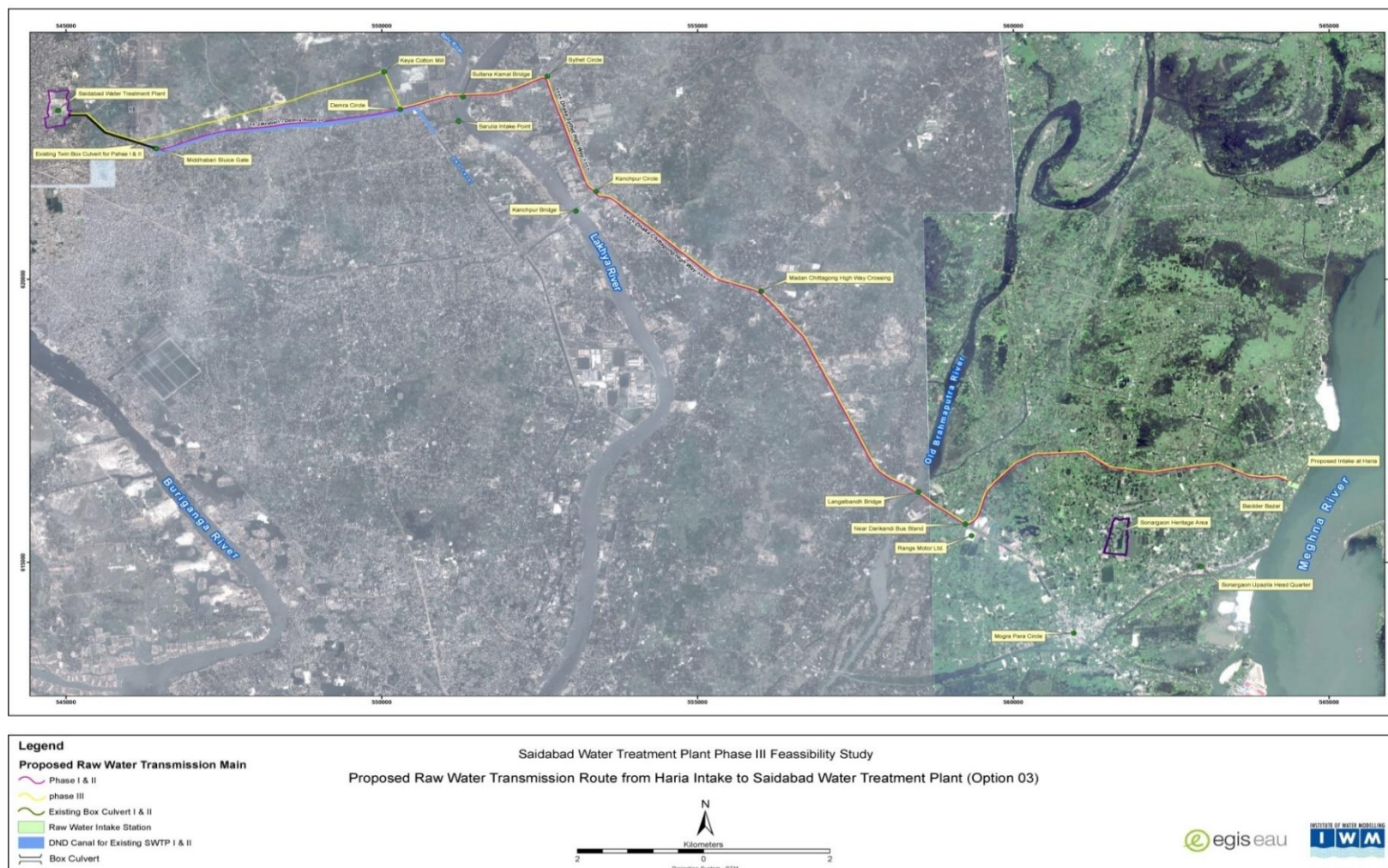


Figure 9-3: Proposed Raw Water Transmission Route from Haria to SWTP (Option 3) (Original Figure 42)



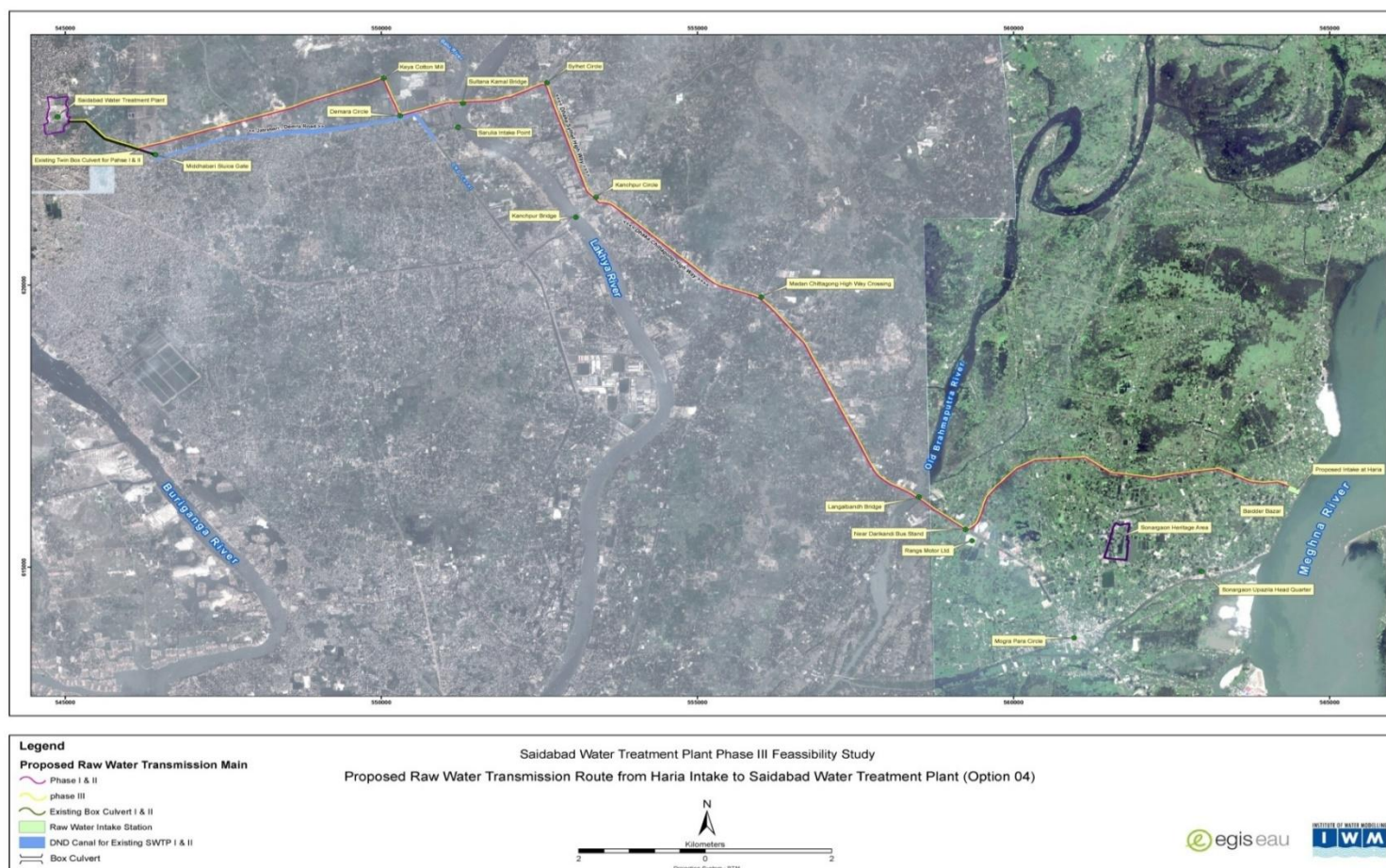


Figure 9-4: Proposed Raw Water Transmission Route from Haria to SWTP (Option 4) (Original Figure 43)

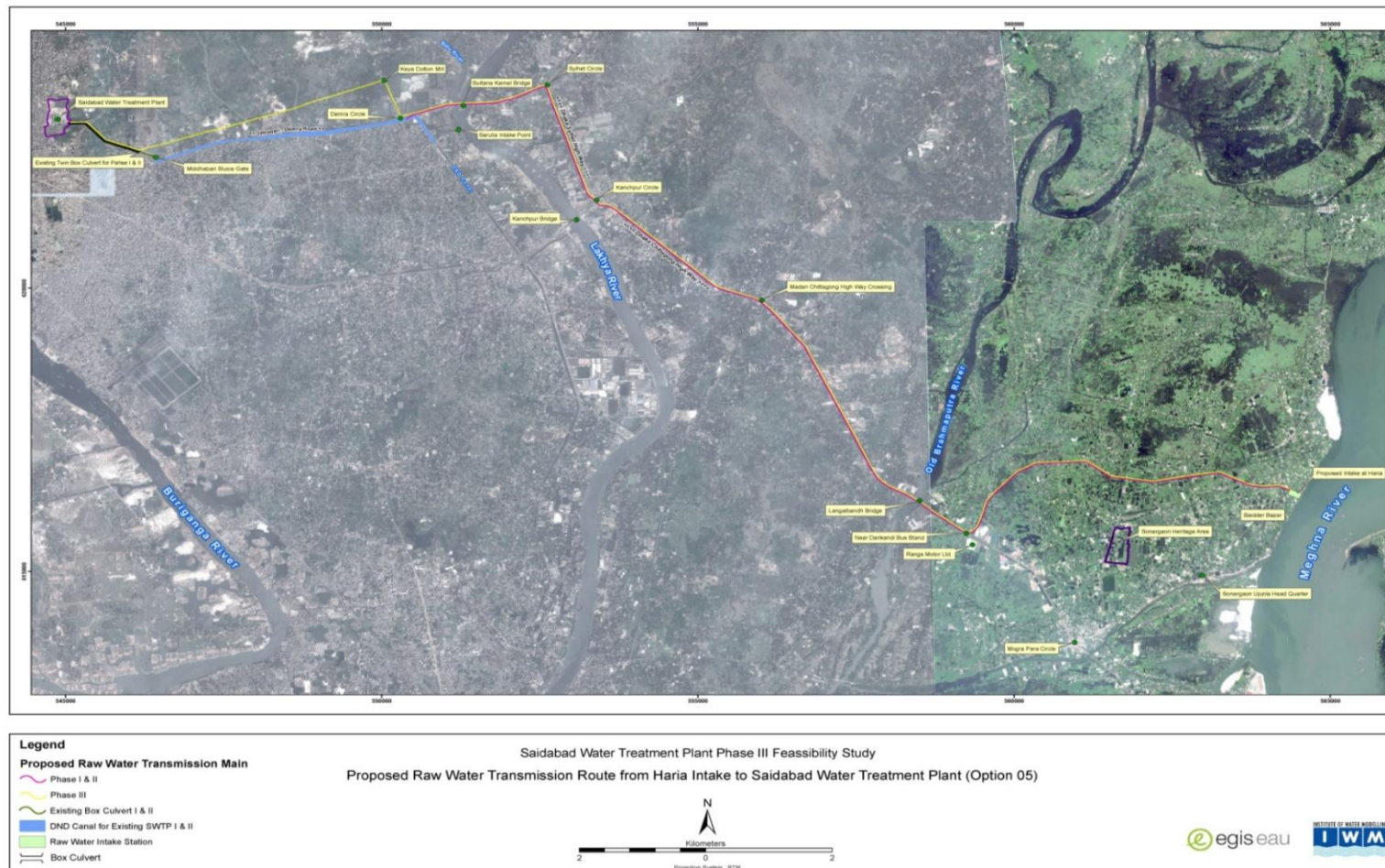


Figure 9-5: Proposed Raw Water Transmission Route from Haria to SWTP (Option 5) (Original Figure 44)

Option-wise required raw water transmission pipeline length is provided in **Error! Reference source not found.**

Table 9-1: Different Options wise Raw Water Transmission Route Length (Original Table 41)

Options	Common length from Haria Intake to Demra circle for all phases (km)	Additional length from Demra circle to SWTP		Total length from Haria Intake to SWTP		Total length of pipelines for Phase-I, II & III (km)
		Transmission Main for Phase-I & II (km)	Transmission Main for Phase-III (km)	Transmission Main for Phase-I & II (km)	Transmission Main for Phase-III (km)	
Option 1	19.2	3.95	5.49	23.15	24.69	47.84
Option 2	19.2	0	5.49	19.2	24.69	43.89
Option 3	19.2	3.95	6.045	23.15	25.25	48.40
Option 4	19.2	4.78	6.045	23.98	25.25	49.23
Option 5	19.2	0	6.045	19.2	25.25	44.45

The total length required for raw water transmission lines for Options 2 and 5 is less because these options use the existing DND canal to partly convey the Meghna River water (by gravity flow) for Saidabad phase I and II. As a result, the operational cost (for pumping energy) and capital cost would be somewhat lower compared to other options. Options 3 to 5 use an alternate route to convey raw water from Demra circle to the box culvert at the downstream end of the DND canal. This strip of land from Demra-Amulia road to the connecting box culvert belongs to DWASA (no land acquisition required) and can be considered if it is desired to avoid the disruption to traffic caused by the construction of pipelines along the northern side of the heavily travelled Demra-Jatrabari road. However, considering all factors, option 1 has been selected as the most viable option during this ESIA study in 2013 due to the following reasons:

- > As mentioned earlier, there is possibility of increased pollution load in the DND canal in future as the area surrounding it is getting increasingly urbanized. Also, the maintenance of DND canal is difficult as there are too many cross-connecting roads with insufficient opening underneath for adequate flow. Further structural rejuvenation of the DND canal (e.g. constructing a box culvert in its place) has also become very difficult due to the construction of electrical transmission towers along the canal. Therefore, the DND canal is not a viable option for transmission of raw water to the treatment plant as considered in options 2 and 5.
- > Soil conditions are expected to be better along the Jatrabari-Demra Road in comparison with Dhaka WASA land strip further to the north. The latter is in a low land within a swampy area which needs to be treated for soil quality improvement and flood protection. Pile foundations may be required to secure pipeline stability, which will increase the capital cost. Also, this alternate route will have a larger number of bends; hence maintenance requirement would also be high. Also, a service road needs to be constructed for maintenance purpose. All of these issues may add up to both operational and capital cost. As a result, options 3, 4 and 5 were not considered to be viable option

**Error! Reference source not found.** shows the Option Analysis in Consideration of Environmental and Social Aspects of the study area.



Table 9-2: Option Analysis in Consideration of Environmental and Social Aspects

Sl. No.	Items		Option 1	Option 2	Option 3	Option 4	Option 5	Remarks
1	Current status of route	1. Agriculture on the route	Yes	Yes	Yes	Yes	Yes	
2		2. Fisheries on the route	No	No	No	No	No	
3		3. Homestead on the route	Yes	Yes	Yes	Yes	Yes	
4		4. River Crossing	Yes	Yes	Yes	Yes	Yes	
5		5. Road Crossing	Yes	Yes	Yes	Yes	Yes	
6		6. Route condition	Better	Better	Not good	Not good	Not good	Soil Quality improvement would be required for option 3, 4 & 5
7		7. Availability of Existing corridor for use	No	Yes	No	No	Yes	Option 2&5 has existing DND canal to partly convey the Meghna River water (by gravity flow)
8	Technical	1. Route length (km)	47.84	43.89	48.4	49.23	44.45	
9		2. Pipeline Construction would be-	Easier	Easier	Difficult	Difficult	Difficult	Pile foundations may be required to secure pipeline stability for option 3, 4 & 5

Sl. No.	Items		Option 1	Option 2	Option 3	Option 4	Option 5	Remarks
10		3. Accessibility (Access to the route for construction work)	Easier	Easier	Difficult	Difficult	Difficult	
11		4. Soil Condition of the Route	Good	Good	Bad	Bad	Bad	low land within a swampy area which needs to be treated for soil quality improvement and flood protection for option 3, 4 & 5
12		6. Any hill cutting issue in the route	No	No	No	No	No	
13	Social	A.						
14		1. Does the route require Land Acquisition?	Yes	Yes	Yes	Yes	Yes	
15		2. Has the Landowner become landless due to Pipeline land acquisition	No	No	No	No	No	
16		3. Does Compensation include actual and "Top-up"?	Yes	Yes	Yes	Yes	Yes	
17		B.						
18		1. Land Cost	High	High	Less	Less	Less	Options 3 to 5 use an alternate route to convey raw water from Demra circle to the box culvert at the downstream end of the

Sl. No.	Items	Option 1	Option 2	Option 3	Option 4	Option 5	Remarks
							DND canal. This strip of land from Demra- Amulia road to the connecting box culvert belongs to DWASA (no land acquisition required)
19	2. Land Income Loss	Yes	Yes	Yes	Yes	Yes	
20	3. Does the project affect? (Please Tick) Indigenous people/Indigenous Ethnic Minorities/Tribal groups/Others vulnerable groups/individuals/ Poorest and Landless community/ Disaster Prone areas (Char, Embankment, Coastal)	No	No	No	No	No	
21	If yes provide number of indigenous people/ ethnic community/Poorest and Landless covered.....	N/A	N/A	N/A	N/A	N/A	
22	6. Does the project affect cultural property? (Please Tick) Graveyard/Mosque/Temple/Pagoda/ Church/Archaeological/Paleontological/Historic/Others	No	No	No	No	No	
23	1. Loss of productive land	Yes	Yes	Yes	Yes	Yes	
24	2. Loss of Agri. Yields	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	
25	3. Increase of Agri. Yields	No	No	No	No	No	
26	4. Effect on national food production	No	No	No	No	No	
27	5. Cumulative and long-term effect	No	No	No	No	No	
28	6. Fish-yielding Capacity	No	No	No	No	No	

Sl. No.	Items		Option 1	Option 2	Option 3	Option 4	Option 5	Remarks
29		7. Loss of Forest	No	No	No	No	No	
30		8. Loss of indigenous species	No	No	No	No	No	
31		9. Loss of Biodiversity	No	No	No	No	No	
32	Financial	Project Cost	Less	Higher	Higher	Higher	Higher	Pile foundations may be required to secure pipeline stability for Options 3-5, which will increase the capital cost. Also, these alternate routes will have a larger number of bends; hence maintenance requirement would also be high. Also, a service road needs to be constructed for maintenance purpose. All of these issues may add up to both



Sl. No.	Items		Option 1	Option 2	Option 3	Option 4	Option 5	Remarks
								operational and capital cost. As a result, options 3, 4 and 5 were not considered to be viable option.

In 2021, the PMC has re-assessed pipe installation on the Demra Canal bed considering other constraints along the Dhaka-Sylhet Road. Separate technical notes were prepared, and route selection options was finalised in agreement with the client and the project financiers. Refer to Quarterly Report -2 for details.

**TEXT MODIFIED IN 2022**

**Update the Kanchpur Circle to Mridhabari Sluice Gate Section of Option-1 under RWP Route Feasibility Study in 2021:**

PMC has updated the Kanchpur Circle to Mridhabari Sluice Gate section of Option-1 in December 2021 under the RWP Route Feasibility Study. In this regard, a short technical note summarising the feasibility review conducted by the PMC on the RWP route from Kanchpur Circle to Mridhabari Sluice Gate was prepared and shared with PMU. Following a presentation (Annex-H) to PMU and DWASA management on 25th Oct 2021, the first version of this note was submitted for PMU review on 2nd Nov 2021. The alternative route was provisionally accepted, and comments provided by PMU/Funders on 12th Nov 2021. Subsequent to the PMU review, multiple meetings and site visits with RHD senior management were organised in November; unavailability of land for shaft yard on east bank of Shitalakshya River was advised by RHD and consequently some modifications in the tunnel alignment were deemed necessary.

**Error! Reference source not found.** shows indicative lengths of the alternative route which is marginally shorter than the Terms of Reference (ToR) proposed route between Kanchpur Bridge and Demra Circle. However, it is to be noted that the final route may become longer, or shorter once further investigations are carried out to optimise alignment of tunnel avoiding public buildings, existing infrastructure etc. Any increases in length will likely be due to the benefits gained from avoiding particular constraints along the route.

The alternative route between Kanchpur Circle and Mridhabari Sluice Gate is shown as a blue line in **Error! Reference source not found.**. This alternative route comprises two parts; the first part is from Kanchpur Circle (on the east bank of the Shitalakshya River) to Demra Canal (on the west bank). This is proposed to be trenchless installation to cross under the river by tunnelling technique. The second part would comprise open cut trench installation of the RWP within the Demra canal below the canal bed level. Two alternative pipe route(s) shown in **Error! Reference source not found.** were developed for review by PMU and have the following key benefits:

- 1 Completely avoids pipe installation along sections of the busy N2 and R201 highways
- 2 Avoids the need to cross the river adjacent to Sultana Kamal Bridge
- 3 Reduces social impact, resettlement activities and public interface by laying pipes within Demra canal

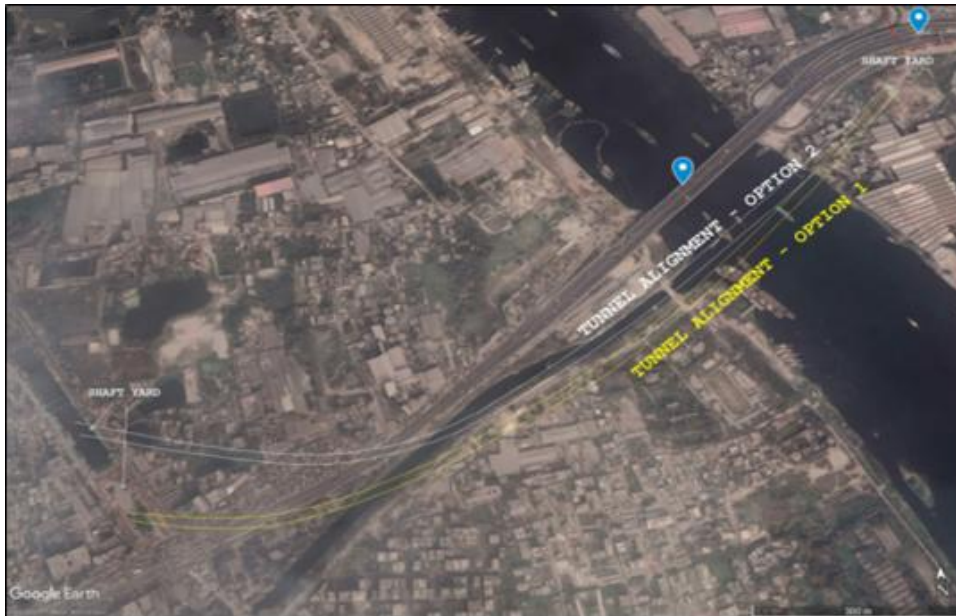


Figure 9-6: Tunnel crossing of Shitalakshya River (Option-1 & 2)

Two options were identified with twin tunnel drives. Option 1 reduces direct interface with existing and proposed private buildings and commercial properties and was preferred by PMU. This option is mostly routed under the DND Outfall canal with an overland short section before ending in the shaft yard (coloured in redline) in Demra canal. One issue for this option is that it would require the receiving shaft to be installed in a contaminated soil zone caused due to illegal solid waste landfill. This contaminated soil poses potential increased risk to the construction but subject to detailed investigation and assessment is assumed that could be mitigated by appropriate measures. In the east bank of Shitalakshya River, deep shaft(s) would be needed for tunnelling operation. The land adjacent to Kanchpur Bridge belongs to RHD and was deemed fit for locating the tunnel shaft yard subject to consenting from RHD.

It should be noted here that following the initial submission of this technical note, multiple meetings and site visits were organised with RHD in November '21. PMU were advised in these meetings, that RHD have future plans for adding further grade separated bypass loops in the location identified for housing the shaft in Option(s) 1 & 2; hence it is very unlikely that the proposed shaft yard location in the east bank of river for Option(s) 1 & 2 will be feasible. PMU were also advised to (1) optimise/reduce the footprint of shaft yard and (2) keep adequate clearance from Kanchpur Bridge and (3) develop alternative alignment avoiding construction of shaft yard within the location identified for future road expansion plans.

Therefore, alternative alignments Option(s) 3 and 4 (**Error! Reference source not found.** and **Error! Reference source not found.**) were developed. Both alignments consider a single tunnel drive thereby (1) reducing footprint of shaft yard/tunnel and (2) maintains adequate clearance from Kanchpur Bridge.



Figure 9-7: River crossing alignment Option 3



Figure 9-8: River crossing alignment Option 4

Option 4 is marginally longer in length and has a drive shaft on the east of the Dhaka – Chittagong highway in a low-lying land which belongs to RHD. This land will have to be reclaimed for shaft installation purposes. Option 4 additionally requires crossing the Dhaka – Chittagong highway by pipe jacking to reach the shaft yard, thereby increasing the cost of the overall solution. Option 3 is therefore preferred by PMU and will be proposed for consideration by RHD. These alignments are currently awaiting submission to RHD for consenting purposes.

In both Options 3 & 4, the tunnel crossing will be approximately 4.2 to 4.5m diameter, which is too large for micro tunnel pipe jacked method of construction. The most appropriate method for this size of tunnel will be segmental lined tunnel using tunnel boring machine. The advantage of precast segmental lined tunnel is that it offers flexibility to accommodate curves in the alignment to negotiate constraints and has much less constraints on drive lengths.

Tunnel will likely be bored from near the south side of the Kanchpur Bridge, following a route under RHD land corridor and across Shitalakshya river to the DND outfall canal and across it to a receiving shaft in the Demra canal. The feasibility of swapping the receiving and drive

shafts will be evaluated during detail design when the tunnel alignment and profile are further optimised.

The proposed alignment is the most practical and shortest route option between the Kanchpur Circle and the Demra Canal, avoiding the need to either install the pipeline parallel to the N1 Highway or through many small local streets between the canal and the river.

The estimated minimum land needed on permanent basis for housing the shaft sites at both ends of proposed tunnel crossing is approximately 30m x 30m assuming that a single tunnel drive is opted. Some adjustments to reduce the requirement may be possible during detail design. Temporary land needed during the construction period is likely to be larger but is typically managed by the contractor by short term renting.

After crossing the Shitalakshya River, it is proposed that the pipes are installed in Demra Canal within a trench excavated below the bed level. This will be relatively straightforward open cut construction, with little interference related to land acquisition, informal settlements or road traffic. The only obstacles along the canal are aeration structures and a number of bridges, most of which are pedestrian bridges that appear to be in poor condition or of a temporary-type construction; these can be reconstructed following completion of pipe installation.

Some indicative sketches of pipe installation underneath the canal are shown below.

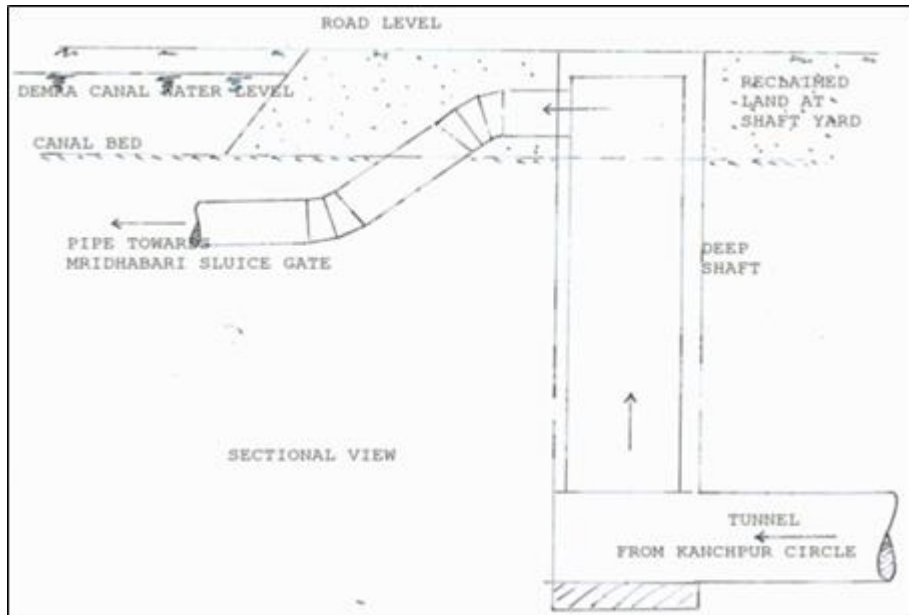


Figure 10-9.a: Indicative Arrangement of Receiving Shaft and Pipe at Demra Canal



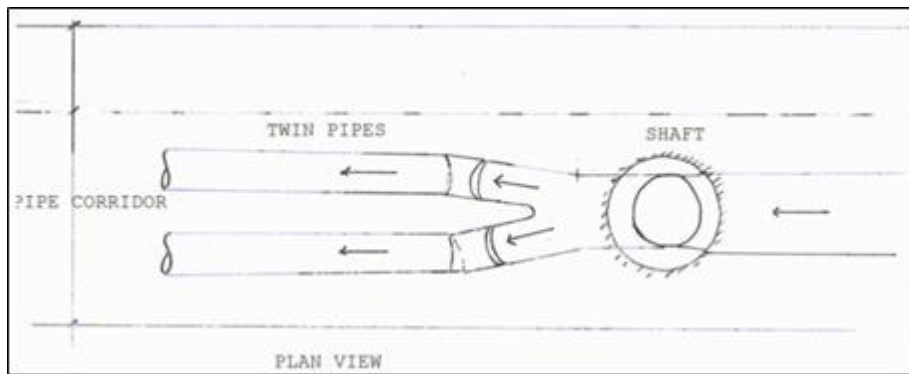


Figure 10-9.b: Indicative Plan View of Shaft and Pipe at Demra Canal

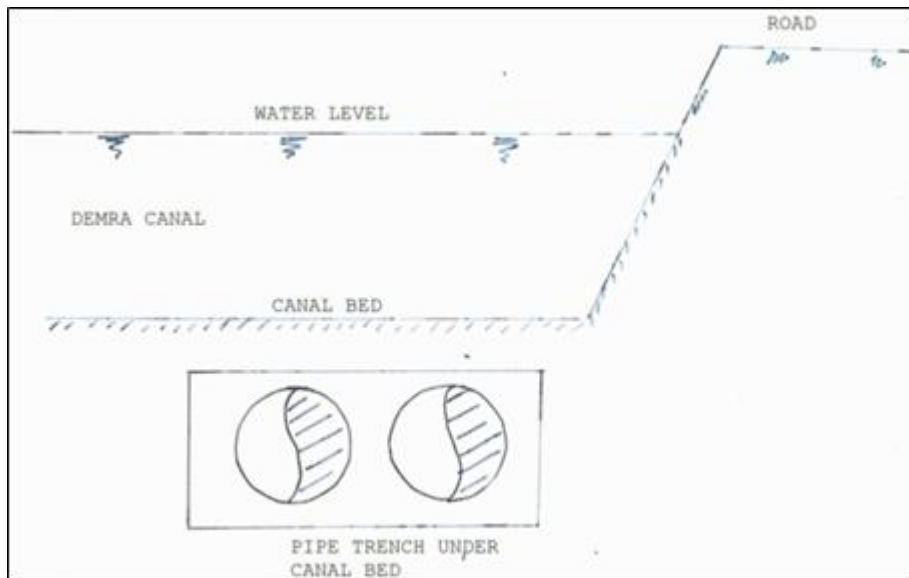


Figure 10-9.c: Indicative Arrangement of Pipe Installation Under Demra Canal Bed

Figure 9-9: Indicative schematic of large diameter twin pipeline construction at Demra canal



Figure 10-9.d: View Along Dewatered Section of Demra Canal

## 9.4 Alternate Options for Water Courses crossing by Transmission Lines

Along transmission lines routing between the intake and treatment plants site, two water courses crossings will be needed (Old Brahmaputra River and Shitalakshya River). Three options were considered to address this issue:

- > Overhead crossing using a bridge for fixing pipes
- > Trench crossing under the water course bottom
- > Pipe jacking or tunnelling with a large protection cover above pipelines

The overhead crossing is the least advantageous option as it implies an additional pumping head at the raw water intake and some additional design restrictions for securing a minimum clearance between the maximum water level in the watercourse and the crossing structure. On the other hand, the BIWTA (Bangladesh Inland Water Transport Authority) is not inclined to allow overhead crossings for navigable watercourses except in special cases such as bridges for highways.

The pipe in trench crossing at river bottom will require additional protection measures against high velocity flow, scouring and erosion effects. Scours are quite deep, unpredictable and destructive in some rivers of Bangladesh. Moreover, in areas with noticeable shipping activities, pipes can be exposed to damage by sailing ships.

Jacking or tunnelling can be considered as a safe option although it implies the use of special equipment, which can make works more expensive in comparison with the trench laying option.

## 9.5 No Project Scenario

Under the no project scenario, there will be no negative impacts associated with the project activities. However, numerous positive impacts related to socio-economic conditions and ensuring public health and safety would not be realized. The Saidabad phase III will not only add 450 MLD treated water to Dhaka City's water supply but is also aimed to recover the huge operational costs of Saidabad phase I and II on account of treating the polluted water of Shitalakshya river during the dry season. Under the no project scenario, the 450 MLD water from surface water sources will not be added to the city's water supply, the dependence on groundwater to meet the city's water demand of the future will continue, which will be a significant deviation from Dhaka City's Water Supply Master Plan.



## 10 Impact Evaluation

### 10.1 Introduction

As a part of the Environmental and Social Impact Assessment (ESIA), environmental impacts of the specific project activities on different ecological, physicochemical and human-interest related parameters, both during the construction phase and the operation phase, have been identified and assessed. As noted earlier in Chapter 2, the major activities to be carried out during the construction phase include: (i) Acquisition of required land (about 9 ha); (ii) Construction of intake channel, intake structure, raw water pumping station, and raw water transmission line; (iii) Construction of water treatment plant (WTP) including all treatment units and ancillary facilities (e.g., pre-chlorination unit, clarification units, rapid sand filter units, clear water reservoir, clear water pumping facilities, sludge treatment facilities, administrative building, workshop building, generator room, guard room); (iv) Installation of water transmission line on land and (v) Installation of water transmission lines across 2 rivers (Old Brahmaputra and Shitalakshya rivers). The important issues to be addressed during the operational phase include: (i) Stability of river bank and intake channel; (ii) Availability of raw water; (iii) Raw water quality; (iv) Treated water quality; (v) Proper operation of treatment plant; (vi) Public health and DWASA service facilities; (vii) Sludge treatment and disposal; (viii) Safety of water distribution network; (ix) Disposal of additional volumes of wastewater that will be generated due to increased water supply in Dhaka city after completion of the project; and (x) Navigation in rivers and khals through which water transmission line has crossed.

The environmental impacts of the specific project activities listed above have been assessed separately for both construction and operational phases of the project, with special emphasis on the issues that could generate significant adverse impacts, such as: (i) Land acquisition and related social impacts, (ii) Ecological impacts affecting water bodies, and (iii) Possible disruption to road communication and navigation during the construction phase. This Chapter provides an assessment of the potential environmental impacts of the proposed project, especially focusing on these issues.

### 10.2 Environmental and Social Impacts During Construction Phase

Based on the preliminary analysis of major activities during construction phase, a set of parameters/indicators have been selected for assessment of environmental and social impacts of the proposed project:

- > Ecological: aquatic environment (flora and fauna); fisheries; species diversity; trees and bushes.
- > Physicochemical: water pollution, air and noise pollution; drainage; sanitation and solid waste.
- > Socio-economic: loss of property/land; loss of income; communication and traffic congestion; employment and commercial activities.

Two Key maps showing the identified environmental & social risks and interventions of this project are annexed in Annex-I & J of this ESIA report.

### 10.2.1 Ecological Impacts

The proposed project activities, including construction of water treatment plant and installation of water transmission pipeline have some potential impacts (direct and indirect) on the existing ecological environment. Important project activities include land clearing and alteration, movement of people and vehicle, materials placement, excavation, accident (e.g., spills, leaks of chemicals), river/water body crossing of water transmission line, etc. Construction activities associated with crossing of rivers/water bodies by water transmission line are likely to have some adverse impact on aquatic environment, especially on aquatic flora, fauna, fish and water quality. It should be noted that there are 2 major rivers (Old Brahmaputra and Shitalakshya rivers) along the proposed route of the transmission line which will be disturbed during the construction activities. During operational phase, ecological impacts may result from improper disposal of dewatered sludge in the environment. For the proposed project, potential ecological impacts could be divided into two broad categories viz. (a) direct impact and (b) indirect impact. This Section describes both impacts on 3F (flora, fauna and fish) diversity of the project areas.

#### ***Potential Impact on Flora***

Activities related to construction of WTP, and installations of water transmission lines have some potential impacts (direct and indirect; positive or negative) on the existing ecological environment. Magnitude / intensity of these impacts may vary from place to place; some could easily be identified while others require long-term study / monitoring. Potential impacts of the proposed project on flora are described below.

#### ***Potential Impact on Aquatic Flora***

The area in and around the project components (intake structures, transmission lines, SWTP site) consists of a number of seasonal freshwater wetlands, including permanent water bodies (e.g. canals, ponds, rivers, etc.). Significant number of freshwater aquatic habitat exists there to support more than 24 aquatic floral species; however, none of them are threatened in Bangladesh. Due to proposed project activities (e.g. those associated with installation of pipeline through water bodies), some aquatic flora may have to face potential adverse impacts. If project activities run over an aquatic floral habitat, partial or entire aquatic flora may be damaged or destroyed. People, vehicle and material movement over the aquatic floral habitat may cause damage or uproot them from the ground. For example, 2 ponds exist on the land to be acquired along the 6 km segment of water transmission route from intake at Haria to Dhaka-Chittagong Highway. These two ponds with their aquatic fauna will cease to exist as these will probably be filled up. On the other hand, the water bodies surrounding the proposed route of water transmission line will be impacted indirectly due to construction activities. It should be noted that creation of other ponds have been evaluated; no potential location identified to create new ponds. In addition, there are number of ponds surrounding the filled ones, and they are identified to contain the same aquatic fauna. Maximum care will be shown to not to disturb existing aquatic fauna with the implementation of best industry practices.

#### ***Potential Impact on Terrestrial Flora***

Except for the site of the proposed WTP, most project areas have significant number of terrestrial habitats to support more than 68 terrestrial floral species, though none of them are threatened in Bangladesh. Most of the floral species are planted by the local Govt. (roadside plantation) and local people (village plantation) for their livelihood, and these are common throughout the project areas. Potential impact on terrestrial flora is likely to be moderate. During construction phase, some trees may be uprooted from its original habitat.

For example, 34 trees of 4 different species (Litchi tree, rain tree, jackfruit tree and mango tree) will require uprooting along the 6 km segment of transmission line from Haria to Dhaka-Chittagong Highway. Since these are used as habitat or nesting ground by birds/animals, clearing of the trees will generate adverse impacts. The removal of trees along the transmission route will adhere to the guidelines outlined in the National Forestry Policy of 1994. If nests are found, they will be relocated to safer locations or onto other trees to minimize the impact on fauna. Terrestrial undergrowth has great contribution to the existing ecosystem and clearing or removal of the undergrowth would also have some adverse impacts. The removal of trees along the transmission route will adhere to the guidelines outlined in the National Forestry Policy of 1994. If nests are found, they will be relocated to safer locations or onto other trees to minimize the impact on fauna.

### ***Potential Impact on Fauna including Fish***

Construction activities related to the proposed project could have potential impacts (direct and indirect) on the existing aquatic and terrestrial fauna due to their highly sensitive and reactive behaviour in response to disturbance that may occur at or near their habitat. Faunal species that are sensitive to direct (human activity and traffic) or indirect disturbance (noise) would be impacted most. Habitat disturbance would reduce habitat availability and effectiveness for a certain period for mammals, reptiles, amphibians, birds and their predators. There are also some possibilities of direct mortality and displacement of amphibians, reptiles, birds and mammals from the use of vehicle or machineries over terrestrial or aquatic faunal habitats. Quantification of these losses is difficult; however, the impact is expected to be low and short-term in nature.

Actions near fish habitats may also have some potential impact on fish e.g., mortality, disturbance of fish passage during monsoon, deposition of excavated soil on fish habitat, contamination of water, destruction of shallow fish habitat or saturated ground by movement of project vehicles, etc. Impacts on fish could be quite difficult to assess immediately, but availability of some indicative fish species could be monitored by which impacts could be evaluated. To mitigate the potential impacts on the fauna DWASA will educate all personnel on-site about DWASA's protocols for managing oil spills and leaks, including the use of dispersants or biological agents to accelerate the degradation of oil from construction equipment. The contractor must present a cleanup method for approval. DWASA will develop and implement a comprehensive waste management strategy. Contractor will install waste bins and sanitary facilities at the contractor's campsite to prevent environmental contamination.

### ***Potential Impact on Amphibians***

One amphibian (skipper frog, *Euphlyctiscyanophlyctis*) has been identified in all the project sites. Amphibians are more sensitive to the environmental changes due to their permeable skin and other biological features. Amphibians use both aquatic and terrestrial habitat for their survival and changes in characteristics of habitat have a great impact for their survival. Some of the project activities could have some impacts on existing amphibians such as (i) undergrowth or vegetation may be cleared for construction works, affecting amphibian habitat, (ii) project vehicle and materials may enter into the shallow / deep freshwater bodies or saturated ground affecting habitat, (iii) increased sediment load or contamination of water due to various project activities, also affecting habitat. These activities may cause temporary or permanent disturbance of amphibian habitat. Impacts on amphibian population could be evaluated by monitoring the changes of species composition and richness and their

relative abundance. DWAS will safeguard the local ecosystem, ensuring all construction activities include measures to protect the amphibians and wildlife.

### ***Potential Impact on Reptiles***

Around 11 aquatic and terrestrial reptiles were identified at or near the project sites and 3 of them are nationally extinct or vulnerable. These are Grey Monitor Lizard (*Varanusbengalensis*), Yellow Monitor Lizard (*Varanussalvator*) and Common Wolf Snake (*Lycodonauculus*). To evaluate specific impacts on reptilian species specifically threatened species, relative abundance and changes in species composition could be used as indicators. Burrowing reptiles are bio-sensitive and respond quickly to any man-made or natural activities/calamities. Special care (listed in Table 11-2) should be taken before conducting any activity in and around the habitats of reptiles and specifically threatened species. If the project construction activities are conducted during pre or post breeding season of the burrowing reptiles, the entire community could be affected seriously, or their life cycle could be jeopardized. Contractors and the DWASA will safeguard the local ecosystem, ensuring all construction activities and operation works include measures to protect plants and wildlife. The specific measures are addressed in Potential Impacts of "Flora and Fauna" in this Table 11-1 for the protection of threatened species that have been identified in the project areas and listed in Table 4 5. No significant impact is envisaged once operation phase is started as potential impacts are identified mostly temporary and isolated. It is anticipated that sheet piled cofferdam and offshore jetty will be constructed to allow piling and subsequent construction of the intake structure. The Contractor will be responsible for various safeguarding aspects and is specified in detail through the ESMP which forms part of the contract. Refer chapter 6 of the ESMP document (enclosed) and the PS-CR which imposes an obligation on the Contractor to comply with the ESMP.

### ***Potential Impact on Birds***

More than 44 bird species (terrestrial and aquatic) are available at or near the project sites, of which 9 are extinct, vulnerable and threatened nationally. Potential impacts of project activities on birds include disturbance due to project related actions and excessive human presence during bird's foraging, resting and nesting time that might result in reproductive disturbance / failure. Removal of floral (tree, herb and shrub) species for the proposed project would affect some bird habitat from where they collect food (insects), take rest and also build nests. Potential impacts for threatened bird species include: (i) habitat destruction, (ii) temporary displacement due to increased human disturbance and vehicle movement, and (iii) nest abandonment and/or reproductive failure caused by project related disturbance. The removal of trees along the transmission route will adhere to the guidelines outlined in the National Forestry Policy of 1994. If nests are found, they will be relocated to safer locations or onto other trees to minimize the impact on fauna.

### ***Potential Impact on Mammals***

At least 10 terrestrial and 1 aquatic mammalian species are available in the project areas, of which the one aquatic mammalian species (Ganges River Dolphin, *Platanista gangetica*) is nationally threatened. Some mammalian species may be disturbed and displaced from their habitat for some hours, days or months due to the project activities. They are likely to return to their habitat soon after the disturbance has ceased.

Construction within intake site will be contained specifically, and there will be no direct waste disposal to the Meghna river; having said that potential minor impacts on endangered species such as Ganges River Dolphin are anticipated if they approach/get closer to water intake structure during construction phase; or they may be disturbed of construction activities and leave their habitat for a temporary period whilst construction continues. Therefore, special care to dolphins to be shown via Ganges River Dolphin as described in

Table 11-1 within ESMP to avoid potential interaction during construction phase. The intake will be at the offshore area where no potential major impacts for Ganges River Dolphin is anticipated given that appropriate mitigation measures will be taken during construction and operation phases of the project. The intake will be installed with PWWC (Passive Wedge Wire Screens) which have a screen pass velocity as low as 0.10~0.15m/s and the entry slots are only 4mm in width. The screen pass velocity is lower than the average river flow velocity in vicinity of the intake and will therefore allow aquatic animals adequate flexibility to avoid the screens all together. Additionally, the slot size being very small, will eliminate any possibility of entrapment of aquatic life in the intake. The potential hotspot for Ganges River dolphins in Bangladesh along the Meghna River is located at Bhairab Bridge in Bhairab, Brahmanbaria district. This area is approximately 68 kilometers upstream from the intake site. Importantly, the construction and operation work of the project are not expected to have any direct impact on this hotspot.

In addition, some mammalian species also utilize village vegetation throughout the year or seasonally as permanent or temporary habitat. Project activities, e.g., movement of vehicle and people could displace potential prey species for some mammal within the project areas. However, disturbances associated with the proposed project works are considered temporary and identified as minimum to have any measurable effect on the prey for mammals with the best industry practices and mitigation listed in Section 11.2.1 Construction Phase Mitigation Measures.

### **Potential Impact on Fish**

More than two dozen freshwater native fish species are available in and around the project areas, of which nine are nationally threatened. These threatened fishes are commercially important to the local community. In order to prevent habitat destruction, measures should be taken for protection of water quantity, quality and fish passage/access to habitat during flow periods. Freshwater native fish may encounter some potential impacts due to project activities, such as mortality, disturbance of fish passage, sediment deposition on fish habitat, contamination of water, destruction of shallow fish habitat due to intrusion of project vehicles, dewatering of water bodies. To minimize the potential effects on local fisheries, DWASA will educate all on-site personnel about the organization's protocols for handling oil spills and leaks. These protocols include the utilization of dispersants or biological agents to expedite the breakdown of oil from construction equipment. Additionally, the contractor is required to submit a cleanup proposal for approval.

Furthermore, DWASA will establish and execute a comprehensive waste management plan. As part of this plan, the contractor will install waste bins and sanitary facilities at the campsite to prevent environmental contamination. This proactive approach aims to safeguard the ecosystem while ensuring efficient construction practices.

## **10.2.2 Evaluation of Ecological Impact**

For evaluation of ecological impact, a simple semi-quantitative descriptive checklist method has been applied. Firstly, the activities during construction and operation were identified and listed in the impact table. Then the corresponding impacts on the specific ecological components (terrestrial and aquatic flora and fauna, fish) were evaluated based on the baseline scenario and an assessment of the typical ecological interactions with project activities. In general, the Aquatic and Terrestrial ecological issues were covers in the evaluation where the threatened species are included. The project's intake will be situated in an offshore area where no potential impacts on the Ganges River dolphins are anticipated

during the construction phase. This is due to the implementation of appropriate mitigation measures throughout both the construction and operation phases. Notably, the potential hotspot for Ganges River dolphins in Bangladesh lies along the Meghna River, specifically near the Bhairab Bridge in Bhairab, Brahmanbaria district, approximately 68 kilometres upstream from the intake site. Providentially, the construction and operational activities of the project are not expected to directly impact this crucial dolphin habitat; however, potential minor impacts on endangered species such as Ganges River Dolphins are anticipated if they approach/get closer to water intake structure during construction phase; or they may be disturbed of construction activities and leave their habitat for a temporary period whilst construction continues. Therefore, special care to Ganges River Dolphins to be shown to avoid interaction during construction of raw water intake. Disturbances associated with the proposed project works are considered temporary and identified as minimum; and mitigated through best industry practices and mitigation listed in Section 11.2.1 Construction Phase Mitigation Measures.

Adequate Sanitary latrine and septic tank system will be installed at the construction sites and the operational sites to mitigate any kind of sewage discharge on soil /water in the project areas. Therefore, the effects on the wildlife would be largely negligible.

Already access roads exist at the sites. No bird sanctuary is on the road route or the nearby route for which impact on birds chosen as "no impact".

The pipeline construction through the waterbodies will be shaft tunnel in the rivers where no potential impacts for the ecology will be anticipated for ensuring the appropriate mitigation measures as specified in the ESMP of the project. It is important to note that the access roads already exist at the sites. There are no bird sanctuaries, and tree cutting is not expected for the access route or the nearby area, resulting in negligible impact on birds. Assessments were made as to whether the impacts were positive (beneficial) or negative (harmful), short-term (short recovery time) or long-term (extended recovery time); and of high or low/moderate intensity. The results of the assessment are summarized in Table 10-1. Table 10-1 indicates that most of the evaluated ecological impacts are low or moderate (minor impact) are short-term in nature. No long-term adverse impacts to the floral species as well as to the populations of the mammals, reptiles, amphibian, birds and fishes are expected.

Table 10-1: Evaluation of ecological impacts resulting from different project activities (Original Table 34)

Source of Potential Impacts	Ecological Issues										
	Flora		Fish	Fauna							
				Amphibia		Reptile		Bird		Mammal	
	AQ	TR		AQ	TR	AQ	TR	AQ	TR	AQ	TR
During construction											
Camp setting	0	-1 S	0	0	-1 S	0	-1 S	0	-1 S	0	-1 S
Access road construction	-1 S	-1 S	0	0	-1 S	0	-1 S	0	0	0	-1 S
Land clearing	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	0	-1 S	0	-1 S
Soil excavation	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	0	0	0	-1 S
Generation of Noise	0	0	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	0	-1 S



Source of Potential Impacts	Ecological Issues										
	Flora		Fish	Fauna							
				Amphibia		Reptile		Bird		Mammal	
	AQ	TR		AQ	TR	AQ	TR	AQ	TR	AQ	TR
Deterioration of water quality	0	0	-1 S	-1 S	-1 S	-1 S	0	-1 S	0	-1 S	0
Sewage discharge on soil / water	-1 S	0	-1 S	0	-1 S	0	0	0	0	0	0
Water body crossing (during pipeline construction) and raw water intake construction	-1 S	0	-1 S	-1 S	0	-1 S	-1 S	-1 S	0	-1 S	0
Traffic	0	0	0	0	-1 S	0	-1 S	0	-1 S	0	-1 S
<b>During Operation</b>											
Spills (oil / Chemical) on land/water	-1 S	-1 S	-2S	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	0	-1 S
Waste/sludge disposal	0	0	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	-1 S	0	-1 S
Water Intake	0	0	0	0	0	0	0	0	0	0	0
Generation of Noise	0	0	-1 S	0	0	0	0	0	0	0	0
Traffic	0	0	0	0	-1 S	0	-1 S	0	-1 S	0	-1 S
Land use	0	0	-1 S	-1 S	0	-1 S	0	-1 S	0	0	0

[Legend: AQ = Aquatic; TR = Terrestrial; 0 = No impact (negligible impact), 3 = High impact, 2 = moderate impact, 1 = Low impact, S = Short term impact, L = Long term impact, +/- = positive/negative impact, AQ = Aquatic, TR = Terrestrial]

### 10.2.3 Risk Assessment

A typical environmental risk assessment matrix has been developed for flora, fauna and fish species within the project areas. A similar format is widely used in oil and gas industries. Table 10-2 shows the consequence severity ranking (from low to critical); Table 10-3 shows the likelihood ranking (from “almost certain” to “rare”), along with frequency level for each ranking. Table 10-4 shows the risk assessment matrix, which is based on consequence severity and likelihood/frequency of occurrence of an event; risk has been classified from “low” to “extreme”. Ecological Aspects listed in the Table 9-5 was assessed based on the impact severity ranking in Table 9-2 whilst taken the likelihood ranking into consideration in Table 9-3. Risk rating is evaluated based on the review of the two factors. Table 9-4 is used to evaluate risk rating in Table 9-5. Results of the evaluation will be minimised implementing best industry practices and specific mitigation measures listed in Section 11, Table 11-1 and 11-2 for both construction and operation phases.

Table 10-2: Consequence (Impact) Severity Ranking (Project Site Level) (Original Table 35)

Environmental effects				
Low	Minor	Moderate	Major	Critical
No lasting effect. Low-level impacts on biological environment. Limited damage to minimal area of low significance	Minor effects on biological environment. Minor short-medium term damage to small area of limited significance	Moderate effects on biological environment but not affecting ecosystem function. Moderate short-medium term widespread impacts (e.g. oil spill)	Serious environmental effects with some impairment of ecosystem function (e.g. displacement of species). Relative widespread medium-long term impacts.	Very serious environmental effects with impairment of ecosystem function. Long-term, widespread effects on significant environment (e.g. unique habitat, national park)

Table 10-3: Likelihood ranking table (Original Table 36)

Likelihood	Description	Frequency Description
Almost certain	Consequence expected to occur in most circumstances	High frequency of occurrence – occur more than once per month
Likely	Consequence will probably occur in most circumstances	Regular frequency. Event likely to occur at least once per year
Possible	Consequence should occur at some time	Occurs once every 1 – 10 years
Unlikely	Consequence could occur at some time	Unlikely to occur during life of operations – occurs once every 10 – 100 years
Rare	Consequence may occur under exceptional circumstances	Highly unlikely to occur during life of the operation. Occurs less than once every 100 years.

Table 10-4: Risk Assessment Matrix (Original Table 37)

Likelihood / Frequency	Consequence Severity				
	Low	Minor	Moderate	Major	Critical
Almost certain	High	High	Extreme	Extreme	Extreme
Likely	Moderate	High	High	Extreme	Extreme
Possible	Low	Moderate	High	Extreme	Extreme
Unlikely	Low	Low	Moderate	High	Extreme
Rare	Low	Low	Moderate	High	High

In Table 10-5, the potential impacts of the project activities on the flora, fauna and fish species have been ranked based on consequence severity ranking (Table 10-2), likelihood/frequency ranking (Table 10-3), and risk rating (Table 10-4). Both the “consequence severity” and “risk” of the possible impacts have been categorized as “low”, while likelihood/frequency” has been categorized as “possible”. Thus, the proposed project is not likely to have any significant adverse impact on the existing ecological environment if appropriate mitigation measures are adopted (see details in Chapter 9).

Table 10-5: Summary of Ecological Risk Assessment Matrix (Original Table 38)

Ecological Aspects	Potential Impact (Consequence)	Consequence severity ranking	Impact likelihood rating	Risk rating
Flora	Minor impact to flora including the threatened species may occur during the installation of water transmission pipeline. Construction of water treatment plant may displace or remove aquatic floral	Minor	Possible	Low

Ecological Aspects	Potential Impact (Consequence)	Consequence severity ranking	Impact likelihood rating	Risk rating
	species including the threatened species and ECA. Removal of flora due to soil/trench excavation (for pipeline installation) may be replaced by plantation programme; hence no major effects are expected.			
Fauna	Minor impacts (temporary displacement) to all types of fauna including the threatened species and species along ECAs may occur during installation of water transmission pipeline. Soil/trench excavation and construction of WTP have negative impacts (e.g., habitat loss). Temporary loss of habitat of threatened species (i.e. Ganges River Dolphins, threatened lizard, and reptile as well as bird species subject to extinction) may occur during construction activities due to sensitivity of the species to change in the habitat. These changes are anticipated to be temporary and number of specific measures will be taken to reduce these impacts. Therefore, no major or long-term effects are anticipated, except loss of some habitat.	Minor	Possible	Moderate
Fish	Fish communities including the threatened species could potentially be impacted from soil deposition in aquatic habitat, fish pass, noise, water pollution, etc. The majority of impacts would be temporary in nature; fish may avoid the impacted areas during construction period but return when it ceases.	Low	Possible	Low

## 10.2.4 Physicochemical Impacts

Major physicochemical parameters considered for assessment of environmental impacts of project activities include drainage congestion, air and noise pollution, sanitation and solid waste, water pollution. The effects of the project activities during construction phase on these parameters have been assessed.

### **Water Quality**

The alignment of the proposed water transmission line passes through large number of water bodies, including two major rivers (Old Brahmaputra and Shitalakshya), ponds, and lowlands. It also passes close to several ponds and canals. These water bodies are susceptible to pollution from construction related activities, e.g., accidental spills of chemicals (e.g., oil/grease), materials and contamination by discharge of wastes from workforce (e.g., from labour sheds) during the construction phase. Care should be taken to avoid such contamination, especially because many of these water bodies are important for fisheries, which could be adversely affected by water pollution.

### **Noise and Air Pollution**

Some noise and air pollution could result from excavation and other construction activities. Noise generated by construction activities will typically be for a short duration with minor adverse impact. Air pollution from construction activities is also likely to be localized close to the actual construction sites with minor impact. Increased movement of vehicles carrying construction material to and from the project sites could also increase noise and air pollution.

### **Sanitation and Solid Waste**

Problems related to sanitation and solid waste may result from improper/inappropriate facilities at the labour sheds. Lack of proper sanitation facilities for project people, including the labour/construction worker and absence of proper solid waste (e.g., food waste, construction debris) disposal facilities may create an unhealthy environment within and around the project sites. The Saidabad phase III site consists of several sludge lagoons (where the sludge from Saidabad phase I and II operation is disposed), which will be excavated for the construction of treatment units (for phase III). The excavated material may contain harmful metals (e.g., Aluminium) and may cause environmental pollution if not disposed in a proper manner.

#### ***River Water Flow***

From the Water Availability Assessment by using general model for a SWTP of 11m<sup>3</sup>/s i.e., 900 MLD), which is about 6.25% of the 80% dependable flow of the Intake site. Surface Water withdrawal for Dhaka City is 11 m<sup>3</sup>/s (950 MLD) and the 80% dependable flow at Baidder Bazar is 176 m<sup>3</sup>/s. Available flow after withdrawal would be 165 m<sup>3</sup>/s. Maximum 40% i.e., 70 m<sup>3</sup>/s of 80% (i.e., 176 m<sup>3</sup>/s) dependable flow is needed for the Environment requirement. Here only 6.25% of the 80% dependable flow will be withdrawal. Thus, Haria is a valid intake option in terms of hydraulics and there will be no impact on the river water flow due to the project intervention. The pipeline construction through the waterbodies will be shaft tunnel in the rivers where no potential impacts for the ecology will be anticipated for ensuring the appropriate mitigation measures as specified in the ESMP of the project. No risk is anticipated for Potential impacts for drainage congestion.

#### ***Drainage Congestion***

Drainage congestion may result from possible obstruction to natural flow of drainage water due to the storage of materials, digging/back-filling of water transmission line trenches. The faster drainage resulting from the project activities does not anticipated to risk for lowering groundwater levels or causing erosion in the project area since the handled volumes are anticipated to be major. Maximum care will be taken to avoid any drainage congestion during the construction of the proposed intake structure, water treatment plant and water transmission line.

#### ***Odour Impacts***

The construction and Operation sites waste shall be disposed of through city corporation/municipality waste management system following the waste management plan. So, there is no chance of organic compounds to be decomposed in the project area.

### **10.2.5 Social-economic Impacts**

Major social parameters considered for assessment of social impacts of the proposed project include loss of land, loss of income, traffic congestion and safety, employment and commercial activities. The effects of the project activities on these parameters have been assessed.

#### ***Loss of Land***

For the proposed project, land acquisition will be required for: (i) intake channel, intake structure and associated facilities (ii) the segment of twin raw water transmission lines (minimum 2000 mm dia) from intake structure to Dhaka-Chittagong highway (~8 ha) (iii) construction of a single pipeline (minimum 2000 mm dia) parallel to the existing box culvert

from Demra road to SWTP site (~1 ha). Thus, the total land area to be acquired for the proposed project is ~9 ha.

As noted earlier, the proposed 6 km segment of transmission line from the intake point at Haria on the bank of Meghna River to Dhaka-Chittagong highway passes over a number of homesteads, ponds, agricultural lands, etc. Therefore, acquisition of these lands would result in loss of land and property.

Along Dhaka-Chittagong and Dhaka-Sylhet highway, the water transmission line has been proposed to be laid along the roadside borrow pit, which is owned by the RHD. Hence no land acquisition will be required. Also, transmission lines along the proposed extension of Demra highway as well as the site for the treatment plant is also owned by DWASA/BWDB, and no additional land acquisition will be required in this case. Therefore, land acquisition for laying of most part of the water transmission line is not significant.

Land acquisition has significant adverse social impacts, and therefore care should be taken to minimize land acquisition. Adequate compensation should be provided as per Government rules and regulations against land acquisition, and care should be taken to ensure that the affected people get the compensation without delay. The project has a Resettlement Policy Framework (RPF) to deal with land acquisition and compensation issues. DWASA will pay additional compensation (if any) on top of DC's payment and resettlement benefits as per policy of the RPF. According to the RPF of this project, the affected people will be included in the income livelihood restoration program under this project.

### ***Loss of Income***

Loss of income may result from inability to use a particular piece of land/ establishment (e.g., agricultural land or industry) during the construction phase for income generation activities. Efforts should be made to keep such loss to a minimum (e.g., scheduling construction keeping in mind agricultural/fishing practices in the area) and provide proper compensation for any loss of income as per policy of the RPF.

### ***Crossing of Roads and Water bodies***

The water transmission pipeline corridor passes through two major rivers - Old Brahmaputra and Shitalakshya. Temporary disruption of river traffic is anticipated during laying of water transmission pipeline across the river. "Pipe jacking" technique has been proposed for installation of pipes across the major rivers, which is not likely to cause significant disruption to river traffic. The proposed water transmission lines also cross local roads as well as the Dhaka-Chittagong and Dhaka-Sylhet highways on two locations and temporary disruption of communication is expected during pipeline laying in these locations.

Possible traffic congestion resulting from movement of vehicles (especially on busy Dhaka-Chittagong highway) carrying material and equipment should be addressed with proper traffic management, and avoiding stockpiling of materials in a way that could hamper traffic movement.

### ***Archaeological and Historical Sites***

Archaeological and historical sites are protected resources. Water transmission line construction and maintenance can damage such sites by digging, crushing by heavy equipment, uprooting trees, exposing sites to erosion, or by making the sites more accessible to vandals. However, no archaeological or historical site was encountered along the route of the proposed water transmission line and other project areas. The historical Panam city, which is maintained by the Archaeological Department, is located (2.3Km from

the Intake site) near the intake area site. Therefore, precautions are to be taken to avoid any damage to the area following the Chance Find procedures (Annex-E). This Annex describes the procedures to be followed in the event of a 'Chance Find' for cultural properties and describes the procedures for its management as per the World Bank Operational Manual for OP4.11.

### ***Safety Issues***

Safety (including occupational safety) is an important issue both during construction and operational phases of a water transmission lines. Safety issues are also important for general construction activities, which should be addressed as part of occupational health and safety plan (Annex-M). Construction workers may face occupational health hazards such as minor or major injuries if there is a lack of general safety requirements and precautions applicable for such sites, malfunctioning equipment, careless use of equipment and vehicles. Poorly designed temporary accommodation and sanitation facilities may pose a health threat and nuisance to the workers. Uncontrolled vending of food and drinking water on the work site may also pose a risk with respect to the transmission of contagious diseases like Typhoid, Diarrhea, Malaria, Dengue, etc. Construction workers will be required to handle hazardous materials such as cement, paints, chemicals, fuels etc., which may increase health risks of workers. High noise from the heavy construction machines would also pose a threat to the construction workers. Accident during construction phase is also an important issue. Proper measures including regular maintenance of equipment and use of protective gear are needed to reduce the risk of such accidents during the construction phase.

### ***Potential Impacts on Public Utility Networks***

Potential impacts on public utilities networks due to project activities include disruptions to water supply, electricity, and communication connections. To mitigate these impacts, stakeholder engagement with utility providers has started during the design stage to minimise or avoid clashes where possible. The contractor is required to undertake a GPR survey prior to any excavation which will be monitored during supervision stage. For water supply disruptions, Dhaka WASA will provide advanced notice to the community, arrange alternative sources such as tankers, ensure rapid repair and restoration services, and coordinate with local ward representatives. For electricity supply disruptions, the contractor will give prior notice to the community, install back-up generators at critical locations, establish a priority restoration plan, and develop an energy management plan with contingencies. A Gas main crossings are already identified, and it was agreed with Dhaka WASA that the Gas Pipeline owner will be undertaking the crossing design in due course. By implementing these measures, potential impacts can be minimized, ensuring minimal inconvenience to the socioeconomic and socio-community aspects of the project. The ESMP also requires utility management as part of supervision activities.

### ***Beneficial Impacts, Employment and Commercial Activities***

The major beneficial impact of the project during construction phase would certainly be in the form of employment and indirectly on the national economy. The project will contribute to resolve the water supply problem in Dhaka city during the operational phase. Impact at local level in the form of employment would induce some positive impacts on some other parameters including commercial activities in the project area.

## 10.3 Environmental Impacts During Operational phases

The most important benefit of the proposed water treatment plant project would be expansion of service facilities of DWASA, through addition of 450 MLD of water supply to Dhaka city. Improvement in water supply situation would alleviate sufferings of around 4,500,000 people in different areas of the city, who go through tremendous hardships to collect potable water, especially during the dry season when many deep tube wells become inoperative. This in turn would have significant benefit on public health. Also, with the added capacity of water supply from surface water sources, the dependence on groundwater is expected to be reduced which will allow for limited abstraction from the DWASA deep tube wells and eventually reduce the pressure on groundwater resources. This will have a positive effect on groundwater quantity and quality. Other beneficial effects during the operation phase include employment of people for the operation and maintenance of the treatment plant. This in turn would induce a positive impact on some other parameters including commercial activities in the project area.

Increased water supply also means increased generation of domestic wastewater in Dhaka city. The wastewater disposal situation in Dhaka city is already poor. The DWASA needs to take up appropriate steps for expanding the sewerage network and sewage treatment system, especially in areas where water supply would be significantly increased due to the proposed project. Otherwise, it may cause long-term adverse impact on water quality. For maintaining proper quality of treated water, the raw and treated water quality should be regularly monitored; provisions should be there for adjusting treatment process (e.g., alum dose) depending on water quality.

At the WTP, sludge will be produced from two major sources: (i) de-sludging of the Clarifiers, and (ii) wash water from filter back wash. Sludge thickeners will be provided to reduce the volume of the sludge from Saidabad phase III. Sludge thickeners will also be installed for the Saidabad phase I under this project (sludge thickeners are already installed for Saidabad phase II). Eventually the thickened sludge from phase I, II and III combined is proposed to be run through a filter press setup to generate 30% dried sludge with a volume of 30,000 m<sup>3</sup>/year. Unsanitary dumping of aluminium-rich dried sludge may cause leaching of metals and cause soil contamination the impact of which can be long-term. Proper disposal of dried sludge has to be ensured to protect the environment. Liquid residuals from sludge dewatering operation needs to be checked against the effluent discharge criteria before disposal as it may contain excess organic matter, toxic metals, ammonia, suspended solids, etc. Besides this, Accidental chemical oil leaks, spills on land/ water from equipment/parts of the treatment plant or pumping station may cause negative impacts on surface water and soil quality and may adversely affect public health; therefore, appropriate mitigation plan should be devised for such occurrences.

Stability of riverbank at the location of intake and protection of water transmission line from possible damage are important issues during the operational phase. Adequate protection, i.e., structural elements of the project, will be designed and constructed by competent professionals and certified or approved by competent authorities or professionals. Additionally, the required measures will be taken in this regard." To mitigate the riverbank stability risk at the intake site, a comprehensive approach is employed. Here are the key steps taken to ensure stability:

- **Design and Build Specifications:** The intake site undergoes "design and build" works, which include specific guidelines to enhance stability. These specifications



address factors like annual changes in riverbed level and the maximum anticipated riverbed scour during peak flood conditions.

- **Foundation Design:** The foundations for the intake structure and transfer pipes are meticulously designed. They are engineered to withstand fluctuations in riverbed levels and the potential scour caused by the river at its Maximum Flood Level.
- **Bathymetric Surveys:** The Contractor conducts monthly bathymetric surveys around the intake structure. These surveys cover a radius of at least 100 meters from the center of the structure. By monitoring changes in bed level during construction, any deviations can be promptly addressed.
- **Hydraulic Modelling:** An independent organization specializing in hydraulic modelling performs physical simulations. These simulations analyse the behaviour of the river flow around and inside the intake. The resulting insights inform the design of the intake structure and other underwater components.
- **Scour Protection Measures:** Based on the modelling results, the design incorporates effective scour protection measures. These measures safeguard the intake structure and other submerged elements from erosive forces caused by the river.
- **River Training Works:** The Contractor implements river training techniques to manage the flow and prevent excessive erosion. These measures contribute to overall stability.

Since the water transmission line would cross a number of rivers and other water bodies, maintaining proper navigation through these water bodies without any risk of damage to transmission lines is also an important issue.

Protection of Meghna River against pollution from untreated domestic and industrial wastewater is a very important consideration during operational phase of the project. Although the density of industries in areas close to the intake location is relatively low at the moment, land filling activities (for raising elevation of existing land) were observed close to the intake location, possibly for the establishment of industrial facilities. It is important to develop a long-term management plan for the protection of water quality in Meghna River, including restriction on establishment of industries producing liquid effluent within certain reaches upstream and downstream of the intake point; discharge of untreated domestic sewage into the river should also be strictly controlled.

## 10.4 Evaluation of Physicochemical and Socio-Economic Impacts

For evaluation of physico-chemical and socio-economic impacts, a simple semi-quantitative descriptive checklist method has been applied. Firstly, the activities during construction and operation phases were identified and listed in the impact table. Then the corresponding impacts on the environmental compartments (air, water, soil quality, noise level etc) and human-use factors (loss of land, income, traffic congestion, safety, etc.) were evaluated depending on their typical interaction with project activities. Assessments were made as to whether the impacts were positive (beneficial) or negative (harmful), short-term (short recovery time) or long-term (extended recovery time) and of high or low/moderate intensity. The results of the assessment are summarized in Table 10-6 and Table 10-7, which show that most of the evaluated impacts are of low or moderate (minor impact) intensity and are short-term in nature.

Table 10-6: Physicochemical impacts from activities associated with the construction and operation of Saidabad Water Treatment Plant Phase III (Original Table 39)

Phases	Project Activities	Physicochemical Impacts						
		Drainage congestion	Noise level	Air quality	Surface Water quality	Groundwater quality	Soil Erosion	Soil quality
During Construction	Labour camp setting and its operation	0	0	0	-1 S	-1 S	0	0
	Access road construction	-1 S	-1 S	-1 S	-1 S	0	-1 S	0
	Land clearing	-1 S	0	0	0	0	-2 S	0
	Soil excavation	-2 S	-2 S	-2 S	-1 S	0	-1 S	-1 S
	Piling work	0	-2 S	-1 S	-1 S	-1 S	0	0
	Concreting work	0	-2 S	-1 S	0	0	0	0
	Water body crossing work (pipeline laying)	-1 S	-2 S	-1 S	-1 S	0	0	0
	Provision for safe water and sanitation facilities for workers	0	0	0	0	0	0	0
During Operation	Solid /hazardous waste and wastewater generation	0	0	0	-1 L	-2 L	0	-2 L
	Access to safe water supply	0	0	0	0	+2 L	0	0
	Accidental chemical oil leaks, spills on land/ water	0	0	0	-1 S	0	0	-1 S

[+3 = High Positive Impact, +2 = Moderate positive impact, +1 = Low Positive Impact, 0 = No impact, -1 = Low Negative Impact, -2 = Moderate Negative Impact, -3 = High Negative Impact S = Short term impact, L = Long term impact]

Table 10-7: Socio-economic impacts from activities associated with the construction and operation of Saidabad Water Treatment Plant Phase III (Original Table 40)

Socio-Economic Impacts									
Phases	Project Activities	Loss of Land	Loss of income and displacement (Economic or Physical)	Traffic	Impact on topsoil	Public Health and safety	Effect on Archaeological sites	Health and Safety	Employment and commercial activities
During Construction	Land acquisition	-2 L	-2 L	0	0	0	0	0	0

Socio-Economic Impacts									
Phases	Project Activities	Loss of Land	Loss of income and displacement (Economic or Physical)	Traffic	Impact on topsoil	Public Health and safety	Effect on Archaeological sites	Health and Safety	Employment and commercial activities
	Labour camp setting	0	0	0	0	-2S	0	-1S	+2 S
	Access road construction	0	-1 S	-1 S	-2 S	-1 S	0	-1 S	+2 S
	Land clearing	0	-1 S	0	-2 S	0	0	-1 S	+2 S
	Soil excavation	0	-1 S	0	-1 S	-1 S	0	-1 S	+2 S
	Piling work	0	0	0	0	-1 S	0	-1 S	+2 S
	Concreting work	0	0	0	0	-1 S	0	-1 S	+2 S
	Water body crossing work	0	0	-1 S	0	-1 S	0	-1 S	+2 S
	Provision for safe water and sanitation facilities for workers	0	0	0	0	+2 S	0	+2S	0
During Operation	Accidental chemical oil leaks, spills on land/ water	0	0	0	-1 S	-1 S	0	-1 S	0
	Solid /hazardous waste and wastewater generation	0	0	0	-1 S	-1 S	0	-1S	0
	Access to safe water supply	0	0	0	0	+3 L	0	+3L	0
	Operational staff movement	0	0	-1 S	0	-1 S	0	0	0

[+3 = High Positive Impact, +2 = Moderate positive impact, +1 = Low Positive Impact, 0 = No impact, -1 = Low Negative Impact, -2 = Moderate Negative Impact, -3 = High Negative Impact S = Short term impact, L = Long term impact]

## 10.5 Climate Change Impact

The main climate risks for this project are flooding, droughts, and water scarcity. Flooding can cause significant disruption to the infrastructure necessary for the project, while

droughts and water scarcity can reduce the volume of water available for treatment. Additionally, climate-induced changes in temperature, and the salinity of the water can affect the effectiveness of the water treatment process. This project is in better position in consideration of the climate impact. The project confirms the intake water availability all over the year. As well as project sites are safer in consideration of droughts, flooding and water scarcity. In particular, Water Treatment Plant site does not have any of the climate risk discussed above.

The Saidabad Water Treatment Plant Project Phase III has conducted a Climate change risk assessment for the Component 1 (**Annex-N**). The risk analysis confirms the very significant risk linked to flooding at a more distant horizon concerning the pumping station. The risk can be qualified as "extreme" on the horizon 2050-2100 according to the risk analysis tables (Table 10-8, Table 10-9 and Table 10-10). The damages related to a strong flood, the problems of accessibility and those related to water quality make this a major issue, in connection with an increased frequency of these events in the coming decades. Studies show that the magnitude of a 1 in 100-year flow in Meghna River is projected to increase correlated with increasing global temperature.

Points of attention: accessibility to the intake facilities, level of infrastructure to resist flooding. The riverbank stability risk of the intake site is mitigated through "design and build" works specifications for the intake site. Foundations for the Intake structure and transfer pipes shall be designed to protect against annual changes in riverbed level and the anticipated maximum riverbed scour when the river is at Maximum Flood Level. The Contractor shall conduct monthly bathymetric surveys of the riverbed level over at least a 100m radius around the centre of the Intake structure to monitor changes in bed level during construction. The Contractor shall also carry out physical modelling of river flowing around and inside the Intake using an independent organization specializing in hydraulic modelling. The design of the Intake structure and all underwater structures, including scour protection measures, shall be based on the results of the modelling. The Contractor shall provide river training works and scour protection to protect the structures and the riverbank from scours with the river flowing at the Maximum Flood Level.

The risks related to extreme temperatures also stand out, particularly in the long term and concerning the pumping station (high risk level), due to problems related to water quality and the potential development of algae and/or bacteria. Climate models also show a sharp increase in heat peaks in the next few years.

- > Points of attention: water treatment process to resist the growth of algae and bacteria. Abstracted raw water from the River Meghna will be conveyed via high pressure pumps. There will be no stagnant water inside twin pipelines during normal operations. The design also considered adequate wash outs and air valves to facilitate isolation of any section of pipelines for cleaning and maintenance works. Therefore, the chances of algae and bacteria growths are minimised through pipelines design standard practice.

Drought-related risks would have significant impacts on the operation of the water intake and the pumping station. Climate projections show an increase in these episodes in the coming years, but this increase would remain moderate.

- > Points of attention: positioning of the water intake to withstand low water events as the pump abstraction level is determined at 0 m PWD, as recommended in Hydrology and Modelling report after assessing minimum dry water flow of the River Meghna. The "design & build" Yellow Book FIDIC works specifications are prepared accordingly for the treatment process to deal with a too high concentration of pollutants in the water.

Finally, the risks related to salinity are qualified as "low" in this analysis. The project is far enough away from the sea, even if in connection with saline intrusions, the risk of corrosion and degraded water quality remains to be monitored.

Table 10-8: Risk Assessment Analysis

Risk assessment								
Sub-system	Flood		Saline intrusion		Drought		Extreme temperature	
	2022 - 2050	2050 - 2100	2022 - 2050	2050 - 2100	2022 - 2050	2050 - 2100	2022 - 2050	2050 - 2100
Water intake	High (12)	High (15)	Low (4)	Low (4)	Medium (8)	High (12)	Medium (8)	Medium (10)
Raw water pumping station	High (16)	Extreme (20)	Low (4)	Low (4)	Medium (8)	High (12)	High (12)	High (15)

Table 10-9: Risk Level Description

Legend					
Likelihood level	Consequence level				
	Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
Almost certain (5)	Medium (5)	Medium (10)	High (15)	Extreme (20)	Extreme (25)
Likely (4)	Low (4)	Medium (8)	High (12)	High (16)	Extreme (20)
Possible (3)	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)
Unlikely (2)	Low (2)	Low (4)	Medium (6)	Medium (8)	Medium (10)
Rare (1)	Insignificant (1)	Low (2)	Low (3)	Low (4)	Medium (5)

Table 10-10: Risk Rating Matrix

Risk level	Definition
Extreme	Extreme risks demand urgent attention at the most senior level and cannot be simply accepted as a part of routine operations. These risks are not acceptable without treatment.
High	High risks are the most severe that can be accepted as a part of routine operations without executive sanction, but they are the responsibility of the most senior operational management and reported upon at the executive level. These risks are not acceptable without treatment.
Medium	Medium risks can be expected to form part of routine operations., but they will be explicitly assigned to relevant managers for action., maintained under review and reported upon at the senior management level. These risks are possibly acceptable without treatment.
Low	Low risks will be maintained under review, but it is expected that existing controls will be sufficient, and no further action will be required to treat them unless they become more severe. These risks can be acceptable without treatment.

Opportunities available to the project for reducing the potential GHG emission from the project interventions are to adopt Best Practices, Designing with a Low Carbon Approach in Mind, Reusing buildings instead of constructing new ones, Specify low-carbon concrete mixes, Limiting carbon-intensive materials, Choosing carbon sequestering materials, Reusing materials, Using high-recycled content materials, Maximizing structural efficiency, Using fewer finish materials, Minimizing waste, Using block instead of bricks, Using low carbon materials, Using durable materials for the facade and roof, Designing facade systems that are easy to maintain, Buying local materials, Reducing waste with prefabrication and modular elements, Being mindful when using finishes or decorative facade elements etc.

## 10.6 Cumulative Impact

The cumulative impact assessment examined the interaction between the project's residual effects (i.e., those effects that remain after mitigation measures have been applied) and those associated with other past, existing, and reasonably foreseeable future projects or activities. The interaction of residual effects associated with multiple projects and/or activities can result in cumulative impacts, both positive and negative. The project's potential cumulative effects were considered with respect to valued components in environmental and socioeconomic categories, in four areas:

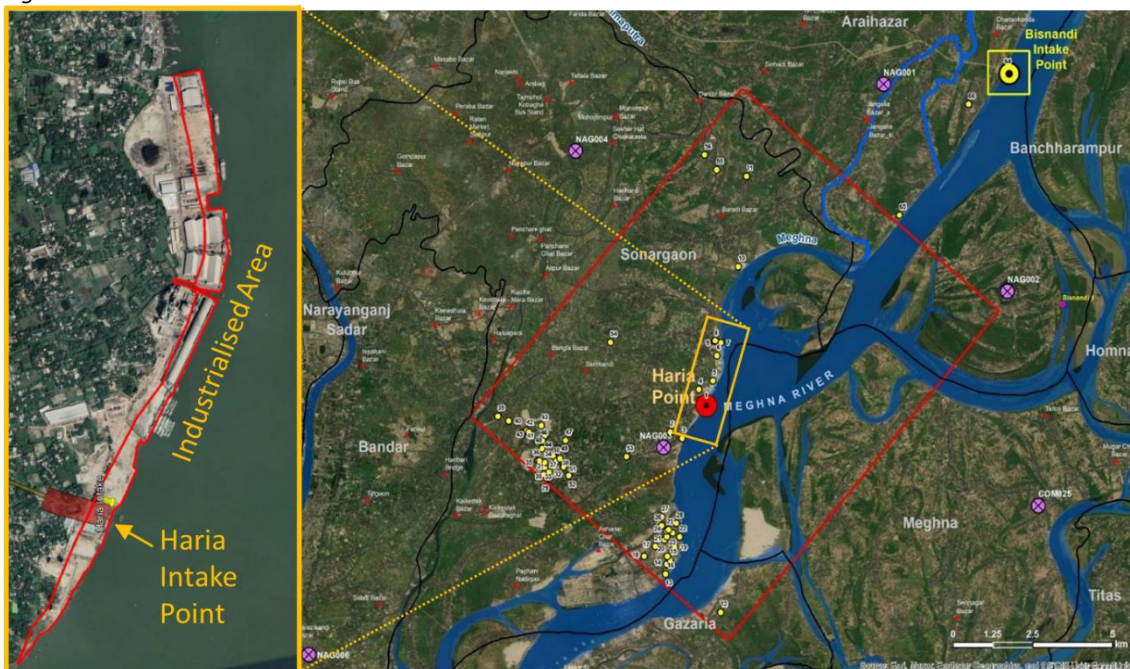
- > of any potential residual project effects that may occur incrementally over time;
- > consideration of other known relevant projects or activities within the specified study area boundaries, even if not directly related to the project;
- > potential overlapping impacts that may occur due to other developments, even if not directly related to the proposed project; and
- > future developments that are reasonably foreseeable and sufficiently certain to proceed

The project has identified the valued components as water quality, air quality, acoustic environment, socioeconomic and socio-community components, and human health and safety. There are no foreseeable projects that will overlap with the said project. The spatial boundary of the subproject are the areas where the facilities (water treatment and Sludge treatment facilities) is located. The temporal boundary can be considered as the whole Water Treatment Plant area.

**Water quality.** Due to nature of the project, there is risk of contaminating ground water and nearby bodies of water during O&M phase. Drains within the facilities will also ensure wastewater generated during operations will be treated and diverted away from any channel leading to agricultural lands, water bodies, and water sources/tube wells. Short-term negative impacts are possible but can be mitigated through design and implementation of ESMP. Potential residual effects are considered to be negligible.

Protection of Meghna River against pollution from untreated domestic and industrial wastewater is a very important consideration during operational phase of the project. Although the density of industries in areas close to the intake location is relatively low at the moment, land filling activities (for raising elevation of existing land) were observed close to the intake location, possibly for the establishment of industrial facilities. It is important to develop a long-term management plan for the protection of water quality in Meghna River, including restriction on establishment of industries producing liquid effluent within certain reaches upstream and downstream of the intake point; discharge of untreated domestic sewage into the river should also be strictly controlled.

Figure 10-1 Location of Haria Intake

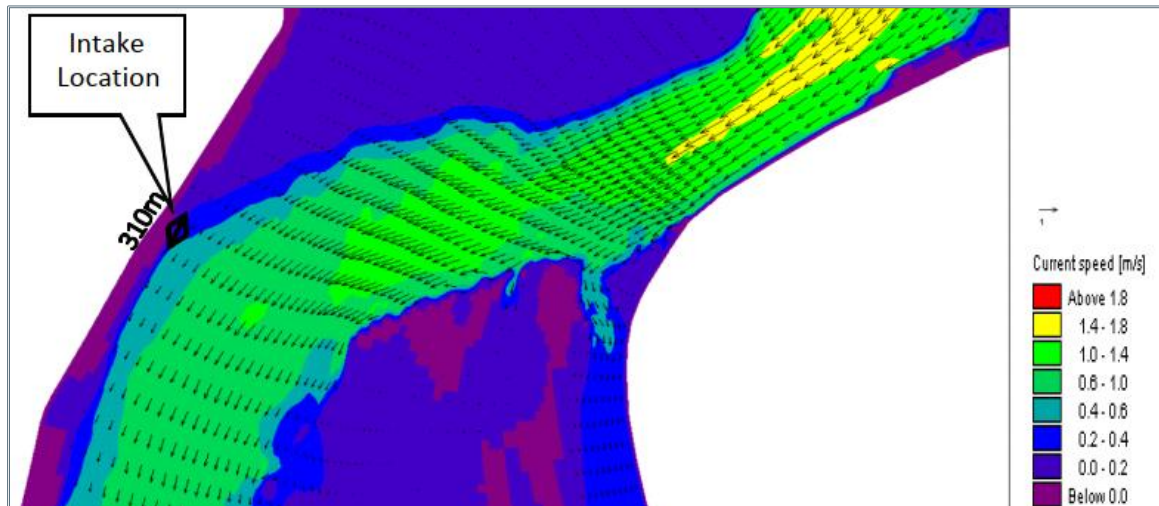


Source: DSC



As shown in Figure 10-2, the intake is located in the region of maximum flow velocity in the river channel, and on the outside of a curved section of the maximum flow path, which is the optimum situation for avoiding sedimentation of the intake and for dilution of local pollution sources.

Figure 10-2 Depth Average Velocity vector near Haria intake during the 1 in 10 year flood event



Source: IWM/EGIS Morphological Study of the Upper Meghna River in Connection with Haria Intake for Saidabad WTP Phase III – 2014

Flow velocities near to the shore have been estimated at 0.4m/s during the 10-year return period flood event.

Full details of the outline design of the intake and pumping station are provided in the report produced for Component 1 of the project *PMCM-GEN-RP-GEN-46003 Outline and Basis of Design Report*.

For the construction phase of the project, strict environmental protection measures (appropriate waste/wastewater disposal practices, installation of sufficient septic tanks and proper disposal of solid waste) will be implemented by the contractor and monitored by DWASA to reduce project related water quality impacts. The wider list of these measures are listed in Table 11-1 in Section 11.2 Mitigation Measures.

**Air quality.** Emissions of common air contaminants and fugitive dust may be elevated in proximity to active work sites during construction and O&M phases; these impacts will be short-term and localized to the immediate vicinity of treatment Plant site. During the operation phase, there is no significant emissions from the treatment plant and the intake site area. The impact of emission during the construction phase is short-term. Greenhouse gas (GHG) emissions may increase as a result of the project activities (i.e., vehicle and equipment operation, concrete production, disposal of excavated material, land filling of residual wastes). Given the project's relatively minor contribution to common air contaminants and GHG emissions during construction, the overall significance rating of both these potential residual effects is considered to be negligible.

**Acoustic environment.** Noise levels during construction and O&M activities in immediate proximity of work sites are expected to increase. The exposure duration will be relatively brief and imperceptible during the construction period. However, for the operational period, it

will be long-term and imperceptible, particularly at the Intake and Water Treatment Plant (WTP) facilities. The exposure represents a temporary, localised, adverse residual effect of low significance for affected receptors. While building damage due to ground vibrations is unlikely, there may be annoyance to spatially located receptors during construction and O&M activities. The overall significance rating of potential residual effects is considered to be negligible.

**Traffic.** Concerns on existing provisions for pedestrians, other forms of transport, and impact around public and traffic at particularly nearby the Water Treatment plant will occur temporarily during construction and O&M activities. Traffic movement will be improved once the construction activities are completed. Operational staff movement is anticipated during the operation phase due to increased volume of water treatment plant operations. Similarly, temporary impacts on fauna especially on birds, reptiles and mammals may occur during construction activities. These will be mitigated through ESMP and special measures listed in Table 11-1. Therefore, along with best industry practices and proposed measures for operational staff movements; no residual impact is anticipated.

**Threatened species and the ECA.** The assessment indicates that the majority of the ecological effects evaluated are either minimal or moderate in severity, with only a transient duration. It is anticipated that there will be no lasting detrimental consequences on plant species or on the communities of mammals, reptiles, amphibians, avian species, and aquatic life. The Ecologically Critical Areas (ECA) will be fully avoided by adopting shaft tunnelling technology for this project. To evaluate specific impacts on reptilian species specifically threatened species, relative abundance and changes in species composition could be used as indicators." and Special care (Addressed in Potential Impacts of "Flora and Fauna" in the Environmental and Social Impacts Table 11-1) for the protection of threatened species such as Ganges River Dolphins, lizards and fish species that have been identified in the project areas and listed in Table 4 5. Potential impacts for threatened bird species include: (i) habitat destruction, (ii) temporary displacement due to increased human disturbance and vehicle movement, and (iii) nest abandonment and/or reproductive failure caused by project related disturbance. " and "If nests are found, they will be relocated to safer locations or onto other trees to minimize the impact on fauna and ECA. Impacts on amphibian population will be monitored by the changes of species composition and richness and their relative abundance.

Impacts will be minimised by prohibiting discharge of fuel, lubricants, chemicals, and wastes into surface waters, preserving aquatic habitats by restricting movement of people/ equipment into them and preventing entry of sediments into these water bodies, restricting activities within the RoW during laying of water pipeline across a water body, keep rest of the water body undisturbed, keeping noise level (e.g., from equipment) to a minimum level, as certain fauna is very sensitive to loud noise.

**New road on the water main.** A new road will be constructed above the water main for pipeline maintenance in the first 6 kms. Dhaka WASA vehicles will access this road with strict control, using bollards and traffic control measures to limit its use by third parties. Consequently, no traffic impact is anticipated from this new road construction, except during the construction period of this maintenance road. While exposure to elevated noise levels, fugitive dust, traffic and common air pollutants will occur near the villages and surrounding environment (including workers' work sites), these effects are expected to be moderate and temporary. Appropriate mitigation measures will be employed to minimize these impacts, making them minor and insignificant with no measurable effects on human health. The Environmental and Social Management Plan (ESMP) outlined in Chapter-11 clearly specifies: (a) the measures to be taken during both the construction and operation phases of the project to eliminate or offset

adverse environmental impacts or reduce them to acceptable levels; (b) the actions required to implement these measures; and (c) a monitoring plan to assess the effectiveness of the mitigation measures implemented.

The contractor is encouraged to utilise river routes for construction equipment deliveries to the intake site rather than using village roads of Sonargaon area. Contractor has already submitted a proposal for a temporary jetty at the intake site for river transportation of imported materials directly into the site.

**Socioeconomic and socio-community.** Concerns on existing provisions for pedestrians, other forms of transport, and over-all impact on liveability particularly nearby the Water Treatment plant will occur spatially during construction and O&M activities. Since the subproject involves small-scale facilities, it will not conflict with existing or planned land use. O&M manuals for the facilities, comprehensive capacity building, and community involvement to be provided under WTP will ensure efficient operation of the facilities and acceptability by the stakeholders. However, following improvement in infrastructures and services, added residential developments, commercial, and business facilities and increased densities are expected to develop and enhance DWASA area. This can be considered a long-term cumulative benefit of the project.

Given the scale of the project it is likely that a number of local people will obtain at least temporary socio-economic benefits, by gaining employment in the construction workforce, and thus raising their levels of income. In addition, a significant number of employments will be generated associated with the O&M of the facilities to be developed under the subprojects. These benefits can bring wider social gains if they are directed at vulnerable groups.

**Community and workers health and safety.** No adverse residual effects to human health will occur as a result of construction or O&M activities, and mitigation measures are in place to ensure public and worker safety, and will be closely monitored. While exposure to elevated noise levels, fugitive dust and common air pollutants will occur in proximity to worksites, due to their short-term and localised nature, these effects are expected to be minor and insignificant with no measurable effects on human health.

Upon completion of the subproject, the socio-community will be the major beneficiaries of this subproject. With the improved water Supply facilities, additional vehicles and workers, they will be provided with reliable and climate-resilient WASA services. In addition to improved environmental conditions, the subproject will reduce occurrence of diseases and people would 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. These are considered a long-term cumulative benefit.

Therefore, the project will benefit the public by contributing to the long-term improvement of WASA services and community liveability in DWASA area.

# 11 Environmental and Social Management Plan

## 11.1 Introduction

This chapter summarizes the mitigation and abatement measures both during construction and operation phases of the project. It also presents an environment management plan (EMP), including a monitoring program with a preliminary cost estimate.

## 11.2 Mitigation Measures

### 11.2.1 Construction Phase

The proposed project involves construction of a water treatment plant at Saidabad, which will draw raw water from the Meghna River. It also involves construction of intake channel, intake structure and treated water transmission pipeline up to injection point. The project will be implemented by Dhaka Water Supply and Sewerage Authority (DWASA). The significant environmental impacts of project activities during construction and operational phases have been presented in Chapter 10. Table 11-1 shows the mitigation measures corresponding to specific adverse impacts during construction phase, along with assignment of responsibilities for their implementation. The measures presented in Table 11-1 are aimed at minimizing the effects of the possible adverse impacts and enhancing the positive impacts. The table shows that most of the adverse impacts could be minimized or even removed if appropriate mitigation measures are taken. However, a post-project monitoring program needs to be put in place to ascertain that the potential impacts have been predicted adequately and that suggested mitigation measures are effective in minimizing adverse impacts on the environment.

*Table 11-1: Environmental and Social impact during construction phase and mitigation measures (Original Table 42)*

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Land acquisition/ requisition	Loss of land / property	<ul style="list-style-type: none"> <li>&gt; Raise awareness of Project Affected Persons (PAPs) through public consultation process prior to actual land acquisition.</li> <li>&gt; Serve land acquisition notices to actual landowners and land users.</li> <li>&gt; Provide adequate (considering present market value), fair, and quick compensation to real landowners and land users, in accordance with applicable laws of GoB.</li> <li>&gt; Provide appropriate and quick compensation for loss of property on acquired land to the landowners and land users.</li> <li>&gt; Involve local people and peoples' representatives in settling social</li> </ul>	DWASA, District Lands Office

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		<p>tension related to land acquisition and those that may develop during the progress of work from the very beginning of project implementation.</p> <ul style="list-style-type: none"> <li>&gt; Formed Grievance Redressal Mechanisms (GRMs) described in Chapter-9 of the Resettlement Action Plans (RAPs) will be functional to safeguard the PAPs grievances if any.</li> <li>&gt; Any grievances will be collected a part of project Grievance Redressal Mechanisms (GRMs) described in Chapter-9 of the RAPs; addressed via grievance reception and management; and will be communicated as part of stakeholder management.</li> </ul>	
	Tree cutting along RoW	<ul style="list-style-type: none"> <li>&gt; Provide adequate, quick and fair compensation to owners</li> <li>&gt; Plantation/afforestation program for tree replacement (plantation of at least two trees of similar species for each cut tree)</li> <li>&gt; Not removing undergrowth fully where possible, so that they may re-grow naturally after the project activity.</li> </ul>	Contractor (Monitoring by DWASA)
Construction and operation of labour shed for workers	Generation of sewage and solid waste	<ul style="list-style-type: none"> <li>&gt; Construction of sanitary latrine and septic tank system</li> <li>&gt; Erection of "no litter" sign, provision of waste bins/cans, where appropriate</li> <li>&gt; Waste minimization, recycle and reuse principles to be followed</li> <li>&gt; Proper disposal of solid waste as per national "Solid Waste Management Rules 2021".</li> <li>&gt; Waste disposal by incineration is strictly prohibited/excluded</li> <li>&gt; Workers' awareness</li> </ul>	Contractor (Monitoring by Employer's Representative)
	Provision for safe water and sanitation facilities for workers	<ul style="list-style-type: none"> <li>&gt; Potable Water supply facilities provision shall be at the working place and the labore shed areas</li> <li>&gt; Ensure the provision of toilets for men and women as per laws</li> <li>&gt; Toilets must be marked by gender (male/female)</li> </ul>	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		<ul style="list-style-type: none"> <li>&gt; Ensure the cleaning monitoring systems</li> <li>&gt; Ensure the number of toilets are- 1 toilet for 25 female workers and 1 toilet for 40 male workers as per legal provisions.</li> <li>&gt; Provide adequate health care and sanitation facilities within the construction sites.</li> </ul>	
	Training to the Construction Workers	<ul style="list-style-type: none"> <li>&gt; Excavation and Trenching</li> <li>&gt; OSHA Construction Training</li> <li>&gt; Protection from Falling</li> <li>&gt; Rigging types of Construction Training</li> <li>&gt; Welding Safety Training</li> <li>&gt; Power Tools Handling Training</li> <li>&gt; Personal Protective Equipment Training</li> <li>&gt; Emergency Preparedness Training</li> <li>&gt; Train all construction workers in basic sanitation and health care issues and safety matters and on the specific hazards of their work.</li> <li>&gt; Provide HIV awareness programming, including STI (sexually transmitted infections) and HIV information, education, and communication for all workers on regular basis.</li> </ul>	
	Labour influx (Risk of social conflict, Increased risk of illegal behaviour, or behaviour that violates social norms in the project area, <ul style="list-style-type: none"> <li>- Influx of additional population ("followers"),</li> <li>- Increased burden on and competition for public service provision, Increased risk of communicable diseases and burden on local</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Developing a CoC for workers and making it part of the employment contract, including sanctions for non-compliance (e.g., termination),</li> <li>&gt; Mandatory and repeated training and awareness raising of the workforce about the CoC, the need to refrain from unacceptable conduct toward local community members, including any particular concerns, such as cultural norms towards women;</li> <li>&gt; Informing workers about national laws that make sexual harassment and GBV a punishable offence which is prosecuted and that the project will cooperate fully with</li> </ul>	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
	<p>health services, Gender-based violence (GBV), Child labour and school dropout,</p> <ul style="list-style-type: none"> <li>- Local inflation of prices, Increased pressure on accommodations and rents, Increase in traffic and related accidents)</li> <li>- Security issues around the project boundary</li> </ul>	<p>any official investigation into allegations; and</p> <ul style="list-style-type: none"> <li>&gt; Contractors adopting a policy to cooperate with law enforcement agencies in investigating complaints, including those about GBV. In rural settings, where the presence of law enforcement is often low, the risk of sexual harassment for local women may be higher, in particular for younger women and girls, but also boys.</li> <li>&gt; Deploying Security at the camp gate and adequate flagman at the roadside nearby the camp.</li> <li>&gt; Contractor will follow EIB's International human rights standards and principles include (i) the UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials, (ii) the UN Code of Conduct for Law Enforcement Officials, (iii) the Voluntary Principles on Security and Human Rights and (iv) the International Code of Conduct on Private Security Providers whilst employing security personnel and implementing security measures during construction.</li> <li>&gt; Building good rapport with local peoples through consultation during the construction and operation of labor shed for workers.</li> </ul>	
	Gender Based Violence and Harassment (GBVH)	<ul style="list-style-type: none"> <li>&gt; Ensure all workers have contracts and background checks including references from most recent employers.</li> <li>&gt; Use robust recruitment processes to select, train, manage and monitor security companies and personnel.</li> <li>&gt; Deliver periodic mandatory training on GBVH to all workers, including contractors, subcontractors and core suppliers, as well as relevant consultants and clients.</li> <li>&gt; Consider engaging expertise (e.g. from local women's rights organisations or NGOs working on GBVH) to conduct awareness</li> </ul>	



Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		<p>campaigns to provide information to local communities, such as what is unacceptable behaviour and how to report an incident of GBVH.</p> <ul style="list-style-type: none"> <li>&gt; Requirements for management of the Code of Conduct for workers comprising aspects such as gender-based violation (GBV), non-discrimination and equal opportunities etc. shall be provided subsequently as an amendment to the ESMP document.</li> </ul>	
	<p>Community Health and Safety</p> <ul style="list-style-type: none"> <li>- Accidents on the approach road and construction site.</li> <li>-Noise and dust pollution.</li> <li>-Communicable diseases can spread among the local community.</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Prior to start the construction activities contractor will be informed the local community.</li> <li>&gt; Instruct the drivers and limit the speed of the vehicles.</li> <li>&gt; Regular health checkup of the workers and awareness training about the communicable disease.</li> <li>&gt; Proper lighting at the project site during the nighttime.</li> <li>&gt; Avoid unnecessary noise pollution.</li> <li>&gt; Spraying water in the dry surface to reduce the dust pollution.</li> <li>&gt; Cover dusty products during transport</li> <li>&gt; Provide proper access control to the project site and unauthorized entry to the project site will be controlled.</li> <li>&gt; Regular mosquito repellent spraying during monsoon periods.</li> </ul>	
	Health of workers	<ul style="list-style-type: none"> <li>&gt; Clean bill of health a condition for employment</li> <li>&gt; Provide appropriate PPE for the Workers</li> <li>&gt; Construction of tube wells with acceptable water quality</li> <li>&gt; Raising awareness about hygiene practices among workers</li> <li>&gt; Regular medical monitoring of workers</li> <li>&gt; Train all construction workers in basic sanitation and health care</li> </ul>	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		<p>issues and safety matters and on the specific hazards of their work.</p> <ul style="list-style-type: none"> <li>&gt; Provide HIV awareness programming, including STI (sexually transmitted infections) and HIV information, education, and communication for all workers on regular basis.</li> <li>&gt; Regular mosquito repellent spraying during monsoon periods.</li> <li>&gt; Provide adequate health care and sanitation facilities within the construction sites.</li> <li>&gt; Please also add other measures against mosquitos, health and safety guidance also on dengue etc. provide sufficient soap, masks, protective cloths, mosquito nets, etc.</li> </ul>	
	Health risk of construction workers due to COVID-19	<ul style="list-style-type: none"> <li>&gt; Prepare the health and safety guidance for COVID-19 at work sites and get approval from DSC.</li> <li>&gt; Strictly follow and implement the H&amp;S guidance for COVID-19 at worksite.</li> <li>&gt; Everyone entering the worksite must wear a mask, gloves and hard shoes.</li> <li>&gt; At the entrance of the worksite/camp site every personnel must wash their hands for 20 second with maintaining a distance of at least 1m (3 ft) from each other.</li> <li>&gt; Discourage site personnel to gather and gossip at any time, rather encourage physical distance while chatting/discussing.</li> <li>&gt; Ensure sufficient stock of soap, sanitizer, washing facility and safe water at the workers' dwelling (both camp site and home).</li> <li>&gt; Encourage frequent hand washing and social distancing at campsite.</li> <li>&gt; Ensure personal distance of at least 1 meter (3 feet), preferably 2m (6ft) during lunch, dinner and prayer.</li> <li>&gt; Train workers on how to properly put on, use/wear, and take off</li> </ul>	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		protective clothing and equipment. Make these trainings mandatory at worksites and provide 10-15 minutes of a workday for such 'training and encouragement' activities.	
	Emergency Preparedness  - Emergency Preparedness and Response Plan	Develop and implement emergency preparedness plan by:  > Perform the threat assessment. > Document contact information > Assign roles and responsibilities. > Take stock of current resources within organization > Determine the response plan steps. > Decide how to communicate with the employees	
Construction of Water Intake, water transmission pipeline and water treatment plant (Access Road construction, Land Clearing, Soil Excavation, Concreting work, Water Body Crossing work)	Air pollution	<ul style="list-style-type: none"> <li>&gt; Ensure that all project vehicles are in good operating condition</li> <li>&gt; Spray water on dry surfaces/ unpaved roads regularly reduce dust generation</li> <li>&gt; Pave access roads</li> <li>&gt; Maintain adequate moisture content of soil during transportation, compaction and handling</li> <li>&gt; Sprinkle and cover stockpiles of loose materials (e.g., fine aggregates).</li> <li>&gt; Not using equipment such as stone crushers at site, which produce significant amount of particulate matter</li> </ul>	Contractor (Monitoring by Employer's Representatives)
	Traffic congestion, communication problems	<ul style="list-style-type: none"> <li>&gt; Schedule deliveries of material/ equipment during non-school hours and after regular working hours</li> <li>&gt; Arrangement of alternative communication routes during laying of pipeline across roads.</li> <li>&gt; Prepare and implement a traffic and transport management plan.</li> <li>&gt; Use signage at the roadside for the safety of the localities.</li> </ul>	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		<ul style="list-style-type: none"> <li>&gt; Deploy Security at the camp gate and adequate flagman at the roadside nearby the camp.</li> <li>&gt; Build good rapport with local peoples through consultation during the construction and operation of labor shed for workers.</li> </ul>	
	Noise pollution	<ul style="list-style-type: none"> <li>&gt; Use of noise suppressors and mufflers in heavy construction equipment.</li> <li>&gt; Avoid using of construction equipment producing excessive noise during school hours and also at night</li> <li>&gt; Avoid prolonged exposure to noise (produced by equipment) by workers/ give protective gears</li> <li>&gt; Regulate use of horns and avoiding use of hydraulic horns in project vehicles.</li> <li>&gt; The Contractor shall take all reasonable measures to minimise noise nuisance arising from construction, installation, testing and commissioning activities. If a noise level exceeding 100 dB(A) is likely to occur in any area, suitable warning signs shall be prominently displayed in that area, indicating that a noise hazard exists, and that ear protection muffs should be worn. Any area where noise levels could exceed 115 dB(A) shall be cordoned off to prevent unprotected personnel from entering the area.</li> </ul>	
	Disruption of local drainage (either congestion or excessive drainage)	<ul style="list-style-type: none"> <li>&gt; Provide adequate diversion channel, if required</li> <li>&gt; Provide facilities for pumping of congested water, if needed</li> <li>&gt; Ensure adequate monitoring of drainage effects, especially if construction works are carried out during the wet season.</li> <li>&gt; Install water retention facilities to avoid too much drainage</li> </ul>	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
	Water and soil pollution	<ul style="list-style-type: none"> <li>&gt; The contractor should use biodegradable fuel</li> <li>&gt; Prevent discharge of fuel, lubricants, chemicals, and wastes into surface waters or on land</li> <li>&gt; Arranging designated areas for storage facilities for all hazardous materials to prevent spillage into the environment</li> <li>&gt; All hazardous materials storage facilities must be located on an impermeable surface and must be enclosed by a sealed bund wall. The bund wall must be capable of containing 110% of the maximum volumes stored to ensure that soil or watercourses are not polluted in the event of a spill in the storage areas;</li> <li>&gt; Adopt proper disposal techniques for any hazardous waste (e.g. excavation materials from sludge lagoons in the SWTP phase III treatment plant site)</li> <li>&gt; Install sediment basins to trap sediments in storm water prior to discharge to surface water.</li> <li>&gt; Replant vegetation when soils have been exposed or disturbed.</li> <li>&gt; Avoid erosion of slopes</li> </ul>	
	Destruction of aquatic habitat and reduction of fisheries, aquatic fauna (including threatened species & ECA)	<ul style="list-style-type: none"> <li>&gt; Prohibit discharge of fuel, lubricants, chemicals, and wastes into surface waters.</li> <li>&gt; Preservation of aquatic habitats by restricting movement of people/ equipment into them and preventing entry of sediments into these water bodies.</li> <li>&gt; Restrict activities within the RoW during laying of water pipeline across a water body, keep rest of the water body undisturbed.</li> <li>&gt; Keep noise level (e.g., from equipment) to a minimum level, as certain fauna is very sensitive to loud noise.</li> <li>&gt; Special care (Addressed in Potential Impacts of "Flora and Fauna" in this Table below) for the protection of threatened species such as Ganges River Dolphins,</li> </ul>	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		<p>lizards and fish species that have been identified in the project areas and listed in Table 4-5.</p> <ul style="list-style-type: none"> <li>&gt; Impacts on amphibian population will be monitored by the changes of species composition and richness and their relative abundance.</li> </ul>	
	Impact on fisherman and other users of river	<ul style="list-style-type: none"> <li>&gt; Full cofferdam is prohibited during the pipeline crossing of the Old Brahmaputra River to avoid flow interruption and disturbance to the aquatic flora and fauna as well as navigability of the local small boats. Full dry season is recommended for the construction works of the river crossing activity.</li> </ul>	
	Cultural Heritage	<ul style="list-style-type: none"> <li>&gt; Chance finds procedure is a standard measure and Annex-E detailed out the Chance find procedure of the project.</li> </ul>	
	Reduction/ damage to plants/ floral habitat	<ul style="list-style-type: none"> <li>&gt; Provide proper compensation if there is any destruction of trees outside RoW.</li> <li>&gt; Control intensive movement of heavy construction vehicles.</li> </ul>	
	Accidents	<ul style="list-style-type: none"> <li>&gt; Following standard safety protocol while digging trenches and laying pipes</li> <li>&gt; Environmental health and safety briefing</li> <li>&gt; Provision of protective gear</li> <li>&gt; Regular and recurring trainings</li> <li>&gt; Install information signs</li> </ul>	
	Spills and leaks oil, toxic chemicals	<ul style="list-style-type: none"> <li>&gt; Good house keeping</li> <li>&gt; Proper handling of lubricating oil and fuel</li> <li>&gt; Collection, proper treatment, and disposal of spills.</li> </ul>	
	Employment of work/ labour force/ economy of the area	<ul style="list-style-type: none"> <li>&gt; Employ local people in the project activities as much as possible.</li> <li>&gt; Promote supply from local suppliers as much as possible</li> </ul>	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		<ul style="list-style-type: none"> <li>&gt; Avoid disruption of access to local business</li> <li>&gt; Install temporary structures from excavation sites (mainly roads) to local businesses</li> <li>&gt; Inform the residents and shops' owners about construction activities and the planned schedule of works</li> <li>&gt; Implement communication and coordination plan with affected owners and a Grievance Redressal Mechanisms (GRMs)</li> </ul>	
	Potential alteration in ship mobility patterns (No ship movement is anticipated)	<ul style="list-style-type: none"> <li>&gt; Although no ship movement is anticipated, coordinate with relevant authorities, set up of signal; limit activities and marine traffic restrictions; communication with river users if any ship movement occurs. There will be 50% flexibility in rivers' crossings during construction phase to make the safe passage to river users and biodiversity.</li> </ul>	
Construction of Pumping Station at Intake and RWP, Distribution Lines	Flora and Fauna	<ul style="list-style-type: none"> <li>&gt; Maximize the replanting of native vegetation following the completion of construction activities.</li> <li>&gt; Preserve existing vegetation whenever possible and consider replanting trees where necessary.</li> <li>&gt; Reduce machinery-related damage by favouring manual construction techniques over mechanical ones.</li> <li>&gt; Safeguard the local ecosystem, ensuring all construction activities include measures to protect plants and wildlife.</li> <li>&gt; Educate all personnel on-site about the company's protocols for managing oil spills and leaks, including the use of dispersants or biological agents to accelerate the degradation of oil from construction equipment. The contractor must present a cleanup method for approval.</li> <li>&gt; Develop and implement a comprehensive waste management strategy.</li> </ul>	Contractor (Monitoring by DWASA)



Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		<ul style="list-style-type: none"> <li>&gt; Install waste bins and sanitary facilities at the contractor's campsite to prevent environmental contamination.</li> <li>&gt; The intake will be installed with PWWC (Passive Wedge Wire Screens) which have a screen pass velocity as low as 0.10~0.15m/s and the entry slots are only 4mm in width. The screen pass velocity is lower than the average river flow velocity in vicinity of the intake and will therefore allow aquatic animals adequate flexibility to avoid the screens all together. Additionally, the slot size being very small, will eliminate any possibility of entrapment of aquatic life in the intake.</li> <li>&gt; It is anticipated that sheet piled cofferdam and offshore jetty will be constructed to allow piling and subsequent construction of the intake structure.</li> </ul>	
	Communication and Stakeholders' management	<ul style="list-style-type: none"> <li>&gt; Monthly public consultation will be conducted for communication and stakeholders' management of the project sites.</li> </ul>	Contractor (Monitoring by DWASA)
	Grievances reception and management	<ul style="list-style-type: none"> <li>&gt; Provide a forum to the internal and external stakeholders to voice their concerns through Internal Grievance Mechanism and External grievance Mechanism,</li> <li>&gt; Queries and issues with the project.</li> <li>&gt; Monitoring the formal and informal consultation activities conducted with the stakeholder groups with respect to GRM.</li> <li>&gt; Tracking feedback received from engagement activities.</li> <li>&gt; Recording and tracking commitments made to communities; and</li> <li>&gt; Assessing the efficacy of the engagement activities in terms of the desired outcomes and the participation of the stakeholder groups</li> </ul>	Contractor (Monitoring by DWASA)

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
	General Environmental Protection	<ul style="list-style-type: none"> <li>&gt; Develop and implement a comprehensive waste management strategy.</li> <li>&gt; Install waste bins and sanitary facilities at the contractor's campsite to prevent environmental contamination.</li> <li>&gt; Construction materials should be properly covered while hauled and stored, roads properly cleaned, and water sprayed in order to minimize concentration of dust in air.</li> <li>&gt; Equipment producing excessive noise should not be operated after dark.</li> <li>&gt; Use of equipment like stone crushers, which produce excessive noise as well as particulate matter must not be used at the site.</li> <li>&gt; Hauling of materials and equipment to and from project sites should preferably be done after the regular working hours, so that it causes minimum disturbances to the regular traffic in and around the project site.</li> <li>&gt; Contractor should take responsibility of proper traffic flow and management within the immediate vicinity of the project site.</li> <li>&gt; Waste/ wastewater (e.g., human waste from labour camps, fuel and wash-water from equipment/ material sheds) should be appropriately disposed, so that they do not find their way into adjacent water bodies.</li> <li>&gt; Solid waste and wastewater should be disposed of in compliance with local legislation and best industry practices. Wastewater should be disposed of by constructing septic tanks. Solid waste, including construction debris, should be regularly collected and transported away from the site for disposal in a designated municipal dump site. Excavated materials from the existing sludge drying beds should</li> </ul>	Contractor (Monitoring by DWASA)

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		<p>be tested for toxicity before disposal.</p> <p>&gt; Appropriate measures should be taken to avoid temporary drainage congestion during construction activities (e.g., keeping existing drains clear, building alternative drainage line/ network, where an existing drainage canal has been filled up).</p>	

### 11.2.2 Operational Phase

At the operational phase, DWASA will be responsible for the operation and maintenance of the water treatment plant, intake structures, water transmission line and the ancillary facilities. No significant air and noise pollution is expected from the operation of the plant. The important issues to be addressed during operational phase include proper disposal of screening wastes at the intake and WTP, disposal of oil, grease and sand from raw water at the intakes and WTP, disposal of laboratory wastes at WTP and proper disposal of dried sludge and liquid effluent from sludge drying operations. Aluminium-rich sludge from clarifiers and wash water from filter back wash will be generated, this disposal of which is the most important issue during the operational phase. It should also be mentioned that the project needs to manage the sludge generated from Saidabad phase I and II. Table 11-2 lists the mitigation and enhancement measures for the operational phase, including measures for ensuring proper disposal of treatment waste.

Table 11-2: Environmental impact during operation phase and mitigation measures (Original Table 43)

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Pumping operation at the Water intake	Screening waste accumulation	<p>&gt; Screening waste needs to be removed regularly from the coarse screens. Local labour may be employed for such operations.</p> <p>&gt; Waste should be stored in a designated Waste Storage Area.</p> <p>&gt; Proper disposal of screening wastes, floating debris (to be treated as a solid waste) by available Sonargaon Municipal Solid Waste Management System: formulate disposal management plan and provide adequate facilities to carry it out</p>	DWASA
	Accidental Spillage of fuel (to run generators)	<p>&gt; Forbid discharge of fuel, lubricants, chemicals, and wastes into surface waters or on land.</p> <p>&gt; Adopt proper disposal techniques for any hazardous waste: hazardous waste management plan and provide adequate facilities to carry it out</p>	
	Noise Pollution	<p>&gt; Plant noise will be maintained following the National Noise Pollution (Control) Rules -2006.</p> <p>&gt; Permissible noise levels inside buildings during operation: The following limits specified as NR rating curves shall not be exceeded with the relevant room</p>	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties																		
		<p>or building in its normal mode of operation and shall hence generally apply with windows and doors shut, and with air-conditioning / ventilation plant in operation. The Contractor shall therefore pay due attention in its design to noise contributed by operation of the facilities outside the room, the noise arising from the air-conditioning/ventilation of the room, and any noise generated by equipment positioned in the room.</p> <table><tr><th>Location</th><th></th></tr><tr><td>Control rooms and conference rooms and any living or sitting rooms</td><td></td></tr><tr><td>Offices, mess and rest rooms, security/firefighting watch rooms</td><td></td></tr><tr><td>Workshops, garages which include vehicle maintenance facilities, stores, fire station work area, and inside all buildings with extended occupancy by operation and maintenance staff, unless otherwise specified</td><td></td></tr><tr><td>Interior of all buildings and enclosures unless otherwise specified or unless those enclosures are themselves provided to prevent the irradiation of noise to the site</td><td></td></tr></table> <p>&gt; Permissible noise levels inside buildings during operation: The noise levels experienced by personnel moving about on the site at any point at grade level, and on various buildings, platforms, galleries, plant items and access ways, shall not exceed the following or the respective figures provided in the applicable Laws, whichever one is lower.</p> <table><tr><th>Location</th><th>Limit</th></tr><tr><td>At the site boundary</td><td>NR 60</td></tr><tr><td>Noise levels at the site boundary during brief transient conditions which only rarely occur, such as the operation of safety valves, shall not exceed</td><td>NR 70</td></tr><tr><td>At any point on the site for which a noise level is not otherwise specified</td><td>NR 85</td></tr></table>	Location		Control rooms and conference rooms and any living or sitting rooms		Offices, mess and rest rooms, security/firefighting watch rooms		Workshops, garages which include vehicle maintenance facilities, stores, fire station work area, and inside all buildings with extended occupancy by operation and maintenance staff, unless otherwise specified		Interior of all buildings and enclosures unless otherwise specified or unless those enclosures are themselves provided to prevent the irradiation of noise to the site		Location	Limit	At the site boundary	NR 60	Noise levels at the site boundary during brief transient conditions which only rarely occur, such as the operation of safety valves, shall not exceed	NR 70	At any point on the site for which a noise level is not otherwise specified	NR 85	
Location																					
Control rooms and conference rooms and any living or sitting rooms																					
Offices, mess and rest rooms, security/firefighting watch rooms																					
Workshops, garages which include vehicle maintenance facilities, stores, fire station work area, and inside all buildings with extended occupancy by operation and maintenance staff, unless otherwise specified																					
Interior of all buildings and enclosures unless otherwise specified or unless those enclosures are themselves provided to prevent the irradiation of noise to the site																					
Location	Limit																				
At the site boundary	NR 60																				
Noise levels at the site boundary during brief transient conditions which only rarely occur, such as the operation of safety valves, shall not exceed	NR 70																				
At any point on the site for which a noise level is not otherwise specified	NR 85																				
	Public Health and Safety	<p>&gt; Take measures to avoid or minimize transmission of communicable diseases that may be associated with the influx of temporary or permanent project labor</p> <p>&gt; Implement measures and actions to control the safety of deliveries of hazardous materials, and of storage, transportation and disposal of hazardous materials and wastes</p> <p>&gt; Implement measures to avoid or control community exposure to the hazardous material</p> <p>&gt; Emergency Response plan of DWASA will include the public evacuation procedures.</p>																			
	Presence of silt, oil and grease in raw water	<p>&gt; Design of intake structure in order not to collect water from the surface to avoid oil and grease.</p> <p>&gt; Design of intake structure in order to avoid collecting water very close to the riverbed to prevent excess silt from entering.</p> <p>&gt; Facilities at intake for removing silt, oil and grease entering accidentally the system</p> <p>&gt; Keeping a provision in the intake system to collect water from different depths depending on the water level of Meghna River</p>																			

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
	Operational staff movement (impact on traffic)	<ul style="list-style-type: none"> <li>&gt; Operational staff movements will be monitored by implementing good industry practices during operation phase</li> <li>&gt; Although minimum impact is anticipated, working hours to be adjusted in a way to avoid school hours, and spread across the shifts of the staff during operation.</li> </ul>	
	Riverbank stability	<ul style="list-style-type: none"> <li>&gt; The riverbank stability risk of the intake site is mitigated through "design and build" works specifications for the intake site.</li> <li>&gt; Foundations for the Intake structure and transfer pipes shall be designed to protect against annual changes in riverbed level and the anticipated maximum riverbed scour when the river is at Maximum Flood Level.</li> <li>&gt; The Contractor shall conduct monthly bathymetric surveys of the riverbed level over at least a 100m radius around the centre of the Intake structure to monitor changes in bed level during construction.</li> <li>&gt; The Contractor shall also carry out physical modelling of river flow around and inside the Intake using an independent organisation specialising in hydraulic modelling. The design of the Intake structure and all underwater structures, including scour protection measures, shall be based on the results of the modelling.</li> <li>&gt; The Contractor shall provide river training works and scour protection to protect the structures and the riverbank from scour with the river flowing at the Maximum Flood Level.</li> </ul>	
Treatment plant operation and Sludge Treatment Facilities	Accidental Spills and leaks oil, toxic chemicals	<ul style="list-style-type: none"> <li>&gt; Good house keeping</li> <li>&gt; Proper handling of lubricating oil and fuel</li> <li>&gt; Collection, proper treatment, and disposal of spills.</li> <li>&gt; Formulate an accident management plan</li> </ul>	DWASA
	Generation of sludge dry cakes after sludge dewatering operation	<ul style="list-style-type: none"> <li>&gt; Assessment of characteristics of sludge through Toxicity characteristic leaching procedure (TCLP) test to confirm that the material is not hazardous</li> <li>&gt; Exploring beneficial options for dewatered sludge disposal (e.g. land application, co-disposal with sewage sludge, selling to brick factory)</li> <li>&gt; If beneficial options are not available, consider landfilling in a suitable land/location.</li> <li>&gt; If lands are not available, make arrangements with Dhaka South City Corporation to dispose the sludge dry cakes in one of their designated landfills.</li> </ul>	
	Noise Pollution	<ul style="list-style-type: none"> <li>&gt; Plant noise will be maintained following the National Noise Pollution (Control) Rules -2006.</li> </ul>	

Activity/Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
	Sludge Transport	<ul style="list-style-type: none"> <li>&gt; The nearest sanitary landfill site has been selected to minimise transport distance; Matuail is only 4km from the site and the DSCC long term development plan includes for a direct road route.</li> <li>&gt; The contractor is incentivised to provide plant that produces sludge cake with a high dry solids content as this will reduce their O&amp;M costs through fewer vehicle movements.</li> <li>&gt; It has been recommended to DWASA that an alternative sludge disposal route is investigated which would involve pumping the sludge to Dasherbandi sewage treatment works.</li> </ul>	
	Generation of liquid residuals after sludge dewatering operation	<ul style="list-style-type: none"> <li>&gt; Direct disposal to nearby lowlands if the residuals meet the effluent discharge criteria as per ECR 1997 (see Annex)</li> <li>&gt; If discharge criteria are not met, return to the head end of the plant for treatment. Must not be discharged to the head end as a pulse, rather metered in at a flow rate compatible with the hydraulic loading of the plant preferably during diurnal high flows.</li> </ul>	
	Poor raw water quality in the Meghna River	<ul style="list-style-type: none"> <li>&gt; Seeking the help of the Department of Environment (DoE) for preventing discharge of untreated industrial and domestic wastewater into Meghna River and thereby ensuring its water quality. Also, it is recommended to restrict development activities both upstream and downstream of the intake point, especially those activities that could affect the water quality and hydrology at the intake location.</li> <li>&gt; The project objective is to reduce (a) ground water abstraction and (b) replace polluted Sitalakshya River water with Meghna River. Additional wastewater due to population growth within Saidabad Phase-I and II supply zones are currently being treated by Dasherbandi Sewage Treatment Plant and the proposed expansion of Saidabad Phase-III distribution network will be treated by upgrading Pagla Sewage Treatment Plant under Dhaka Sanitation Improvement Project (WB). Therefore, conventional wastewater treatment process will be in place to treat and dispose of water production from all three phases of Saidabad project.</li> </ul>	DWASA and DoE
	Site security issues during operation	<ul style="list-style-type: none"> <li>&gt; No special security personnel is envisaged during the operation phase; security features has been addressed in design specifications. EIB's International human rights standards and principles include (i) the UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials, (ii) the UN Code of Conduct for Law Enforcement Officials, (iii) the Voluntary Principles on Security and Human Rights and (iv) the International Code of Conduct on Private Security Providers will be followed if security personnel is employed.</li> </ul>	DWASA

It is very important that DWASA establishes its own laboratory at the proposed WTP with required manpower and chemicals/equipment for measurement of routine water quality parameters. Establishment of the laboratory should be considered as an integral part of the proposed project.

## 11.3 Environmental and Social Management Plan

### 11.3.1 Scope of ESMP

The primary objective of environmental management and monitoring is to record environmental impacts resulting from the project activities and to ensure implementation of the “mitigation measures” identified earlier (see Table 11-1 and Table 11-2) in order to reduce adverse impacts and enhance positive impacts from specific project activities. Besides, it would also address any unexpected or unforeseen environmental impacts that may arise during construction and operation phases of the project.

The ESMP should clearly lay out: (a) the measures to be taken during both construction and operation phases of the project to eliminate or offset adverse environmental impacts or reduce them to acceptable levels; (b) the actions needed to implement these measures; and (c) a monitoring plan to assess the effectiveness of the mitigation measures employed. Environmental management and monitoring activities for the proposed transmission line project could be divided into management and monitoring: (a) during construction phase, and (b) during operation phase.

### 11.3.2 Work Plans and Schedules

The environmental management program should be carried out as an integrated part of the project planning and execution. It must not be seen merely as an activity limited to monitoring and regulating activities against a pre-determined checklist of required actions. Rather it must interact dynamically as project implementation proceeds, dealing flexibly with environmental impacts, both expected and unexpected.

For this purpose, it is recommended that the Project Director (PD) for this specific project takes the overall responsibility of environmental management and monitoring. The PD will form a team with required manpower and expertise to ensure proper environmental monitoring, and to take appropriate measures (as outlined in Table 11-1 and Table 11-2) to mitigate any adverse impact and to enhance beneficial impacts, resulting from the project activities. The PD through its team will make sure that the Contractor undertake and implement appropriate measures as stipulated in the contract document, or as directed by the PD to ensure proper environmental management of the project activities.

It should be emphasized that local communities should be involved in the management of activities that have potential impacts on them (e.g., drainage congestion). They should be properly consulted before taking any management decision that may affect them. Environmental management is likely to be most successful if such decisions are taken in consultation with the local community.

The environmental management during the construction phase should primarily be focused on addressing the possible negative impacts arising from:

- > Land acquisition processes (loss of land/property/crop, loss of income)



- > Cutting/ clearing of crops/ trees/ vegetation along RoW of water transmission line, and associated impact on terrestrial fauna
- > Air pollution
- > Traffic/communication problems
- > Noise pollution
- > Drainage congestion
- > Water and soil pollution
- > Destruction of aquatic habitat and reduction of fisheries, aquatic fauna
- > Reduction of damage to plants and floral habitat
- > Employment of labour force giving priority to local people with required skills
- > Accidents, spills and leaks
- > Occupational health, safety and
- > Prevention of Gender Based Violence and Harassment (GBVH)

The environmental management during the operation phase should primarily be focused on addressing the possible negative impacts arising from:

- > Maintenance of screens and generation of solid waste
- > Accidental spills of oils, leaks etc.
- > Occupational health, safety and
- > Prevention of Gender Based Violence and Harassment (GBVH)
- > Generation of sludge cakes from sludge dewatering operation
- > Generation of liquid residuals from sludge dewatering operation
- > Poor water quality of Meghna River

The mitigation measures for addressing the above issues are listed in Table 11-1 and Table 11-2. It must be ensured that these measures are implemented in the field under the supervision of the PD of the project.

## 11.4 Environmental and Social Monitoring Plan

The primary objective of the environmental and social monitoring is to record environmental and social impacts resulting from the project activities and to ensure implementation of the “mitigation measures” identified earlier in order to reduce adverse impacts and reduce negative impacts from specific project activities. In addition, the monitoring plan should also include regular reviews of the impacts that cannot be adequately assessed before the start of the works, or which arise unexpectedly, along with appropriate measures to mitigate any negative impacts and/or enhancing beneficial impacts.

### 11.4.1 Monitoring during Construction Phase

Specific monitoring requirements for the environmental and social issues during construction phase listed in Table 11-1 are presented in Table 11-4. Please note full mitigation measures are listed in Table 11-3: Environmental and Social impact during construction phase and mitigation measures (Original Table 42); listed items in below table should be monitored in full during construction phase of the project.

*Table 11-4: Monitoring issues/ requirements during construction phase of the project (Original Table 44)*

Environmental/Social Issue	Monitoring requirements/issues
Air pollution	<ul style="list-style-type: none"> <li>&gt; Construction materials should be properly covered while hauled and stored, roads properly cleaned, and water sprayed in order to minimize concentration of dust in air.</li> <li>&gt; Use of equipment like stone crushers, which produce excessive noise as well as generate particulate matter must not be used close to human settlement.</li> <li>&gt; Concentration of particulate matter within and around the project site should be measured, at least once every three months, and air quality management plan should be revised, if needed.</li> <li>&gt; Avoid excessive air pollution near the ECA area and threatened species, report incidents/accidents to management involving threatened species, specific attention/monitoring should be shown while working near ECA.</li> <li>&gt; Ensure that all project vehicles are in good operating condition</li> <li>&gt; Spray water on dry surfaces/ unpaved roads regularly reduce dust generation (Pave access roads)</li> <li>&gt; Maintain adequate moisture content of soil during transportation, compaction and handling</li> <li>&gt; Sprinkle and cover stockpiles of loose materials (e.g., fine aggregates).</li> <li>&gt; Not using equipment such as stone crushers at site, which produce significant amount of particulate matter</li> </ul>
Noise pollution	<ul style="list-style-type: none"> <li>&gt; Equipment producing excessive noise should not be operated after dark.</li> <li>&gt; Use of equipment like stone crushers, which produce excessive noise as well as particulate matter must not be used at the site.</li> <li>&gt; Vehicle movement to and from the site should be properly managed in order to ensure that this causes minimum disturbance to the people living in the surrounding areas.</li> <li>&gt; Avoid excessive noise near the ECA area and threatened species; no noise pollution must be measures whilst working near ECA and threatened species.</li> </ul>
Traffic congestion	<ul style="list-style-type: none"> <li>&gt; Hauling of materials and equipment to and from project sites should preferably be done after the regular working hours, avoiding school times, so that it causes minimum disturbances to the regular traffic in and around the project site.</li> </ul>

Environmental/Social Issue	Monitoring requirements/issues
	<ul style="list-style-type: none"> <li>&gt; Contractor should take responsibility of proper traffic flow and management within the immediate vicinity of the project site.</li> </ul>
Change in drainage (i.e. excessive drainage and drainage congestion)	<ul style="list-style-type: none"> <li>&gt; Appropriate measures should be taken to avoid any kind of temporary drainage congestion during construction activities such as keeping existing drains clear, building alternative drainage line/network, where an existing drainage canal has been filled up.</li> <li>&gt; Similar measures will be taken at accommodation camps to avoid drainage issues during construction phase.</li> <li>&gt; Provide adequate diversion channel, if required to prevent drainage flooding in wet season</li> <li>&gt; Ensure adequate monitoring of drainage effects (such as drainage flooding), especially if construction works are carried out during the wet season.</li> </ul>
Disposal of construction waste	<ul style="list-style-type: none"> <li>&gt; Waste/ wastewater (e.g., human waste from labour camps, fuel and wash-water from equipment/ material sheds) should be appropriately disposed, so that they do not find their way into adjacent water bodies.</li> <li>&gt; Solid waste and wastewater should be disposed of in proper fashion. Erection of "no litter" sign, provision of waste bins/cans, where appropriate. Waste minimization, recycle and reuse principles to be followed. Proper disposal of solid waste as per national "Solid Waste Management Rules 2021". Workers' awareness program should be monitored.</li> <li>&gt; Wastewater should be disposed of by constructing septic tanks. Solid waste, including construction debris, should be regularly collected and transported away from the site for disposal in a designated municipal dump site. Excavated materials from the existing sludge drying beds should be tested for toxicity before disposal. Work in the river at the intake site shall require monitoring for impact (waste disposal, increase in turbidity due to dredging and other forms of construction etc) on fishing activities for the local communities.</li> </ul>
Employment of workforce	<ul style="list-style-type: none"> <li>&gt; Local people should be employed in the project activities as much as possible.</li> </ul>
Labour issues and OHSS	<ul style="list-style-type: none"> <li>&gt; Ensuring safety and well-being of workers is crucial, monitoring the working conditions and implementing safety measures such. as proper ventilation, protective gear, and training programs is essential.</li> <li>&gt; Monitoring the air quality, water quality, waste management of the worker camps</li> </ul>

Environmental/Social Issue	Monitoring requirements/issues
	<ul style="list-style-type: none"> <li>&gt; Construction of tube wells with acceptable water quality should be checked.</li> <li>&gt; Waste minimization, recycle and reuse principles to be followed by the labours.</li> <li>&gt; Construction of sanitary latrine and septic tank system</li> <li>&gt; Erection of "no litter" sign, provision of waste bins/cans, where appropriate</li> <li>&gt; Potable Water supply facilities provision shall be at the working place and the labore shed area</li> <li>&gt; Worker's accommodation should be followed as per international processes and standards such as "Workers accommodation: Processes and Standards- Guidance Note by IFC/EBRD."</li> <li>&gt; Ensure the provision of toilets for men and women as per laws and ensure the cleaning monitoring systems</li> <li>&gt; Toilets must be marked by gender (male/female)</li> <li>&gt; Ensure the number of toilets are- 1 toilet for 25 female workers and 1 toilet for 40 male workers as per legal provisions</li> <li>&gt; Worker's awareness about hygiene practices</li> <li>&gt; Regular medical monitoring of workers</li> <li>&gt; Proper monitoring and management of solid waste disposal, minimizing environmental impacts and ensuring worker safety.</li> <li>&gt; Strictly follow and implement the H&amp;S guidance for COVID-19 at worksite.</li> <li>&gt; Monitoring working hours and managing worker fatigue are important considerations.</li> <li>&gt; Excessive working hours can lead to increased accidents and decreased productivity</li> <li>&gt; Mandatory safety trainings should be provided to the construction workers - Excavation and Trenching; OSHA Construction Training; &gt; Protection from Falling; Rigging types of Construction Training; Welding Safety Training; Power Tools Handling Training; Personal Protective Equipment Training; Emergency and Preparedness Training</li> </ul>
Surface Water Quality	<ul style="list-style-type: none"> <li>&gt; Monitor the Surface Water Quality of the nearby Kajla khal (canal) as well as during all type of construction activities along ECAs within the project boundary.</li> </ul>

Environmental/Social Issue	Monitoring requirements/issues
Flora and Fauna	<ul style="list-style-type: none"> <li>&gt; Note the amount of native vegetation following the completion of construction activities.</li> <li>&gt; Monitor the preservation of the existing vegetation whenever possible and consider replanting trees where necessary.</li> <li>&gt; Monitor the machinery-related damage by favouring manual construction techniques over mechanical ones.</li> <li>&gt; Monitor the safeguard of the local ecosystem, ensuring all construction activities include measures to protect plants and wildlife.</li> <li>&gt; Monitor the education of all personnel on-site about the company's protocols for managing oil spills and leaks, including the use of dispersants or biological agents to accelerate the degradation of oil from construction equipment. Ensure the contractor's cleanup method for approval.</li> <li>&gt; Monitor the implementation of the waste management strategy.</li> <li>&gt; Monitor the use of the waste bins and sanitary facilities at the contractor's campsite to prevent environmental contamination.</li> </ul>
Commercial activities	<ul style="list-style-type: none"> <li>&gt; Efforts should be made to ensure that local communities are benefited from the increased commercial activities during the construction phase of the project (e.g., by ensuring their participation in the activities).</li> <li>&gt; Care should be taken to avoid haphazard development of commercial activities (e.g., shops) in and around the project sites, which would adversely affect the local environment.</li> </ul>
Community Health and Safety	<ul style="list-style-type: none"> <li>&gt; Monitor the community health and safety to avoid or minimize the transmission of communicable diseases that may be associated with the influx of temporary or permanent project labour</li> <li>&gt; Conduct Health screenings, vaccinations, and health education programs.</li> <li>&gt; Measures and actions should be in place to control the safety of deliveries, storage, transportation, and disposal of hazardous materials and wastes.</li> <li>&gt; Implement strategies to avoid or control community exposure to these hazardous materials.</li> </ul>

Environmental/Social Issue	Monitoring requirements/issues
	<ul style="list-style-type: none"> <li>&gt; The emergency response plan of DWASA should include comprehensive public evacuation procedures to ensure the community's safety in case of any incidents.</li> <li>&gt; All workers must have written contracts and undergo background checks with references from prior employers</li> <li>&gt; 24 x 7 CCTV coverage at key areas within the camp shall be provided for security and safeguarding purposes</li> <li>&gt; The security of the community, particularly of women must be safeguarded, considering the influx of mainly male construction workers.</li> <li>&gt; A Code of Conduct (CoC) must be developed making it part of the employment contracts, including sanctions for non-compliance (e.g., termination)</li> <li>&gt; Mandatory and repeated CoC awareness and behavioural training should be conducted, focusing on respectful behaviour toward local communities and cultural norms, especially those relating to women</li> <li>&gt; Workers must be clearly informed about national laws prohibiting sexual harassment and gender-based violence (GBV), including punishments and legal processes</li> <li>&gt; Contractor must adopt a policy to fully cooperate with law enforcement agencies in cases of misconduct or GBV</li> <li>&gt; In rural areas with limited law enforcement, heightened measures must be taken to prevent risks of harassment, especially for women, girls, and boys.</li> <li>&gt; Mandatory training should be included on GBVH (Gender-Based Violence and Harassment) for all staff, including contractors, subcontractors, core suppliers, and consultants.</li> <li>&gt; Collaboration with local women's rights organizations or NGOs to conduct awareness campaigns and provide community guidance on unacceptable behaviour and reporting GBVH</li> <li>&gt; No forced, bonded, or underage labor will be allowed. Children aged 14–18 may only engage in light work as per national law.</li> <li>&gt; Development of a Worker Influx Management Plan following IFC Performance Standards 2 if more than 500 external workers are mobilized at the site.</li> </ul>
Archaeological	<ul style="list-style-type: none"> <li>&gt; Proximity to historic Panam city could increase possibility of archaeological finds during construction works. Detailed</li> </ul>

Environmental/Social Issue	Monitoring requirements/issues
	plans with watching brief may be required if major finds are identified.

*Table 11-5 Environmental (air quality and noise level) and Socio-economic monitoring during construction phase (Original Table 45)*

Parameters/Items	Monitoring Frequency	Resource Required and Responsibility	Comment
Particulate Matter (PM <sub>10</sub> , PM <sub>2.5</sub> )	Once every 3 months, and as directed by the PD	PM <sub>10</sub> and PM <sub>2.5</sub> measuring equipment. Contractor's responsibility	Results to be verified by the Environmental Expert of DSC Team.
Noise Level	Once every month, and as directed by the PD	Noise level meter. Contractor's responsibility	
Surface Water Quality (pH, Turbidity, BOD, COD, TDS, DO, Ammonia (NH <sub>3</sub> -N) and Oil & Grease) of Kajla Khal	Once every Quarter and as directed by PD	From Accredited Laboratory; Contractor's responsibility	
Employment of workforce	Once every Quarter and as directed by PD	Contractor's responsibility, Supervised by the Design Supervision Consultant	
Community Health and Safety	Once every Quarter and as directed by PD	Contractor's responsibility, Supervised by the Design Supervision Consultant	
Surveys and interviews with local residents and businesses	Once in a year as directed by PD	Contractor's responsibility, Supervised by the Design Supervision Consultant	

*Note: Actual monitoring time and location will be decided by DWASA and the Design Supervision Consultant (DSC) and included in the Employer's Requirements*

### 11.4.2 Monitoring during Operational Phase

The environmental monitoring during the planning/ operation phase should primarily address the following issues:

- > Disposal of treatment wastes (mainly sludge and liquid residuals from sludge dewatering operations)
- > Treated water quality
- > Raw water quality and availability of raw water
- > Generation of additional volumes of wastewater as treated water supplies in the city are improved
- > Safety of water distribution network



Specific monitoring requirements for each of the environmental issues listed above are presented in Table 11-6. As noted earlier, the monitoring plan should also include regular reviews of the impacts in order to address those that may arise unexpectedly during the operation phase of the project.

*Table 11-6: Monitoring issues/ requirements during operation phase of the project (Original Table 46)*

Environmental/Social Issue	Monitoring requirements/issues	Responsibility
Stability of riverbank and intake channel	<p>The riverbank stability risk of the intake site is mitigated through "design and build" works specifications for the intake site.</p> <p>Foundations for the Intake structure and transfer pipes shall be designed to protect against annual changes in riverbed level and the anticipated maximum riverbed scour when the river is at Maximum Flood Level.</p> <p>The Contractor shall conduct monthly bathymetric surveys of the riverbed level over at least a 100m radius around the centre of the Intake structure to monitor changes in bed level during construction.</p> <p>The Contractor shall also carry out physical modelling of river flow around and inside the Intake using an independent organisation specialized in hydraulic modelling. The design of the Intake structure and all underwater structures, including scour protection measures, shall be based on the results of the modelling.</p> <p>The Contractor shall provide river training works and scour protection to protect the structures and the riverbank from scour with the river flowing at the Maximum Flood Level.</p>	Contractor and DWASA
Disposal of treatment waste	<p>Regular (once every three months) assessment of the characteristics of sludge through TCLP test to ensure that it is not hazardous.</p> <p>Monitoring of discharge parameters of liquid residuals from sludge drying operations.</p> <p>Studies to explore the possibility beneficial sludge disposal options (e.g., land application), and in designated landfills (coordinating with the Dhaka City Corporation)</p>	DWASA
Treated water quality	<p>Regular monitoring of treated water quality (as part of the ongoing regular plant operation) to ensure that it is safe for public consumption.</p> <p>Modification of treatment process (e.g., increase/decrease alum dose of chlorine dose), if needed.</p>	DWASA
Raw water quality and availability of raw water	<p>Regular monitoring of raw water quality, as part of ongoing regular plant operation.</p> <p>In association with the Department of Environment (DoE), developing of a long-term management plan for the protection of raw water quality in Meghna River (including restriction on establishment of industries producing liquid effluent within certain reaches upstream and downstream of the intake point).</p>	DWASA

	<p>The intake is located 9.35 km downstream of the Badyar Bazar hydrometric station where the following flow rates have been determined:</p> <p>Flow Rate Occurrence at Bayar Bazar</p> <table><tr><th>Probability of Occurrence</th><th>River Flow (m³/s)</th></tr><tr><td>100 Year Return Period Flow</td><td>22,820</td></tr><tr><td>10 Year Return Period Flow</td><td>17,235</td></tr><tr><td>Flow exceeded for 5% of the time</td><td>11,630</td></tr><tr><td>Flow exceeded for 50% of the time</td><td>4,037</td></tr><tr><td>Dry Season (January to March) flow exceeded for 50% of the time</td><td>260</td></tr><tr><td>Dry Season (January to March) flow exceeded for 80% of the time</td><td>176</td></tr></table> <p>Source: PMCM-GEN-RP-GEN-46003 Component 1&amp;3 Outline and Basis of Design Report – 2023</p> <p>For comparison, the maximum abstraction rate of 950ML/d at Haria for the Saidabad Phase I, II and III WTPs equates to 11m3/s</p> <p>Maximum 40% of 80% dependable flow is needed for the Environment requirement. Only 6.25% of the 80% dependable flow will be withdrawal. Thus, no impact on the river water flow due to the project intervention is projected.</p> <p>In addition, Hydrology and Modelling Report for the project recommended minimum water level of 0 mPWD for the raw water pump abstraction. Works specifications required water abstraction from the minimum water level of the River Meghna as specified.</p>	Probability of Occurrence	River Flow (m³/s)	100 Year Return Period Flow	22,820	10 Year Return Period Flow	17,235	Flow exceeded for 5% of the time	11,630	Flow exceeded for 50% of the time	4,037	Dry Season (January to March) flow exceeded for 50% of the time	260	Dry Season (January to March) flow exceeded for 80% of the time	176	
Probability of Occurrence	River Flow (m³/s)															
100 Year Return Period Flow	22,820															
10 Year Return Period Flow	17,235															
Flow exceeded for 5% of the time	11,630															
Flow exceeded for 50% of the time	4,037															
Dry Season (January to March) flow exceeded for 50% of the time	260															
Dry Season (January to March) flow exceeded for 80% of the time	176															
Generation of additional volume of wastewater as treated water supply increases	This issue should be taken into consideration in the ongoing planning and implementation activities of DWASA aimed at expanding sewerage network and treatment facilities in Dhaka city. This would obviously necessitate additional sewage treatment plant at appropriate locations.	DWASA														
Safety of water distribution network	Monitoring and detection of leaks and expansion and up-gradation of water distribution network of, as part of DWASA's regular monitoring and expansion works.	DWASA														

As noted earlier, the raw and treated water quality of the proposed WTP should be regularly monitored. Besides, the characteristics of sludge and liquid residuals produced at the treatment plant should also be regularly monitored. Table 11-7 shows the monitoring plan (parameter and frequency of measurement) for the operational phase of the proposed WTP.

*Table 11-7: Environmental (water quality and sludge) and Socioeconomic Monitoring during operational phase of proposed WTP (Original Table 47)*

Monitoring Items	Water Quality / Other Parameters	Monitoring Frequency	Responsibility
Raw water	pH, Colour, Turbidity, Ammonia, Nitrate, Phosphate, Sulphate, TC, FC	Daily	DWASA
	Lead, Chromium, Mercury, Cadmium, Total Suspended Solids, COD, BOD <sub>5</sub> , Oil & grease	Once a month	DWASA
Treated water	pH, Colour, Turbidity, Ammonia, Nitrate, Residual Chlorine, TC, FC	Daily	DWASA
	BOD <sub>5</sub> , COD, Aluminium, Total Dissolved Solids	Once every two months	DWASA
Dewatered sludge	TCLP test and determination of Al, Pb, Cr, Cd in TCLP extract	Once every three months	DWASA
Liquid residuals from dewatering operation	pH, Ammonia-N, BOD <sub>5</sub> , COD, Cd, Cr, Mercury, Chloride, Total Dissolved Solids, Total Suspended Solids, Nitrate, Sulphide	Once a month	DWASA
Employment of workforce	Once every Quarter and as directed by PD	Contractor's responsibility, Supervised by the Design Supervision Consultant	DWASA
Community Health and Safety	Once every Quarter and as directed by PD	Contractor's responsibility, Supervised by the Design Supervision Consultant	DWASA
Surveys and interviews with local residents and businesses	Once in a year as directed by PD	Contractor's responsibility, Supervised by the Design Supervision Consultant	DWASA

(1) The parameters listed above are based on water quality measurements of Meghna River as a part of this study. The list should be updated based on monitoring results and information on possible pollution of river water by contaminants (e.g., from an industrial source)

(2) Actual monitoring time and location will be decided by DWASA and the Design Supervision Consultant (DSC) and included in the Employer's Requirements.

### 11.4.3 Cost of Environmental Monitoring

Table 11-8 and Table 11-9 show preliminary cost estimates for monitoring activities during construction and operation phases respectively.

Table 11-8: Preliminary cost estimates for monitoring and other mitigation activities during construction phase (Original Table 48)

Parameter/Activity	Frequency of activity	Preliminary cost estimate	Preliminary cost for 1 year activity period
Particulate Matter (PM <sub>10</sub> , PM <sub>2.5</sub> )	Once every 3 months	Tk. 30,000/- per each set of PM <sub>10</sub> and PM <sub>2.5</sub> measurement	Tk. 1,20,000/-
Noise Level	Once every month (day and night)	Tk. 25,000/- (per set of measurement)	Tk. 3,30,000/-
Surface Water Quality (pH, Turbidity, BOD, COD, TDS, DO, Ammonia (NH <sub>3</sub> -N) and Oil & Grease) of Kajla Khal	Once every 3 months	Tk. 30,000/- (per set of measurement)	Tk. 120,000/-
Water spraying for dust control	At least twice a day	Tk. 10,000/- per site per month	Tk. 1,20,000/-
Waste Disposal	Every Day	Tk. 80,000/- per site per month	Tk. 960,000/-
Total annual cost for monitoring during construction phase			Tk. 16,50,000/-

Notes: (1) Actual monitoring time and location will be decided by DSC. and the Design Supervision Consultant (DSC) and included in the Employer's Requirements (2) The estimated costs for particular matter (PM) and noise level measurements are based on current rates charged by BRTC, BUET for analysis of the parameters.

Table 11-9: Preliminary cost estimates for monitoring and other mitigation activities during operational phase (Original Table 48)

Parameter/Activity	Frequency of activity	Preliminary cost estimate	Preliminary cost for 1 year activity period
Raw water: pH, Colour, Turbidity, Ammonia, Nitrate, Phosphate, Sulphate	Daily	Tk. 6,000/- per set of measurement	Tk. 21,90,000/-
Raw water: Lead, Chromium, Mercury, Cadmium, Total Suspended Solids, COD, BOD <sub>5</sub> , Oil & grease	Once a month	Tk. 15,000/- per set of measurement	Tk. 1,80,000/-
Treated water: pH, Colour, Turbidity, Ammonia, Nitrate, Residual Chlorine, TC, FC	Daily	Tk. 5,500/- per set of measurement	Tk. 20,07,500/-
Treated water: BOD <sub>5</sub> , COD, Aluminium, Total Dissolved Solids	Once every two months	Tk. 8,500/- per set of measurement	Tk. 51,000/-
Sludge from Clarifiers: TCLP test and determination of Al, Pb, Cr, Cd in TCLP extract	Once every three months	Tk. 14,000/- per set of measurement	Tk. 56,000/-

Parameter/Activity	Frequency of activity	Preliminary cost estimate	Preliminary cost for 1 year activity period
Total annual cost for monitoring during operation phase			Tk. 44,84,500/-

**Notes:**

(1) The parameters listed above are based on water quality measurements of Meghna River as a part of this study. The list should be updated based on monitoring results and information on possible pollution of river water by contaminants (e.g., from an industrial source)

(2) Actual monitoring time and location will be decided by DWASA and the Design Supervision Consultant (DSC) and included in the Employer's Requirements.

(3) The estimated costs are based on current rates charged by BRTC, BUET for analysis of the parameters.

The treated water quality parameters must be checked against the Bangladesh drinking water quality standard (ECR 1997). In addition to the above, alum dose should also be checked on a regular basis. The parameters of the liquid residuals should be checked against the standards for disposal of wastewater/effluent from industrial units or project waste as per ECR, 1997 Schedule-10 (see Annex C).

## 11.5 Summary of the Resettlement Action Plan (RAP)

The project requires private land acquisition of about 34 acres from which mostly (32 acres) from Naryanganj district and 2 acres in Dhaka district. Approximately 300 HHs and other entities including shops and community properties will be affected within the pipeline right of way. Three (3) Resettlement Action Plans (RAPs) has been prepared for the three sections of the project i.e. RAP-1: From Raw water pumping station to near Darikandi Bus stand of Dhaka- Chittagong Highway (6km); RAP-2: Middhabari Sluice Gate to Saidabad WTP (6.5Km); RAP-3a: Along Dhaka-Chittagong Highway up to Kanchpur Bridge Circle (8.5 Km); RAP 3b: Along the DND canal and RAP 3c: Primary & Secondary Distribution Mains for Saidabad Phase-III WTP (54Km within the Dhaka South City Corporation Area). The RAP-I is for the land acquired for raw water pumping station and 6.00km pipeline alignment (six km) under Narayanganj district based on the 100% census and survey of the affected HHs.

### Land Acquisition and resettlement Impacts

Sl. No.	Project Impact	Total
1	Private Land Area (Acres)	32.277
2	Affected Households	52
2.1	Residence Structures	51
2.2	Commercial Structures	1
3	No. of CPRs	3
4	Land and secondary structure of a group of company (titled)	1
(2+4) Total affected units		56
5	Business affected	1
6	Trees affected	1031

### Resettlement and Relocation

Among the HHs losing structures, about 57% preferred for the Self-Relocation by purchasing new land, followed by Project Assisted Resettlement (25%) and Relocation on Residual Land (18%). Among the land losers, more than 57% preferred cash for land and about 43% preferred land for lost land. Since there is scarcity of land in the country, so land for land option cannot be entertained and therefore adequate compensation for lost land will be paid at replacement cost so that landowners can purchase alternative land with compensation money. Regarding compensation assistance for the affected structure owners, more than 57% opted for cash compensation for structure and remaining preferred receiving replacement structures.

### Legal and Policy Framework

The principal legal instrument governing land acquisition in Bangladesh is the Acquisition and Requisition of Immovable Property Ordinance (ARIPO 1982) and Acquisition and Requisition of Immovable Property Act (ARIPA 2017), EIB and World Bank's Environmental and Social Standard-5/IFC Performance Standard-5 on Land Acquisition, Restriction on Land uses and Involuntary Resettlement and triggered to ensure fair value for (i) land and assets permanently acquired (including standing crops, trees, houses); and (ii) any other damages caused by such acquisition. The Deputy Commissioners (DC) in all the cases, determine the market value of acquired land based on the assessment of transacted deeds of the 12 months prior to the date of notice under Section 3. However, in an area people cannot transact land below the mouza rate. The government determines this rate based on various factors such as land fertility, location, infrastructure development, and market demand. It serves as the basis for calculating land taxes, registration fees, and other related charges. Mouza rates can vary significantly depending on the region and its development status. They are periodically revised by the government to reflect changes in market conditions and land value.

### Income Livelihood Restoration

About 57% of affected HHs indicated that they required help with employment opportunities in construction work, about 15% want assistance or loan from other ongoing development scheme, and about 29% showed their interest in vocational & Skill development training on IGA.

*Table 11-10: PAPs preferences for income and livelihood restoration*

Options for Income restoration assistance	No.	%
Employment opportunities in construction work	29	55.77
Assistance/loan from other ongoing development scheme	8	15.38
Vocational & Skill development training	15	28.85
Total	52	100

### Entitlements, Assistance and Income-Restoration Measures

Entitlement Matrix (Source - Resettlement Action Plan-II Along Demra-Jatrabari Road up to Middhabari Sluice Gate 6.5 km)

Sl. No.	Items to be Entitled	Entitlement
1	Loss of Agricultural Land	<ul style="list-style-type: none"> <li>&gt; Cash compensation under law (CCL) that includes premium to be paid by Deputy Commissioner (DC) following latest LA law.</li> <li>&gt; A top-up payment on DC's amount if the DC price seems significantly lower than the replacement cost to be assessed by PAVC.</li> <li>&gt; Stamp duty and registration cost on purchasing of replacement land using an amount not exceeding total price of land. Stamp duty and transaction costs will be paid if the replacement land is purchased within 12 months of receiving CCL or within RAP implementation period whichever is longer.</li> </ul>
2	Loss of homestead, commercial, industrial land and community property resources	<ul style="list-style-type: none"> <li>&gt; Cash compensation under law (CCL) that includes premium to be paid by DC following latest LA law.</li> <li>&gt; A top-up payment on DC's amount if the DC price seems significantly lower than the replacement cost to be assessed by PAVC.</li> <li>&gt; Land development cost @ 10% of land value (replacement cost)</li> <li>&gt; Dislocation allowance @ BDT 200 per decimal maximum BDT 20,000 to each entitled person.</li> <li>&gt; Stamp duty and registration cost on purchasing of replacement land using an amount not exceeding total price of land. Stamp duty and transaction costs will be paid if the replacement land is purchased within 12 months of receiving CCL or within RAP implementation period whichever is longer</li> </ul>
3	Loss of water bodies (ponds, both cultivated and non-cultivated)	<ul style="list-style-type: none"> <li>&gt; Cash compensation under law (CCL) that includes premium to be paid by DC following latest LA law.</li> <li>&gt; A top-up payment on DC's amount if the DC price seems significantly lower than the replacement cost to be assessed by PAVC.</li> <li>&gt; Dislocation allowance @ BDT 100 per decimal not exceeding BDT 20,000 to each entitled person</li> <li>&gt; Stamp duty and registration cost on purchasing of replacement</li> <li>&gt; land using an amount not exceeding total price of land. Stamp duty and transaction costs will be paid if the replacement land is purchased within 12 months of receiving CCL or during RAP implementation period whichever is longer.</li> </ul>
4	Loss of residential structures with or without title to land	<ul style="list-style-type: none"> <li>&gt; Replacement cost of residential structure assessed.</li> <li>&gt; Transfer Grant of affected structure @ BDT 10 per sft.</li> </ul>



		<ul style="list-style-type: none"> <li>&gt; Reconstruction Grant of affected structure @ BDT 15 per sft.</li> <li>&gt; Owner will be allowed to take away all salvageable materials free of cost within DWASA declared deadline.</li> </ul>
5	Loss of commercial/industrial structures with or without title to land	<ul style="list-style-type: none"> <li>&gt; Replacement cost of structure.</li> <li>&gt; Transfer Grant of affected structure @ BDT 10 per sft.</li> <li>&gt; Reconstruction Grant of affected structure @ BDT 15 per sft.</li> <li>&gt; Owner will be allowed to take away all salvageable materials free of cost within DWASA declared deadline.</li> </ul>
6	Loss of community properties on private or public lands (Mosque, Graveyard)	<ul style="list-style-type: none"> <li>&gt; Replacement cost of structure.</li> <li>&gt; Transfer Grant of affected structure @ BDT 10/sft.</li> <li>&gt; Reconstruction Grant of affected structure @ BDT 15/sft.</li> <li>&gt; Owner will be allowed to take all salvageable materials free of cost within DWASA declared deadline OR</li> <li>&gt; The project authority will construct two new mosques and a portion of the boundary wall of affected Community Graveyard</li> </ul>
7	Loss of trees with title to landowner and owner of trees on public land or lessees	<ul style="list-style-type: none"> <li>&gt; Cash Compensation under law to be paid by DC.</li> <li>&gt; Value of fruits @ 30% of timber value for each grown up trees.</li> <li>&gt; Owner of the tree will be allowed to fell and take the trees free of cost within the DWASA declared deadline.</li> </ul>
8	Loss of standing crops/fish stock with title to land	<ul style="list-style-type: none"> <li>&gt; Market value of standing crops/fish stock as per LA law to be determined by DC.</li> <li>&gt; Owners will be allowed to harvest crops and fish stock within</li> <li>&gt; DWASA declared deadline.</li> </ul>
9	Loss of leased or mortgaged land	<ul style="list-style-type: none"> <li>&gt; CCL of crops/fish stock.</li> <li>&gt; Dislocation Allowance will be paid by DWASA to the actual cultivator of the acquired land.</li> <li>&gt; The cultivator will be allowed to take the crops/fish within the DWASA declared deadline</li> </ul>
10	Loss of income (wage earners in agricultural, small business and industry (excluding owners or employers)	<ul style="list-style-type: none"> <li>&gt; Grant to cover temporary loss of regular wage income for 30 days @ 400/day if lost due to the project interventions.</li> </ul>
11	Loss of income from business (structure owners and tenants)	<ul style="list-style-type: none"> <li>&gt; Restoration Grants for business loss for the minimum days of closing the business temporarily or partially (not over 15 days) during construction of the project in case of temporary &amp; partial loss of business premises.</li> <li>&gt; In case of permanent dislocation, the business owners will be paid maximum 45 days net income identified by PAVC or during census survey.</li> </ul>

		<ul style="list-style-type: none"> <li>&gt; Right to take away business material from demolished structure.</li> <li>&gt; Tenants' business operators will be entitled for moving assistance equivalent to wage labourers (@ 400/day for 30 days)</li> </ul>
12	Shifting of household's belonging/inside materials	<ul style="list-style-type: none"> <li>&gt; An amount of BDT 5,000 will be given to each HH who will lose shelter including tenants if shifted within the deadline declared by DWASA</li> </ul>
13	Loss of Income and livelihood (Vulnerable PAPs)	<ul style="list-style-type: none"> <li>&gt; BDT 10,000/- as one time grant in addition to other compensations for each vulnerable household.</li> <li>&gt; BDT 5,000/- as one time grant to poor female headed households in addition to other compensation.</li> <li>&gt; Skill Training for vulnerable households on IGA.</li> <li>&gt; Preferential employment in project civil work and during operational period of the project</li> </ul>
14	Unforeseen adverse impacts	<ul style="list-style-type: none"> <li>&gt; Entitlements will be determined as per the resettlement policy framework</li> </ul>

### Resettlement Cost and Budget

The cost is estimated on the basis of inventory of losses identified through census and IoL and property valuation/market surveys. Replacement value of land, structures and other assets are calculated using the market rates. The Property Valuation Advisory Committee will confirm the rates by types of land and location during the RAP implementation. The costs for relocation and special assistance are consistent with the entitlement matrix. The total estimated budget for implementation of the Resettlement Plan is BDT 709 million, from which 139 million to be paid by DWASA.

### Implementation Arrangement

- > DWASA will establish a Project Implementation Unit (PIU) at its headquarters to prepare and implement the entire project
- > PD will oversee preparation and implementation of the phase-wise land acquisition and the RAP
- > Executive Engineer (XEN)- assigned for land acquisition and resettlement activities, will implement the project on the ground
- > RAP implementing agency (consultant) to identify the project affected households/business enterprises and persons relating to the enterprises, estimating their losses and dislocations, and processing their entitlement as per the packages to be contained in the RAP
- > The Deputy Commissioners will pay compensation to the legal owners of the affected properties following the land acquisition law of Bangladesh (ARIPO 1982)
- > DWASA will pay additional compensation (if any) on top of DC's payment and resettlement benefits as per policy of the RPF
- > The PAVC will verify and cross check the field book of the joint verification survey (JVS) conducted jointly by DWASA and the Deputy Commissioners at respective project area

- > The RP implementation process in about 19 months.

### **Monitoring and Evaluation**

- > DWASA will set up an internal monitoring system to report on regular basis involving the SDEs/XENs at the field level
- > The RAP implementing consultant will primarily be responsible for collection of monitoring data on land acquisition and implementation of resettlement action plans
- > PIU will prepare six-monthly reports on monitoring of land acquisition and implementation of resettlement plans to be implemented by the consultant
- > Independent reviews of the DWASA land acquisition process will be carried out at regular intervals through the SWTPP-III integrated performance audit procedure on a 15% sample of affected households.
- > DWASA may engage national level consultant to prepare monitoring report independently on bi-annual basis

Knowledge Management Consultant (KMC) has prepared the Resettlement Action Plan (RAP) for the DWASA and the reference of the RAP report is listed in the Reference Section of this ESIA report for further details.

## **11.6 Stakeholder Engagement**

The Employer has developed a stakeholder mapping for assessing and categorizing external stakeholders using an impact vs influence matrix.

Each external stakeholder has been categorised according to their level of authority, level of concern about the project's outcomes (interest), ability to influence the outcomes of the project (influence), or ability to cause changes to the project's planning or execution.

The Contractor shall be responsible for development of detail Stakeholder Engagement Plan relevant to the specific construction work packages and taking in cognizance the Employer's SEP

## **11.7 Corporate Social Responsibility (CSR)**

The Corporate Social Responsibility (CSR) Plan deals with the employment issues on Saidabad III related to DWASA moving from operating many deep tube wells (DTWs) to several large surface water plants and fewer DTWs. Since this shift will affect the staffing requirement, as have been foreseen, at the intakes and pumping stations (Haria and Sarulia), the CSR Plan has covered overall staffing requirements smooth operation and maintenance of new assets related to surface water treatment III. The scope of the development of the CSR plan is limited to the employment issues on Saidabad III related to DWASA moving from operating many DTWs to several large surface water plants and fewer DTWs only. The CSR Plan recommends the following:

The impact on the employment issues on Saidabad III related to DWASA moving from operating many DTWs to several large surface water plants and fewer DTWs is apparently insignificant, which might be mitigated with the followings:

- 1 The project specify that the Design and Build Contractor analyse and identify requirement of staff with positions and number for the operation and maintenance of the plant along with the designing of the plant.
- 2 DWASA considers non-appointment of new pump operators against the position getting vacant through retiring ones over time rather fills the position promoting the interns who qualifies thereby manage the number of redundant staff.
- 3 DWASA identifies qualifying redundant pump operators/interns, if any, due to operation of the Saidabad III well ahead of commissioning of the plant, nominate them for the suitable positions of the plant, and arrange their training as necessary through the designed training, which is part of the project (Ref: DSC Submitted Capacity Analysis and TA Support Plan).
- 4 On successful completion of the training (item 3 above), DWASA appoint them to the respective positions.

In addition to the above, DWASA initiates development a full-fledged Corporate Social Responsibility (CSR) Plan aligned to its Citizen Charter as part of its corporate responsibility considering the following as a long-term strategy:

**Institutional Aspect (interim, 2023 - 2035):** Whilst the Dhaka City Water Supply Master Plant is currently being implemented, DWASA will continue maintaining the existing DTWs as supplementary water sources and to improve resilience is supply.

**Institutional Aspect (long term, beyond 2035):** the shift from groundwater to surface water usage will require restructuring of the current decentralised O&M structure in the long term when all the planned surface water treatment plants will be constructed by 2035.

**Outage Study:** System resilience and outage study will be required for DWASA's readiness to operate three large surface water treatment plants. The outcome of the outage study should focus on Dhaka city's water supply system resilience. An outage model can provide necessary information to DWASA on re-zoning and bulk water transfer from one surface water treatment plant zone to other in case of emergency shut down any large treatment plant.

Whilst the consultants' current ToR does not include development of such network models and outage simulation exercises under Saidabad Component-3, we recommend DWASA to develop a comprehensive strategy to address these issues should that be considered prudent by DWASA management.

Thus provide the highest level of customer service without any outage during the shift from decentralised groundwater supply-based operation and maintenance structure to large surface water treatment facilities.

**Capacity Building:** Refer to all recommendations on DWASA's capacity building as outlined in "Capacity Building and TA Support Plan" as prepared under the DSC contract; Document No.: DSCJV-TRA-RP-CMP2-0014.

The standalone CSR report of the Saidabad III water treatment plant project is annexed in Annex-G of this ESIA report.

## 12 Conclusions and Recommendation

### 12.1 Conclusions

In an effort to meet the increasing demand of water supply, the Dhaka Water Supply and Sewerage Authority (DWASA) shall be constructing a surface water treatment plant, which will draw raw water from Meghna River. The proposed Saidabad phase III surface water treatment plant will be installed in an area adjacent to Saidabad phase I and phase II treatment plants and will have a water treatment capacity of 450 MLD. The intake structures and transmission lines will be designed to withdraw and transport raw water up to 900 MLD; the additional 450 MLD is to be transferred to Saidabad phase I and II in the dry season (instead of treating the polluted water of Shitalakshya river during the period). The proposed project involves construction of intake channel and intake structure at Haria at Sonargaon for drawing water from the Meghna River, a water treatment plant at Saidabad and around a total of 27 km of twin raw water transmission mains.

In this updated ESIA report, Environmental and Social expert team has incorporated the feasibility review of the PMC on the RWP route from Kanchpur Circle to Mridhabari Sluice Gate. In the new alignment three major environmental and social benefits were achieved compared to the ToR alignment. The benefits are completely avoiding the pipe installation along sections of the busy N2 and R201 highways; avoid the need to cross the river adjacent to Sultana Kamal Bridge and finally reduces social impact, resettlement activities and public interface by laying pipes within Demra canal.

The ESIA baseline condition of 2014 is updated in this 2022 version of the report. The PMC has assessed the current baseline condition, particularly ambient air quality, noise level, surface water quality of the river, Focus Group Discussion and Socioeconomic survey in relation to public consultation and socioeconomic condition assessment. This updated ESIA report incorporated the current baseline information in the same baseline table of 2014 to understand the changes of environmental and social parameters in the last 8 years. Although there are some changes in the baseline data, the concentrations are mostly within the national standards of ECR'97.

A comparison of the baseline data in 2022 demonstrates the changes in environmental and socio-economic conditions are within the limit and will not warrant a new formal approval from the Department of Environment (DoE). An extension of the existing permit will be adequate for the implementation of proposed C1&3 works as "Conclusion and Recommendations" given in 2014 ESIA study are still valid.

Environmental and social assessments of the proposed project have been carried out following the guidelines (GoB, 1997) of the Department of Environment (DoE) and other relevant operational policies and guidelines. The overall objectives of the ESIA were to identify potential significant impacts, both positive and negative, during construction and operation phases of the proposed project, and to recommend mitigation measures to avoid or reduce adverse environmental impacts and to enhance positive impacts. Environmental impacts of the specific project activities on different ecological, physicochemical and human-interest related parameters, both during the construction phase and the operation phase, have been identified and evaluated. Mitigation and abatement measures have been suggested and an environmental and social management plan (ESMP) has been developed.

It has been found that most of the adverse impacts during construction phase could be minimized or even removed if appropriated mitigation measures are taken. However, a

monitoring program needs to be put in place to assess any adverse impacts on the environment. Possible adverse impacts during operational phase are insignificant.

## 12.2 Recommendations

Possible environmental impacts of the proposed project have been evaluated and mitigation and abatement measures to reduce or eliminate potential adverse impacts and to enhance beneficial impacts have been suggested. Mitigation and abatement measures both during construction and operation phases of the project have been explained in the report. It also presents an environmental and social management plan (EMSP), including a monitoring program, identifying the management responsibilities for implementation. The EMP should be carried out as an integral part of the project planning and execution.

It is recommended that the environmental team of DSC and PMC for this specific project takes the overall responsibility of environmental management and monitoring during the preconstruction and construction phases. During the operation phase DWASA will take the appropriate measures for the management and monitoring of the environmental and social issues. The PD will follow up through Project management unit (PMU) with required manpower and expertise to ensure proper environmental monitoring, and to take appropriate measures to mitigate any adverse impact and to enhance beneficial impacts, resulting from the project activities.

By the year 2030, two water treatment plants (the proposed Saidabad phase III WTP and the 1000 MLD Gandharbpur plant with intake at Bishnondi) will be installed with a combined capacity of 1400 MLD, which will be relying on the water of Meghna River to ensure safe water supply of the inhabitants of Dhaka city. For long-term sustainability of these water treatment plants, the source water quality and quantity at Meghna should be protected for future use. The following recommendations are made to address this issue:

- > Installations of polluting industries along the banks of Meghna River will degrade its water quality and jeopardize the operation of the treatment plants. Meghna is a tidal river; pollutants discharged at a certain point can travel both upstream and downstream depending on the tidal period and therefore, restriction on installation of polluting industries need to be enforced both upstream and downstream of the location of the intakes. According to Environment Conservation Act (1995), the Ministry of Environment and Forest through the Department of Environment is entrusted with the task of issuing environmental clearance for establishment of industries and enforcement of discharge standards. All industries have to obtain environmental clearance through the DoE before installation. The DoE has the jurisdiction to impose restrictions on installing industrial units which may harm or degrade the environment. The DoE must ensure water quality control of Meghna River using appropriate methods depending on the scenario and this may involve restrictions on installation of polluting industries within a certain reach (both upstream and downstream of the intake locations) of the river which may be termed as an "Environmental Protection Zone". Water quality model simulations under the most critical scenario may be used demarcate such a reach of the river. Considering the state of rapid development (both industrial and human settlement) that is taking place surrounding and along the banks of Meghna River, and considering the sensitive nature of the water use (as raw water for WTP), the DoE should immediately look into the issue of declaring Meghna (or a certain stretch of it) as Ecologically Critical Area (ECA)

- > If DoE deems that it does not possess the required manpower to carry out such activities, it may decide to delegate its functions to DWASA for conserving the Environmental Protection Zone for the Meghna River. A strong commitment by the Ministry of Environment is needed in this respect to enforce strict compliance of environmental control in the Protection Zone based on water quality monitoring by DWASA.
- > Illegal landfilling/development activities along the banks of the Meghna River can threaten the stability of riverbank, adversely affect the water quality at the intake location, threaten the operation of the intake structure as well as affect the water availability of the Meghna River. BIWTA, which is mandated with the protection of riverbanks, should step up its effort to prohibit such activities and take legal actions if necessary and thereby, ensure the smooth operation of these two water treatment plants.



## 13 References

- BBS (2012) Population and Housing Census 2011 by Bangladesh Bureau of Statistics
- DWASA (2013) Fasep N°990 – Feasibility Study for Saidabad WTP Phase-III, Dhaka, Dhaka Water Supply and Sewerage Authority. November 2013.
- DWASA (2013a) Water Supply Master Plan of Dhaka City. Dhaka Water Supply and Sewerage Authority, Ministry of Local Government, Rural Development and Cooperatives. June 2013.
- DOE (1997), Environmental Conservation Rules 1997, Bangladesh
- GoB (1997), Environmental Conservation Rules 1997, Department of Environment, Ministry of Environment and Forest, Government of the People’s Republic of Bangladesh, June 1997.
- GoB (1997a), EA Guidelines for Industries, Department of Environment, Ministry of Environment and Forest, Government of the People’s Republic of Bangladesh, June 1997.
- GoB (2005), SRO No. 220-Rule/2005, Revision of the Environment Conservation Rules 1997, Ministry of Environment and Forest, Government of the People’s Republic of Bangladesh, Dhaka.
- IUCN Bangladesh (2002), Bio-ecological Zones of Bangladesh. The World Conservation Union, Bangladesh Country Office, Dhaka, Bangladesh. pp. 139.
- IUCN Bangladesh (2000a), Red book of Threatened Amphibians and Reptiles of Bangladesh. IUCN-Bangladesh, House 11, Road 138, Gulshan 1, Dhaka, Bangladesh. Pp. 95.
- IUCN Bangladesh (2000b), Red book of Threatened Birds of Bangladesh. IUCN-Bangladesh, House 11, Road 138, Gulshan 1, Dhaka, Bangladesh. Pp. 116.
- IUCN Bangladesh (2000c), Red book of Threatened Mammals of Bangladesh. IUCN-Bangladesh, House 11, Road 138, Gulshan 1, Dhaka, Bangladesh. Pp. 71.
- World Bank (2004), Good Practice Note: Using Poverty and Social Impact Analysis to Support Development Policy Operations, Washington, D.C., USA.
- World Bank (2004a), Involuntary Resettlement Sourcebook, Planning and Implementation of Development Projects, Washington, D.C., USA.
- World Bank (2003), A User’s Guide to Poverty and Social Impact Analysis, Washington, D.C., USA
- World Bank (1999a) Pollution Prevention and Abatement Handbook 1998: Toward Cleaner Production, Washington, D.C., USA.
- World Bank (1999b) Operational Policies, OP - 4.01: Environmental Assessment, The World Bank, Washington, D.C., USA.
- World Bank Group and IFC (2007), Environmental Health and Safety Guidelines, International Finance Corporation and the World Bank.
- Saidabad III Feasibility Study (FS) - ESIA Report V1 - Egis IWM -August 2014 of Dhaka WASA.
- PMCM-GEN-RP-GEN-00005 Inception Report of PMC, Mott MacDonald February 2022.
- DSCJV-HYD-RP-CMP2-0022 Raw Water Monitoring and Contingency Plan, DSC, April 2023

Resettlement Action Plan 1: Raw water pumping station to near Darikandi Bus stand of Dhaka-Chittagong Highway (6.00 km), Saidabad Water Treatment Plant Project, Phase- III, Dhaka Water Supply and Sewerage Authority (DWASA), KMC, December 2018

KMC (2023 – ongoing) RAP: Resettlement Action Plan

# ANNEX-A: QUESTIONNAIRE SAMPLE FOR SOCIAL BASELINE STUDY

## For C-2

### Questionnaire for Social Survey

#### Component-2 of Saidabad WTP Project, Phase-III, DWASA

0. General Data	
0.1	Survey ID No. <input type="text"/>
0.2	Division: <u>Dhaka</u>
0.3	District: <u>Dhaka</u>
0.4	City Corporation: <u>Dhaka South City Corporation (DSCC)</u>
0.5	Upazila/Thana: _____
0.6	Ward Name & No. of City Corporation residing at present: _____
0.7	Mauza Name and Plot No. _____
0.8	Name of Interviewee: _____
0.9	Sex of Interviewee: (M / F) _____
0.10	Age (Years): _____
0.11	Name of Father: _____
0.12	Name of Mother: _____
0.13	Name of Husband/Wife: _____
0.14	National ID-Card No.: _____
0.15	Occupation: _____
0.16	What is your education? <div>0 1 1 2 1 3 1 4 1 5 1 6 1 7 1 8</div> <small>[0] None; [1] Primary (1-5); [2] Madrasa (1-10); [3] Secondary School (6-10); [4] SSC Pass; [5] HSC Pass; [6] Completed Vocational; [7] Graduate; [8] Tertiary (including university, business or teachers training college)</small>
0.17	What is your <u>Marital status</u> ? <div>0 1 1 2 1 3 1 4</div> <small>[0] Not married; [1] Married; [2] Separated; [3] Divorced; [4] Widowed/Widower</small>
0.18	What is your <u>Religion</u> ? <div>1 1 2 1 3 1 4 1 5</div> <small>[1] Islam [2] Hinduism [3] Christianity [4] Buddhist [5] Other (specify):</small>
0.19	What is your <u>Ethnicity</u> ? <div>1 1 2 1 3 1 4</div> <small>[1] Bengali [2] Indigenous [3] Non-Bengali [4] other, specify...</small>

*C-2, Saidabad WTP Project, Phase-III, DWASA /Social Survey 2023*

<b>1. Detailed Household Data</b>		
<b>1.1</b>	Is the Interviewee the HOUSEHOLD HEAD?	Y   I   N
<b>1.2</b>	What is the sex/gender of the household head?	Female   I   Male
<b>1.3</b>	What is the age of the household head? (Years)	
<b>1.4</b>	Is the household head & spouse of the household head literate	Can Read/Write Bangla
1.4.1	Household head	0 1 2 3 4 5 6 7 8
1.4.2	Spouse of the household head	0 1 2 3 4 5 6 7 8
	[0] None; [1] Primary (1-5); [2] Madrasa (1-10); [3] Secondary School (6-10); [4] SSC Pass; [5] HSC Pass; [6] Completed Vocational; [7] Graduate; [8] Tertiary (including university, business or teachers training college)	
<b>1.5</b>	Education of the other household members	Male   Female
	[0] None;	
	[1] Primary (Class 1-5);	
	[2] Madrasa (1-10)	
	[3] Secondary School (6-10);	
	[4] SSC Pass	
	[5] HSC Pass	
	[6] Completed Vocational	
	[7] Graduate	
	[8] Tertiary (University, business /teachers training college).	
<b>1.6</b>	What is the category of household by occupation?	
<b>1.7</b>	Would you rate your household as:	1   2   3   4   5
	[1] Wealthy; [2] Medium; [3] Lower Medium; [4] Poor; [5] Vulnerable	
<b>1.8</b>	Are any members of the household disabled or long-term illness?	Y   I   N   I   Total Nos.
1.18.1	Male	Male Nos.
1.18.2	Female	Female Nos.
<b>1.9</b>	Is the Household a Female headed and/or vulnerable household? If yes, Mark FHH (Female-headed) or Vulnerable or Both.	FHH   I   Vulnerable
<b>1.10</b>	Total number household members:	
<b>1.11</b>	Occupation HH head and other family members:	HH Head   Other family members
1.11.1	Daily Labor /Rickshaw-Van Puller	Female   Male
1.11.2	Agriculture	
1.11.3	Business/Small business	
1.11.4	Driver	
1.11.5	Housewife	
1.11.6	Unemployed	
1.11.7	Student	
1.11.8	Retired	
1.11.9	Service	
1.11.10	Remittance	
1.11.11	Others, specify	

*C-2, Saidabad WTP Project, Phase-III, DWASA /Social Survey 2023*

**1.12** Number of Household members earning money:

Male	Female

**1.13** Income Household Head in Taka per year:  
[1] 24,000-48,000; [2] 24,000-48,000; [3] 48,000-60,000; [4] 60,000 to above

1 | 2 | 3 | 4

**1.14** Income Household without Household Head in Taka per year:  
[1] 0-24,000; [2] 24,000-48,000; [3] 48,000-60,000; [4] 60,000 to above

1 | 2 | 3 | 4

**1.15** Combined Total income in Taka per year:  
[1] 12,000-40,000; [2] 41,000-80,000; [3] 81,000-120,000 [4] Above120,000

1 | 2 | 3 | 4

**1.16** Total HH Expenditure in Taka per month:  
[1] 10,000-20,000; [2] 21,000-40,000; [3] 41,000-60,000; [4] Above 60,000

1 | 2 | 3 | 4

**1.17** How many MALES live in your household, by age group? Total: Nos.

1.20.1	1.20.2	1.20.3	1.20.4	1.20.5	1.20.6
0 - 4 years	5 - 14 years	15 - 24 years	25 - 45 years	46 - 59 years	60+ years

**1.18** How many FEMALES live in your household, by age group? Total: Nos.

1.21.1	1.21.2	1.21.3	1.21.4	1.21.5	1.21.6
0 - 4 years	5 - 14 years	15 - 24 years	25 - 45 years	46 - 59 years	60+ years

**1.19** Total number household members:

**2. Land Ownership, land use and Land Acquisition Information**

**2.1** Were you born in this village? If not, when have you moved here? Y | N | ---- Years

**2.1a** If yes, why did you move here?  
i) river erosion /natural disaster, ii) For employment, iii) others, specify .....

**2.2** Where did you live before come here? \_\_\_\_\_

How long do you live on this land?

**2.3** [1] 1-5 Years; [2] 6-12 Years; [3] 13-25 Years; [4] Above 25. 1 | 2 | 3 | 4

**2.4** Do you rent out and/or mortgage-out and/or lease out this Land? Y | N

**2.5** If the answer of 2.4 is yes fill below:

Dag No. (CS/RS/BS)	Name of person with address

**2.6** If you are a sharecropper or Leased: What is your production share? (%)

**2.7** How many times in a year you grow crops on the agricultural land? 1 | 2 | 3

**2.8** Did your land affect and under acquisition by the WTP? Y | N | NA

*C-2, Saidabad WTP Project, Phase-III, DWASA /Social Survey 2023*

2.9 If 2.8 yes, did you get compensation? Y I N I NA

2.10 If 2.8 yes, please give details of land and structures as follows:

2.11 Total Land and affected Land

	Plot wise information					
	2.11.1		2.11.2		2.11.3	
	Total land	Affected land	Total land	Affected land	Total land	Affected land
Mauza Name						
DAG No.						
Khatian No.						
Land Use A*						
Land Size						
Land elevation B*						
Ownership C*						
Affected Land area						
Land price						

\*A Land use: 1-Dwelling land; 2-Cultivable land; 3-Pond; 4-Fallow land; 5 Lost Land; 6-Others

\*B Elevation: 1: not flooded; 2: 1-3ft flooded; 3: 3-6ft flooded; 4: 6-10ft flooded; 5: >10ft flooded

\*C Ownership: 1: Own; 2: Khas; 3 don't own ; 4 leased; 5 Government land

2.12 What is the area of all types of your crops/garden that done on land? Answer as many as relevant.  
extended for Kharif 1, Kharif 2 and Rabi

		Area (decimals )
<b>Cereals</b>		
1	B. Aus (HYV)	
2	B. Aus (LV)	
3	T. Aus (HYV)	
4	T. Aus (LV)	
5	T. Aman (HYV)	
6	T. Aman (LV)	
7	Boro (HYV)	
8	Boro (Hybrid)	
9	Wheat	
10	Maize	
<b>Pulses</b>		
11	Lentil	
12	Khesari	
13	Mung bean	
14	Black gram	
15	Pea	
16	Chickpea	
<b>Oilseeds</b>		
17	Mustard	
18	Groundnut	
19	Sesame	
<b>Spices</b>		
20	Chill	
21	Onion	
22	Garlic	

*C-2, Saidabad WTP Project, Phase-III, DWASA /Social Survey 2023*

23	Ginger	
24	Turmeric	
	<b>Vegetables</b>	
25	Potato	
26	Tomato	
27	CaBWDBge	
28	Cauliflower	
29	Spinach	
30	Amaranthas	
31	Bottle gourd	
32	Snake gourd	
33	Bitter gourd	
34	Sweet gourd	
35	White gourd	
36	Ribbed gourd	
37	Pointed gourd	
38	Okra	
39	Brinjal	
40	Country bean	
41	Cucumber	
	<b>Fiber crops</b>	
42	Jute	
43	Cotton	
44	Sugarcane	
45	Other	

**2.13** What number by type and productivity of trees are here? (answer as many as relevant)

		A. No. of seedlings	B. No. of non-fruit bearing	C. No. of fruit bearing
1	<b>Fruit</b>			
2	Mango			
3	Jackfruit			
4	Litchi			
5	Tamarind			
6	Amra			
7	Atta			
8	Sarifa			
9	Kamranga			
10	Jaipai			
11	Amlaki			
12	Baroi			
13	Chabeda			
14	Dewaphal			
15	Jambura			
16	Jamnul			
17	Jam			
18	Katbel			
19	Coconut			
20	Betel-nut			
21	Palm (tal)			
	Guava			
	<b>Timber/Fuelwood</b>			
22	Segun			
23	Koroi			
24	Babla			



*C-2, Saidabad WTP Project, Phase-III, DWASA /Social Survey 2023*

25	Kadom			
26	Mahogoni			
27	Shimul			
28	Sikaroi			
29	Sirish			
30	Sisso			
31	Ukalittas			
	<b>Groves</b>			
32	Banana			
33	Bamboo			
	<b>Medicinal</b>			
34	Arjun			
35	Bohera			
36	Nim			
	<b>Herb</b>			
37	Papaya			
	<b>Vegetables</b>			
38	Sajna			
39	Others			

### 3. Details of Structures and affected structures

**3.1** Did your any structure affect or under acquisition by the WTP?      Y | N | NA

**3.2** If 3.1 yes, did you get compensation?      Y | N | NA

**3.3** If yes please give details

No. of structure by area		
Residential	No.	
	Area sft.	
	Area affected	
	Type	
Toilet	No.	
	Area sft.	
	Area affected	
	Type	
Kitchen	No.	
	Area sft.	
	Area affected	
	Type	
Tube/Dug well	No.	
	Area sft.	
	Area affected	
	Type	
Stable, animal pen or coral	No.	
	Area sft.	
	Area affected	
	Type	
Other (specify)	No.	
	Area sft.	
	Area affected	
	Type	

*C-2, Saidabad WTP Project, Phase-III, DWASA /Social Survey 2023*

- 1 Pucca = concrete/cemented floor + brick wall + concrete roof;
- 2 Semi-pucca = concrete/cemented floor + brick wall + tin (corrugated iron sheet)/tiles roof;
- 3 Kutcha = earthen floor + tin or bamboo + tin roof;
- 4 Thatched = earthen floor + bamboo or thatching grass (straw) + straw roof

**3.4** If moved temporarily - Can the structure(s) be rebuilt further back on the same land? Yes or No.

3.4.1	Residential	Y	I	N
3.4.2	Toilet	Y	I	N
3.4.3	Kitchen	Y	I	N
3.4.4	Tube/Dug Well	Y	I	N
3.4.5	Stable	Y	I	N
3.4.6	Other, specify _____	Y	I	N

**3.5** How long will it take to rebuild/relocate the structure(s)? (days)

	No. Of days
3.5.1	Residential
3.5.2	Toilet
3.5.3	Kitchen
3.5.4	Tube/Dug Well
3.5.5	Stable
3.5.6	Other structure <sup>1</sup> , specify _____

## 4. Other Livelihood Impacts

**4.1** Are any business or livelihood activities of your household affected by the project? (Y=Yes, N=No)  
If the answer is no, then go to question no. 5  
Communicable Diseases, Health & Safety and Utilities

Y	I	N
---	---	---

**4.2** If 4.1 is yes, what type of AFFECTED business or livelihood activities? Answer as many as relevant

4.2.1	Shop/store	Y	I	N
4.2.2	Tea Stall Restaurant	Y	I	N
4.2.3	Handloom Factory	Y	I	N
4.2.4	Dairy/Livestock farm/ Bakery	Y	I	N
4.2.5	Poultry farm	Y	I	N
4.2.6	Fish pond	Y	I	N
4.2.7	Husking/ flower Mill	Y	I	N
4.2.8	Saw Mill	Y	I	N
4.2.9	Other [Specify]: _____	Y	I	N

**4.3 Structures Category of affected business or livelihood Program:**

	Category	Area Sqft
4.3.1 What is the category of the main structure of the affected small business?	1 1 2 1 3 1 4	
4.3.2 What is the category of the secondary structure?	1 1 2 1 3 1 4	

1. Pucca = concrete/cemented floor + brick wall + concrete roof;
2. Semi-pucca = concrete/cemented floor + brick wall + tin (corrugated iron sheet)/tiles roof;
3. Kutcha = earthen floor + tin or bamboo + tin roof;
4. Thatched = earthen floor + bamboo or thatching grass (straw) + straw roof

**4.4** Sex/Gender of the Head of the small business (M or F)

M	I	F
---	---	---

*C-2, Saidabad WTP Project, Phase-III, DWASA /Social Survey 2023*

**4.5** How many people from your household do business or livelihood activities?

4.5.1 Male

4.5.2 Female

**4.6** Do people from outside your household work for the business activities? Y I N

**4.7** If answer to 4.6 is yes, how many people (people from your household) work for the business?

Nos.

4.7.1 Male

4.7.2 Female

**4.8** Do the people working for the business activities earn wages?  Y I N

**4.9** If 4.8 is yes, what are the total average monthly wages you pay (in Taka)? Tk. ....

**4.10** What are your average monthly earnings (in Taka) of the livelihood activity?

**4.11** Is the business registered?  Y I N

**4.12** What are the hours of operation of the business or livelihood activities?

4.12.1 Number of hours per day

4.12.2 Number of days per week

**4.13** Did you (or any member of your household) have taken a loan?  Y I N

**4.14** If answer to 4.13 is yes:

1 From whom did you take the loan from? [1] NGO; [2] other people  1 I 2

2 What is the interest rate? [1] <12.5%; [2] 12.5-15%; [3] >15%  1 I 2 I 3

3 Number of loans taken (times)

4 Amount of loan taken (Taka)

5 In what sector do you use the loan? [1] Agriculture; [2] Business; [3] Reason of Erosion  1 I 2 I 3

**4.15** What are the three biggest NGOs work in the area?

[1] BRAC [2] ASA [3] Grameen Bank, [4] Other, specify:  1 I 2 I 3 I 4

**4.16** Are you a member of any NGO? Y I N

**4.16a** What is the name of the NGO? (Max. 3 names):

**4.17** Thinking about the food your household consumes, is it?

[1] Mostly home grown/caught; [2] About three quarters home grown/caught;  
[3] About half home grown/caught; [4] About a quarter home grown/caught;  
[5] Very little home grown/caught, we mostly buy our food

**4.18** In your judgment what are the most profitable occupation in the project area (Rank in order)

1

2

3

**4.19** Which is the most suitable income generating activities for women?

1

2

3

**4.20** Which is the most suitable income generating activities for men?

1	_____
2	_____
3	_____

## 5. Communicable Diseases, Health & Safety and Utilities

**5.1** Is anyone affected by any disease by last six months?

**Y I N**

5.1a If yes, who affected? [1] Children [2] Old age man. [3] Old age women

5.1b If yes, what diseases was that? Name: .....

**5.2** Common diseases in your family? (max. 4)

1	Dysentery	
2	Diarrhea	
3	Influenza	
4	Malaria/ Dengue fever	
5	Cough and cold	
6	Common fever	
7	Chicken pox	
8	Kala jar	
9	Diabetic	
10	Blood pressure	

**5.3** Generally, from where you/family get treatment?

1	Quack/Village Doctor	
2	MBBS Doctor	
3	Government Hospital	
4	Medicine shop staff	
5	Non-gov. hospital	
6	Private Clinic	

**5.4** Where did go for treatment a pregnant woman of your family?

1	Quack/Village Doctor	
2	MBBS Doctor	
3	Government Hospital	
4	Medicine shop staff	
5	Non-gov. hospital	
6	Private Clinic	

**5.5** What is the source of your water?

[1] DWASA [2] Own Tube well [3] Neighbor Tube well [4] Pond/River [5] Others

5.5.1	for cooking	1   2   3   4   5
5.5.2	for drinking	1   2   3   4   5

*C-2, Saidabad WTP Project, Phase-III, DWASA /Social Survey 2023*

5.5.3	for bathing	<div>1 1 2 1 3 1 4 1 5</div>
5.6	If it is Tube well, do you know the quality of water with arsenic?	<div>Y I N</div>
5.7	If yes, did you take any measurement to reduce arsenic?	<div>Y I N</div>
5.8	What kind of latrine do you use?	
5.8.1	Sanitary (Private)	<div></div>
5.8.2	Sanitary sharing by full family	<div></div>
5.8.3	Sanitary sharing by Community	<div></div>
5.8.4	Non-Sanitary (Kutcha)	<div></div>
5.8.5	Open Land (no latrine)	<div></div>
5.9	What is the ownership of the latrine you use?	
5.9.1	Own	<div></div>
5.9.2	Land/house owner	<div></div>
5.9.3	Neighbor	<div></div>
5.9.4	Community	<div></div>
5.10	What is your household cooking facility? [1] Natural Gas [2] Cylinder Gas [3] Electric Oven [5] Kerosine Stove [6] Fire-wood	<div>1 1 2 1 3 1 4 1 5</div>
5.11	Does your household use electricity?	<div>Y I N</div>
5.12	If yes, which source do you use?	
5.12.1	Grid	<div></div>
5.12.2	No Grid	<div></div>
5.12.3	Solar Panel	<div></div>

**6. Other observations**

6.1	Any affect will be observed during construction of WTP? If yes, what is that? [1] Waste water flow [2] Land occupies [3] Mobility restriction [4] Health hazards	<div>Y I N</div> <div>1 2 3 4</div>
6.2	Any accident/damage for carrying the construction materials? If yes, what type of damage? [1] Floating shop [2] Mobile-van-shop [3] Footpath [4] Open veg-shop	<div>Y I N</div> <div>1 2 3 4</div>
6.3	Carrying construction materials will affect school going children? If yes, what action need to be taken [1] Avoid school time [2] Carry early morning [3] Carry at night	<div>Y I N</div> <div>1 2 3</div>
6.4	Will it create any other problem for construction of C-2? If yes, what type of problems? [1] Wastage damping [2] Demolish of Community structure [3] Sound	<div>Y I N</div> <div>1 1 2 1 3</div>
6.5	Will it benefit you and community after completion of WTP?	<div>Y I N</div>
6.6	If yes, what type of benefit? [1] Employment [2] Good quality water supply [3] small business [4] Land price increase	<div>1 1 2 1 3 1 4</div>

C-2, Saidabad WTP Project, Phase-III, DWASA /Social Survey 2023

**6.7** Do you want to say anything to us or any comment:

**6.8** Surveyor/Interviewer can add any observation note:

<p>Name of Surveyor/Interviewer:</p>  <p>Signature and date of Interviewer:</p>  <p>Date of Survey/Interview:</p>	<p>Name of Interviewee:</p>  <p>Signature of Interviewee:</p>  <p>Date of Survey/Interview:</p>
---	---

# QUESTIONNAIRE SAMPLE FOR SOCIAL BASELINE STUDY OF C-1&3

## Saidabad WTP Phase-III, DWASA

### Questionnaires: Socio-economic Sample Survey

1) General Census; 2) Socio-economic (SES); and 3) Inventory of Losses (IOL).

#### General Data

0.1	Survey ID No.	<input type="text"/>
0.2	Division:	<input type="text"/>
0.3	District:	<input type="text"/>
0.4	Upazilla/Thana:	<input type="text"/>
0.5	Union Parishad/Ward Name of City Corporation:	<input type="text"/>
0.6	Village/ Ward No. of City Corporation residing at present:	<input type="text"/>
0.7	Mauza:	<input type="text"/>
0.8	Plot No.	<input type="text"/>
0.9	Name of Household Head	<input type="text"/>
0.10	Name of Father/Husband	<input type="text"/>
0.11	Name of Mother	<input type="text"/>
0.12	National ID-Card No.	<input type="text"/>

#### I Census

##### 1. General Household Data

1.1	Is the RESPONDENT the HOUSEHOLD HEAD? (Y/N)	<input type="text" value="Y"/> <input type="text" value="I"/> <input type="text" value="N"/>
1.2	What is the gender of the household head? (M or F)	<input type="text" value="F"/> <input type="text" value="I"/> <input type="text" value="M"/>
1.3	What is the age of the household head?	<input type="text"/>
1.4	What is the marital status of the household head? [0] Not married; [1] Married; [2] Separated; [3] Divorced; [4] Widowed/Widower	<input type="text" value="0"/> <input type="text" value="1"/> <input type="text" value="2"/> <input type="text" value="3"/> <input type="text" value="4"/>
1.5	What is the education of the household head? [0] None; [1] Some primary; [2] Completed primary; [3] Some secondary school, vocational; [4] Completed secondary school, vocational; [5] Tertiary (including university, business or teachers training college)	<input type="text" value="0"/> <input type="text" value="1"/> <input type="text" value="2"/> <input type="text" value="3"/> <input type="text" value="4"/> <input type="text" value="5"/>
1.6	What is the household head's religion? [1] Islam [2] Hinduism [3] Christianity [4] Other (specify below) Specify: _____	<input type="text" value="1"/> <input type="text" value="2"/> <input type="text" value="3"/> <input type="text" value="4"/>



1.7 How long do you live on this land? ( [1] 1-5 Years; [2] 6-10 Years; [3] >10 Years) 1 | 2 | 3

1.8 Occupation of Household Head:

1.8.1	Agri-labor	
1.8.2	Agriculture	
1.8.3	Business	
1.8.4	Daily labor	
1.8.5	Housewife	
1.8.6	Unemployed	
1.8.7	Student	
1.8.8	Retired	
1.8.9	Rickshaw-Van Puller	
1.8.10	Service	
1.8.11	Others	

1.9 Number of Household members working for money:

	Male	Female

1.10 Income Household Head in Taka per year [1] <12000; [2] 12000-15000; [3] >15000 1 | 2 | 3

1.11 Income Household without Household Head in Taka per year: [1] 0-48000; [2] 48000-108000; [3] >108000 1 | 2 | 3

1.12 Combined Total income in Taka per year: [1] 1000-60000; [2] 60000-120000; [3] >120000 1 | 2 | 3

1.13 Total expenditure in Taka per month: [1] 1000-5000; [2] 5000-10000; [3] >10000 1 | 2 | 3

1.14 Would you rate your household as: [1] Wealthy; [2] Medium; [3] Poor 1 | 2 | 3

1.15 Are there members of the household who are disabled, invalids or have a long-term illness, if so how many?

1.15.1	Males	
1.15.2	Females	

1.16 Is the Household a vulnerable household? (female-headed or old-aged headed or rated poor(1.7)) Y | I | N

1.17 How many MALES live in your household, by age group?

1.20.1	1.20.2	1.20.3	1.20.4	1.20.5	1.20.6
0 - 4 years	5 - 14 years	15 - 24 years	25 - 45 years	46 - 59 years	60 + years

1.17 a Total number of males in household

1.18 How many FEMALES live in your household, by age group?

1.21.1	1.21.2	1.21.3	1.21.4	1.21.5	1.21.6
0 - 4 years	5 - 14 years	15 - 24 years	25 - 45 years	46 - 59 years	60 + years

1.18 a Total number of females in household

1.19 Total number household members

1.20 Families in Household

**II IOL Form**

**2. Affected Land/Crops/Trees**

Total Land/Land ownership

2.1	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5
	Mauza Name				
	DAG No.				
	Khatian No.				
	Land Use Classification				
	Land Size				
	Land elevation				
	Type of ownership				
	aff. Land area				
	Land price				

\*1 Land use: 1-Dwelling land; 2-Cultivable land; 3-Pond; 4-Fallow land; 5 Lost Land; 6- Others (specify)

\*2 Elevation: 1: not flooded; 2: 1-3 ft flooded; 3: 3-6 ft flooded; 4: 6-10 ft flooded; 5: >10 ft flooded

(during normal flood)

\*3 Ownership: 1: Own; 2: Khas; 3 don't own ; 4 leased; 5 Government land

2.2 a Is your Households in possession of the legal title documents? (Y or N)

 Y  I  N

2.2 b If the answer to 2.2 a is No, do they need assistance to organize new legal documents? (Y or N)

 Y  I  N

2.3 What is the area of all types of your crops/garden that will be affected? Answer as many as relevant. extended for Kharif 1, Kharif 2 and Rabi

		Area (decimales)
	<b>Cereals</b>	
2.3.1	B. Aus (HYV)	
2.3.2	B. Aus (LV)	
2.3.3	T. Aus (HYV)	
2.3.4	T. Aus (LV)	
2.3.5	T. Aman (HYV)	
2.3.6	T. Aman (LV)	
2.3.7	Boro (HYV)	
2.3.8	Boro (Hybrid)	
2.3.9	Wheat	
2.3.10	Maize	
	<b>Pulses</b>	
2.3.11	Lentil	
2.3.12	Khesari	
2.3.13	Mung bean	
2.3.14	Black gram	
2.3.15	Pea	
2.3.16	Chickpea	

	<b>Oilseeds</b>	
2.3.17	Mustard	
2.3.18	Groundnut	
2.3.19	Sesame	
	<b>Spices</b>	
2.3.20	Chili	
2.3.21	Onion	
2.3.22	Garlic	
2.3.23	Ginger	
2.3.24	Turmeric	
	<b>Vegetables</b>	
2.3.25	Potato	
2.3.26	Tomato	
2.3.27	CaBWDBge	
2.3.28	Cauliflower	
2.3.29	Spinach	
2.3.30	Amaranthas	
2.3.31	Bottle gourd	
2.3.32	Snake gourd	
2.3.33	Bitter gourd	
2.3.34	Sweet gourd	
2.3.35	White gourd	
2.3.36	Ribbed gourd	
2.3.37	Pointed gourd	
2.3.38	Okra	
2.3.39	Brinjal	
2.3.40	Country bean	
2.3.41	Cucumber	
	<b>Fiber crops</b>	
2.3.42	Jute	
2.3.43	Cotton	
2.3.44	Sugarcane	
2.3.45	Other	

**2.4** What number by type and productivity of trees are affected? (answer as many as relevant)

	<b>Fruit</b>	A. No. of seedlings	B. No. of non-fruit bearing	C. No. of fruit bearing
2.4.1	Mango			
2.4.2	Jackfruit			
2.4.3	Litchi			
2.4.4	Tamarind			
2.4.5	Amra			
2.4.6	Atta			
2.4.7	Sarifa			
2.4.8	Kamranga			
2.4.9	Jalpai			
2.4.10	Amloki			
2.4.11	Baroi			
2.4.12	Chabeda			
2.4.13	Dewaphal			
2.4.14	Jambura			
2.4.15	Jamrul			
2.4.16	Jam			
2.4.17	Katbel			
2.4.18	Coconut			

2.4.19	Betel-nut			
2.4.20	Palm (tal)			
2.4.21	Guava			
	<b>Timber/Fuelwood</b>			
2.4.22	Segun			
2.4.23	Koroi			
2.4.24	Babla			
2.4.25	Kadom			
2.4.26	Mahogoni			
2.4.27	Shimul			
2.4.28	Silkaroi			
2.4.29	Sirish			
2.4.30	Sisso			
2.4.31	Ukaliftas			
	<b>Groves</b>			
2.4.32	Banana			
2.4.33	Bamboo			
	<b>Medicinal</b>			
2.4.34	Arjun			
2.4.35	Bohera			
2.4.36	Nim			
	<b>Herb</b>			
2.4.37	Papaya			
	<b>Vegetables</b>			
2.4.38	Sajna			
2.4.39	Others			

2.5 Do you rent out and/or mortgage-out and/or lease out the aff. Land? 

Y	I	N
---	---	---

2.6 If the answer is yes fill below :

	Dag number (CS/RS/BS)	Name of person (s)	Father's/Husband's name	Address
2.6.1				
2.6.2				

### 3. Affected Structures

3.1	No. of structure by area		
	Residential	No.	
		Area sft.	
		Area affected	
		Type	
	Toilet	No.	
		Area sft.	
		Area affected	
		Type	
	Kitchen	No.	
		Area sft.	
		Area affected	
		Type	
	Tube/Dug well	No.	
		Area sft.	
		Area affected	
		Type	
		No.	

Stable, animal pen or coral	Area sft.	
	Area affected	
	Type	
Other (specify)	No.	
	Area sft.	
	Area affected	
	Type	

- 1 Pucca = concrete/cemented floor + brick wall + concrete roof;
- 2 Semi-pucca = concrete/cemented floor + brick wall + tin (corrugated iron sheet)/tiles roof;
- 3 Kutcha = earthen floor + tin or bamboo + tin roof;
- 4 Thatched = earthen floor + bamboo or thatching grass (straw) + straw roof

**3.2** Can the structure(s) be rebuilt further back on the same land? Y=Yes; N=No

3.2.1	Residential	Y	I	N
3.2.2	Toilet	Y	I	N
3.2.3	Kitchen	Y	I	N
3.2.4	Tube/Dug Well	Y	I	N
3.2.5	Stable	Y	I	N
3.2.6	Other structure1, specify	Y	I	N

**3.3** How long will it take to rebuild/relocate the structure(s)? (days)

	No. Of days
3.3.1	Residential
3.3.2	Toilet
3.3.3	Kitchen
3.3.4	Tube/Dug Well
3.3.5	Stable
3.3.6	Other structure1, specify

**4. Other Livelihood Impacts**

**4.1** Are any other business or livelihood activities of your household affected by the project? (Y=Yes, N=No)

**If no, go to 5 - Resettlement Options section**

Y I N

**4.2** If answer to 4.1 is yes, what type of AFFECTED business or livelihood activities? Answer as many as relevant. (Y=Yes, N=No)

4.2.1	Shop/store	Y	I	N
4.2.2	Tea Stall Restaurant	Y	I	N
4.2.3	Handloom Factory	Y	I	N
4.2.4	Dairy/Livestock farm/ Bakery	Y	I	N
4.2.5	Poultry farm	Y	I	N
4.2.6	Fish pond	Y	I	N
4.2.7	Husking/ flower Mill	Y	I	N
4.2.8	Saw Mill	Y	I	N

4.2.9 Other [Specify]: Y I N

**4.3**

Category Area (sft)

What is the category of the main structure of the affected small business?	1   2   3   4   5
What is the category of the secondary structure of the affected small business?	1   2   3   4   5

Pucca = concrete/cemented floor + brick wall + concrete roof;  
Semi-pucca = concrete/cemented floor + brick wall + tin (corrugated iron sheet)/tiles roof;  
Kutchha = earthen floor + tin or bamboo + tin roof;  
Thatched = earthen floor + bamboo or thatching grass (straw) + straw roof

<b>4.4</b>	Gender of the Head of the small business (M or F)	M   I   F
<b>4.5</b>	How many people from your household undertake the business or livelihood activities?	No. of people
4.5.1	Male	
4.5.2	Female	
<b>4.6</b>	Do people from outside your household work for the business or livelihood activities? (Y=Yes, N=No)	Y   I   N
<b>4.7</b>	If answer to <b>4.6</b> is yes, how many people (excluding people from your household) work for the business?	No. of people
4.7.1	Male	
4.7.2	Female	
<b>4.8</b>	Do the people working for the business/livelihood activities earn wages? (Y=Yes, N=No)	Y   I   N
<b>4.9</b>	If answer to <b>4.8</b> is yes, what are the <u>total</u> average monthly wages you pay (in Taka)? (i.e. to ALL the people who work for the business or livelihood activity)	
<b>4.10</b>	What are the average monthly earnings (in Taka) of the business or livelihood activity?	
<b>4.11</b>	Is the business registered? Y=Yes or N=No	Y   I   N
<b>4.12</b>	What are the hours of operation of the business or livelihood activities?	
4.12.1	Number of hours per day	
4.12.2	Number of days per week	

III SES Form	
5. Detailed Household Data	

<b>5.1</b>	Were you born in this village?	
<b>5.2</b>	If not, when have you moved here?	(years)
<b>5.3</b>	Where have you lived before?	
<b>5.4</b>	Is the household head and spouse of the household head literate (i.e. can they read and write Bangla)? (Yes=Y; NO=N)	
5.4.1	Household head	
5.4.2	Spouse of the household head	
<b>5.5</b>	Education of the members of your household	Male   Female

5.5.1	None		
5.5.2	some primary		
5.5.3	completed primary		
5.5.4	some secondary		
5.5.5	completed secondary		
5.5.6	tertiary(incl university, business/teacher training college)		

**5.6** What is the occupation of the members of your household?

		Male	Female
5.6.1	Farming		
5.6.2	Agricultural day labor		
5.6.3	Non-Agricultural day labor		
5.6.4	Livestock rearing		
5.6.5	Poultry rearing		
5.6.6	Fishing		
5.6.7	Fish trader		
5.6.8	Service		
5.6.9	Business		
5.6.10	Weaving		
5.6.11	Tailoring		
5.6.12	Blacksmith		
5.6.13	Potter		
5.6.14	Carpenter		
5.6.15	Mason		
5.6.16	Rickshaw/van/cart pulling		
5.6.17	Barbour		
5.6.18	Retired		
5.6.19	Disable/Old		
5.6.20	Unemployed/ House wife		
5.6.21	Beggar		
5.6.22	Students		
5.6.23	Child		
5.6.24	Migrant		

**5.7** What is the TOTAL household income per year from the following sectors?

		a	b
		Househ old head	Household w/o HH
5.7.1	Agriculture		
5.7.2	Fish culture		
5.7.3	Livestock/Poultry		
5.7.4	Wage (Daily labour)		
5.7.5	Fishing		
5.7.6	Salary (regular)		
5.7.7	Craft		
5.7.8	Business		
5.7.9	Pension		
5.7.10	Remittance		

**5.8** Did you (or any member of your household) have taken a loan?

Y	I	N
---	---	---

**5.9** If answer to 5.11 is yes:

5.9.1	From whom did you take the loan from? [1] NGO; [2] other people	1	I	2
5.9.2	What is the interest rate? [1] <12.5%; [2] 12.5-15%; [3] >15%			
5.9.3	Number of loan taken			



	5.9.4	Amount of loan taken	
	5.9.5	In what sector do you use the loan? [1] Agriculture; [2] Business; [3] Reason of Erosion	1   2   3
<b>5.10</b>	Thinking about the food your household consumes, is it?		1   2   3   4   5
	[1] Mostly home grown/caught; [2] About three quarters home grown/caught; [3] About half home grown/caught; [4] About a quarter home grown/caught; [5] Very little home grown/caught, we mostly buy our food		
<b>5.11</b>	In your judgment what are the most profitable occupation (e.g. agriculture, business, etc.) in the project area (list in rank order)		
	5.11.1	<hr/>	
	5.11.2	<hr/>	
	5.11.3	<hr/>	
<b>5.12</b>	Which are the most suitable income generating activities for women?		
	5.12.1	<hr/>	
	5.12.2	<hr/>	
	5.12.3	<hr/>	
<b>5.13</b>	Which are the most suitable income generating activities for men?		
	5.13.1	<hr/>	
	5.13.2	<hr/>	
	5.13.3	<hr/>	
<b>5.14</b>	Common diseases in your family? (max 4)		
	5.14.1	Dysentery	
	5.14.2	Diarrhoea	
	5.14.3	Influenza	
	5.14.4	Malaria	
	5.14.5	Cough and cold	
	5.14.6	Common fever	
	5.14.7	Chicken pox	
	5.14.8	Kalajar	
<b>5.15</b>	Whom do you contact first?		
	5.15.1	Quack	
	5.15.2	Doctor	
	5.15.3	Hospital	
	5.15.4	Other	
<b>5.16</b>	What is the source of your water? [1] Tube-well; [2] Pond; [3] Mud well; [4] River/Pond; [5] Other		
	5.16.1	for cooking	1   2   3   4   5
	5.16.2	for drinking	1   2   3   4   5
	5.16.3	for bathing	1   2   3   4   5
<b>5.17</b>	What is the ownership of the source of the water? [1] own; [2] Neighbor; [3] Government; [4] NGO; [5] Other		
	5.17.1	for cooking	1   2   3   4   5

5.17.2	for drinking	1 1 2 1 3 1 4 1 5
5.17.3	for bathing	1 1 2 1 3 1 4 1 5

**5.18** If the water source is a tube-well, do you know the quality in respect of arsenic? (Y/N)

Y	I
N	

**5.19** What kind of latrine do you use?

5.19.1	Sanitary	
5.19.2	Non-Sanitary (Kutcha)	
5.19.3	Open Land (no latrine)	

**5.20** What is the ownership of the latrine you use?

5.20.1	Own	
5.20.2	Neighbor	
5.20.3	Joint	

What are the three biggest NGOs work in the area?

<b>5.21</b>	<b>Name of organization</b>	<b>Code</b>	<b>Working Area</b>	<b>Activities</b>
	5.21.1			
	5.21.2			
	5.21.3			

**5.22** Are you a member of a NGO?

Y	I	N
---	---	---

**5.23 a** If Yes, which Organisation? (max. 3)

--	--	--

**5.23 b** Which activities do you perform for the NGO?

--	--	--

**5.24** What kind of assistance do you want from the NGO?

5.24.1	Technical	
5.24.2	Financial	
5.24.3	Equipment	
5.24.4	Seed	
5.24.5	Fertilizer	
5.24.6	Other	

**5.25** What kind of assistance do you want from GO?

5.25.1	Technical	
5.25.2	Financial	
5.25.3	Equipment	
5.25.4	Seed	
5.25.5	Fertilizer	
5.25.6	Other	

**5.26** Does your household use electricity?

Y	I	N
---	---	---

**5.27** If Yes, which source do you use?

5.27.1	Grid	
5.27.2	No Grid	
5.27.3	Solar Panel	

<b>IV Plot user</b>									
<b>6. Information about affected plot users</b>									
<b>6.1</b>	Survey ID No.	<input style="width: 95%;" type="text"/>							
<b>6.2</b>	Division	<input style="width: 95%;" type="text"/>							
<b>6.3</b>	District:	<input style="width: 95%;" type="text"/>							
<b>6.4</b>	Upazilla/Thana:	<input style="width: 95%;" type="text"/>							
<b>6.5</b>	Union Parishad/City Corp.:	<input style="width: 95%;" type="text"/>							
<b>6.6</b>	Mauza:	<input style="width: 95%;" type="text"/>							
<b>6.7</b>	Name of Household Head	<input style="width: 95%;" type="text"/>							
<b>6.8</b>	Name of Father/Husband	<input style="width: 95%;" type="text"/>							
<b>6.9</b>	Name of Mother	<input style="width: 95%;" type="text"/>							
<b>6.10</b>	Nat. ID-Card No.	<input style="width: 95%;" type="text"/>							
<b>6.11</b>	What is your status about the plot?								
	6.14.1 Owner	<input style="width: 95%;" type="text"/>							
	6.14.2 Leased	<input style="width: 95%;" type="text"/>							
	6.14.3 Sharecropper	<input style="width: 95%;" type="text"/>							
	6.14.4 User without permission	<input style="width: 95%;" type="text"/>							
<b>6.12</b>	If you are not the owner of the plot: Who is the owner?	<input style="width: 95%;" type="text"/>							
	6.15.1 Khas Land								
	6.15.2 Other	<input style="width: 95%;" type="text"/>							
<b>6.13</b>	If you are a sharecropper or Leased: What is your production share? (%)	<input style="width: 95%;" type="text"/>							
<b>6.14</b>	How long do you use the plot? ([1] 1-5 years; [2] 5-10 years; [3] 10+ years)	<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20px;">1</td> <td style="width: 20px;">2</td> <td style="width: 20px;">3</td> </tr> <tr> <td style="border: none;"> </td> <td style="border: none;"> </td> <td style="border: none;"> </td> </tr> </table>		1	2	3			
1	2	3							
<b>6.15</b>	Plot information:	<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 20%;">Plot No.</th> <th style="width: 30%;">Area total (decimal)</th> <th style="width: 30%;">Area affected (decimal)</th> </tr> </thead> <tbody> <tr> <td style="height: 20px;"></td> <td></td> <td></td> </tr> </tbody> </table>		Plot No.	Area total (decimal)	Area affected (decimal)			
Plot No.	Area total (decimal)	Area affected (decimal)							
<b>6.16</b>	How many times you grow crops on the agricultural land? ([1] single, [2] double, [3] triple crops)	<input style="width: 95%;" type="text"/>							
<b>6.17</b>	If you use the land for agriculture, what crops are grown on the land?	Numbers as in list							
	6.17.1 Rabi	<input style="width: 95%;" type="text"/>							
	6.17.2 Kharif I	<input style="width: 95%;" type="text"/>							
	6.17.3 Kharif II	<input style="width: 95%;" type="text"/>							
<b>6.18</b>	Do you use the land for other purposes?								
	6.18.1 Forestry	<input style="width: 95%;" type="text"/>							
	6.18.2 Fish pond	<input style="width: 95%;" type="text"/>							

	6.18.3 Others (specify)											
<b>6.19</b>	How much money do you earn <u>per year</u> by using the plot? [1] < 6000; [2] 6000 - 12000; [3] >12000	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20px;">1</td> <td style="width: 20px;"> </td> <td style="width: 20px;">2</td> <td style="width: 20px;"> </td> <td style="width: 20px;">3</td> </tr> <tr> <td colspan="5" style="height: 20px;"></td> </tr> </table>	1		2		3					
1		2		3								
<b>6.20</b>	Combined Total income <u>in Taka per year</u> : [1] 1000-60000; [2] 60000-120000; [3] >120000	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20px;">1</td> <td style="width: 20px;"> </td> <td style="width: 20px;">2</td> <td style="width: 20px;"> </td> <td style="width: 20px;">3</td> </tr> <tr> <td colspan="5" style="height: 20px;"></td> </tr> </table>	1		2		3					
1		2		3								
<b>6.21</b>	Does the AH lose more than 10% of their annual income?	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20px;">Y</td> <td style="width: 20px;"> </td> <td style="width: 20px;">N</td> </tr> </table>	Y		N							
Y		N										
<b>6.22</b>	What is the gender of the household head? (M or F)	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20px;">F</td> <td style="width: 20px;"> </td> <td style="width: 20px;">M</td> </tr> </table>	F		M							
F		M										
<b>6.23</b>	Are there members of the household who are disabled, invalids or have a long-term illness, if so how many?	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20px;">Y</td> <td style="width: 20px;"> </td> <td style="width: 20px;">N</td> </tr> </table>	Y		N							
Y		N										
	6.23.1	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="width: 50px;">Number male</td> <td style="width: 50px; height: 20px;"></td> </tr> </table>	Number male									
Number male												
	6.23.2	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="width: 50px;">Number female</td> <td style="width: 50px; height: 20px;"></td> </tr> </table>	Number female									
Number female												
<b>6.24</b>	How many people live in your household?											
	6.24.1	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="width: 50px;">Number male</td> <td style="width: 50px; height: 20px;"></td> </tr> </table>	Number male									
Number male												
	6.24.2	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="width: 50px;">Number female</td> <td style="width: 50px; height: 20px;"></td> </tr> </table>	Number female									
Number female												

**7. Do you want to say anything to us:**

Name and Signature of Surveyor:

Date of Survey:

Name of Household Head:

Signature of Household Head:

## ANNEX-B: LIST OF PARTICIPANTS

### For C-2

Date	Location	Participants	Meeting Type
29/12/22	Jatrabari	10	FGD
30/12/22	Jatrabari	11	FGD
30/12/22	Mugda	8	FGD
31/12/22	Jatrabari	10	FGD
31/12/22	Jatrabari	8	FGD
31/12/22	Jatrabari	10	FGD
31/12/22	Mugda	10	FGD
01/01/23	Mugda	9	FGD
01/01/23	Mugda	10	FGD

## LIST OF PARTICIPANTS FOR C-1&3

Sl. No.	Date	Time	Meeting Place	Attendees
1	12.05.2022	10.45-11.45	Gazi Bari, Haria, Baidho Bazar, 2 No Union, Sonargaon, Narayanganj	10
2	12.05.2022	11.50-01.10	Aminpur Unioun, Ward No. 1, Dorpat, Sonargaon, Narayanganj	11
3	12.05.2022	12.30-02.00	Dorpat, Thotaliya, Sonargaon, Narayanganj	10
4	13.05.2022	09.30-10.30	Joshna Begum Bari, Noyanagar, Ramdi, Sonargaon, Narayanganj	12
5	13.05.2022	11.20-12.15	Hazi Md Jashim Uddin Bari, Noyanagar, Ramdi, Sonargaon, Narayanganj	11
6	13.05.2022	12.30-01.40	Dorpat Tea stall, Sonargaon, Narayanganj	11
7	14.05.2022	10.40-11.50	Maddhay Nandi para, Sabujbagh, Dhaka	10
8	14.05.2022	12.30-01.50	Rusulbagh, 24 Feet, Kadamtoli, Dhaka	11
9	14.05.2022	12.30-01.40	Abdul Hannan Tea stall, Jatrabari, Dhaka	10
10	15.05.2022	09.20-10.30	Hazinagar tea stall, Demra, Dhaka	13
11	15.05.2022	10.30-11.20	Dakkhin hajinagar, Demra, Dhaka	12
12	15.05.2022	11.20-12.30	Nandipara, Khilgaon, Dhaka	10
13	16.05.2022	10.30-11.30	Golden Convation Center, Zia Sarni Road, Kadamtoli, Dhaka	11
14	16.05.2022	12.30-01.30	Dakkhingaon, Sabujbagh, Dhaka	9
15	16.05.2022	01.30-02.30	Purbo basabo Patwary Goli, Sabujbagh, Dhaka	12

# ANNEX-C: DEPARTMENT OF ENVIRONMENT'S (DOE) STANDARDS FOR WASTE DISCHARGE

## DoE Standards for Waste Discharge (Schedule 04, Rule 32, Environment Conservation Rules 2023)

Parameters	Unit	Places for determination of standards except pH		
		Inland Surface Water	Public Sewerage system connected to treatment at second stage	Coastal Area
Ammonia-nitrogen (as elementary N)	mg/l	50	50	50
Ammonia (as free ammonia)	mg/l	5	5	5
Arsenic (as As)	mg/l	0.2	0.2	0.2
BOD <sub>5</sub> at 20°C	mg/l	30	250	100
Boron	mg/l	2	2	4.0
Cadmium (as Cd)	mg/l	2	1	2
Chloride	mg/l	600	600	-
Chromium (as total Cr)	mg/l	0.5	1.0	1.0
COD	mg/l	200	400	250
Chromium (as hexavalent Cr)	mg/l	0.5	1.0	1.0
Copper (as Cu)	mg/l	3	3	3.0
Dissolved oxygen (DO)	mg/l	4.5-8	4.5-8	4.5-8
Electro-conductivity (EC)	µSiemens/cm	1200	1200	1200
Total dissolved solids	mg/l	2100	2100	2100
Fluoride (as F)	mg/l	2	15	15
Sulfide (as S)	mg/l	1	-	5
Iron (as Fe)	mg/l	3	3	3
Total kjeldahl nitrogen (as N)	mg/l	100	-	100
Lead (as Pb)	mg/l	0.1	1.0	2
Manganese (as Mn)	mg/l	2	2	2
Mercury (as Hg)	mg/l	0.01	0.01	0.01
Nickel (as Ni)	mg/l	1.0	2.0	5.0
Nitrate (as elementary N)	mg/l	10.0	Not fixed	20.0
Oil and grease	mg/l	10	20	10
Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH)	mg/l	1.0	5.0	5.0
Dissolved phosphorus (as P)	mg/l	5	-	-



Parameters	Unit	Places for determination of standards		
		Inland Surface Water	Public Sewerage system connected to treatment at second stage	Irrigated land
Selenium (as Se)	mg/l	0.05	0.05	0.05
Zinc (as Zn)	mg/l	5	15	15
Temperature (thermal effluent)	°C (summer) °C (winter)	40 45	40 45	40 45
Suspended solids	mg/l	100	500	100
Cyanide	mg/l	0.1	2.0	0.2

**Notes:**

- (1) These standards shall be applicable to all industries or projects other than those specified under the heading "Standards for sectorwise industrial effluent or emission."
- (2) Compliance with these standards shall be ensured from the moment an industrial unit starts trial production, and in other cases, from the moment a project starts operation.
- (3) These standards shall be inviolable even in case of any sample collected instantly at any point of time. These standards may be enforced in a more stringent manner if considered necessary in view of the environmental conditions of a particular situation.
- (4) Inland Surface Water means drains/ponds/tanks/water bodies/ditches, canals, rivers, springs and estuaries.
- (5) Public sewerage system means treatment facilities of the first and second stage and also the combined and complete treatment facilities.
- (6) Irrigable land means such land area which is sufficiently irrigated by waste water taking into consideration the quantity and quality of such water for cultivation of selected crops on that land.
- (7) Inland Surface Water Standards shall apply to any discharge to a public sewerage system or to land if the discharge does not meet the requirements of the definitions in notes 5 and 6 above.

## ANNEX-D: DECLARATION OF SHITALAKSHYA RIVER AS ECOLOGICAL CRITICAL AREA (ECA)

রেজিস্টার্ড নং ডি এ-১



অতিরিক্ত সংখ্যা  
কর্তৃপক্ষ কর্তৃক প্রকাশিত

রবিবার, অক্টোবর ৪, ২০০৯

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

পরিবেশ ও বন মন্ত্রণালয়

পরিবেশ শাখা-৩

প্রজ্ঞাপন

তারিখ, ০১ সেপ্টেম্বর, ২০০৯

নং পবম/পরিবেশ-৩/৫/মামলা-০৪/২০০৯/৩৮৫—সরকার এ মর্মে সন্তুষ্ট হয়েছে যে, মানুষের অপরিণামদর্শী এবং অপরিণামিত কার্যকলাপের কারণে রাজধানী ঢাকার চতুষ্পাশ্বে প্রবাহিত বুড়িগঙ্গা, তুরাগ, বালু ও শীতলক্ষ্যাসহ সংশ্লিষ্ট নদীসমূহের প্রতিবেশ ব্যবস্থা (Ecosystem) সংকটাপন্ন অবস্থায় উপনীত হয়েছে, যার ভবিষ্যতে আরও অবনতি হবার আশংকা রয়েছে।

এ বিষয়ে দায়েরকৃত একটি রীট পিটিশনের (নং ৩৫০৩/২০০৯) রায়ে মহামান্য সুপ্রীম কোর্টের হাইকোর্ট বিভাগ উপরোক্ত নদীসমূহকে প্রতিবেশগত সংকটাপন্ন এলাকা (Ecologically Critical Area) হিসেবে ঘোষণা করার নির্দেশ প্রদান করেছেন।

এমতাবস্থায়, প্রাকৃতিক পরিবেশ সংরক্ষণ, পরিবেশগত মান উন্নয়ন এবং পরিবেশ দূষণ নিয়ন্ত্রণ ও প্রশমন এবং টেকসই পরিবেশ ব্যবস্থাপনার লক্ষ্যে “বাংলাদেশ পরিবেশ সংরক্ষণ আইন, ১৯৯৫” (১৯৯৫ সনের ১নং আইন) এর ৫নং ধারার উপ-ধারা (১) এ প্রদত্ত ক্ষমতাবলে এবং পরিবেশ সংরক্ষণ বিধিমালা, ১৯৯৭-এর ৩ নং বিধি অনুসারে এবং সর্বোপরি মহামান্য সুপ্রীম কোর্টের হাইকোর্ট বিভাগের নির্দেশনা অনুযায়ী বুড়িগঙ্গা, তুরাগ, বালু ও শীতলক্ষ্যাসহ সংশ্লিষ্ট নদীসমূহের এবং উভয় তীরস্থ ফোরশোর এলাকাসমূহকে প্রতিবেশগত সংকটাপন্ন এলাকা (Ecologically Critical Area) হিসেবে ঘোষণা করা হলো।

( ৬৬৫৭ )

মূল্য ৪ টাকা ২.০০

৬৬৫৮

বাংলাদেশ গেজেট, অতিরিক্ত, অক্টোবর ৪, ২০০৯

অতএব, বুড়িগঙ্গা, তুরাগ, বালু ও শীতলক্ষ্যাসহ সংশ্লিষ্ট নদীসমূহের এবং নদীগুলোর ফোরশোরে নিম্নলিখিত কার্যাবলী এতদ্বারা নিষিদ্ধ করা হলো, যা বাংলাদেশ সরকারের গেজেটে প্রকাশনার দিন হতে কার্যকর হবেঃ—

- \* সকল প্রকার শিকার।
- \* নদীতে বসবাসকারী জলজ প্রাণী ধরা বা সংগ্রহ।
- \* প্রাণী ও উদ্ভিদের আবাসস্থল ধ্বংস বা সৃষ্টিকারী সকল প্রকার কার্যকলাপ।
- \* ভূমি ও পানির প্রাকৃতিক বৈশিষ্ট্য নষ্ট/পরিবর্তন করতে পারে এমন সকল কাজ।
- \* মাটি, পানি, বায়ু এবং শব্দ দূষণকারী শিল্পপ্রতিষ্ঠান স্থাপন।
- \* মাছ এবং অন্যান্য জলজ প্রাণীর ক্ষতিকারক যে কোন প্রকার কার্যাবলী।
- \* নদীসমূহের চারপাশের বাসাবাড়ী, শিল্পপ্রতিষ্ঠান এবং অন্যান্য প্রতিষ্ঠানের পরঃপ্রণালী সৃষ্ট বর্জ্য ও তরল বর্জ্য নির্গমন।

উন্নততর পরিবেশগত ব্যবস্থাপনার লক্ষ্যে এ এলাকার পরিসীমা এবং বিধি-নিষেধ পরিবর্তন/পরিবর্তন করার ক্ষমতা পরিবেশ অধিদপ্তরের মহাপরিচালক সংরক্ষণ করেন।

রাষ্ট্রপতির আদেশক্রমে

ড. মিহির কান্তি মজুমদার

সচিব।

মোঃ মাছুম খান (উপ-সচিব), উপ-নিয়ন্ত্রক, বাংলাদেশ সরকারি মুদ্রালায়, ঢাকা কর্তৃক মুদ্রিত।

মোঃ মজিবুর রহমান (উপ-সচিব), উপ-নিয়ন্ত্রক, বাংলাদেশ ফরম ও প্রকাশনা অফিস,  
তেজগাঁও, ঢাকা কর্তৃক প্রকাশিত। [www.bgpress.gov.bd](http://www.bgpress.gov.bd)

## ANNEX-E: CHANCE FIND PROCEDURE

Works could impact sites of social, sacred, religious, or heritage value. "Chance find" procedures would apply when those sites are identified during the design phase or during the actual construction period and the related activity will not be eligible for financing under the project. Cultural property includes monuments, structures, works of art, or sites of significant points of view, and are defined as sites and structures having archaeological, historical, architectural, or religious significance, and natural sites with cultural values. This includes cemeteries, graveyards and graves. This Annex describes the procedures to be followed in the event of a 'Chance Find' for cultural properties and describes the procedures for its management as per the World Bank Operational Manual for OP4.11.

### Procedures for Chance Find:

- 1 In the event of finding of properties of cultural value during construction, the following procedures for identification, protection from theft, and treatment of discovered artifacts should be followed and included in standard bidding document.
  - › Stop the construction activities in the area of the chance find;
  - › Delineate the discovered site or area;
  - › Secure the site to prevent any damage or loss of removable objects.
  - › Notify the supervisory Engineer who in turn will notify the responsible local authorities;
  - › Responsible local authorities and the relevant Ministry would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures.
  - › Decisions on how to handle the finding shall be taken by the responsible authorities and the relevant Ministry. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance), conservation, restoration and salvage.
  - › Implementation of the authority decision concerning the management of the finding shall be communicated in writing by the relevant Ministry.
  - › Construction work could resume only after permission is given from the responsible local authorities and the relevant Ministry concerning safeguard of the heritage.
- 2 These procedures must be referred to as standard provisions in construction contracts. During project supervision, the Site Engineer shall monitor the above regulations relating to the treatment of any chance find encountered.
- 3 Relevant findings will be recorded in World Bank Supervision Reports and Implementation Completion Reports will assess the overall effectiveness of the project's cultural property mitigation, management, and activities, as appropriate.

## ANNEX-F: CORPORATE SOCIAL RESPONSIBILITY (CSR)



**DANIDA SUSTAINABLE  
INFRASTRUCTURE FINANCE**



**COWI**

### SAIDABAD WATER TREATMENT PLANT PROJECT, PHASE III, COMPONENT-2

DESIGN & SUPERVISION CONSULTANTS (DSC) FOR THE MANAGEMENT, DESIGN, AND SUPERVISION FOR DESIGN REVIEW AND SUPERVISION OF CONSTRUCTION FOR COMPONENT 2 OF THE SAIDABAD III WATER TREATMENT PROJECT, COMPRISING WATER TREATMENT PLANT AND SLUDGE TREATMENT PLANT

CONTRACT NO. 46.113.620.12.011.100.2018-32  
CONTRACT AGREEMENT DATE: 07 MARCH 2022  
PROJECT COMMENCEMENT DATE: 22 APRIL 2022

#### CORPORATE SOCIAL RESPONSIBILITY PLAN

CLIENT  
FINANCER

Dhaka Water Supply and Sewerage Authority (DWASA)  
DANIDA Sustainable Infrastructure Finance (DSIF)



**DANIDA SUSTAINABLE  
INFRASTRUCTURE FINANCE**



ADDRESS COWI A/S  
Parallelvej 2 2800 Kongens  
Lyngby Denmark

PROJECT OFFICE House No 7 Road-32, Gulshan,  
Dhaka, Bangladesh

TEL +45 56 40 00 00  
WWW cowi.com

# SAIDABAD WATER TREATMENT PLANT PROJECT, PHASE III, COMPONENT-2

DESIGN & SUPERVISION CONSULTANTS (DSC) FOR THE MANAGEMENT, DESIGN, AND  
SUPERVISION FOR DESIGN REVIEW AND SUPERVISION OF CONSTRUCTION FOR  
COMPONENT 2 OF THE SAIDABAD III WATER TREATMENT PROJECT, COMPRISING  
WATER TREATMENT PLANT AND SLUDGE TREATMENT PLANT

CONTRACT NO. 46.113.620.12.011.100.2018-32  
CONTRACT AGREEMENT DATE: 07 MARCH 2022  
PROJECT COMMENCEMENT DATE: 22 APRIL 2022

## COPORATE SOCIAL RESPONSIBILITY PLAN

PROJECT NO. DOCUMENT NO.  
A201608; 100398092 DSCJV-RSE-RP-CMP2-0030  
(MOTT MACDONALD)

VERSION	DATE OF ISSUE	DESCRIPTION	PREPARED	CHECKED	APPROVED
01	11 APRIL 2023	Draft issue to DWASA for comment	Ahbar Choudhury, Tahir Choudhury, Quazi Shammis Sayeed	Quentin Rea, Camille Fong	Rubén Asorey Pierre de Rancourt

### DISCLAIMER

This document is issued for the party which commissioned it for specific purposes connected with the above-captioned project only. It should not be relied upon any other party or used for any other purpose. We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any errors or omission which is due to an error or omission in data supplied to us by other parties. This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.



## EXECUTIVE SUMMARY

### PURPOSE OF THE DOCUMENT

The Design and Supervision Consultants' (DSC) scope requires preparation of a Corporate Social Responsibility (CSR) Plan that deals with the employment issues on Saidabad III related to DWASA moving from operating many deep tube wells (DTWs) to several large surface water plants and fewer DTWs. Since this shift will affect the staffing requirement, as have been foreseen, at the intakes and pumping stations (Haria and Sarulia), the CSR Plan should cover overall staffing requirements smooth operation and maintenance of new assets related to surface water treatment III.

The scope of the ToR limits the scope of development of the CSR plan to 'the employment issues on Saidabad III related to DWASA moving from operating many DTWs to several large surface water plants and fewer DTWs'.

### KEY POINTS

The plan covers the followings:

- > Saidabad Water Treatment Plants Service Coverage and O&M Staffing.
- > The CSR Plan.

### RECOMMENDATIONS

The CSR Plan recommends the following:

The impact on the employment issues on Saidabad III related to DWASA moving from operating many DTWs to several large surface water plants and fewer DTWs is apparently insignificant, which might be mitigated with the followings:

1. The project specify that the Design and Build Contractor analyse and identify requirement of staff with positions and number for the operation and maintenance of the plant along with the designing of the plant.
2. DWASA considers non-appointment of new pump operators against the position getting vacant through retiring ones over time rather fills the position promoting the interns who qualifies thereby manage the number of redundant staff.
3. DWASA identifies qualifying redundant pump operators/interns, if any, due to operation of the Saidabad III well ahead of commissioning of the plant, nominate them for the suitable positions of the plant, and arrange their training as necessary through the designed training, which is part of the project (Ref: DSC Submitted Capacity Analysis and TA Support Plan).
4. On successful completion of the training (item 3 above), DWASA appoint them to the respective positions.

In addition to the above, DWASA initiates development a full-fledged Corporate Social Responsibility (CSR) Plan aligned to its Citizen Charter as part of its corporate responsibility considering the following as a long-term strategy:

**Institutional Aspect (interim, 2023 - 2035):** Whilst the Dhaka City Water Supply Master Plant is currently being implemented, DWASA will continue maintaining the existing DTWs as supplementary water sources and to improve resilience is supply



**Institutional Aspect (long term, beyond 2035):** the shift from groundwater to surface water usage will require restructuring of the current decentralised O&M structure in the long term when all the planned surface water treatment plants will be constructed by 2035.

**Outage Study:** System resilience and outage study will be required for DWASA's readiness to operate three large surface water treatment plants. The outcome of the outage study should focus on Dhaka city's water supply system resilience. An outage model can provide necessary information to DWASA on re-zoning and bulk water transfer from one surface water treatment plant zone to other in case of emergency shut down any large treatment plant.

Whilst the consultants' current ToR does not include development of such network models and outage simulation exercises under Saidabad Component-3, we recommend DWASA to develop a comprehensive strategy to address these issues should that be considered prudent by DWASA management.

Thus provide the highest level of customer service without any outage during the shift from decentralised groundwater supply-based operation and maintenance structure to large surface water treatment facilities.

**Capacity Building:** Refer to all recommendations on DWASA's capacity building as outlined in "Capacity Building and TA Support Plan" as prepared under the DSC contract; Document No.: DSCJV-TRA-RP-CMP2-0014.

## CONTENTS

1	Introduction	1
1.1	General Background	1
1.2	Scope of the CSR plan	5
2	Saidabad Water Treatment Plants Service Coverage and O&M Staffing	7
2.1	O&M Staff Serving Saidabad West-East Sector	9
2.1.1	Present Staff Strength of Saidabad West-East Sector O&M Team	13
2.1.2	Possible redundancy of Staff	14
2.2	Staff Requirement of Saidabad Phase III WTP and Sludge Plant	15
3	CSR Plan	16
4	Conclusion and Recommendations	17
	References	19

## LIST OF FIGURES

Figure 1-1 Layout of the Saidabad Project Phase III	4
Figure 2-1 DWASA Service Area Sectorization	7
Figure 2-2 DWASA high-level organogram	11
Figure 2-3 Dhaka WASA's MODS zones for groundwater abstraction	12
Figure 2-4 Saidabad Phase II WTP Staff Organogram	14

## LIST OF TABLES

Table 2-1 Number DMAs and Deep Tube Wells by MODS Zone within Saidabad West-East Sector	8
---	---

## ABBREVIATIONS

ADB	Asian Development Bank
AFD	French Agency for Development
BFUJ	Bangladesh Federal Union of Journalists
BMA	Bangladesh Medical Association
BUET	Bangladesh University of Engineering and Technology
CSR	Corporate Social Responsibility (plan)
DANIDA	Danish International Development Agency
DBO	Design, Build, Operate
DBF	DANIDA Business Finance
DCCI	Dhaka Chamber of Commerce, and Industry
DESWSP	Dhaka Environmentally Sustainable Water Supply Project
DND	Dhaka-Narayanganj-Demra canal
DMA	District Metering Area
DO	Dissolved Oxygen
DOE	Department of Environment
DPDC	Dhaka Power Distribution Company
DSC	Design and Supervision Consultants
DSCJV	Design and Supervision Consultants Joint Venture
DSCC	Dhaka South City Corporation
DSIF	DANIDA Sustainable Infrastructure Finance
DTW	Deep Tube Well
DWASA	Dhaka Water Supply and Sewerage Authority
DWSSDP	Dhaka Water Supply Sector Development Project
EIB	European Investment Bank
EMP	Environmental Management Plan
ESMP	Environmental and Social Management Plan
ESIA	Environmental and Social Impact Assessment
FIDIC	International Federation of Consulting Engineers (French)
FGD	Focused Group Discussion
FR/FS	Feasibility Report/ Study
GoB	Government of Bangladesh
GW	Ground Water
ICA	Instrumentation Control and Automation
ICAB	Institute of Chartered Accountants Bangladesh
IEB	Institute of Engineers Bangladesh
IWM	Institute of Water Modelling
KfW	Kreditanstalt für Wiederaufbau
KII	Key Informants Interview
LGD	Local Government Division
LGRDC	Local Government Rural Development and Cooperatives
l/c/d	Litres Per Capita per Day
MD	Managing Director
MIS	Management Information System

MI/d	Megalitres per Day
MODS	Maintenance, Operation, Distribution & Services
PD	Project Director
PGCB	Power Grid Company Bangladesh
PMC	Project Management Consultants
PMU	Project Management Unit
PS	Pumping Station
PWD	Public Works Department
REB	Rural Electrification Board
RAP	Resettlement Action Plan
RHD	Roads and Highways Department
RPE&M	Resource Planning Equipment & Miscellaneous
RWP	Raw Water Pipeline
RWPS	Raw Water Pumping Station
SCADA	Supervisory Control and Data Acquisition
SEP	Stakeholder Engagement Plan
SER	Service Economique Régional - French Embassy in Dhaka
SMW	Structural Maintenance Work
SWTPPP III	Saidabad Water Treatment Plant Project Phase III
TOR	Terms of Reference
WHO	World Health Organisation
WTP	Water Treatment Plant
m³/d	Cubic Metres per day

## 1 Introduction

### 1.1 General Background

Dhaka Water Supply and Sewerage Authority (DWASA) is diversifying the current water resource dependence on groundwater to one more heavily focused on surface water. The target is to shift away from approximately 78% ground water resource to roughly 70% surface water resource by the 2020s. Diversification started with the construction of Saidabad WTP Phase I (2002) and Saidabad WTP Phase II (2012), providing a total 450,000m<sup>3</sup>/d capacity.

According to DWASA 2014 Master Plan, 400 square kilometres of DWASA service area of Dhaka Metropolitan City has been divided into eight Sectors (by 20235) considering the population density, strategy of city development, nearby available sources of ground and surface water, socio economic condition of the locality and the corresponding water demand for the better management of its services. Each of the 8 Service Sectors is then divided into Zones, titled as Maintenance, Operation, Distribution & Services Zone (MODS Zones). The MODS Zones are subdivided into a smaller service area named as District Metering Area (DMA). Altogether there are 10 MODS Zones, and 166 DMAs under DWASA.

The very first Surface Water Treatment Plant, the Chandnighat WTP, was developed for Dhaka in 1874 that uses the River Buriganga water. Later the plants were upgraded in 1970, and 1996. There were two more Surface Water Treatment Plants develop long before, namely, Godnail (to supply to Narayangonj) and Sonakanda, which use the River Sitalakhya as the Source of water. For the shift of dependency to surface water from the ground water, DWASA planned to develop 8 mega surface water treatment plants using water from the Sitalakhya, the Padma, the Meghna rivers.

A schematic of the MODS Zones, and DMA along with water supply sources, both surface water and DTWs, and distribution system is available in DWASA web site <http://dwasa.org.bd/site/page/c4b37e89-74a8-4a25-b292-4d00db8aad7/Digital-Map>. A further detail of Service Sectors and Surface Water Sources are given in section 2.

Among the 8 mega projects, two (Saidabad I and Saidabad II) were commissioned in 2002 , and 2012 supplying 450,000m<sup>3</sup>/d. Three more "mega projects" are now underway to increase the surface water supply by a further 1,400,000m<sup>3</sup>/d, these are:

- > Padma I - capacity 450,000m<sup>3</sup>/d: Chinese Exim Bank funded and completed in 2020.
- > The Dhaka Environmentally Sustainable Water Supply Project (DESWSP, also known as Gandharbpur WTP) - capacity 500,000m<sup>3</sup>/d. Asian Development Bank (ADB), Agence Française de Développement (French Development Agency) (AFD) and European Investment Bank (EIB) funded, construction in progress with completion due by December 2025.
- > Saidabad Water Treatment Plant Project Phase III (SWTPPP III) capacity 450,000 m<sup>3</sup>/d.

The SWTPPP III is split into two Sub-Projects which further split into three Components as follows:

- > **Sub-Project 1:**
  - > **Component 1:** A 950,000m<sup>3</sup>/d (950ML/d) river intake, raw water pumping station at Haria, on the Meghna River and a 27km transmission system comprising twin large diameter Raw Water Pipelines (RWP) to the Saidabad Water Treatment Plant site.
  - > **Component 3:** A 54km extension treated water, primary and secondary distribution pipeline network (pipe size DN400 to DN1800), located in the Southeast of Dhaka city.
- > **Sub-Project 2:**
  - > **Component 2** - A 450,000m<sup>3</sup>/day (450ML/d) capacity water treatment plant and a combined sludge treatment facility to process sludge generated from the existing Phase I and II WTPs and the proposed Phase III WTP.

**The funders for the components are:**

- > Components 1 and 3: the Government of the People's Republic of Bangladesh (GoB), AFD, EIB and Kreditanstalt für Wiederaufbau (Credit Institute for Reconstruction) (KfW).
- > Component 2: GoB and Danish International Development Agency (DANIDA).

The two sub-projects are being implemented independently, each with their own set of funders and JV consultants. DWASA's Project Management Unit (PMU) ensure a client coordination role for the overall project with Mott MacDonald providing a design and consultancy presence across all three Components. Figure 1-1 shows key features for all three components of SWTPPP III.

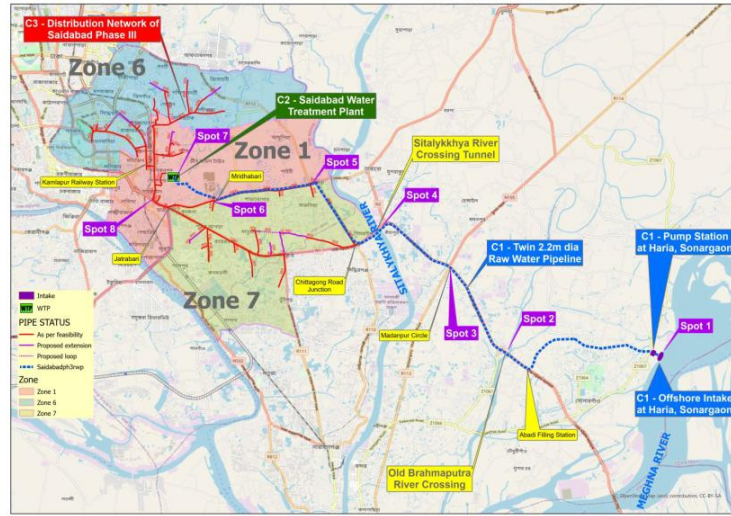


Dhaka Water Supply and Sewerage Authority (DWASA) has appointed Design and Supervision Consultants (DSC) on 7 March 2022 for the design and supervision of construction of Component 2.

The ToR of DSC requires a Corporate Social Responsibility (CSR) Plan under activity G. Review and Update of ESIA and Associated Documents that deals with the employment issues on Saidabad III related to DWASA moving from operating many deep tube wells (DTWs) to several large surface water plants and fewer DTWs. Since this shift will affect the staffing requirement, as have been foreseen, at the intakes and pumping stations (Haria and Sarulia), the CSR Plan should cover overall staffing requirements for the smooth operation and maintenance of new assets related to the Phase III project.

DSCJV-RSE-RP-CMP2-0030

Figure 1-1 Layout of the Saidabad Project Phase III



Source : PMC

DSCN-RSE-RP-CMP2-0030

## 1.2 Scope of the CSR plan

Outside the terms of this report, Corporate Social Responsibility (CSR) is a type of corporate strategy that looks at how a business can better society as a whole. Being socially responsible is not an occasional act, but it is an on-going year-round commitment, which is integrated into the very core of any business. CSR initiatives are often broken down into four categories: environmental, philanthropic, ethical, and economic responsibility. Environmental initiatives focus on preservation of natural resources, while philanthropic initiatives focus on donating to worthy causes that may not relate to a business. Ethical responsibility ensures fair and honest business operations, while economic responsibility promotes the fiscal support of the goals above.

In Bangladesh, having a CSR Plan is still voluntary with the exception of disclosure of expenditures on energy usage required under the Companies Act of 1994 and the Securities and Exchange Rules of 1987, which require the total amount spent on energy to be shown as a separate expenditure in the notes to the financial statements.

Though DWASA has no CSR Plan as such, yet it's strategic document, the DWASA's Citizen Charter covers the following topics that relate to its undefined Corporate Social Responsibility in the form of DWASA's services, as promised to its customers. The latest DWASA's Citizen Charter, as updated on 31 December 2022 can be found in the following [link](#) (only in Bengali). It covers:

1. Citizen services: new water and sewerage connections in all Service Area Sectors to all citizens consisting of residential, communities (religious and social), institutional, commercial, industrial, private DTW owners, firefighting water services, government officials, low-income communities, mobile water tanks, water quality testing, water meter checks, supplier classifications, enrolment, and renewal services.
2. Official services: not applicable.
3. Internal services: general provident fund, house building loan, computer purchase loan, vacation, maternity leave, casual leave, earned leave, sick leave, international travel leave, further education leave, lamp grant, retirement and LPR application, pension, passport, housing, vehicle allocation, employees' children scholarship, funeral services, sports and cultural fund applications.
4. DWASA's request to citizens: visiting websites, use correct application forms, relevant legal awareness, awareness of DWASA's programmes and activities, depositing correct level of fees, follow instructions given in SMS notifications, present during the appointment date and time, not lobbying for services and provide all requested information.
5. Complain Management.

**The scope of this document, regarding development of the CSR Plan, is limited by the DSC ToR to 'the employment issues on Saidabad III related to DWASA moving from operating many deep tube wells to several large surface water plants and fewer deep tube wells'.**

This plan is prepared in conjunction with the information from PMC, Consultant to Sub-project C1 and C3 for the shift in staffing in intake and pumping stations.

Structure of the report is described below:

- > Chapter 2 describes the Saidabad Water Treatment Plants Service Coverage and O&M Staffing.
- > Chapter 3 presents the CSR Plan.
- > Chapter 4 presents Conclusions and Recommendations.

## 2 Saidabad Water Treatment Plants Service Coverage and O&M Staffing

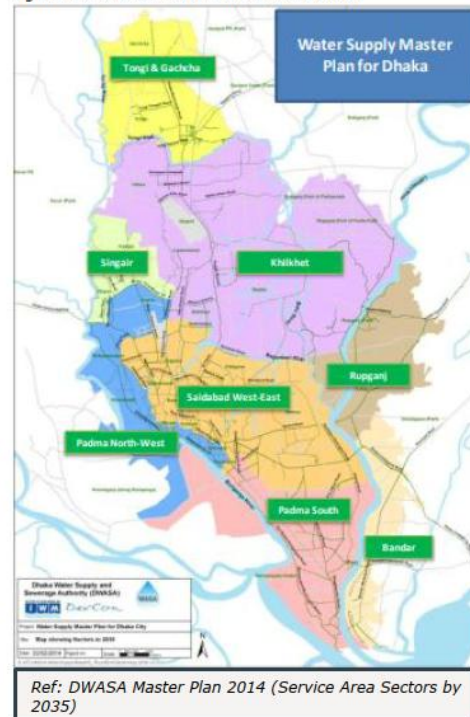
Dhaka, the capital city of Bangladesh, is situated in the East bank of the River Buriganga. It has a population of approximately 15 million living in an area of around 400 square kilometres. Dhaka Water and Sewerage Authority (DWASA) is a publicly owned and semi-autonomous utility set up in 1963, and is responsible for the construction, operation and maintenance of water supply and sanitation infrastructure in the metropolitan Dhaka, including DTWs, surface water treatment plants, water supply distribution network, sewerage networks and wastewater treatment plants.

According to the Water Master Plan 2014, DWASA's service area has been divided into eight Sectors (by 2035) considering the population density, strategy of city development, nearby available sources of ground and surface water, socio economic condition of the locality and the corresponding water demand. The sectors are:

- Tongi and Gachcha Sector
- Singair Sector
- Khilkhet Sector (includes Airport)
- Rupganj Sector
- **Saidabad West- East Sector**
- Padma North-West Sector
- Padma South Sector
- Bandar Sector

The sectoral boundaries are shown in Figure 2-1.

Figure 2-1 DWASA Service Area Sectorization



<sup>1</sup>The source of water for each sector has been established. To mitigate the Dhaka Metro's water demand DWASA is being developed Surface Water Sources to reduce its dependency upon ground water sources between 2011 to 2035. The surface water sources, as reported in the Master Plan are:

<sup>1</sup> Source: DWASA 2014 Water Master Plan

- Godnail (known as Narayanganj Water Works, production reduced to 10-12ML/d from 45ML/d, using Shitalakshya River water), Sonakanda (using Shitalakshya River water, producing 2ML/d) and Chandnighat (the 1<sup>st</sup> surface water treatment plant in the country developed in 1874, updated in 1947, 1970, and 1996, using Buriganga River Water)
- Saidabad Phase I WTP (developed in 2002) (presently using Shitalakshya water with a plan to use Meghna River Water at completion of Saidabad III)
- Saidabad Phase II WTP (developed in 2012) (presently using Shitalakshya water with a plan to use Meghna River Water at completion of Saidabad III)
- **Saidabad Phase III WTP (under development) (Meghna River Water)**
- Gandharbpur Phase I WTP (is being completed by 2024) (Meghna River Water)
- Gandharbpur Phase II WTP (planned) (Meghna River Water)
- Gandharbpur Phase III WTP (planned) (Meghna River Water) (In plan)
- Jashaldia Phase I WTP (developed in 2022) (using Padma River Water)
- Jashaldia Phase II WTP (planned) (Padma River)

Saidabad Phase I, II and III WTPs are to provide water to the Saidabad West-East Sector. Saidabad Phase I and II WTPs are already in operation since 2002 and 2012 respectively. Saidabad Phase III WTP is in execution and is expected to deliver water in 2028.

A total of 64 DMAs of 6 MODS Zones (1, 2, 3, 5, 6, and 7) fall within the Saidabad West-East Sector. The area is served by Saidabad Phase I and II WTPs in addition to 324 Tube Wells as have been identified within the sector. Table 2-1 presents the number of DMAs and DTWs within each MODS Zone.

Table 2-1 Number DMAs and Deep Tube Wells by MODS Zone within Saidabad West-East Sector

MODS Zone	Number of DMAs Covered	Number of Deep Tube Wells
1	15	43
2	5	18
3	9	63
5	5	45
6	17	115
7	13	38



-	-	2
Total	65	324

Source: Deduced from DWSNIP DWSA Transmission Line Map  
(<http://dwaso.org.bd/site/page/c4b37e89-74a8-4a25-b292-4d00db8aad7/Digital-Map> )

According to the Saidabad WTP Project Phase III Final Feasibility Study Report for DWASA, total production of water will be 1,180ML/d (Saidabad Phases I, II and III WTPs - 900ML/d and Ground Water 280ML/d) against a 2020 demand of 1,065ML/d. The demand will increase successively to 1,284ML/d in 2035 whilst the groundwater production will reduce to 260ML/d. The surface water production, as expected, will remain steady to 900ML/d. It indicates that there might require abstraction of ground water to make up the deficiency of about 125ML/d.

It is clear that it will be necessary to keep existing DTWs functional to satisfy:

- i. Shortage of surface water production against the future demand of water.
- ii. DWASA's wish to keep several DTWs functional to mitigate any emergencies in securing the resilience of the supply system.

This will require operating the retained DTWs on a routine basis to keep them serviceable and to maintain the quality of water supplied.

## 2.1 O&M Staff Serving Saidabad West-East Sector

DWASA is an autonomous government authority under the Local Government Division (LGD) of the Ministry of Local Government, Rural Development and Cooperative.

DWASA's Board Members are representatives of the following organisations which provide policies and the strategic direction of the organisation:

1. Chairman of DWASA Board: Consumer Representative
2. Additional Secretary, Water Supply Wing, Local Government Division: Ministry of LGRD and Cooperatives
3. Joint Secretary, Macroeconomic Policy Analysis and Forecasting: Member of DWASA Board, Ministry of Finance.
4. Member of DWASA Board: Ex-Vice President, Dhaka Chamber of Commerce, and Industry (DCCI)
5. Member of DWASA Board: Vice President of Institute of Chartered Accountants Bangladesh (ICAB)



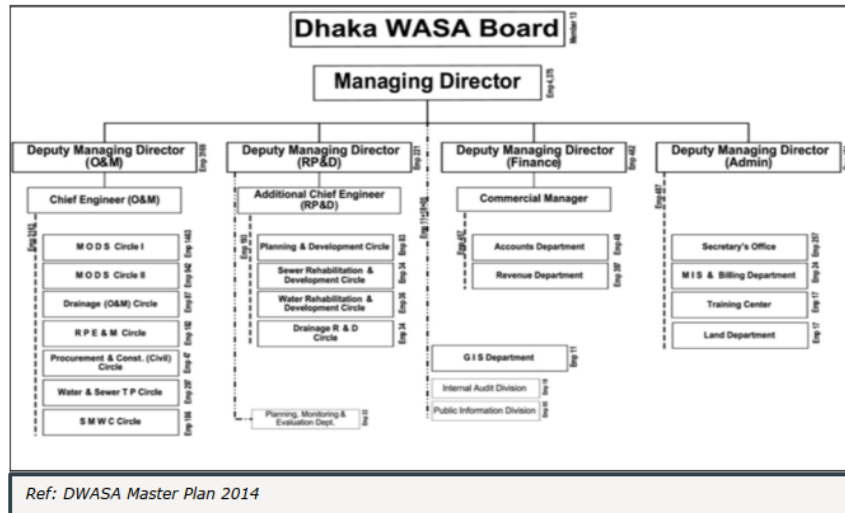
6. Member of DWASA Board: President, Institute of Engineers Bangladesh (IEB)
7. Member of DWASA Board: a member of Bangladesh Bar Council
8. Member of DWASA Board: Secretary General of Bangladesh Federal Union of Journalists (BFUJ)
9. Member of DWASA Board: President of Bangladesh Medical Association (BMA)
10. Member of DWASA Board: President, Central Executive Committee, Institution of Diploma Engineers.
11. Member of DWASA Board: Councillor of Ward number 12, Dhaka South City Corporation
12. Member of DWASA Board: Councillors of Ward numbers 6, 7, 8 (seat-14 and seat-16) Dhaka North City Corporation
13. Member of DWASA Board, Managing Director and Chief Executive, DWASA.

The Managing Director (MD) is the Chief Executive of DWASA. The management positions are:

1. Managing Director
2. Deputy Managing Director (Admin)
3. Deputy Managing Director (Finance)
4. Deputy Managing Director (Operation and Maintenance)
5. Deputy Managing Director (Research, Planning and Development)
6. Chief Engineer
7. Commercial Manager
8. Secretary

A high-level organogram of DWASA is given in Figure 2-2. A more detailed organogram is provided in the following [link](#) (only in Bengali):

Figure 2-2 DWASA high-level organogram



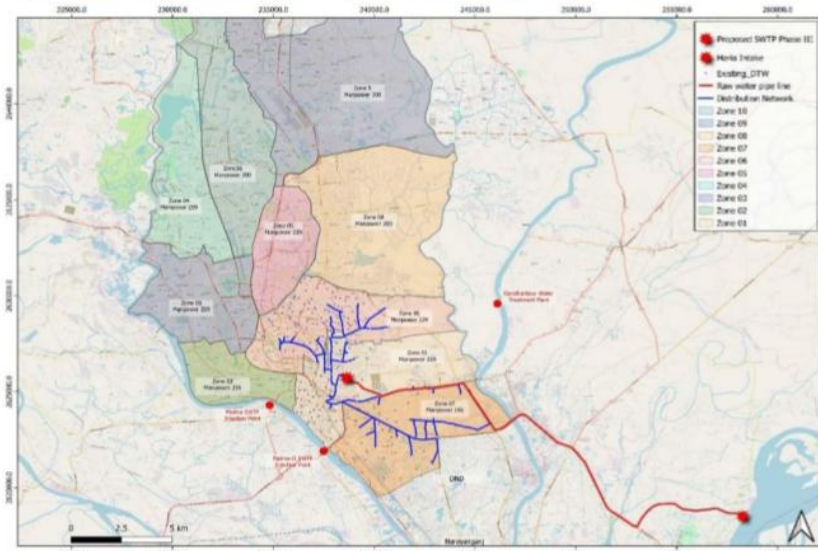
A total number of 4,431 staff report under four Deputy Managing Directors. These four disciplines are:

1. Admin: 548 staff. They provide systems management: (a) Management Information System (MIS) Department (72 staff) and (b) GIS Department (15 staff); general administration (253 staff), disciplinary department, 3 nos of Magistrate Courts, legal, land (17 staff) and Training Centre (17 staff).
2. Finance: 462 staff are divided into Accounts Departments (48 staff) and Revenue Departments (total 397 staff for ten revenue zones, Narayanganj zone and a Central Function and PDR).
3. Research, Planning and Development: 221 staff. About 193 staff report to an Additional Chief Engineer who is responsible for (a) water rehabilitation and development circle (36 staff), (b) sewerage rehabilitation and development circle (34 staff), (c) drainage research and development circle (34 staff) and (d) P&D circle (83 staff).
4. Operation and Maintenance: 3,169 staff. A Chief Engineer is accountable for 2 MODS Circles (1,463+942 staff consisting of 10 MODS zones and Narayanganj zone), Drainage O&M (87 staff), Resource Planning Equipment & Miscellaneous (RPE&M) Circle (182 staff), Water and Sewerage Treatment Circle (297 staff). Separate operation and maintenance teams for Saidabad Water Treatment Plants, water quality unit, a security section and Pagla Sewerage Treatment Plant) and

Structural Maintenance Work Circle (SMW) Circle (186 staff for non-revenue water management and metering)

DWASA's service area has been divided into 10 MODS Zones, which are shown in Figure 2-3 along with the Saidabad supply lines.

Figure 2-3 Dhaka WASA's MODS zones for groundwater abstraction



Reproduced by DSC from the information of DWASA Transmission line map

The size of the labour force for each MODS zone depends on the area, population density and number of DTWs. Staffing in each MODS zone ranges from 200 – 260, and comprises as follows:

- 1 Executive Engineer: 1 no
- 2 Sub-divisional Engineer: 1 no
- 3 Assistant Engineers: 3 nos.
- 4 Sub-assistant Engineers: 8 nos.
- 5 Head Clerk: 1 no.
- 6 Office Assistance cum Data Entry Operators: 3 nos.

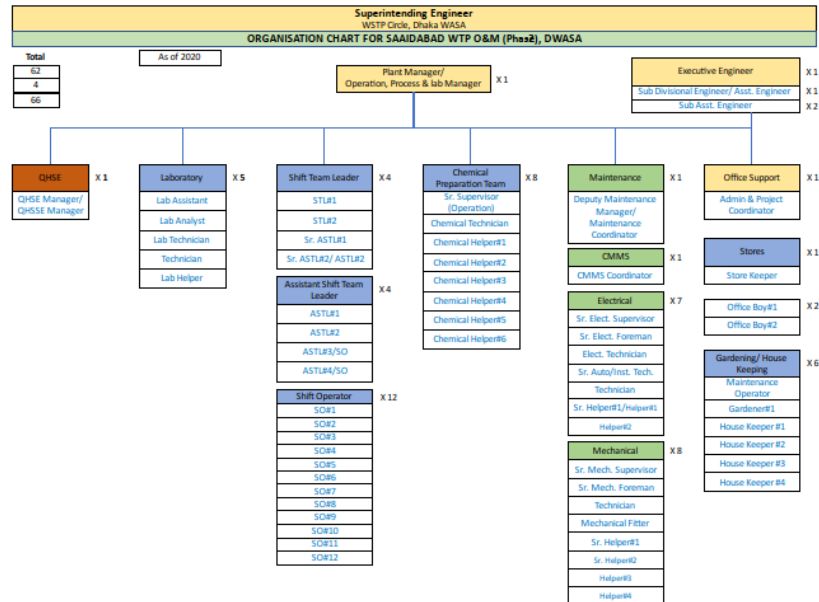
- 7 Wireless Operators: 2 nos.
- 8 Store Officer: 1 no
- 9 Pipeline Inspectors: 6 nos.
- 10 Pipeline Mechanics: 10 nos.
- 11 Assistant Pipeline Mechanics: 10 nos.
- 12 Sewage Inspectors: 8 nos.
- 13 Drivers: 6 nos.
- 14 Helpers: 6 nos.
- 15 Pump Operators: 45 nos. (usually 1 per tube well pump)
- 16 Intern Pump Operator: 90 no. (usually 2 per tube well pump)
- 17 LDA cum Cashier: 1 nos.
- 18 MLSS: 2 nos.

#### 2.1.1 Present Staff Strength of Saidabad West-East Sector O&M Team

The Saidabad Phase I and II WTPs and local DTWs are serving, as detailed earlier, 6 MODS Zones 1, 2, 3, 5, 6 and 7. The estimated staff number is in between 1,200 to 1,500 for the 6 MODS Zones in addition to 113 sanctioned positions for operation and maintenance staff of the WTPs. Out of these 113, 66 are relevant to Saidabad Phase II WTP, and the rest are for Saidabad Phase I WTP. Category-wise Saidabad Phase II WTP staff numbers are given below:

1. DWASA Support Staff
  - > Executive Engineer's Office 4 nos.
2. Contracted
  - > Managers 2 nos.
  - > Laboratory 5 nos.
  - > Shift Staff 20 nos.
  - > Chemical Preparation Team 8 nos.
  - > Maintenance Team 17 nos.
  - > Office Support, Stores, Gardening and House Keeping 10 nos.

An organogram is given in Figure 2-4.



Source: PMU SWTPPP III, DWASA

### 2.1.2 Possible redundancy of Staff

DWASA is preparing an upgraded 5-year Corporate Business Plan. According to the Corporate Business plan April 2022, considering the average rate of production of a DTW is 2,200 litre/min, a 450MI/d WTP is equivalent to the production capacity of 142 DTWs. This can be translated as employment of 426<sup>2</sup> to 497<sup>3</sup> pump operators and intern pump operators.

From the earlier analysis, it was found that there will be a shortage of production of about 125 MI/d by 2035, which is equivalent to about 40 DTWs. This can be translated as employment of 120 to 140 pump operators and intern pump operators.

The above analysis indicates that following completion of the Saidabad Phase III WTP, there is a potential reduced requirement for pump operators and intern pump operators of between 300 and 350 staff.

<sup>2</sup> @ 3 operators per pump according to the standard staff list of MODS Zone

<sup>3</sup> @ 3.5 operators per pump according to the draft 5-Year Corporate Business Plan

However, if the existing DTWs are to be retained for resilience purposes, and they require periodic daily operation, it is suggested that 2/3 of the DTW staff would need to be retained. In this case the requirement would only be reduced by 110 (= 324/3) personnel.

The Sarulia Intake, at present is run by only three operators on a shifting duty basis. The source, as planned, would remain functional to operate and withdraw water from the Shitalakshya River during wet season, which currently is of about four months duration each year. The intake will also need to be operated during the dry season periodically as well for the sake of keeping the intake and its associated equipment functional. Hence there would be no redundancy of staff at Sarulia due to the operation of Saidabad Phase III WTP.

## 2.2 Staff Requirement of Saidabad Phase III WTP and Sludge Plant

The capacity of the Saidabad Phase III WTP is planned to be double (450 Ml/d) that of the individual Saidabad Phase I and II WTPs (each is of capacity 225 Ml/d). It is expected that the requirement for staff for the Saidabad Phase III WTP would therefore be almost double that of the Saidabad Phase I or II WTPs, ie approximately 132 personnel. In addition there will be operators for the proposed Sludge Treatment Plant for all the three Phases, which will be a sizeable figure. The conjectured list of roles below suggest that the total would be 30 posts.

1. Plant Manager: 1 no
2. Assistant Engineers: 2 nos.
3. Sludge Plant Shift Operators: 6 nos.
4. Maintenance Technician Mechanical: 1 no.
5. Maintenance Technician Electrical: 1 no.
6. Weighbridge Shift Operators: 6 nos.
7. Sludge Truck Drivers: 10 nos.
8. Senior Laboratory Technician: 1 nos.
9. Junior Laboratory Technicians: 2 nos.

For the Phase III WTP the staff positions are expected to be similar to those for the Phase II WTP, the number of them, and the number required to operate the sludge facilities, would only be possible to determine at completion of the design of the Saidabad Phase III WTP and sludge plant, which is part of the Design and Build Contract.

In addition to the Phase III WTP, the proposed Intake and Pump Station at Haria will require another 12 staff as estimated.



### 3 CSR Plan

The nature of business demands DWASA plays an integral role in wider society and the natural and built environment of the Dhaka Metropolitan City.

Though there is no Corporate Social Responsible (CSR) Plan as such, DWASA, to be compliant to its Citizen Charter, is attending to certain aspects of corporate social responsibility.

From the above discussions, it is found that **there is a possibility of redundancy of maximum 110 pump operators/interns**. To mitigate this the following are suggested:

1. At completion of the designing of Saidabad Phase III WTP, the contractor shall indicate the requirement of staff with positions and number for the operation and maintenance of the plant.
2. DWASA considers non-appointment of new pump operators against the position getting vacant through retiring ones over time rather fills the position promoting the interns who qualifies thereby manage the number of redundant staff.
3. DWASA identifies qualifying redundant pump operators/interns, if any, due to operation of the Saidabad Phase III WTP, sludge plant and Haria Intake Pumping Station well ahead of commissioning of the plant, nominate them for the suitable positions of the plant, and arrange their training as necessary through the designated training, which is part of the project (Ref: D&B and O&M Contracts Employer's Requirements, DSC Submitted Capacity Analysis and TA Support Plan).
4. On successful completion of the training (item 3 above), DWASA appoint them to the respective positions.

In addition to the above, DWASA should consider developing a full-fledged Corporate Social Responsibility (CSR) Plan aligned to its Citizen Charter as part of its corporate responsibility. Aspects of the prospective CSR Plan are already proposed in the Component 1 and 3 works as described in the Saidabad WTP Project Phase III Environmental and Social Impact Assessment.



## 4 Conclusion and Recommendations

The impact on the employment issues of the Saidabad Phase III project related to DWASA moving from operating many DTWs to several large surface water plants and fewer DTWs should be mitigated with the following actions:

1. The project specify that the Design and Build Contractor analyse and identify requirement of staff with positions and number for the operation and maintenance of the plant along with the designing of the plant.
2. DWASA considers non-appointment of new pump operators against the position getting vacant through retiring ones over time and instead fills the positions promoting the interns who qualify thereby managing the number of redundant staff.
3. DWASA identifies qualifying redundant pump operators/interns, if any, due to operation of the Saidabad Phase III WTP, sludge plant and and Haria Intake Pumping Station well ahead of commissioning of the plant, nominate them for the suitable positions of the plant, and arrange their training as necessary through the designed training, which is part of the project (Ref: D&B and O&M Contracts Employer's Requirements, DSC Submitted Capacity Analysis and TA Support Plan).
4. On successful completion of the training (item 3 above), DWASA appoint them to the respective positions.

In addition to the above, DWASA initiates development of a full-fledged Corporate Social Responsibility (CSR) Plan aligned to its Citizen Charter as part of its corporate responsibility considering the following as a long-term strategy:

**Institutional Aspect (interim, 2023 - 2035):** Whilst the Dhaka City Water Supply Master Plan is currently being implemented, DWASA will continue maintaining the existing DTWs as supplementary water sources and to improve resilience in supply.

**Institutional Aspect (long term, beyond 2035):** The shift from groundwater to surface water usage will require restructuring of the current decentralised O&M structure in the long term when all the planned surface water treatment plants will be constructed by 2035.

**Outage Study:** System resilience and outage study will be required for DWASA's readiness to operate three large surface water treatment plants. The outcome of the outage study should focus on Dhaka's water supply system resilience. An outage model can provide necessary information to DWASA on re-zoning and bulk water transfer from one surface water treatment plant zone to other in case of emergency shut down of any large treatment plant.

Whilst the PMC's current ToR does not include development of such network models and outage simulation exercises under SWTPPP III Component 3, we recommend DWASA develop a comprehensive strategy to address these issues should that be considered prudent by DWASA management.

This would help DWASA to understand what action is required to provide an acceptable level of customer service with adequate supply headroom during the shift from decentralised DTW-based operation and maintenance structure to large surface water treatment facilities.

**Capacity Building:** Refer to recommendations on DWASA's capacity building as outlined in "Capacity Building and TA Support Plan" as prepared under the DSC contract; Document No.: DSCJV-TRA-RP-CMP2-0014.

## References

DWASA (2014) Water supply master plan for Dhaka city. Ministry of local government, rural development and co-operatives.




DWASA Organogram. Retrieved on 12 March 2023 from <http://dwasa.org.bd/site/view/download/->

DWASA transmission line map. Retrieved on 12 March 2023 from <http://dwasa.org.bd/site/page/c4b37e89-74a8-4a25-b292-4d00db8aad7/Digital-Map>

DSCJV-ENV-RP-CMP2-0028 - Environmental & Social Impact Assessment (ESIA), DSC Update 2023, DSC and PMC, March 2023

DSCJV-TRA-RP-CMP2-0014 Capacity Analysis and TA Support Plan, DSC, Nov 2022

## ANNEX-G: AMBIENT AIR QUALITY REPORT

<b>Industry &amp; Facilities Division</b> <b>Third Party Inspection Report</b>		 <b>BUREAU VERITAS</b>	Page: 1 / 5		
INSPECTION REPORT N° BV/ EMETS /SE _MAY,22		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;"><input type="checkbox"/> Interim</td> <td style="width: 50%; text-align: center;"><input checked="" type="checkbox"/> Final</td> </tr> </table>		<input type="checkbox"/> Interim	<input checked="" type="checkbox"/> Final
<input type="checkbox"/> Interim	<input checked="" type="checkbox"/> Final				
<b>BV Job nr: BAN.D.3084A6.022.382</b>					
<b>PROJECT: Air quality Report</b>		<b>Ref: BAN.D.3084A6.022.382</b>			
<b>BV Client: Enviro-METS Services (EMETS)</b>		<b>P/o nr: N/A</b>			
<b>Manufacturer: N/A</b>		<b>P/o nr: N/A</b>			
<b>Inspection requested by: Engr. Mohammad Nurul Alam Siddique</b>					
<b>SUPPLY / SUBJECT OF INSPECTION</b>		<b>ITEM / TAG Nr</b>			
<b>Air quality Report</b>		Common Environmental Parameters			
		<b>QTY</b> 02			
<b>DOCUMENTS OF REFERENCE : See continuation sheet for additional documents: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</b>					
<b>Title</b> PURCHASE ORDER	<b>Reference n°</b> n/a	<b>Rev.</b>	<b>Approved by</b> <div style="border: 1px solid black; height: 20px; width: 100%;"></div>		
<b>Date</b>					
<b>INSPECTIONS :</b>		<b>Results of inspection :</b> <input checked="" type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory			
<b><u>Inspection place :</u></b> May 18~19,2022 Beside Dhaka-Chittagong Highway and Dhaka WASA Intake Area <b><u>Stage of inspection :</u></b> <input type="checkbox"/> Before manufacturing <input checked="" type="checkbox"/> During manufacturing <input type="checkbox"/> Final <input type="checkbox"/> Packing  <b><u>Type of inspection:</u></b> <input type="checkbox"/> Pre-inspection meeting <input type="checkbox"/> Document and QC record review <input type="checkbox"/> Visual examination, checks <input checked="" type="checkbox"/> Witnessing tests <input type="checkbox"/> Manufacturing progress status <input type="checkbox"/> Vendor assessment <input checked="" type="checkbox"/> Final inspection <input type="checkbox"/> Packing (for details see continuation sheet)		<b><u>Non Conformities Reports (NCR):</u></b> <input checked="" type="checkbox"/> <b><u>NCR's issued during reported period :N/A</u></b>  <input type="checkbox"/> <b><u>List of outstanding NCR's : N/A</u></b>  <b><u>Next visit scheduled:</u></b>  <b>No schedule found yet</b>			
<b><u>Stamping :</u></b> <div style="display: flex; justify-content: space-around; align-items: center;"> <input checked="" type="checkbox"/> No           <input type="checkbox"/>  <input type="checkbox"/>  </div>					

INSP 002 En  
 GM SI 101

Copyright Bureau Veritas 04/2011

**Industry & Facilities Division**  
**Third Party Inspection Report**



**BUREAU  
VERITAS**

Page:2 /5

<input type="checkbox"/>	Interim
<input checked="" type="checkbox"/>	Final

INSPECTION REPORT N° BV/ EMETS /SE MAY,22

**BV Job nr:** BAN.D.3084A6.022.382

**Place of testing: Beside Dhaka-Chittagong Highway**

Geo-Location:	Parameter	Unit	Result	Standard ECR'1997, Amendment 05	Remarks
Latitude: 23°40'11.5"N, Longitude: 90°33'37.0"E	PM <sub>2.5</sub>	µg/m <sup>3</sup>	26	65	Acceptable
	PM <sub>10</sub>	µg/m <sup>3</sup>	33	150	Acceptable
	SO <sub>2</sub>	µg/m <sup>3</sup>	0	365	Acceptable
	CO	ppm	0	9	Acceptable
	NO <sub>2</sub>	µg/m <sup>3</sup>	0	100	Acceptable
	O <sub>3</sub>	µg/m <sup>3</sup>	0	157	Acceptable

**Source:** Field Survey May 18, 2022

**Comments:** During Air quality monitoring, It's has been found that, tested parameters are within the acceptable limit.

**Abbreviation:** SO<sub>2</sub> = Sulfur dioxide, NO<sub>2</sub>= Nitrogen Dioxides, CO = Carbon Monoxide, PM<sub>2.5</sub> = Particulate Matter 2.5, PM<sub>10</sub>= Particulate Matter 10, O<sub>3</sub>= Ozone, ECR = Environmental Conservation Rules, ppm= Parts per million, µg/m<sup>3</sup>= microgram per meter cube.



**Air Quality Monitoring:** Beside Dhaka-Chittagong Highway, Geo-Location:  
Latitude:23°40'11.5"N, Longitude: 90°33'37.0"E

INSP 002 En  
GM SI 101

Copyright Bureau Veritas 04/2011

**Industry & Facilities Division**  
**Third Party Inspection Report**



**BUREAU  
VERITAS**

INSPECTION REPORT N° BV/ EMETS /SE MAY,22

**BV Job nr: BAN.D.3084A6.022.382**

Page:3 /5

<input type="checkbox"/>	Interim
<input checked="" type="checkbox"/>	Final

**Place of testing:** Dhaka WASA-Intake Area

Geo-Location:	Parameter	Unit	Result	Standard ECR'1997, Amendment 05	Remarks
Latitude: 23°39'34.4"N, Longitude: 90°37'49.8"E	PM <sub>2.5</sub>	µg/m <sup>3</sup>	10	65	Acceptable
	PM <sub>10</sub>	µg/m <sup>3</sup>	12	150	Acceptable
	SO <sub>2</sub>	µg/m <sup>3</sup>	0	365	Acceptable
	CO	ppm	0	9	Acceptable
	NO <sub>2</sub>	µg/m <sup>3</sup>	0	100	Acceptable
	O <sub>3</sub>	µg/m <sup>3</sup>	0	157	Acceptable

**Source:** Field Survey May 19, 2022

**Comments:** During Air quality monitoring, It's has been found that, tested parameters are within the acceptable limit

**Abbreviation:** SO<sub>2</sub> = Sulfur dioxide, NO<sub>2</sub>= Nitrogen Dioxides, CO = Carbon Monoxide, PM<sub>2.5</sub> = Particulate Matter 2.5, PM<sub>10</sub>= Particulate Matter 10, O<sub>3</sub>= Ozone, ECR = Environmental Conservation Rules, ppm= Parts per million, µg/m<sup>3</sup>= microgram per meter cube.



**Air Quality Monitoring:** Dhaka WASA-Intake Area, Geo-Location: Latitude: 23°39'34.4"N, Longitude: 90°37'49.8"E

INSP 002 En  
GM SI 101

Copyright Bureau Veritas 04/2011



<b>Industry &amp; Facilities Division</b> <b>Third Party Inspection Report</b>	 <b>BUREAU VERITAS</b>	Page: 4 / 5 <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;"><input type="checkbox"/> Interim</td> <td style="width: 50%;"></td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/> Final</td> <td></td> </tr> </table>	<input type="checkbox"/> Interim		<input checked="" type="checkbox"/> Final	
<input type="checkbox"/> Interim						
<input checked="" type="checkbox"/> Final						
INSPECTION REPORT N° BV/ EMETS /SE MAY,22 <b>BV Job nr: BAN.D.3084A6.022.382</b>						
<p><i>"The inspection results are valid at time and place of inspection. The above inspection has been carried out according to Bureau Veritas general conditions of service, the issuance of this inspection report does not release the contractual parties from their own responsibilities and the fulfilment of their obligations."</i></p> <p>ANNEXES <input type="checkbox"/> Yes (Total number of pages: ...) <input checked="" type="checkbox"/> No</p>						
<b>Issued by:</b>  Name: Md. Akmal Hossain  <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">Signature: </div> <div style="text-align: center;">  </div> </div>	<b>Checked by:</b>  Name: Md. Walid Hossain  <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">Signature: </div> </div>					
<b>Inspection centre:</b> BV Dhaka. <b>Date of Issue:</b> 24 May, 2022						
Distribution: <input checked="" type="checkbox"/> EMETS <input checked="" type="checkbox"/> BV Bangladesh.						
<div style="display: flex; justify-content: space-between;"> <div>             INSP 002 En              GM SI 101           </div> <div>             Copyright Bureau Veritas 04/2011           </div> </div>						





**PHOTOGRAPHS OF NOISE MONITORING**



(i) Proposed Intake Point at Haria



(ii) Lichu Garden



(iii) Dhaka-Chittagang Highway Crossing



(iv) Old Brahmaputra (Langalbandh Bridge)



(v) Madan Bus Station



(vi) Kanchpur Circle



(vii) Chattogram Road Bus Stand



(viii) Staff Quarter (DND Canal)



(ix) Middhabari Sluice Gate



(x) SWTP III Site



## ANNEX-I: LABORATORY TEST REPORT OF SURFACE WATER QUALITY

### LABORATORY TEST REPORT OF MEGHNA RIVER



	<p>জীবনের জন্য বিজ্ঞান</p> <p>শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন</p> <p>বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর)</p> <p>BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)</p>

Institute Name: Institute of National Analytical Research & Service (INARS)

Analysis Report





Analytical Service Cell Ref No: May2022033386	Unit (Lab/Inst.) Ref No: A-629
Lab ID: INS-629	Sample Receiving Date: 29/05/2022
Sample ID: A-629	Submission Date: 19 May 2022
	Report Delivery Date: 08/06/2022
Sample Description: Surface Water Quality Test Of Meghna River For The ESIA Environmental Of Saidabad Water Treatment Plant Phase III	
Client's Details: Mohammad Nurul Alam Siddique Enviro-MET Services House#House#287/1/H, Level-4, Middle Pirobag, Dhaka-1216	
Number of Sample: 1	

Report Details:

Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-629	Surface water quality test of Meghna River For The ESIA Environmental Of Saidabad Water Treatment Plant	Nitrate (NO <sub>3</sub> )	Less than 3.0 mg/L	4110.B
		Ammonia (NH <sub>3</sub> )	0.65 mg/L	4500.NH <sub>3</sub> -F
		Sulphate (SO <sub>4</sub> )	8.82 mg/L	4110.B
		Phosphate (PO <sub>4</sub> )	0.68 mg/L	4500/P.C

  
 09.06.2022  
 Analyst  
**Tajnin Jahan**  
 Scientific Officer  
 Institute of National Analytical  
 Research & Service (INARS)  
 BCSIR, Dhaka-1205

  
 09.06.22  
 Section/Division In-Charge  
 Dr. Muhammad Abdullah Al-Mansur  
 Principal Scientific Officer  
 Institute of National Analytical  
 Research & Service (INARS)  
 BCSIR, Dhaka-1205

  
 09/06/22  
 In-Charge/Director  
**Shamim Ahmed**  
 Director (In-Charge)  
 Institute of National Analytical  
 Research & Service (INARS)  
 BCSIR, Dhaka-1205




Note:

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

Analytical Service Cell

Dr. Qudrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
 Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd

	জীবনের জন্য বিজ্ঞান বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)	“শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন”
---	---	--

Institute Name: Institute of National Analytical Research &amp; Service (INARS)

## Analysis Report



Analytical Service Cell Ref No: May2022033386	Unit (Lab/Inst.) Ref No: A-629
Lab ID: INS-629	Sample Receiving Date: 29/05/2022
Sample ID: A-629	Submission Date: 19 May 2022
	Report Delivery Date: 08/06/2022
Sample Description: Surface Water Quality Test Of Meghna River For The ESIA Environment Of Saidabad Water Treatment Plant Phase III	
Client's Details: Mohammad Nurul Alam Siddique Enviro-MET Services House#House#287/1/H, Level-4, Middle Pirerbag, Dhaka-1216	
Number of Sample: 1	

## Report Details:

Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-629	Surface Water Quality test of Meghna River For The ESIA Environmental Of Saidabad Water Treatment Plant	Turbidity	11.7 NTU	2130.B
		Electrical Conductivity	87.9 $\mu$ S/cm	2510.B
		COD (Chemical Oxygen Demand)	4.7 mg/L	5220.B
		BOD (Biological Oxygen Demand)	1.78 mg/L	5210.B
		pH at 25.1C	7.81	4500-H*.B
		TDS (Total dissolved solids)	94.0 mg/L	2540.C
		TSS (Total Suspended Solids)	57.0 mg/L	2540.D



## Note:

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

Analytical Service Cell

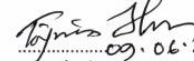
Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh

Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd

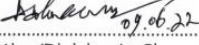
Pages 2 of 4

8th of June 2022 04:05 PM

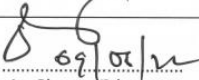
	<p>জীবনের জন্য বিজ্ঞান</p> <p>শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন</p> <p>বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)</p>
---	---

  
Analyst 09.06.2022

**Tajnin Jahan**  
Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

  
Section/Division In-Charge

Dr. Muhammad Abdullah Al-Mansur  
Principal Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

  
In-Charge/Director

**Shamim Ahmed**  
Director (In-Charge)  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205



Note:

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

Analytical Service Cell

Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh

Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd

	জীবনের জন্য বিজ্ঞান শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)
---	---

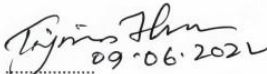
Institute Name: Institute of National Analytical Research &amp; Service (INARS)

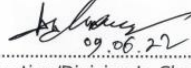
## Analysis Report

Analytical Service Cell Ref No: May2022033386	Unit (Lab/Inst.) Ref No: A-629
Lab ID: INS-629	Sample Receiving Date: 29/05/2022
Sample ID: A-629	Submission Date: 19 May 2022
	Report Delivery Date: 08/06/2022
Sample Description: Surface Water Quality Test Of Meghna River For The ESIA Environmental Of Saidabad Water Treatment Plant Phase III	
Client's Details: Mohammad Nurul Alam Siddique Enviro-MET Services House#House#287/1/H, Level-4, Middle Pirerbag, Dhaka-1216	
Number of Sample: 1	

## Report Details:

Lab ID	Particulars of supplied Sample	Parameters	Concentration	Test Method (APHA)
A-629	Surface water quality test of Meghna River For The ESIA Environmental Of Saidabad Water Treatment Plant	Color DO (Dissolved Oxygen)	29.2 PCU 6.74 mg/L	Colorimetric 4500-O-G

  
09.06.2022  
Analyst  
**Tajnin Jahan**  
Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

  
09.06.22  
Section/Division In-Charge  
Dr. Muhammad Abdullah Al-Mamun  
Principal Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

  
09/06/22  
In-Charge/Director  
**Shamim Ahmed**  
Director (In-Charge)  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205



## Note:

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

## Analytical Service Cell

Dr. Qudrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd



	জীবনের জন্য বিজ্ঞান শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)
---	---

Institute Name: Institute of National Analytical Research &amp; Service (INARS)

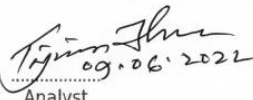
## Analysis Report

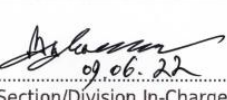


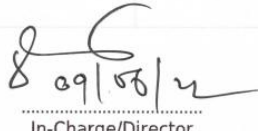
Analytical Service Cell Ref No: May2022033387	Unit (Lab/Inst.) Ref No: A-630
Lab ID: INS-630	Sample Receiving Date: 29/05/2022
Sample ID: A-630	Submission Date: 19 May 2022
	Report Delivery Date: 08/06/2022
Sample Description: Surface Water Quality Test Of Meghna River For The ESIA Environmental Of Saidabad Water Treatment Plant Phase III	
Client's Details: Mohammad Nurul Alam Siddique Enviro-MET Services House#House#287/1/H, Level-4, Middle Pirerbag, Dhaka-1216	
Number of Sample: 1	

## Report Details:

Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-630	Surface Water Quality test of Meghna River For The ESIA Environmental Of Saidabad Water Treatment Plant	Oil and Grease	Less than 2.0 mg/L	5520.B

  
09.06.2022  
Analyst  
**Tajnin Jahan**  
Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

  
09.06.22  
Section/Division In-Charge  
**Dr. Muhammad Abdullah Al-Mansur**  
Principal Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

  
09/06/22  
In-Charge/Director  
**Shamim Ahmed**  
Director (In-Charge)  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205



## Note:

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

## Analytical Service Cell

Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd

**LABORATORY TEST REPORT OF  
BRAHMAPUTRA RIVER**

	জীবনের জন্য বিজ্ঞান শেখ হাসিনার দর্শন: সব মানুষের উন্নয়ন বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)
---	--

Institute Name: Institute of National Analytical Research &amp; Service (INARS)

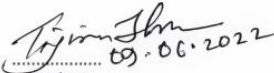
## Analysis Report

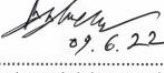


Analytical Service Cell Ref No: May2022033388	Unit (Lab/Inst.) Ref No: A-631
Lab ID: INS-631	Sample Receiving Date: 29/05/2022
Sample ID: A-631	Submission Date: 19 May 2022
	Report Delivery Date: 09/06/2022
Sample Description: Surface Water Quality Test Of Brahmaputra River For The ESIA Environmental Of Saidabad Water Treatment Plant Phase III	
Client's Details: Mohammad Nurul Alam Siddique Enviro-MET Services House#House#287/1/H, Level-4, Middle Pirerbag, Dhaka-1216	
Number of Sample: 1	

## Report Details:

Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-631	Surface water quality test of Brahmaputra River For The ESIA Environmental Of Saidabad Water Treatment Plant	Nitrate (NO <sub>3</sub> )	3.46 mg/L	4110.B
		Ammonia (NH <sub>3</sub> )	1.50 mg/L	4500.NH <sub>3</sub> -F
		Sulphate (SO <sub>4</sub> )	47.0 mg/L	4110.B
		Phosphate (PO <sub>4</sub> )	1.88 mg/L	4500/P.C

  
09.06.2022  
Analyst  
**Tajnin Jahan**  
Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

  
09.6.22  
Section/Division In-Charge  
**Dr. Muhammad Abdullah Al-Mansur**  
Principal Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

  
09/06/22  
In-Charge/Director  
**Shamim Ahmed**  
Director (In-Charge)  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205



## Note:

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

## Analytical Service Cell

Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd



	জীবনের জন্য বিজ্ঞান শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)
---	---

Institute Name: Institute of National Analytical Research &amp; Service (INARS)

## Analysis Report



Analytical Service Cell Ref No: May2022033388	Unit (Lab/Inst.) Ref No: A-631
Lab ID: INS-631	Sample Receiving Date: 29/05/2022
Sample ID: A-631	Submission Date: 19 May 2022
	Report Delivery Date: 09/06/2022
Sample Description: Surface Water Quality Test Of Brahmaputra River For The ESIA Environmental Of Saidabad Water Treatment Plant Phase III	
Client's Details: Mohammad Nurul Alam Siddique Enviro-MET Services House#House#287/1/H, Level-4, Middle Pirerbag, Dhaka-1216	
Number of Sample: 1	

## Report Details:

Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-631	Surface water quality test of Brahmaputra River For The ESIA Environmental Of Saidabad Water Treatment Plant	Turbidity	1.61 NTU	2130.B
		Electrical Conductivity	518 $\mu$ S/cm	2510.B
		COD (Chemical Oxygen Demand)	12.2 mg/L	5220.B
		BOD (Biological Oxygen Demand)	5.79 mg/L	5210.B
		pH at 24.8C	7.43	4500-H*.B
		TDS (Total dissolved solids)	310 mg/L	2540.C
		TSS (Total Suspended Solids)	67.0 mg/L	2540.D




## Note:

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

Analytical Service Cell

Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh

Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd

	<p>জীবনের জন্য বিজ্ঞান</p> <p>শেখ হাসিনার দর্শন: সব মানুষের উন্নয়ন</p> <p>বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর)</p> <p>BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)</p>
	<p><i>Tajnin Jahan</i> Analyst 09.06.2022</p> <p><i>Dr. Muhammad Abdullah Al-Mansur</i> Section/Division In-Charge 09.06.2022</p> <p><i>Shamim Ahmed</i> In-Charge/Director 09.06.2022</p>
<p><b>Tajnin Jahan</b> Scientific Officer Institute of National Analytical Research &amp; Service (INARS) BCSIR, Dhaka-1205</p>	<p><b>Dr. Muhammad Abdullah Al-Mansur</b> Principal Scientific Officer Institute of National Analytical Research &amp; Service (INARS) BCSIR, Dhaka-1205</p>
	<p><b>Shamim Ahmed</b> Director (In-Charge) Institute of National Analytical Research &amp; Service (INARS) BCSIR, Dhaka-1205</p>



**Note:**

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

**Analytical Service Cell**

Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd

	জীবনের জন্য বিজ্ঞান	শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন
	<p align="center"><b>বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর)</b> BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)</p>	


Institute Name: Institute of National Analytical Research & Service (INARS)

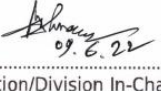
Analysis Report


Analytical Service Cell Ref No: May2022033388	Unit (Lab/Inst.) Ref No: A-631
Lab ID: INS-631	Sample Receiving Date: 29/05/2022
Sample ID: A-631	Submission Date: 19 May 2022
Report Delivery Date: 09/06/2022	
Sample Description: Surface Water Quality Test Of Brahmaputra River For The ESIA Environment Of Saidabad Water Treatment Plant Phase III	
Client's Details: Mohammad Nurul Alam Siddique Enviro-MET Services House#House#287/1/H, Level-4, Middle Pirerbag, Dhaka-1216	
Number of Sample: 1	

Report Details:

Lab ID	Particulars of supplied Sample	Parameters	Concentration	Test Method (APHA)
A-631	Surface water quality test of Brahmaputra River For The ESIA Environmental Of Saidabad Water Treatment Plant	Color DO (Dissolved Oxygen)	40.8 PCU 4.65 mg/L	Colormetric 4500-O-G

  
 09.06.2022  
 Analyst  
**Tajnin Jahan**  
 Scientific Officer  
 Institute of National Analytical  
 Research & Service (INARS)  
 BCSIR, Dhaka-1205

  
 09.06.22  
 Section/Division In-Charge  
**Dr. Muhammad Abdullah Al-Mansur**  
 Principal Scientific Officer  
 Institute of National Analytical  
 Research & Service (INARS)  
 BCSIR, Dhaka-1205

  
 09/06/22  
 In-Charge/Director  
**Shamim Ahmed**  
 Director (In-Charge)  
 Institute of National Analytical  
 Research & Service (INARS)  
 BCSIR, Dhaka-1205



Note:

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

Analytical Service Cell

Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh

Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd

	<p>জীবনের জন্য বিজ্ঞান</p> <p>শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন</p> <p>বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর)</p> <p>BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)</p>

Institute Name: Institute of National Analytical Research & Service (INARS)

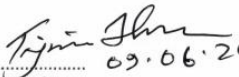
Analysis Report




Analytical Service Cell Ref No: May2022033389	Unit (Lab/Inst.) Ref No: A-632
Lab ID: INS-632	Sample Receiving Date: 29/05/2022
Sample ID: A-632	Submission Date: 19 May 2022
	Report Delivery Date: 09/06/2022
Sample Description: Surface Water Quality Test Of Brahmaputra River For The ESIA Environmentl Of Saidabad Water Treatment Plant Phase III	
Client's Details: Mohammad Nurul Alam Siddique Enviro-MET Services House#House#287/1/H, Level-4, Middle Pirerbag, Dhaka-1216	
Number of Sample: 1	

Report Details:

Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-632	Surface water quality test of Brahmaputra River For The ESIA Environmental Of Saidabad Water Treatment Plant	Oil and Grease	Less than 2.0 mg/L	5520.B

  
 09.06.2022  
 Analyst  
**Tajnin Jahan**  
 Scientific Officer  
 Institute of National Analytical  
 Research & Service (INARS)  
 BCSIR, Dhaka-1205

  
 09.06.2022  
 Section/Division In-Charge  
**Dr. Muhammad Abdullah Al-Mansur**  
 Principal Scientific Officer  
 Institute of National Analytical  
 Research & Service (INARS)  
 BCSIR, Dhaka-1205

  
 09/06/22  
 In-Charge/Director  
**Shamim Ahmed**  
 Director (In-Charge)  
 Institute of National Analytical  
 Research & Service (INARS)  
 BCSIR, Dhaka-1205



Note:

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

Analytical Service Cell

Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd



Form No. QSF-22

Revision No. 12

Revision Date: 04 November, 2022

জীবনের জন্য বিজ্ঞান



"শেখ হাসিনার দর্শন, সব মানুষের উন্নয়ন"



বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Institute of National Analytical Research and Service (INARS)

## ANALYSIS REPORT

ASC Ref No. : IN-533 of Analytical Service Cell, BCSIR, 23/10/2022  
Lab/Sample ID : A-545  
Client's Details : Nurul Amin

### EMETS

#### Enviro-MET Services

Address: House# 287/1/H, Pererbag, Mirpur, Dhaka-1216.

Number of Sample : 01 (One)  
Sample Description : Surface Water Quality Test of Brahmaputra River for the ESIA  
Study of Saidabad Water Treatment Plant Phase III পরীক্ষণ প্রসঙ্গে

Test Commencement Date : 23/10/2022

Test Completion Date : 06/11/2022

Lab ID	Particulars of supplied sample	Parameters	Results	Test Method (APHA)
A-545	Surface Water (Brahmaputra River)	Ammonia (NH <sub>3</sub> )	2.11 mg/L	4500-N-F
		BOD (Biological Oxygen Demand)	8.50 mg/L	5210.B
		COD (Chemical Oxygen Demand)	22.5 mg/L	5220.B
		Nitrate (NO <sub>3</sub> -N)	Less than 3.0 mg/L	4110.B
		Sulphate (SO <sub>4</sub> )	18.2 mg/L	4110.B
		Phosphate (PO <sub>4</sub> )	1.23 mg/L	4500/P.C
		Turbidity	4.78 NTU	Turbidimeter
		Electrical Conductivity	731 µS/cm	2510.B
		pH at 24.8° C	7.24	4500-H <sup>+</sup> .B
		TDS (Total dissolved solids)	214 mg/L	2540.C
		TSS (Total Suspended Solids)	144 mg/L	2540.D

06.11.22

Analyst  
**Mehedi Hasan**  
Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)

06.11.22

Supervisor  
Dr. Muhammad Abdullah Al-Mansur  
Principal Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)

06.11.22

Director  
**Shamim Ahmed**  
Director (In-Charge)  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

- Notes:
- Results reported here are based only on the supplied samples in this laboratory.
  - Any complain about test report will not be acceptable after one month from the date of issuing of the said report.
  - This report/result shall not be reproduced/published without prior approval of the authority.

#### Analytical Service Cell

Dr. Qudrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: [www.bcsir.gov.bd](http://www.bcsir.gov.bd)



Form No. QSF-22

Revision No. 12

Revision Date: 04 November, 2022

জীবনের জন্য বিজ্ঞান

“শেখ হাসিনার দর্শন, সব মানুষের উন্নয়ন”



বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Institute of National Analytical Research and Service (INARS)

### ANALYSIS REPORT

ASC Ref No. : IN-533 of Analytical Service Cell, BCSIR, 23/10/2022  
Lab/Sample ID : A-545  
Client's Details : Nurul Amin

#### **EMETS**

#### **Enviro-MET Services**

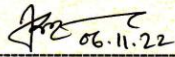
Address: House# 287/1/H, Pererbag, Mirpur, Dhaka-1216.

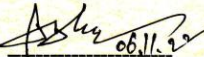
Number of Sample : 01 (One)  
Sample Description : Surface Water Quality Test of Brahmaputra River for the ESIA  
Study of Saidabad Water Treatment Plant Phase III পরীক্ষণ প্রসংগে

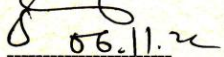
Test Commencement Date : 23/10/2022

Test Completion Date : 06/11/2022

Lab ID	Particulars of supplied sample	Parameters	Results	Test Method (APHA)
A-545	Surface Water (Brahmaputra River)	Color	81.9 PCU	Colormetric
		DO (Dissolved Oxygen)	1.32 mg/L	4500-O-G

  
06.11.22  
Analyst  
**Mehedi Hasan**  
Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

  
06.11.22  
Supervisor  
Dr. Muhammad Abdullah Al-Mansur  
Principal Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

  
06.11.22  
Director  
**Shamim Ahmed**  
Director (In-Charge)  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

Page 1 of 1

Note:

- The results reported here are based only on the supplied samples in this laboratory.
- Any complain about test report will not be acceptable after one month from the date of issuing of the said report.
- This report/result shall not be reproduced/published without prior approval of the authority.

#### **Analytical Service Cell**

Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: [www.bcsir.gov.bd](http://www.bcsir.gov.bd)



Form No. QSF-22

Revision No. 12

Revision Date: 04 November, 2022

জীবনের জন্য বিজ্ঞান



"শেখ হাসিনার দর্শন, সব মানুষের উন্নয়ন"



বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Institute of National Analytical Research and Service (INARS)

## ANALYSIS REPORT

ASC Ref No. : IN-534 of Analytical Service Cell, BCSIR, 23/10/2022

Lab/Sample ID : A-546

Client's Details : Nurul Amin

### EMETS

#### Enviro-MET Services

Address: House# 287/1/H, Pererbag, Mirpur, Dhaka-1216.

Number of Sample : 01 (One)

Sample Description : Surface Water Quality Test of Brahmaputra River for the ESIA

Study of Saidabad Water Treatment Plant Phase III পরীক্ষণ প্রসংগে

Test Commencement Date : 23/10/2022

Test Completion Date : 06/11/2022

Lab ID	Particulars of supplied sample	Parameters	Results	Test Method (APHA)
A-546	Surface Water (Brahmaputra River)	Oil and Grease	Less than 2.0 mg/L	5520.B

*[Signature]* 06.11.22

**Analyst**  
**Mehedi Hasan**  
Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

*[Signature]* 06.11.22

**Supervisor**  
Dr. Muhammad Abdullah Al-Mansur  
Principal Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

*[Signature]* 06.11.22

**Director**  
**Shamim Ahmed**  
Director (In-Charge)  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

Page 1 of 1

Note:

- The results reported here are based only on the supplied samples in this laboratory.
- Any complain about test report will not be acceptable after one month from the date of issuing of the said report.
- This report/result shall not be reproduced/published without prior approval of the authority.

Analytical Service Cell

Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh

Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: [www.bcsir.gov.bd](http://www.bcsir.gov.bd)



**LABORATORY TEST REPORT OF  
SITALAKHYA RIVER**

	<p>জীবনের জন্য বিজ্ঞান</p> <p>শেখ হাসিনার দর্শন: সব মানুষের উন্নয়ন</p> <p>বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর)</p> <p>BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)</p>

Institute Name: Institute of National Analytical Research & Service (INARS)
---

Analysis Report



Analytical Service Cell Ref No: May2022033390	Unit (Lab/Inst.) Ref No: A-633
Lab ID: INS-633	Sample Receiving Date: 29/05/2022
Sample ID: A-633	Submission Date: 19 May 2022
	Report Delivery Date: 09/06/2022
Sample Description: Surface Water Quality Test Of Sitalakhya River For The ESIA Environment Of Saidabad Water Treatment Plant Phase III	
Client's Details: Mohammad Nurul Alam Siddique Enviro-MET Services House#House#287/1/H, Level-4, Middle Pirerbag, Dhaka-1216	
Number of Sample: 1	

Report Details:

Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-633	Surface water quality test of Sitalakhya River For The ESIA Environmental Of Saidabad Water Treatment Plant	Nitrate (NO <sub>3</sub> )	6.28 mg/L	4110.B
		Ammonia (NH <sub>3</sub> )	0.75 mg/L	4500.NH <sub>3</sub> -F
		Sulphate (SO <sub>4</sub> )	21.4 mg/L	4110.B
		Phosphate (PO <sub>4</sub> )	1.82 mg/L	4500/P.C

*Tajnin Jahan*  
09.06.2022  
Analyst  
**Tajnin Jahan**  
Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

*Dr. Muhammad Abdullah Al-Mansur*  
09.06.22  
Section/Division In-Charge  
Dr. Muhammad Abdullah Al-Mansur  
Principal Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

*Shamim Ahmed*  
09/06/22  
In-Charge/Director  
**Shamim Ahmed**  
Director (In-Charge)  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205



Note:

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

Analytical Service Cell

Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd

	<p>জীবনের জন্য বিজ্ঞান</p> <p>শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন</p>
	<p>বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর)</p> <p>BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)</p>

Institute Name: Institute of National Analytical Research & Service (INARS)
---

Analysis Report



Analytical Service Cell Ref No: May2022033390	Unit (Lab/Inst.) Ref No: A-633
Lab ID: INS-633	Sample Receiving Date: 29/05/2022
Sample ID: A-633	Submission Date: 19 May 2022
	Report Delivery Date: 09/06/2022
Sample Description: Surface Water Quality Test Of Sitalakhya River For The ESIA Environmental Of Saidabad Water Treatment Plant Phase III	
Client's Details: Mohammad Nurul Alam Siddique Enviro-MET Services House#House#287/1/H, Level-4, Middle Pirerbag, Dhaka-1216	
Number of Sample: 1	

Report Details:

Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-633	Surface water quality test of Sitalakhya River For The ESIA Environmental Of Saidabad Water Treatment Plant	Turbidity	0.94 NTU	2130.B
		Electrical Conductivity	354 $\mu$ S/cm	2510.B
		COD (Chemical Oxygen Demand)	28.2 mg/L	5220.B
		BOD (Biological Oxygen Demand)	12.6 mg/L	5210.B
		pH at 25.1C	7.27	4500-H*.B
		TDS (Total dissolved solids)	212 mg/L	2540.C
		TSS (Total Suspended Solids)	23.0 mg/L	2540.D


✓



**Note:**

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

<p>Analytical Service Cell</p> <p>Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh</p> <p>Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd</p>
--

	<p>জীবনের জন্য বিজ্ঞান</p> <p>শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন</p>
	<p>বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর)</p> <p>BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)</p>

*Tajnin Jahan*  
Analyst 09.06.2022

**Tajnin Jahan**  
Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

*Dr. Muhammad Abdullah Al-Mansur*  
Section/Division In-Charge 09.06.22

Dr. Muhammad Abdullah Al-Mansur  
Principal Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

*Shamim Ahmed*  
In-Charge/Director 09/06/22

**Shamim Ahmed**  
Director (In-Charge)  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205



Note:

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

Analytical Service Cell

Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd

	<p>জীবনের জন্য বিজ্ঞান</p> <p>“শেখ হাসিনার দর্শন সব মানুষের উন্নয়ন”</p> <p>বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)</p>

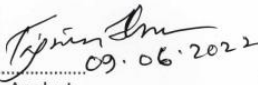
Institute Name: Institute of National Analytical Research & Service (INARS)
---

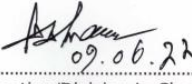
### Analysis Report

Analytical Service Cell Ref No: May2022033390	Unit (Lab/Inst.) Ref No: A-633
Lab ID: INS-633	Sample Receiving Date: 29/05/2022
Sample ID: A-633	Submission Date: 19 May 2022
	Report Delivery Date: 09/06/2022
Sample Description: Surface Water Quality Test Of Sitalakhya River For The ESIA Environment Of Saidabad Water Treatment Plant Phase III	
Client's Details: Mohammad Nurul Alam Siddique Enviro-MET Services House#House#287/1/H, Level-4, Middle Pirerbag, Dhaka-1216	
Number of Sample: 1	

### Report Details:

Lab ID	Particulars of supplied Sample	Parameters	Concentration	Test Method (APHA)
A-633	Surface water quality test of Sitalakhya River For The ESIA Environmental Of Saidabad Water Treatment Plant	Color DO (Dissolved Oxygen)	13.2 PCU 1.48 mg/L	Colormetric 4500-O-G

  
 09.06.2022  
 Analyst  
**Tajnin Jahan**  
 Scientific Officer  
 Institute of National Analytical  
 Research & Service (INARS)  
 BCSIR, Dhaka-1205

  
 09.06.22  
 Section/Division In-Charge  
**Dr. Muhammad Abdullah Al-Mansur**  
 Principal Scientific Officer  
 Institute of National Analytical  
 Research & Service (INARS)  
 BCSIR, Dhaka-1205

  
 09/06/22  
 In-Charge/Director  
**Shamim Ahmed**  
 Director (In-Charge)  
 Institute of National Analytical  
 Research & Service (INARS)  
 BCSIR, Dhaka-1205



#### Note:

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

Analytical Service Cell  
 Dr. Qudrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
 Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd



	জীবনের জন্য বিজ্ঞান শেখ হাসিনার দর্শন: সব মানুষের উন্নয়ন বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ (বিসিএসআইআর) BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (BCSIR)
---	--

Institute Name: Institute of National Analytical Research &amp; Service (INARS)

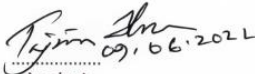
## Analysis Report

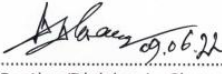


Analytical Service Cell Ref No: May2022033391	Unit (Lab/Inst.) Ref No: A-634
Lab ID: INS-634	Sample Receiving Date: 29/05/2022
Sample ID: A-634	Submission Date: 19 May 2022
	Report Delivery Date: 09/06/2022
Sample Description: Surface Water Quality Test Of Sitalakhya River For The ESIA Environmental Of Saidabad Water Treatment Plant Phase III	
Client's Details: Mohammad Nurul Alam Siddique Enviro-MET Services House#House#287/1/H, Level-4, Middle Pirerbag, Dhaka-1216	
Number of Sample: 1	

## Report Details:

Lab ID	Particulars of supplied sample	Parameters	Concentration	Test Method (APHA)
A-634	Surface water quality test of Sitalakhya River For The ESIA Environmental Of Saidabad Water Treatment Plant	Oil and Grease	Less than 2.0 mg/L	5520.B

  
09.06.2022  
Analyst  
**Tajnin Jahan**  
Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

  
09.06.22  
Section/Division In-Charge  
Dr. Muhammad Abdullah Al-Mansur  
Principal Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

  
09/06/22  
In-Charge/Director  
**Shamim Ahmed**  
Director (In-Charge)  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205



## Note:

- The results reported here pertained to the sample received in this laboratory only.
- Complain and/or query regarding delivered test report should be lodged within one month of report delivery date.
- The laboratory is not responsible for the data quality affected due to sampling, transporting and storage conditions of the sample(s) maintained before received in the laboratory.
- The report shall not be reproduced/published partly or fully without prior approval of the authority.

Analytical Service Cell  
Dr. Qudrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: www.bcsir.gov.bd

Form No. QSF-22

Revision No. 12

Revision Date: 04 November, 2022

জীবনের জন্য বিজ্ঞান



"শেখ হাসিনার দর্পন, সব মানুষের উন্নয়ন"



বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Institute of National Analytical Research and Service (INARS)

## ANALYSIS REPORT

ASC Ref No. : IN-532 of Analytical Service Cell, BCSIR, 23/10/2022  
Lab/Sample ID : A-544  
Client's Details : Nurul Amin

### EMETS

#### Enviro-MET Services

Address: House# 287/1/H, Pererbag, Mirpur, Dhaka-1216.

Number of Sample : 01 (One)  
Sample Description : Surface Water Quality Test of Sitalakhya River for the ESIA  
Study of Saidabad Water Treatment Plant Phase III পরীক্ষণ প্রসঙ্গে

Test Commencement Date : 23/10/2022

Test Completion Date : 06/11/2022

Lab ID	Particulars of supplied sample	Parameters	Results	Test Method (APHA)
A-544	Surface Water (Sitalakhya River)	Ammonia (NH <sub>3</sub> )	1.11 mg/L	4500-N-F
		BOD (Biological Oxygen Demand)	3.85 mg/L	5210.B
		COD (Chemical Oxygen Demand)	9.8 mg/L	5220.B
		Nitrate (NO <sub>3</sub> -N)	Less than 3.0 mg/L	4110.B
		Sulphate (SO <sub>4</sub> )	14.3 mg/L	4110.B
		Phosphate (PO <sub>4</sub> )	1.16 mg/L	4500/P.C
		Turbidity	79.5 NTU	Turbidimeter
		Electrical Conductivity	308 µS/cm	2510.B
		pH at 25.1 <sup>0</sup> C	7.02	4500-H <sup>+</sup> .B
		TDS (Total dissolved solids)	141 mg/L	2540.C
		TSS (Total Suspended Solids)	198 mg/L	2540.D

*[Signature]*  
06.11.22  
Analyst  
**Mehedi Hasan**  
Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

*[Signature]*  
06.11.22  
Supervisor  
Dr. Muhammad Abdullah Al-Mansur  
Principal Scientific Officer -  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

*[Signature]*  
06.11.22  
Director  
**Shamim Ahmed**  
Director (In-Charge)  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

- a. The results reported here are based only on the supplied samples in this laboratory.  
b. Any complain about test report will not be acceptable after one month from the date of issuing of the said report.  
c. This report/result shall not be reproduced/published without prior approval of the authority.

#### Analytical Service Cell

Dr. Qudrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: [www.bcsir.gov.bd](http://www.bcsir.gov.bd)



Form No. QSF-22

Revision No. 12

Revision Date: 04 November, 2022

জীবনের জন্য বিজ্ঞান

"শেখ হাসিনার দর্শন, সব মানুষের উন্নয়ন"



বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Institute of National Analytical Research and Service (INARS)

## ANALYSIS REPORT

ASC Ref No. : IN-532 of Analytical Service Cell, BCSIR, 23/10/2022  
Lab/Sample ID : A-544  
Client's Details : Nurul Amin

### EMETS

#### Enviro-MET Services

Address: House# 287/1/H, Pererbag, Mirpur, Dhaka-1216.

Number of Sample : 01 (One)  
Sample Description : Surface Water Quality Test of Sitalakhya River for the ESIA  
Study of Saidabad Water Treatment Plant Phase III পরীক্ষণ প্রসংগে

Test Commencement Date : 23/10/2022

Test Completion Date : 06/11/2022

Lab ID	Particulars of supplied sample	Parameters	Results	Test Method (APHA)
A-544	Surface Water (Sitalakhya River)	Color	149 PCU	Colormetric
		DO (Dissolved Oxygen)	2.67 mg/L	4500-O-G

*[Signature]* 06.11.22

Analyst  
**Mehedi Hasan**  
Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

*[Signature]* 06.11.22

Supervisor  
Dr. Muhammad Abdullah Al-Mansur  
Principal Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

*[Signature]* 06.11.22

Director  
**Shamim Ahmed**  
Director (In-Charge)  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

Page 1 of 1

Note:

- The results reported here are based only on the supplied samples in this laboratory.
- Any complain about test report will not be acceptable after one month from the date of issuing of the said report.
- This report/result shall not be reproduced/published without prior approval of the authority.

#### Analytical Service Cell

Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: [www.bcsir.gov.bd](http://www.bcsir.gov.bd)



Form No. QSF-22

Revision No. 12

Revision Date: 04 November, 2022

জীবনের জন্য বিজ্ঞান



“শেখ হাসিনার দর্শন, সব মানুষের উন্নয়ন”



বাংলাদেশ বিজ্ঞান ও শিল্প গবেষণা পরিষদ

BANGLADESH COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Institute of National Analytical Research and Service (INARS)

## ANALYSIS REPORT

ASC Ref No. : IN-535 of Analytical Service Cell, BCSIR, 23/10/2022  
Lab/Sample ID : A-547  
Client's Details : Nurul Amin

### EMETS

### Enviro-MET Services

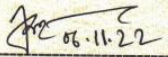
Address: House# 287/1/H, Pererbag, Mirpur, Dhaka-1216.

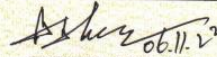
Number of Sample : 01 (One)  
Sample Description : Surface Water Quality Test of Sitalakhya River for the ESIA  
Study of Saidabad Water Treatment Plant Phase III পরীক্ষণ প্রসঙ্গে

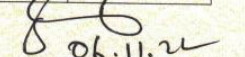
Test Commencement Date : 23/10/2022

Test Completion Date : 06/11/2022

Lab ID	Particulars of supplied sample	Parameters	Results	Test Method (APHA)
A-547	Surface Water (Sitalakhya River)	Oil and Grease	Less than 2.0 mg/L	5520.B

  
Analyst  
**Mehedi Hasan**  
Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

  
Supervisor  
Dr. Muhammad Abdullah Al-Mansur  
Principal Scientific Officer  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205

  
Director  
**Shamim Ahmed**  
Director (In-Charge)  
Institute of National Analytical  
Research & Service (INARS)  
BCSIR, Dhaka-1205


Page 1 of 1

Note:

- The results reported here are based only on the supplied samples in this laboratory.
- Any complain about test report will not be acceptable after one month from the date of issuing of the said report.
- This report/result shall not be reproduced/published without prior approval of the authority.

Analytical Service Cell  
Dr. Quadrat-I-Khuda Road, Dhanmondi, Dhaka-1205, Bangladesh  
Telephone: 9671108, Fax: 88-02-9671108 E-mail: asc@bcsir.gov.bd Website: [www.bcsir.gov.bd](http://www.bcsir.gov.bd)

## ANNEX-J: ECC OF SWTP PROJECT PHASE III




গণপ্রজাতন্ত্রী বাংলাদেশ সরকার  
পরিবেশ অধিদপ্তর  
ঢাকা অঞ্চল কার্যালয়  
পরিবেশ ভবন, ই/১৬, আগারগাঁও, ঢাকা ১২০৭  
[www.doe.gov.bd](http://www.doe.gov.bd)

পরিবেশগত ছাড়পত্র নবায়ন  
ছাড়পত্র নং: ২২-৯০৪৯১

পরিবেশগত ব্যবস্থাপনা নিশ্চিতকরণ সাপেক্ষে সংযুক্ত শর্তে নিম্নবর্ণিত প্রতিষ্ঠান/প্রকল্পের অনুকূলে পরিবেশগত ছাড়পত্র নবায়ন প্রদান করা হলো :

প্রতিষ্ঠান/প্রকল্পের নাম	: Saidabad Water Treatment Plant Project Phase 3
উদ্যোক্তার নাম	: Dhaka WASA
সনাক্তকরণ নং	: ১৪২১৬২
প্রতিষ্ঠান/প্রকল্পের কার্যক্রম	: Water treatment plant
প্রতিষ্ঠান/প্রকল্পের শ্রেণী	: Red
প্রতিষ্ঠান/প্রকল্পের ঠিকানা	: Dhalpur City Palli, Saidabad Water Treatment Plant, Jatrabari, Dhaka.
প্রদানের তারিখ	: ১৮ ডিসেম্বর ২০২২
মেয়াদ উত্তীর্ণের তারিখ	: ২৫ অক্টোবর ২০২৩



এ ছাড়পত্র সনদের সাথে পৃথকভাবে সংযুক্ত প্রদত্ত শর্তাবলী যথাযথভাবে প্রতিপালন করতে হবে, অন্যথায় ছাড়পত্র বাতিল/কর্তিপূরণ আদায়সহ যে কোন আইনানুগ ব্যবস্থা গ্রহণ করা হবে।

বিঃদ্রঃ এটি একটি সিস্টেম জেনারেটেড ছাড়পত্র এবং এতে কোনোরূপ স্বাক্ষরের প্রয়োজন নেই।

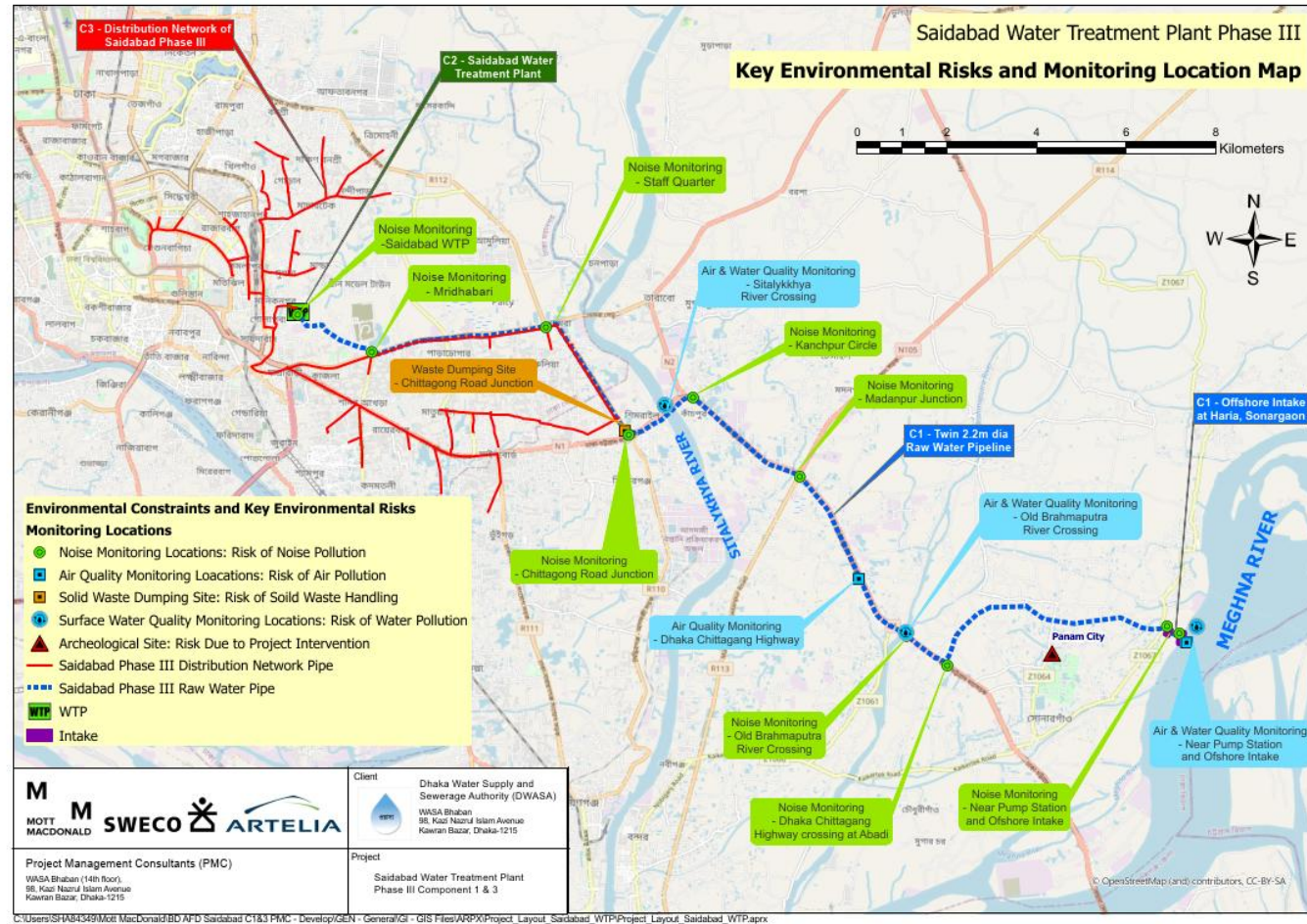
সনাক্তকরণ নং: ১৪২১৬২ Saidabad Water Treatment Plant Project Phase 3 ছাড়পত্র নং: ২২-৯০৪৯১

পরিবেশগত ছাড়পত্র নবায়ন এর জন্য প্রযোজ্য শর্তাবলী:

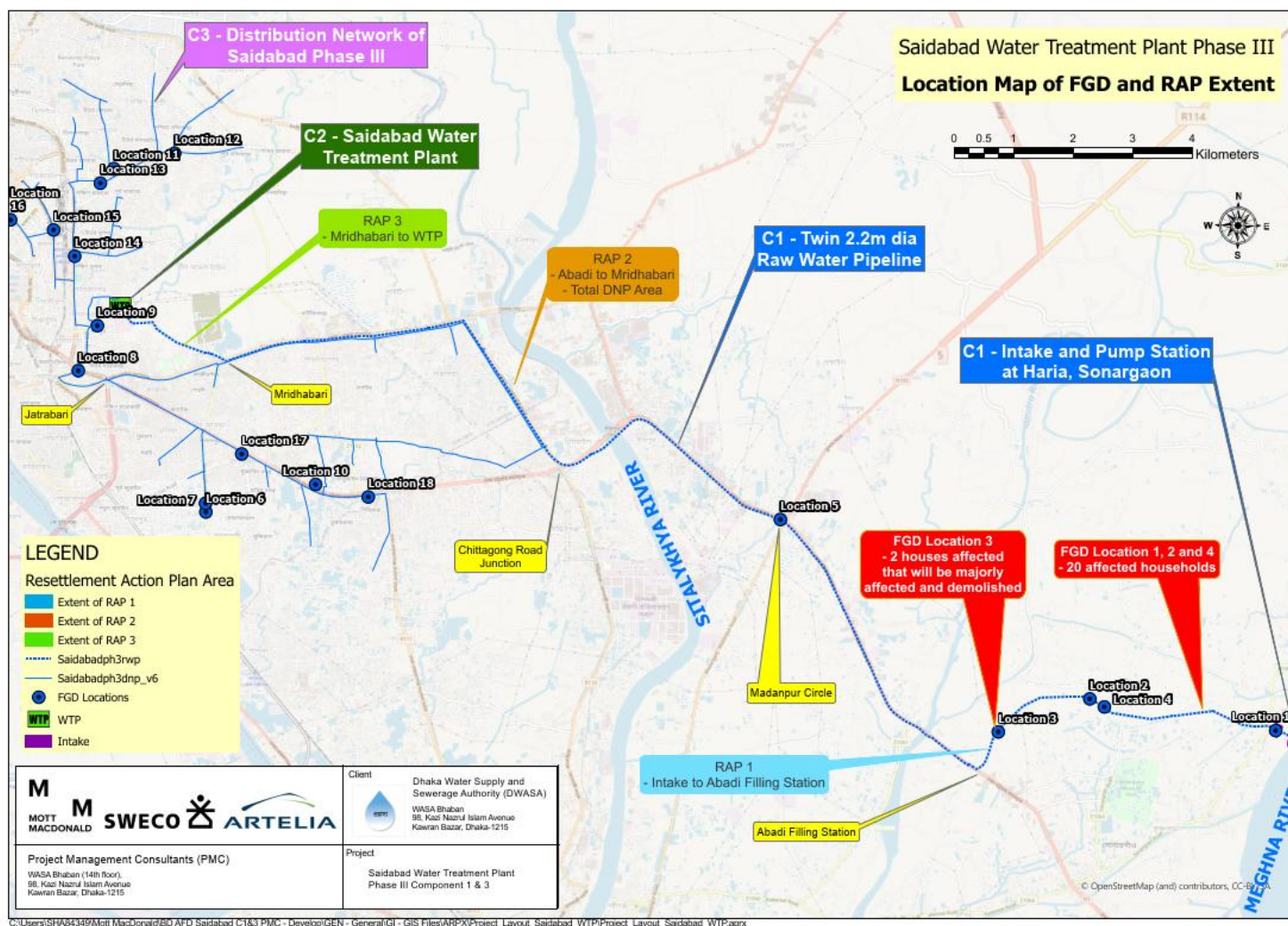
১. প্রকল্পে কর্মরত স্টাফ/কর্মচারী/প্রমিকদেরকে পেশাগত স্বাস্থ্য রক্ষার্থে সকল ব্যবস্থা সার্বক্ষণিক চালু রাখতে হবে।
২. প্রকল্পে কর্মরত প্রমিক কর্মচারীদের জন্য সুপেয় পানীয় জলের ব্যবস্থা নিশ্চিত করতে হবে এবং প্রকল্পের সঙ্গে স্বাস্থ্যসম্মত টয়লেট ব্যবস্থা গড়ে তুলতে হবে এবং তা সর্বদা পরিষ্কার পরিচ্ছন্ন রাখতে হবে।
৩. প্রকল্পের মেরামত কার্যক্রম পরিচালনার সময় স্ট্রাংগ, বায়ু ও তরল বর্জ্যের নির্গমন/নিঃসরণ মানমাত্রা শব্দ দূষণ (নিয়ন্ত্রণ) বিধিমালা, ২০০৬, বায়ু দূষণ (নিয়ন্ত্রণ) বিধিমালা, ২০২২ ও পরিবেশ সংরক্ষণ বিধিমালা, ১৯৯৭ অনুসারে নির্ধারিত মানমাত্রার মধ্যে রাখতে হবে।
৪. প্রকল্পের জন্য প্রযোজ্য সকল পরিবেশ ব্যবস্থাপনা কার্যকর রাখতে হবে এবং সেই অনুসারে ত্রৈমাসিক প্রতিবেদন ঢাকা অঞ্চল কার্যালয়ে দাখিল করতে হবে।
৫. ছাড়পত্রের মূলকপি প্রকল্পটিতে সংরক্ষণ করতে হবে এবং পরিবেশ অধিদপ্তরের কর্মকর্তা পরিদর্শনে গেলে তা প্রদর্শন করতে দিতে হবে।
৬. প্রকল্পের অনুকূলে জারিকৃত পরিবেশগত ছাড়পত্রের সকল শর্তাবলি যথাযথ প্রতিপালন করতে হবে।
৭. পরিবেশগত ছাড়পত্র জারির তারিখ হতে পরবর্তী ১ (এক) বৎসরের জন্য বহাল থাকবে এবং মেয়াদ শেষ হবার অন্ততঃ ৩০ (ত্রিশ) দিন পূর্বে পরিবেশগত ছাড়পত্র নবায়নের জন্য আবেদন করতে হবে।



## ANNEX-K: KEY MAP OF ENVIRONMENTAL RISK AND INTERVENTIONS



## ANNEX-L: KEY MAP OF SOCIAL RISK AND INTERVENTIONS



# ANNEX-M: CONSTRUCTION RELATED OCCUPATIONAL HEALTH AND SAFETY PLAN

## 1 INTRODUCTION

Occupational health aims at the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities; and, to summarize: the adaptation of work to man and of each man to his job. This is the definition jointly agreed by Joint ILO/WHO Committee on Occupational Health and has been adopted by the International Commission on Occupational Health (ICOH) and features in the 2002 update of the International Code of Ethics for Occupational Health Professionals.

The objectives of OHS Plan are:

- > To develop, in the workplace, a collaborative approach to managing Occupational Health and Safety between management and workers
- > To identify work associated risk and hazard
- > To provide and maintain safe working procedures and operations
- > To ensure awareness of all potential work-related risks and hazards and to develop preventive strategies against these risks and hazard
- > To define responsibilities to ensure effective implementation of health and safety
- > To provide appropriate training to all concerned to work safely and effectively
- > To maintain a constant and continuing interest in the improvement of occupational health and safety performance and to provide the required resources necessary for the implementation and maintenance of the OHS plan.

The following sections present the general requirement of OHS, identification of risk and hazards at the workplace, suggested measures, and roles and responsibilities to implement the OHS plan; as relevant to the construction phase of the project.

## 2 APPLICABLE STANDARDS/GUIDELINES AND GENERAL REQUIREMENTS

Bangladesh Labor Law 2006 (BLL2006), Bangladesh Labor Rules (2015) and Bangladesh Factories Act 1965 (BFA1965) are the national legislations relevant to OHAS. Among WB/IFC guidelines are WB EHS general guidelines, IFC OHS related guidelines, Guidelines on community health and safety, Guidelines on construction and decommissioning are relevant among others e.g., International Good Practice Guidelines. Bangladesh legislations may actually be considered to constitute a subset of WBG/ILO guidelines. This is due to the general compatibility between the two sets and somewhat less coverage in the Bangladesh documents. Thus, the national legislations are not discussed here. The IFC PS is applicable to Saidabad Water Treatment Plant (SWTP) PHASE III and the IFC PS 2 under it, highlights the need for safe and healthy work environment taking into account the inherent risks in its particular sector and specific classes of hazards with respect to a project, including physical, chemical, biological hazards. The need to prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far



as reasonably practicable, the causes of hazards. In the construction stage, most of OHS impacts are related to civil works. The main impacts and mitigations at this stage are summarized below.

#### **Over-exertion**

- > Over-exertion, and ergonomic injuries and illnesses, such as repetitive motion, over-exertion, and manual handling, are among the most common causes of injuries in construction.

#### **Mitigation**

- > Training of workers engaged in lifting and materials handling techniques in construction projects, including the placement of weight limits above which mechanical assists or two-person lifts are necessary.

#### **Slips and Falls**

- > Slips and falls on the same elevation associated with poor housekeeping, such as excessive waste debris, loose construction materials, liquid spills, and uncontrolled use of electrical cords and ropes on the ground, are also among the most frequent cause of lost time accidents at construction and decommissioning sites.

#### **Mitigations**

- > Implementing good house-keeping practices, such as the sorting and placing loose construction materials / debris in established areas away from foot paths.
- > Cleaning up excessive waste debris and liquid spills regularly and locating electrical cords and ropes
- > in common areas and marked corridors

#### **Work in Heights**

- > Falls from elevation associated with working with ladders, scaffolding, and partially built or demolished structures are among the most common cause of fatal or permanent disabling injury at construction site.

#### **Mitigations**

- > Training and use of temporary fall prevention devices, such as rails or other barriers able to support a weight of 100 kg, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or through an opening in a work surface
- > Training and use of personal fall arrest systems, such as full-body harnesses and energy absorbing lanyards able to support 2500 Kg as well as fall rescue procedures to deal with workers whose fall has been successfully arrested.

#### **Struck By Objects**

- > Construction and demolition activities may pose significant hazards related to the potential fall of materials or tools, as well as ejection of solid particles from abrasive or other types of power tools which can result in injury to the head, eyes, and extremities.

#### **Mitigations**

- > Clear traffic ways shall be provided to avoid driving of heavy equipment over loose scrap which may result in scattering of objects.
- > Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes shall be made mandatory.

### **Moving Machinery**

- > Vehicle traffic and use of lifting equipment in the movement of machinery and materials on a construction site may pose temporary hazards, such as physical contact, spills, dust, emissions, and noise.
- > Heavy equipment operators have limited fields of view close to their equipment and may not see pedestrians close to the vehicle.

### **Mitigations**

- > Planning and segregating the location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic.
- > Ensuring the visibility of personnel through their use of high visibility vests when working in or walking
- > through heavy equipment operating areas, and training of workers to verify eye contact with equipment operators before approaching the operating vehicle
- > Ensuring moving equipment is outfitted with audible back-up alarms. Use inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and securing loads when
- > lifting them to higher job-site elevations.

### **Trespassing**

- > Risks may arise from inadvertent or intentional trespassing, including potential contact with hazardous materials, contaminated soils and excavations and structures which may pose falling and entrapment hazards.

### **Mitigation**

- > Restricting access to the site, through a combination of institutional and administrative controls, with a focus on high-risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the local community

### **Other Site Hazards**

- > Construction site may pose a risk of exposure to dust, chemicals, hazardous or flammable materials, and wastes in a combination of liquid, solid, or gaseous forms. Hot jobs or electrical fittings can lead to fire hazards also.

### **Mitigation**

- > Use of waste-specific PPE based on the results of an occupational health and safety assessment, including respirators, clothing/protective suits, gloves and eye protection.
- > The receptors who will be particularly vulnerable to occupational health and safety related impacts are the construction workers. The potential for impact on health and safety will be local for medium term and of moderate intensity during the construction; which with proper mitigation can be reduced to insignificant level.
- > In addition to specific mitigation measures, the general good practice approach can minimize the OHS impacts. These are given below.

### **Housekeeping**

- > Work areas should be maintained in a neat and clean and orderly condition;
- > Scrap material, such as rags, bolts, and wedges should not be allowed to accumulate in the site area;
- > Spills of oil, grease, paint and other slippery substances should be cleaned up immediately;
- > Walkways should be kept clear of tripping hazards at all times;
- > All personal protective equipment required for a procedure or production area must be properly fitted and worn;
- > Maintain a free access to all safety equipment including firefighting equipment, electrical panels, and boxes, etc.;
- > Scaffolding and ladders must be secured;
- > Proper barricades, safety rings, and safety wires should be used for openings, manholes, etc.;
- > Barricades must be properly lighted for visibility;
- > Operating equipment, tools or machinery without proper guards and/or signalling devices is prohibited;
- > Observe all warning signs in the yard; and
- > Before leaving the job, always check the area for any sparks or smouldering materials.

### **Ventilation and illumination**

- > Adequate local ventilation is to be arranged in connection with all types of works involving injurious or irritating gases/smoke/ fumes, which may occur or may form while the work is going on
- > Ventilation is to start up before work commences and a check is to be made by the EHS Manager
- > Workplace should be properly illuminated

### **First Aid**

- > All work areas must be provided with adequate first aid facilities with a trained first aider during working hours
- > The contractor must provide or ensure that there is the provision of adequate and appropriate facilities for enabling first aid to be rendered to their employees if they are injured or become ill at work

### **Overcrowding**

- > Workplace should not be overcrowded. Enough space should be provided for every worker in a work room.

### **Dust and Fumes**

- > Any dust or fumes or other impurities likely to be injurious to the workers. Effective measures should be adopted to avoid its accumulation and protective gears should be used to prevent its inhalation by the workers.

### **Latrines and Urinals**

- > Sufficient latrines and urinals shall be provided.

- > Shall be maintained in clean and sanitary condition.
- > Shall be adequately lighted and ventilated.

**Precautions in case of fire**

- > Shall be provided with means of escape in case of fire.
- > Effective measures shall be taken to ensure that all the workers are familiar with the means of escape.
- > Firefighting apparatus should be provided and maintained.
- > Fire drills should be conducted at regular intervals.

**Disposal of wastes and effluents**

- > Provide with proper disposal system for solid waste and effluents.
- > Dustbins and Spittoons should be provided in proper places.

**Monitoring Occupational diseases**

- > During construction period mostly non-hazardous materials will be used. The likelihood of occupational diseases is expected to be low; even then proper health monitoring should be in place to look for the unlikely events.

**Use of Personal Protective Equipment Gears**

Personal Protective Equipment (PPE) must be used by the workers and even by the visitors at the construction site to minimize the risk. All personal protective equipment must:

- > be appropriate for the risks involved, without itself leading to any increased risk
- > correspond to existing conditions at the workplace
- > fit the wearer correctly after any necessary adjustment

The SWTP PHASE III management must provide the appropriate equipment to the workers and must ensure that it is in good working order. The OHS team shall organize training and demonstrate the use of personal protective equipment. Workers shall be informed of all measures to be taken. Consultation and participation shall take place on the matters related to the use of these protective equipment. A partial list of protective gears to be worn by the workers at designated work areas is given below:

- > Head Protection: Protective helmets must be worn at all times in hard-hat areas, such as the building construction sites, under scaffolds, erection and stripping of formworks, etc., where there are possibilities of head injuries from falling/flying objects.
- > Hearing Protection: Ear plugs or ear muffs or full acoustic helmets, whichever is appropriate, should be worn in areas where exposure to high noise level is expected. Examples of such activities include percussion drill, bolt driving, etc.
- > Eye and Face Protection: Spectacles, Goggles, Face Shield or Arc-welding Mask with Hand
- > Masks, whichever is appropriate, should be worn at times when percussion drilling, spray painting, welding or similar activities are in progress at the field.
- > Respiratory Protection: In work areas such as septic tanks, dump sites, sewers etc., where exposure to harmful or toxic gases is likely the workers should wear gas masks, dust filters, or insulating appliances with air supply, whichever is appropriate.

- > Hand and Arm Protection: Gloves must be worn at all times when, machineries are used which involve piercing, cutting or vibration. For protection against toxic chemicals special chemical resistant gloves should be worn. Over sleeves must be worn to protect ones arms.
- > Foot Protection: Working on or under scaffolds, roof works, formwork erection at the construction site and dismantling, safety shoes/boots are essential protective measures. When working with chemicals special chemical resistant shoes may be necessary. Electrical works require insulated and antistatic shoes/boots.
- > Trunk, Abdomen and Body Protection: Where heavy loads need to be lifted and/or physical force becomes necessary body belts are the appropriate protective measure. Safety aprons are essential when welding works are in progress or when handling chemicals. Body harness along with safety ropes and nets are required when working at higher elevation or where possibilities of accidental falls exist.

Table 1: List of PPEs to be worn at the construction site

Sl. No.	Works/ Equipment Use	Safety Measures for Workers and/or Work Areas
1	Common Construction Works	HH, STB, HG
2	Earth-works	HH, STB, HG
3	Electric works	RSB, HG
4	Wood works	HH, STB, HG
5	Road paving	HH, STB, HG, BP, FM
6	Cranes	HH, STB, HG, WB
7	Pile Driver	HH, STB, HG, EP, WB
8	Arc Welder	HH, WV, HG
9	Bull Dozer	HH, STB, WB
10	Heavy Roller	HH, STB, HG, WB
11	Concrete Mixer	HH, STB, HG, WB
12	Fork Lift	HH, HG, STB, WB
13	Percussion Drill	HH, STB, HG, WB, EG, EP, WB
14	Sledge/Pick Hammer	HH, STB, HG, WB
15	Vibrator	HH, STB, HG, WB
16	Working on Scaffolds	HH, STB, HG, WB

Note: HH = Hard Hat, STB = Steel-tipped Boot, HG = Hand Gloves, BH = Body Harness WB = Waist Belt, EM = Ear Muff, EP = Ear Plug, WV = Welding Visor, FM = Face Mask, BP = Body Protective Apron, RSB = Rubber Soled Boot, EG = Eye protection Glasses

### Safety and Health Signs

Safety signs, health signs, prohibition sign, warning sign, mandatory sign, emergency escape sign, first- aid sign, information sign, signboard, supplementary signboard, safety color, symbol, pictogram, illuminated sign, acoustic signal, verbal communication and hand signal are essential tools for preventing accidents by providing information in advance.

### 1 OHS TEAM AT

According to the SWTP PHASE III organogram, the OHS/EHS team consists of three professionals. These officers are Chief Safety Officer (CSO), EHS Manager and Safety officer. The CSO has the

overall responsibility to oversee the OHS/EHS in the SWTP PHASE III and reports to the management. Of course, all the employees and workers are involved in the activities one way or the other. As SWTP PHASE III has dispensed with the contractors for the construction work; it will be solely responsible for OHS/EHS functions at the work site. The duties of the EHS Manager and Safety officer are given in the following.

### **EHS Manager**

The main duties of an EHS Manager shall include the following:

- > Ensure that the operations at the facility are in compliance with OHS/EHS requirements at all times;
- > Conducting Health and Safety Audits on a regular basis and advice management for necessary action;
- > Providing first aid facilities and personal protective equipment as required;
- > Recording all type of accidents and Reporting to Site Supervisor;
- > Training of workers and ensuring that they are issued with adequate instructions and creating awareness of safe work practice among them;
- > Carrying out Job Safety Analysis to determine the Hazards of the operations/activity and facilitating
- > suitable solutions; and
- > Participate in the preparation of, all Safety instructions, procedures and activities.

### **Safety Officer**

The safety officer's responsibly are to maintain OHs/EHS compliance at the project site. The roles are:

- > identify potential hazards and potential major incidents;
- > review the effectiveness of health and safety measures;
- > inspect the site with a view to the health and safety of employees, at regular intervals;
- > participate in any internal health or safety audit; and
- > ensure that the operations at the facility are in compliance with OHS/EHS requirements at all times.

The CSO on behalf on the management ensures that the provision of necessary assistance, facilities and training to carry out the OHS/EHS functions are smoothly carried out.

### **Employees/Workers**

The employs and worker will do their part of the responsibility to maintain OHS/EHS at the project site. Their roles are:

- > Use the correct tools and equipment for the job;
- > use Safety equipment and protective equipment/clothing supplied, e.g. Safety helmets, shoes, harness, goggles etc.; and
- > Report all defects in plant or equipment to health and safety representatives.

## **2 OHS ACTION PLAN**

Occupational health aims at:

- > the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations;
- > the prevention amongst workers of departures from health caused by their working conditions;
- > the protection of workers in their employment from risks resulting from factors adverse to health;
- > the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities; and
- > to summarize: the adaptation of work to man and of each man to his job.

Since occupational accidents and work-related injuries to health occur at the individual workplace, preventive and control measures within the enterprise should be planned and initiated jointly by the employer, managers and workers concerned. Measures for the prevention and control of occupational hazards in the workplace should be based upon a clear, implementable and well-defined policy at the level of the enterprise. This occupational safety and health action plan represents the foundation from which occupational safety and health goals and objectives, performance measures and other system components are developed. It should be concise, easily understood, approved by the highest level of management and known by all employees in the organization. The plan should be in written form and should cover the organizational arrangements to ensure occupational safety and health. In particular, it should:

- > allocate the various responsibilities for OSH within the enterprise;
- > bring policy information to the notice of every worker, supervisor and manager;
- > determine how occupational health services are to be organized; and
- > specify measures to be taken for the surveillance of the working environment and workers' health.

An OHS management plan for the implantation of OHS measures at the SWTP PHASE III site during the construction phase is provided in table-2. Most of the actions listed are currently being implemented informally. What is needed is gradual formalization and documentation of the actions. If implemented with due diligence, it will ensure OHS at the site.



Table 2: Occupational Health and Safety Management Plan for SWTP PHASE III (Construction Phase)

SN.	Issues	Actions Required	Current Status	Responsibility
1.	OHS Policy and Management	Develop a written OHS policy that states the organization's commitment to OHS and outlines specific OHS responsibilities for managers and employees. Review and update regularly.	OHS management plan is available	SWTP PHASE III OHS/EHS Team
		Communicate policy to all employees, contractors and clients.	Employees are invited in the monthly meetings based on relevance.	
2.	Consultation	OHS is a standing agenda item at board meetings, management meetings and team meetings.	This is being implemented.	SWTP PHASE III OHS/EHS Team
		Develop and implement sources of information for staff notice boards, newsletters.	Some notices are provided on ad hoc basis.	
		Establish a Health and Safety committee.	No formal committee exists. A resident health assistant is available at the site.	
		Develop an issues resolution procedure, train staff.	GRM is available.	
3.	Induction	Develop induction process and checklist. Ensure coverage of permanent staff, agency staff, contractors and volunteers.	New employees are trained.	SWTP PHASE III OHS/EHS Team
4.	Training	Identify safety training needs and develop a training plan.	No written safety training plan.	SWTP PHASE III OHS/EHS Team
		Train supervisors/managers and workers.	Being done based on need.	
		Identify safety training needs and develop a training plan. Train supervisors/managers and workers.	Included in OHS management plan	
		Develop procedure for proactive OHS hazard reporting. Train all staff in procedure		
5.	Hazard/ incident/ accident reporting	Develop procedure for proactive OHS hazard reporting. Train all staff in procedure	Included in OHS management plan	SWTP PHASE III OHS/EHS Team
		Develop procedure and supporting documentation for near miss/ incident/ accident reporting. Train all staff in procedure.		
		Develop procedure for investigating any incidents or near misses to identify the hazards that contributed to these events		
		Ensure that corrective actions are documented, responsibilities assigned and implemented.		

SN.	Issues	Actions Required	Current Status	Responsibility
		Develop procedure and supporting documentation for near miss/ incident/ accident reporting.  Train all staff in procedure.		
		Develop procedure for investigating any incidents or near misses to identify the hazards that contributed to these events. Ensure that corrective actions are documented, responsibilities assigned and implemented.		
6.	Incident Recording	Develop a procedure for notifying Work Safe following a serious incident (in consultation with employees).	Recorded in the general log- book.	SWTP PHASE III OHS/EHS Team
7.	Manual Handling	Identify and list any tasks considered to involve manual handling based on Code of Practice Manual Handling i.e., all tasks involving handling people/children, equipment, home maintenance tasks.  Assess and develop controls. Care plans should clearly define handling requirements.  Transferring people safely for guidance on specific client transfers  Manual Handling Code of Practice for general guidance on non-client related manual handling controls  Designing Workplaces for Safer Handling of patients and residents for guidance on workplace design including dimension requirements  Homecare Guide for OHS controls for homecare, attendant care, and at home maintenance tasks  Implement controls and monitor effectiveness.	Included in OHS management plan	SWTP PHASE III OHS/EHS Team
8.	Slips, Trips & Falls	Undertake regular workplace inspections to identify any slip/ trip/ fall hazards, and implement controls.	Done based on need.	SWTP PHASE III OHS/EHS Team
9.	Hazardous Substances	Develop a Register of all chemicals stored on premise. The register can form the index to the Material Safety Data Sheet (MSDS) file.  Provide, and train staff in the use of, required Personal Protective Equipment.	Hanging of MSDS and labelling	SWTP PHASE III OHS/EHS Team

SN.	Issues	Actions Required	Current Status	Responsibility
		Complete a workplace inspection and ensure that all chemicals are adequately labelled, in appropriate containers and stored appropriately.		
10.	Infectious diseases	Develop infection control procedures. Train staff.	Threat of vector (mosquitos) borne diseases exist during part of the year.	SWTP PHASE III OHS/EHS Team
		Develop appropriate handling and disposal methods for sharps. Train staff.	Handled as part of solid wastes.	
11.	Workplace Bullying	Develop and communicate procedures for reporting and investigating and resolving incidents of workplace bullying.	Internal GRM can be used.	SWTP PHASE III OHS/EHS Team
		Identify and list situations/environments where there is the potential for occupational violence to occur. Implement controls and monitor effectiveness.		
12.	Occupational Violence	Identify and list situations/environments where there is the potential for occupational violence to occur.	Internal GRM can be used.	SWTP PHASE III OHS/EHS Team
		Assess and develop controls – consider both the workplace environment, and tasks.		
		Implement controls and monitor effectiveness.		
		Train workers in the prevention of aggression and violence.		
13.	Off-site workers	Ensure that procedures for hazards below, control OHS risks for offsite workers:  Hazardous substances  Manual handling  Workplace layout and housekeeping  Occupational violence  Biological hazards  Electrical hazards  Emergency evacuation Emergency communication	Need based actions are taken.	SWTP PHASE III OHS/EHS Team

SN.	Issues	Actions Required	Current Status	Responsibility
14.	Office/computer workstations	Provide appropriate equipment, set up workstations and train staff.	Routinely done	SWTP PHASE III OHS/EHS Team
15.	Electrical Safety	Undertake regular workplace inspections to identify any electrical equipment (plugs, sockets, switches, cords, leads appliances, power tools, power boards and extension leads).	Certified electricians are available and jobs are routinely done.	
		Maintain electrical equipment in line with ISO Standards.		
		Develop and communicate a procedure for the immediate withdrawal of any faulty items, and repair if appropriate.		
16.	First Aid	Determine the first aid needs of your workplace.	A certified resident medical Doctor is available at the site for routine first aid.	SWTP PHASE III OHS/EHS Team and medical technician.
		Train first aiders.	Some employees are trained.	
		Put together first aid kits and establish a protocol to check and replenish them regularly.	First Aid Kits are available at the medical room in the custody of the medical Doctor.	
		Develop first aid procedures and communicate to all staff.	Training routinely provided.	
17.	Contractor management	Develop procedures for the management of contractors – including cleaners, electricians, equipment service personnel – that covers OHS requirements.	Currently only supplier contractors are involved.	SWTP PHASE III OHS/EHS Team
18.	Purchasing equipment	Develop and implement a procedure for considering OHS issues prior to the purchase of any equipment.	Purchases are vetted for OHS issues.	SWTP PHASE III OHS/EHS Team
19.	Emergency preparedness	Develop emergency response procedures and train staff.	Included in OHS management plan.	SWTP PHASE III OHS/EHS Team

## ANNEX-N: VULNERABILITY ASSESSMENT

## ANNEX-O: GRIEVANCE REDRESSAL PROCEDURE

- 
- <sup>i</sup> Pickett KE, Pearl M. Multi-level analyses of neighbourhood socioeconomic context and health outcomes: a critical review. J Epidemiol Community Health. 2001;55:111–122. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)] [[Ref list](#)]
- <sup>ii</sup> Yen IH, Syme SL. The social environment and health: a discussion of the epidemiologic literature. Annu Rev Public Health. 1999;20:287–308. [[PubMed](#)] [[Google Scholar](#)] [[Ref list](#)]