



# Initial Environmental Examination

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**PUBLIC**

June 2024

## India: West Bengal Drinking Water Sector Improvement Projectd

Subproject : Bulk Water Supply for Two Blocks in Bankura (Package DWW/BKP/01)

Prepared by Public Health Engineering Department, Government of West Bengal for the Asian Development Bank (ADB). This is an updated version of the initial environmental examination report originally posted in April 2022 available - <https://www.adb.org/projects/documents/ind-49107-006-iee-24>.

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**Asian Development Bank**

# **INITIAL ENVIRONMENTAL EXAMINATION**

**3<sup>rd</sup> UPDATED**

**PROJECT NUMBER: 49107-006  
JULY 2024**

SFG Log: 6182

**IND: WEST BENGAL DRINKING WATER SECTOR  
IMPROVEMENT PROJECT – BULK WATER  
SUPPLY FOR TWO BLOCKS IN BANKURA  
(Package DWW/BKP/01)**

**PREPARED BY PUBLIC HEALTH ENGINEERING DEPARTMENT,  
GOVERNMENT OF WEST BENGAL FOR THE ASIAN DEVELOPMENT  
BANK**



## ABBREVIATIONS

ADB	- Asian Development Bank
CBO	- Community-Based Organization
CPCB	- Central Pollution Control Board
CTE	- Consent to Establish
CTO	- Consent to Operate
DBO	- Design, Build and Operate
DDR	- Due Diligence Report
DMS	- Detailed Measurement Survey
DSC	- District Steering Committee
DSISC	- Design, Supervision and Institutional Support Consultant
EAC	- Expert Appraisal Committee
EHS	- Environmental, Health and Safety
EIA	- Environmental Impact Assessment
EMP	- Environmental Management Plan
ESSU	- Environment and Social Safeguard Unit
FGD	- Focus Group Discussion
GLR	- Ground Level Reservoir
GoWB	- Government of West Bengal
GRC	- Grievance Redress Committee
GRM	- Grievance Redress Mechanism
HIDCO	- Housing and Infrastructure Development Corporation
HSGO	- Head, Safeguards and Gender Officer
IBPS	- Intermediate Booster Pumping Station
IEE	- Initial Environmental Examination
IPP	- Indigenous People Plan
IWD	- Irrigation and Waterways Department
MOEFCC	- Ministry of Environment, Forest and Climate Change
NGO	- Nongovernment Organization
NOC	- No Objection Certificate
PHED	- Public Health Engineering Department
PIU	- Project Implementation Unit
PMC	- Project Management Consultant
PMU	- Project Management Unit
PPTA	- Project Preparatory Technical Assistance
PWSS	- Piped Water Supply Scheme
REA	- Rapid Environmental Assessment
RFCTLARRA	- Right to Fair Compensation and Transparency in Land
ROW	- Right-of-Way
SIA	- Social Impact Assessment
SPS	- Safeguard Policy Statement
SGC	- Safeguard and Gender Cell
TOR	- Terms of Reference
WBDWSIP	- West Bengal Drinking Water Sector Improvement Project

WBPCB	- West Bengal Pollution Control Board
WHO	- World Health Organization
WTP	- Water Treatment Plant

### WEIGHTS AND MEASURES

m <sup>3</sup> /h	:	cubic meter per hour
dBa	:	decibel
°C	:	degree Celsius
Ha	:	hectare
Km	:	kilometre
Lpcd	:	liter per capita per day
M	:	meter
Mbgl	:	meters below ground level
Mgd	:	million gallons per day
MLD	:	million liters per day
mm	:	millimetre
km <sup>2</sup>	:	square kilometer

### CURRENCY EQUIVALENTS

(as of 11 July 2018)

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

### NOTE

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

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## EXECUTIVE SUMMARY

1. The proposed West Bengal Drinking Water Sector Improvement Project (WBDWSIP) aims to provide safe, reliable and continuous drinking water as per Government of India's standard to about 2.6 million people in the arsenic, fluoride, and salinity affected selected areas of North 24 Parganas, South 24 Parganas, East Medinipur and Bankura districts of West Bengal.

2. The project will adopt a sector approach, and subprojects will be selected and proposed for funding adhering to the agreed Subproject Selection Criteria (SSC). Project districts are North 24 Parganas (with two blocks of South 24 Parganas included for distribution network), Bankura and East Medinipur, and subprojects to be covered under the Project will be within these districts only unless otherwise agreed with ADB. Subprojects proposed under the Project stem from a district-wide comprehensive water quality and sustainability planning and completion of the Drinking Water Quality Action Plan (DWQAP) for the concerned district. WBDWSIP

3. WBDWSIP will be implemented over a 6-year period beginning in 2018, and will be funded by ADB via a sector loan modality. Specific sub project will be implemented over period of 3 years after award of contract and total operate and maintenance period is of 2 years thereafter.

4. **The Subproject.** Creation of surface water based bulk water supply system to meet the water demand for the blocks of Indpur and Taldangra in Bankura district under the WBDWSIP. The sub- project will also help in reducing the incidence of ground water depletion and intrusion of fluoride in ground water. The selected blocks are located in the north of the Mukutmanipur reservoir. The subproject includes the following work components: (i) Intake with fixed type Jetty with arrangement for housing pumping machineries and raw water Main (approx. 700 m) for 44 MLD in 2050; (ii) water treatment plant (WTP) of 44 MLD (9.51 mgd) capacity with pumping facilities up to design period of 44 MLD in 2050, (iii) Ground Level Water Storage reservoir (GLSR) (only clear water reservoir part) at Gobindapur of capacity 2500 KL, and (iv) approximately 22.36 kilometre (km) long primary transmission main from WTP to the GLSR

5. **Project Implementation Arrangements.** Public Health Engineering Department (PHED) of Government of West Bengal is the executing and implementing agency for the WBDWSIP. Project management unit (PMU) exclusively established in PHED for the WBDWSIP will implement the project. PMU is assisted by district level Project Implementation Units. Safeguard and gender cell (SGC) in the PMU are responsible for safeguards compliance. Project Management Consultant and PIU-wise design, supervision and institutional support consultant will assist PMU and PIUs in implementation and management of the project.

6. **Screening and Assessment of Potential Impacts.** ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. As per the Government of India EIA Notification, 2006, this subproject does not require EIA study or environmental clearance. The potential environmental impacts of the subproject have been assessed using ADB's rapid environmental assessment checklist for water supply. The potential negative impacts were identified in relation to pre-construction, construction and operational period.

7. **Categorization.** Based on results of the assessment and ADB's SPS, the subproject is classified as environmental Category B, i.e., the subproject is judged to be unlikely to have any significant adverse environmental impacts. However, an initial environmental examination (IEE) is

required. The environmental category continues to “B” and ADB cleared IEE report has been updated covering the night work under the project and minor change in pipeline length.

8. **Description of the Environment.** The subproject components are located in Indpur and Taldangra blocks of Bankura District which is situated on the western part of the State of West Bengal. The total area of the district is 6882 square kilometres (km<sup>2</sup>). It extends from 22°38’ north Latitude and between 86°36’ and 87°47’ east longitude. Headquarter of Bankura district is at Bankura, from which this district derived its name It is bounded by Paschim Medinipur in the south and Hooghly district in the north, Purulia district in the west, Bardhaman district in the north and east. In shape, it resembles an isosceles triangle wedged in between Purulia and Bardhaman, with its apex nearly opposite to Raniganj and with an irregular base line resting on Paschim Medinipur and Hooghly. The district is drained by Damodar, Dwarakeswar and Kangsabati river along with their tributaries of which Gandheswari, Silai and Kumari deserve separate mention. The district comprises of 22 blocks and 3 municipalities.

9. The district physiography is quite varied and marked successively from west to east by zones of plateau, plateau fringe, piedmont zones, marginal plan to delta flank, one merging imperceptively into the other. There are long stretches of paddy fields in the eastern alluvial part, but in the west, the undulating plain and hill tract are covered with low jungle, though traces of taller forest trees are occasionally seen. About 14 percent (%) of the total area of the district is under forest cover. Low forest clad spurs such as Biharinath (447.8 m) and Susunia (439.5 m), which are extensions of the Chhotonagpur table and are found in the northwest of the district. There are several other low hills interspersed here and there. Bankura is drained by Damodar, Dwarakeswar and Kangsabati river along with their tributaries of which Gandheswari, Silai and Kumari deserve separate mention. They have in general a south-easterly flow. The courses of the principal rivers are approximately parallel to each other.

10. Maximum elevation of the district is within 448 meters above mean sea level (msl), whereas average elevation of 78 meters. The district falls under red laterite zone and generally undulating, coarse textured, susceptible to erosion, acidic soil. Bankura is generally arid compared to other parts of Bengal. Annual average rainfall in the district is 1400 mm and the temperature vary from a maximum of ≥44°C and minimum of ≤6°C. The climate in the western portion of the district is drier than the eastern regions. From March to May, the hot westerly winds prevail and the day time temperatures are oppressive. The north- westerly winds are frequent during the early part of March (locally called as “*Kal Baisakhi*”) and help to mitigate the excessive heat. As per the report published by National Institute of Disaster Management (NIDM) in 2013, the districts of Bankura, Purulia, Birbhum and parts of Paschim Medinipur have been affected by drought at regular intervals, mainly due to deficient rainfall and adverse soil conditions. Every summer many parts of the district suffer water shortage with respect to the entire state.

11. **The Project.** As per information available in the project report of PHED, only 8.76% of the total rural habitations in the select 2 project blocks are connected with Piped Water Supply based on ground / sub-surface water source. The impact of ground water abstraction and the associated risks of fluoride contamination in the blocks of Indpur and Taldangra and cannot be undermined. In effect, a comprehensive Piped Water Supply Scheme (PWSS) is essential to be drawn up with respect to sustainable water sources to effectively mitigate the risks and impact of Fluoride contamination. Total population of selected 2 project blocks is 304,415 (rural 304.415 and urban nil) as per 2011 census. Scheduled castes numbered 102,435 (33.64%) and Scheduled tribes numbered 35,600 (11.69%) as per 2011 census. The project area does have any Census town but has 16 Gram Panchayats and 339 habituated villages.

12. As far as possible, based on the land availability, project components are located within the existing water facilities. The overall improvement plan is to tap the raw water from Mukutmanipur reservoir (also known as Kangsabati reservoir) and treat the water at Water Treatment Plant. The treated water will be pumped to centrally located GLSR through the Primary transmission main of approx. 22.36 km.

13. The raw water source is Mukutmanipur reservoir. It is located at approximately 3.2 km upstream of the confluence of River Kangsabati and River Kumari. In 1956, a giant water dam reservoir was constructed at Mukutmanipur, about 12 km from Khatara town in the district of Bankura, WB. The Mukutmanipur dam provides major irrigation facilities (Kangsabati Major Irrigation Project) to 8,000 km<sup>2</sup> of agricultural land, stretched across Bankura, Purulia, Paschim Medinipur and parts of upper Hooghly.

14. Mukutmanipur reservoir has abundant flow throughout the year even during lean seasons. WBPHED already has a water supply scheme of 6.09 MLD from Mukutmanipur reservoir commissioned in the year 2008 for supplying water to Khatara and Ranibandh blocks serving approximately 73,600 persons in 72 Mouzas and is performing satisfactorily. The reservoir is also the source of another two proposed surface water based piped water supply schemes of PHED:(i) 27 MLD in Khatara, Hirbandh and Ranibandh blocks of Bankura district and (ii) 65 MLD for Manbazar and Bunduan blocks of adjacent Puruliya district. Based on the Mukutmanipur reservoir data of 2005-15 and considering the lowest water storage during lean season as on 1st June before onset of monsoon: the average water storage calculated is 86,440 MLD. The total ultimate abstraction for the WTP is 44 MLD up to design year 2050, which is only 0.03% of the total volume of available water during lean season (February to May). Therefore, the reservoir water is sufficient to meet the demand of the project during lean period. Quality of raw water is, in general, of acceptable quality and that which can be used for potable purposes after conventional treatment and disinfection. This further justifies considering the Mukutmanipur reservoir as the potential sustainable source of raw water. There are no notable pollution sources near the intake. There are no wastewater disposal points in the upstream vicinity of the intake. Further assessment for possible adverse impacts on aquatic species from construction and operations of the water intake and jetty will be conducted as per requirement.

15. The Irrigation and Waterways Department (IWD) has already given the permission of drawl of 32 MLD raw water vide Memo No. 263/1(6)-1, dated 22.6.2017 and for additional 12 MLD vide Memo No. 06-I-4M-48/2012, dated 14.01.21 (Total 44 MLD) for drinking water purpose under the Bankura water supply project.

16. Previously the WTP for the said project was proposed on an 8 acres land parcel belongs to I&WD at Lohadihi Mouza. The relinquishment was done in favour of the project and also CTE was approved by WBPCB. However, some critical issues developed regarding the approach road to the site as it belonged to few tribal families. Despite several initiatives taken by the department the issue remained unresolved. Thereafter, after careful searching, the department has decided to shift the WTP location to 9.35 acres Government vested land belongs to I&WD located at Kungarbahal and Jhantipahari Mouza under Khatra Block. The proposed site is adjacent to intake site. Land possession has been received from concerned department. Also, Consent to Establish- CTE (Amendment of earlier CTE) received from WBPCB for new location of WTP.

17. The coordinates of the new WTP location are 22.98 °N and 86.76° E. The Topography of the site is undulating, average elevation is about 140 m above the mean sea level. There are no major trees except ground vegetation and few small trees. No tree felling is required at the site. The same approach road which connects the intake site to the nearby villages will be used to reach the WTP

site. As per local enquiries carried out during field visits, the site is not prone to flooding and is not used for agriculture or cattle grazing purpose by the local villagers. The proposed GLSR is located at Gobindapur Mouza of the Indpur block and is easily accessible by State Highway No. 2 (SH 2). The land of GLSR- is privately owned land purchased through negotiated settlement. Overall, there are no notable sensitive environmental features in both new WTP and GLSR sites. After revision of alignment design total length of the primary transmission main (CWTM) is about 22.36 km (final surveyed length) from new WTP to GLSR. There is no tree on the alignment.

18. **Potential Environmental Impacts.** The subproject is unlikely to cause significant adverse impacts considering: (i) the components will involve general civil construction work with limited or no impact during operational period; (ii) there are no significant sensitive environmental features in the project sites and (iii) predicted impacts are site-specific and likely to be associated with the construction process and are produced because the process is invasive, involving excavation and earth movements. Raw water source is Mukutmanipur reservoir, which has abundant storage of water throughout the year even during lean seasons. Quality of raw water is, in general, of acceptable quality and that which can be used for potable purposes after conventional treatment and disinfection.

19. The GLSR- sites have few small trees, however no tree felling is anticipated after final survey and design. Approximately 22.36 km length of primary transmission main from WTP to GLSR will be laid along the edge of the roads. It is proposed that the primary rising main shall be laid primarily through open cut method. However, the laying of the rising main through open cut method may not be feasible at major junctions (State/National Highway crossings), congested market areas and crossing over Hatirampur canal and Silabati river. It is proposed that the transmission main will be laid by 150 m trenchless method at congested area and crossing over of river & canal through pipe bridges as per requirement in these stretches.

20. Construction activities shall be confined to the selected sites, and the interference with the general public and community around is minimal. There will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.), mining of construction material, occupational health and safety aspects. During the construction phase of pipeline work along the public roads, impacts arise from the construction dust and noise; disturbance to residents, businesses, traffic by the construction work, and from the need to dispose of surplus soil. The social impacts (access disruptions) due to construction activities are minimal.

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

22. **Environmental Management Plan.** An environmental management plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels. Locations and site-selection of the proposed infrastructures were considered to further reduce impacts. The EMP includes design and location related measures such as (i) wash water recovery in WTP to improve the efficiency and avoid wastewater generation and disposal; (ii) collection, treatment and beneficial use of treated sludge; (iii) chlorine safety, (iv) energy efficient pumping system, and (v) noise controls.

23. The EMP includes during construction activities, mitigation measures such as (i) barricading, dust suppression and control measures (ii) traffic management measures for work along the roads and for hauling activities; (iii) provision of walkways and planks over trenches to ensure that access will not be impeded; (iv) finding beneficial use of excavated materials to an extent that shall render it possible to reduce the quantity that will be disposed of and (v) Implement all site-specific occupational health and safety (OHS) Plan as per the “Standard Operating Procedure for Prevention and Risk Minimization of Corona Virus Disease (COVID-19) at the Facilities and Work Sites” developed by PMU and implemented measures such as: (a) excluding public from the site; (b) personal hygiene, disinfection and maintaining social distancing; (c) ensuring all workers are provided with and use personal protective equipment including face mask; (d) Occupational Health Safety (OHS) Training and COVID 19 awareness training for all site personnel. EMP guides the environmentally-sound construction of the subproject. EMP includes a monitoring program to measure the effectiveness of EMP implementation and includes observations on- and off-site, document checks, and interviews with workers and beneficiaries.

24. The contractor has submitted to PIU, for review and approval, a site specific environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved SEMP; (iii) monitoring program as per SEMP; (iv) application of Health and Safety Plan for personal protection and protection from COVID 19 infection and (v) budget for SEMP implementation. No works are allowed to commence prior to approval of SEMP. A copy of the EMP/approved SEMP is kept on site during the construction period at all times. The EMP is included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

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

26. **Monitoring and Reporting.** The PMU and PIUs is responsible for monitoring, and submits semi-annual environment monitoring reports to ADB. ADB posts the environmental monitoring reports on its website. Later, accepted reports are disclosed in project website.

27. **Conclusion and Recommendations.** As per ADB SPS, the project is classified as environmental Category B and does not require further environmental impact assessment. However, to conform to government guidelines WTP requires consent to establish (CTE) and consent for operate (CTO) from West Bengal Pollution Control Board. Consent to Establish (CTE) for changed WTP site is obtained from West Bengal Pollution control board. This IEE report has been updated covering the night work under the project and minor change in pipeline length. No additional impact is expected. Report will be reviewed and approved by PMU, and further submitted to ADB for approval. In case of any change of location, design and scope IEE will be updated further for approval of ADB.

## I. INTRODUCTION

### A. Background

1. West Bengal Drinking Water Sector Improvement Project (WBDWSIP) aims to provide safe, reliable and continuous drinking water as per Government of India's standard to about 2.6 million people in the Arsenic, Fluoride, and salinity affected selected areas of North 24 Parganas, South 24 Parganas, East Medinipur and Bankura districts of West Bengal.

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

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

- (i) **Output 1: Climate resilient drinking water infrastructure constructed.** The project will provide a minimum of 70 lpcd of continuous potable water through metered connections to the households in selected areas of the project districts. The distribution systems will be designed on a DMA basis. Both the bulk and the distribution systems will be integrated with modern STWM and monitoring tools, including supervisory control and data acquisition and geographic information systems. Bulk water supply systems, consisting of intakes, water treatment plants, and transmission mains, will be sized to provide water supply enroute to urban and rural areas. They will be connected into a grid with the existing and the new systems in the project districts, where feasible, to reduce redundancy, improve resilience, and efficiently manage the system; and
- (ii) **Output 2: Institutions and capacity of stakeholders for drinking water service delivery strengthened.** The Project will strengthen institutional structures and capacity of PHED, the bulk water supplier up to the Gram Panchayats, and project Gram Panchayats - for efficient and sustainable drinking water service delivery. It will support and enable them to conduct web-based water quantity and quality monitoring, electronic billing and collections, meter reading, and accounting. To ensure long-term asset sustainability and service delivery, GoWB will issue Government order defining roles and responsibilities of PHED and project Gram Panchayats for sustainable asset management and service delivery which each project Gram Panchayats will endorse prior to commissioning of the system. The Project will introduce innovative practices and high technology on smart water management to create a model for rural water service delivery and bulk water supply systems for the state and the country. It will provide skill training, and generate employment for about 350 locals, of which 33 percent (%) minimum are expected to be women. It will support the Project Gram

Panchayats in creating public awareness on water conservation; water, sanitation and hygiene (WASH); and livelihood enhancement in Project Gram Panchayats. It will also support the state to strengthen water and sanitation safety planning, develop regulatory framework and piloting for septage management in West Bengal.

4. WBDWSIP targets three districts: North 24 Parganas district is the most Arsenic-affected district in West Bengal; Bankura is heavily affected by Fluoride, and East Medinipur is affected by Salinity. These districts are also one of the most water-stressed districts in West Bengal as they are reliant on depleting groundwater sources. Overall, the Project is intended to meet the requirements of “VISION 2020”, endorsed by the GOWB and in line within the guidelines and implementation frame-work of National Rural Drinking Water Program (NRDWP).

5. In line with the national objectives, GoWB has decided to consistently ensure the availability of safe and acceptable drinking water supply in sufficient quantity to the district of Bankura, which has been affected by Fluoride contamination (10 of the 22 Blocks in Bankura are affected by Fluoride contamination). The need for comprehensive piped water supply was necessitated on account of the absence of reliable<sup>1</sup> and sustainable ground water sources<sup>2</sup>, poor coverage of piped water supply and also in the backdrop of social backwardness and high tribal population<sup>3</sup>.

6. Based on the water quality test results and analysis, it may be inferred that pattern of fluoride contamination in the district varies from being severely affected to blocks which remain unaffected. A matrix has been framed to separate out the blocks which are critically affected by fluoride contamination from those which are only moderately affected or unaffected. The details of the severity of the Blocks affected by fluoride contamination within Bankura is given below:

**Table 1: Severity of Blocks Affected by Fluoride Contamination**

Sr. No.	Fluoride Contamination	Name of Blocks	Number of Blocks
1	Critically affected	Bankura-II, Barjora, Chhatna, Gangajalghati, Hirbandh, Mejhia, Raipur, Saltora, Simlapal and Taldangra, Indpur,	11
2	Moderately affected	Bankura-I, Indus, Khatra, Onda, Sarenga and Sonamukhi	6
3	Un-affected	Bishnupur, Joypur, Kotulpur, Patrasayer and Ranibundh	5
<b>Total Number of Blocks</b>			22

7. Based on the various investigations and lithological study (as provided in the Central Ground Water Board brochure), the blocks in Bankura can be categorized with respect to ground water potential to make an even comparison on the water security scenario. The Central Ground Water Board (CGWB) in its ground water brochure has indicated 3 major issues related to Bankura district, namely: (i) fluoride contamination (ii) iron concentration beyond permissible limit and (iii) declining ground water levels. To make a fair assessment of the criticality of the blocks, it is imperative that a broader framework be prepared and emphasis be provided to the blocks which are severely water stressed.

<sup>1</sup> As per the Central Ground Water Board Report, the blocks in the western part of the district have hydro-geological formations, which are unsuitable for large scale water abstraction.

<sup>2</sup> An assessed 4.6% of rural households in Bankura have treated tap water as per the District Census handbook for Bankura-2011.

<sup>3</sup> An estimated 33.5% of rural population are Scheduled Castes and 11.5% belong to the Schedule Tribes as per the District Census handbook for Bankura-2011.

**Table 2: Groundwater Potential of Blocks in Bankura**

Sr. No	Ground Water Potential	Name of Blocks	Number of Blocks
1	Poor	Bankura-I and II, Chhatna, Gangajalghati, Hirbunadh, Indpur, Khatra, Mejhia, Onda, Ranibunadh, Saltora, Sarenga	12
2	Poor to medium	Joypur, Patrasayer, Raipur, Taldangra,	4
3	Medium to High	Barjora, Bishnupur, Indus, Kotulpur, Simlapal, Sonamukhi	6
<b>Total Number of Blocks</b>			<b>22</b>

Source: CGWB.

8. Presently, the demand of the rural areas within the fold of the selected 2 blocks of Indpur and Taldangra (henceforth referred as project area) is met from ground water and sub-surface sources. With increase in population, and increase in ground water withdrawal (for agricultural and drinking water purposes), the ground water resources are getting depleted. Also, in select areas, the ground water is affected by fluoride contamination.

9. Primarily the prioritization and appraisal of the WS Scheme is based on the Preliminary Project Report prepared by the PHED, as a part of its endeavour to provide Piped Water Supply to the rural areas as per the plan outlined in "VISION-2020". The selected 2 blocks have been prioritized by PHED for comprehensive coverage with surface based WS Scheme and is proposed for implementation under the WBDWSIP funded by ADB. The objective of the subproject is to provide sustainable water supply at a rate 70 litres per capita per day (lpcd) to each household in all habitations in the Indpur and Taldangra blocks. A detailed description of the components is provided in Section III.

## **B. Purpose of the Initial Environmental Examination Report**

10. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. The potential environmental impacts of the subproject have been assessed using ADB rapid environmental assessment (REA) checklist for water supply (**Appendix 1**). Then potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure, and results of the assessment show that the subproject is unlikely to cause significant adverse impacts. Thus, this initial environmental examination (IEE) has been prepared in accordance with ADB SPS's requirements for environment category B projects.

11. Initial bidding stage IEE was based on the preliminary project report prepared by PHED and a technical due diligence report prepared by the project preparatory technical assistance (PPTA) team. Earlier in March 2022 IEE report updated due to changed WTP site and CWTM length and also activities undertaken during implementation stage by design, build and operate (DBO) contractor. The approved updated IEE is further updated now covering the night work under the project and minor change in pipeline length. This document may be further updated to reflect any new/ additional changes in design and/ or scope in future. The updated IEE is based on field reconnaissance surveys, secondary sources of information, base line data and limited during construction data of environmental parameters. Field monitoring (environmental) survey was conducted as part of the environmental management plan (EMP) to establish the baseline environmental conditions prior to commencement of civil works by the contractors. The results are reported as part of the environmental monitoring report and forms the basis to ensure no degradation takes place during subproject implementation. Stakeholder consultation has been

considered as an integral part of the IEE.

### **C. Report Structure**

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

- (i) Executive summary;
- (ii) Introduction;
- (iii) Description of the project;
- (iv) Policy, legal and administrative framework
- (v) Description of the environment;
- (vi) Anticipated environmental impacts and mitigation measures;
- (vii) Public consultation and information disclosure;
- (viii) Grievance redress mechanism;
- (ix) Environmental management plan; and
- (x) Conclusion and recommendation.

## II. DESCRIPTION OF THE PROJECT

### A. Project Area

13. The project area falls in Bankura district of West Bengal. Bankura is located in the western part of the State of West Bengal. The District Bankura is bounded by latitude 22°38' N and longitude 86°36' E to 87°47' E. The Damodar river flows along the northern boundary of the district. The district is bounded by Bardhaman in the north, Purulia in the west and Paschim Medinipur in the south.

14. The total area of Bankura district<sup>4</sup> is 6882 km<sup>2</sup>. As per the latest Census data (2011), the population of the district<sup>5</sup> is 3,596,674. It is the 3rd least populated district in West Bengal (After Alipurduar and Purulia) with Population Density of 523 persons/km<sup>2</sup>. The district has 22 Panchayet Samitis<sup>6</sup>, with 190 Gram Panchayats<sup>7</sup>, consisting of 3823 Villages and 6638 habitations.

15. The total number of urban centres is 12, of which 3 are Municipalities (Bankura, Bishnupur and Sonamukhi), and the remaining 9 are Census towns<sup>8</sup>, (Khatra, Ledisol, Jhanti Pahari, Kotulpur, Simlapal, Raipur Bazar, Ghutgarya, Barjora and Beliatore). Bankura district has 22 blocks, divided into 3 subdivisions, namely Bankura Sadar, Khatra and Bishnupur. The details of blocks within each subdivision and the municipalities are shown below:

**Table 3: Administrative Division of Bankura**

Sr. No.	Sub-Division	Block Details	Municipality
1	Bankura Sadar	Bankura-I, Bankura-II, Barjora, Chhatna, Gangajalghati, Mejia, Onda and Saltora	Bankura
2	Khatra	Indpur, Khatra, Hirbandh, Raipur, Sarenga, Ranibundh, Simlapal and Taldangra	-
3	Bishnupur	Indas, Joypur, Patrasayer, Kotulpur, Sonamukhi and Bishnupur	Bishnupur and Sonamukhi

16. **Communication Network and Connectivity.** The critical importance of a road network and connectivity to the inhabited villages and in building up of a comprehensive piped water supply network is of paramount importance, considering the need to implement and maintain a sustainable water supply system. While a good road network is appropriate to gain accessibility to the various habitations, a rail network normally creates impediments in the laying of pipeline across them. Bankura does not have an exhaustive rail network. However, it is well connected to Howrah (approximately 235 km) Bardhaman and Asansol.

<sup>4</sup> As per Provisional Census Report 2011 of Bankura District.

<sup>5</sup> District Census Handbook-2011.

<sup>6</sup> The Panchayat Samiti is the rural local self-government system at the block level. They form the middle level of the Panchayati Raj Institutions in India. It acts as a link between Village Panchayats (Gram Panchayats) and Zila Parishad (District council). Each district is divided into a number of blocks and each block consists of a number of adjoining villages (Gram Panchayat). For each block again there is a Panchayat Samiti.

<sup>7</sup> Gram Panchayat is the organization of elected members of Gram Sabha of the village. A Gram Sabha consists of members that include every adult of the village or Gram.

<sup>8</sup> Census Towns (CTs) are rural pockets with (a) A minimum population of 5000 (b) where, at least 75% of the male main working population engaged in non-agricultural pursuits and (c) have a density of population of at least 400 per km<sup>2</sup>.

17. The subproject component locations are in two selected blocks of Indpur and Taldangra. As far as possible, based on the land availability, project components are located within the existing water facilities. Total population of selected 2 project blocks (hereinafter referred to as the Project area) is 304,415 (rural 304.415 and urban nil) as per 2011 census. The total project area is 652.34 km<sup>2</sup> which is totally rural area. The entire project area is located on the left bank of the river Silai and is bounded by Chhatna, Bankura I and Onda Community Development Blocks on the north; Bishnupur (Bankura block) and Garhbeta-II Community Development Blocks of Paschim Medinipur district on the east; Khatra and Simlapal Community Development Blocks on the south and Hirbandh (Bankura) and Pancha Community Development Blocks of Purulia district, on the west. The project area does not have any census town but has 16 Gram Panchayats. Details of project area including Gram Panchayats in each block is shown below:

**Table 4: Details of Project Area and Gram Panchayats**

	Block	Area <sup>a</sup> (km <sup>2</sup> )		Number of Gram Panchayats
		Total	Rural	
1	Indpur	302.60	302.60	7
2	Taldangra	349.74	349.74	9
<b>Total</b>		<b>652.34</b>	<b>652.34</b>	<b>16</b>

<sup>a</sup> District Census Handbook-2011: Bankura. Source: Census 2011.

## B. Existing Water Supply Situation

18. Incidence of ground water level depletion and intrusion of fluoride in ground water is reported from vast area of the district. High iron concentration in groundwater is also recorded in the district. The water demand is met through (i) piped water supply scheme (PWSS) with ground/sub-surface water source, conveyed either through direct pumping and or through an overhead tank (OHR) or (ii) spot sources (primarily hand pumps and shallow tube wells). As per information available in the project report of PHED, out of the 639 habitations in the 2 blocks of Indpur and Taldangra, 56 habitations have been covered with PWSS, while the remaining 583 are still uncovered. The Command area of the scheme comprising of the habitations covered existing PWSS is shown in table below.

**Table 5: Habitations Covered under Piped Water Supply Schemes**

	Name of Block	Total Habitations	Habitations Covered under Piped Water Supply Scheme, Based on			Habitations under Piped Water Supply Scheme	Percentage of Total Habitations connected to Piped Water Supply (%)
			Surface Source	Sub-Surface Source	Ground Water		
1	Indpur <sup>a</sup>	283	-	18	11	29	10
2	Taldangra <sup>b</sup>	356	-	-	27	27	8
<b>Total</b>		<b>639</b>	<b>-</b>	<b>18</b>	<b>38</b>	<b>56</b>	<b>8.76</b>

Source: PHED.

<sup>a</sup> The Sub-surface source is of River Silabati.

<sup>b</sup> Excludes Water Supply Scheme under Dual Use Solar Pump.

19. In effect, only 8.76% of the total rural habitations in the 2 Blocks are connected with piped Water Supply. The impact of ground water abstraction and the associated risks (of Fluoride contamination) in the blocks of Indpur and Taldangra and cannot be undermined. In effect, a

comprehensive piped Water Supply Scheme is essential to be drawn up with respect to sustainable water sources to effectively mitigate the risks and impact of Fluoride contamination.

20. There is no PWSS with surface water source. The PHED has commissioned only one sub-surface water based piped water supply scheme in Indpur block (year 2011-2012) covering a design population of 8,040 in 18 habitations. This scheme known as Goaladanga involves raw water abstraction from river Silabati.

### C. Proposed Project

21. The assessment of net water demand is derived based on (i) Domestic water demand at 70 lpcd and (ii) Institutional Water Demand as 5% of the Domestic Water Demand. Again, Gross water demand to be worked out considering (i) Transmission and Distribution Losses as 10% of the demand and (ii) Treatment Plant Losses as 5%. The net and gross water demand pertaining for the 2 blocks in the design years is worked out below.

**Table 6: Net and Gross Water Demand-Design Years**

	Block	Net Water Demand (MLD)			Raw Water Demand (MLD)		
		Yr-2020	Yr-2035	Yr-2050	Yr-2020	Yr-2035	Yr-2050
1	Indpur	12.9	15.6	18.9	15.1	18.3	22.1
2	Taldangra	12.3	15.2	18.7	14.4	17.7	21.8
<b>Total</b>		<b>25.2</b>	<b>31.2</b>	<b>37.6</b>	<b>29.5</b>	<b>36</b>	<b>43.9</b>

22. Total water demand is 36 million litres per day (MLD) up to design period 2035 and 44 MLD in 2050 and ultimate design of 44 MLD in 2050. The Raw water source is Mukutmanipur reservoir (also known as Kangsabati reservoir). It is located at approximately 3.2 km upstream of the confluence of River Kangsabati and River Kumari. In 1956, a giant water dam/reservoir was constructed at Mukutmanipur, about 12 km from Khatra town in the district of Bankura, West Bengal. The Mukutmanipur reservoir provides major irrigation facilities (the Kangsabati Major Irrigation Project) across Bankura, Purulia, Paschim Medinipur and parts of upper Hooghly.

23. The reservoir has two regulators supplying to a left bank feeder canal of 192 cumec design capacity and a right bank feeder canal of 70 cumec capacity. The left bank feeder after some distance bifurcates into two, the Supur main canal and the Khatra Main canal. Khatra main canal crosses the river Silabati through barrage (Silabati barrage), after which it is known as Indpur main canal. The right bank canal crosses the river Bhairabanki and the river Tarafeni via two barrages (Tarafeni barrage and Bhairabanki barrage) on these rivers. Salient features of the reservoir are given below:

**Table 7: Salient Features of Mukutmanipur Reservoir**

Sr. No.	Description	Remarks
1	Location	Mukutmanipur, District Bankura on the rivers Kangsabati and Kumari about 3.2 km. upstream of their confluence.
2	Type of Dam	Earthen Gravity Dam with Concrete Saddle Spillway
3	Catchment Area	3625 km <sup>2</sup> (1400 miles <sup>2</sup> )
4	Length of Dam	11.27 km (7 miles) including Dyke and Hillock
5	Height of Dam (Max.)	41.15 m (135 ft) above river bed
6	Length of Spillway/No. of Bays	125.00 m (440 ft) 11 (width of each bay 9.14 m)

Sr. No.	Description	Remarks
7	Optimum Pond level	134.11 m (410 ft)
8	Design flood level	135.63 m (445 ft)
9	Design Discharge	5663.32 cumecs (2,00,000 cusecs)
10	Total storage (DS and LS)	103614.16 ha m (8,40,000 ac. ft.)
11	Total submerged area	13,668 ha (33,760 acre)
12	Canal and Barrage Discharge	Left - 192.55 cumecs (6,800 cusecs) Right - 70.75 cumecs (2,500 cusecs)
13	Pickup Barrages	i) Silabati, ii) Bhairabanki, iii) Tarafeni

cumec =cubic meter per second, ft = foot, ha = hectare, km = kilometre, m = meter, km<sup>2</sup> = square kilometre.  
Source: Irrigation and Waterways Department, GOWB.

24. Mukutmanipur reservoir has abundant flow throughout the year even during lean seasons. WBPHED already has a water supply scheme of 6.09 MLD from Mukutmanipur reservoir commissioned in the year 2008 for supplying water to Khatara and Ranibandh blocks serving approximately 73,600 persons in 72 Mouzas and is performing satisfactorily. The reservoir is also the source of another two proposed surface water based piped water supply schemes of PHED: (i) 27 MLD in Khatra, Hirbandh and Ranibandh blocks of Bankura district and (ii) 65 MLD for Manbazar and Bunduan blocks of adjacent Puruliya district. Based on the Mukutmanipur reservoir data of 2005-15 (**Appendix 20**) and considering the lowest water storage during lean season as on 1<sup>st</sup> June before onset of monsoon: the average water storage calculated is 86,440 MLD. The total ultimate abstraction for the water treatment plant (WTP) is 44 MLD up to design year 2050, which comprises only 0.03% of the total volume of available water during lean season (February to May). Therefore, the reservoir water is sufficient to meet the demand of the project during lean period. Quality of raw water is, in general, of acceptable quality and that which can be used for potable purposes after conventional treatment and disinfection. This further justifies considering the Mukutmanipur reservoir as the potential sustainable source of raw water. There are no notable pollution sources near the intake. There are no wastewater disposal points in the upstream vicinity of the intake.

25. The Irrigation and Waterways Department (IWD) has initially given a permission of drawl of 32 MLD raw water vide Memo no. 263/1(6)-1, dated 22 June 2017 for the project (**Appendix 14**). Further permission is given vide Memo No. 06-I-4M-48/2012, dated 14.01.21 for abstraction of additional 12 MLD water (Total 44 MLD) from the reservoir for drinking water purpose under the Bankura water supply project (**Appendix 14**).

26. The overall improvement plan is to tap the raw water from Mukutmanipur reservoir and treat the water at WTP close to the intake point. The proposed WTP land belongs to Irrigation and Waterways Department, Government of West Bengal (IWD). The treated water will be pumped to intermediate GLSR located at Gobindapur mouza of Indpur block. The revised alignment design indicated that the length of the primary transmission main (CWTM) from WTP to GLSR is around 22.36 km.

27. Following Table (**Table 8**) shows the nature and size of the various components of the subproject. Location of subproject components and layout plans are shown in **Figure 1 to Figure 8**.

**Table 8: Proposed Water Supply Subproject Components**

Infrastructure	Function	Description	Location
Raw water intake	(i) Abstract water from	Intake well cum pump	22.984015° N latitude and

<b>Infrastructure</b>	<b>Function</b>	<b>Description</b>	<b>Location</b>
with approach bridge and substation	the Mukutmanipur reservoir and pump it to water treatment plant (WTP) inlet	house and approach bridge. Mukutmanipur reservoir has abundant water throughout the year. Quality of reservoir/river water is in general of acceptable quality, which can be used for potable purposes after conventional treatment and disinfection. The Irrigation and Waterways Department (IWD) has given the permission of drawl of 44 million litres per day (MLD) raw water. The subcomponents of intake are intake pump house and intake approach bridge	86.781074 <sup>0</sup> E Longitude. Average GL=133.012 m Raw water source for the subproject is Mukutmanipur reservoir. The proposed intake site is located at Satsol Mouza of Khatra block. Substation for intake is located at Kunar Bahal Mouza. There are no notable pollution sources near the intake. There are no wastewater disposal points in the upstream vicinity of the intake.
Raw Water Main from Intake	Raw water main will be laid to supply raw water from intake to WTP with the help of raw water pumping machineries.	The raw water main (approx. 650 m) is proposed to follow the shortest possible route, keeping in view the velocity considerations to avoid silting and other physical considerations. Based on an assessed velocity (of minimum 1.2 m/s and maximum 2.4 m/s), the indicative pipe diameter of 800 millimetres (mm)	Pipe supporting bridge will be constructed for installation of raw water main to transmit raw water from intake to WTP.
Water Treatment Plant	Treatment of raw water to meet the drinking water standards. Conventional water treatment is proposed to treat the raw water from the Mukutmanipur reservoir.	44 MLD capacity conventional WTP with the following process: Alum coagulation and flocculation Sedimentation, Rapid gravity filtration, Disinfection with chlorination Wash water recovery Sludge drying beds Water quality testing laboratory Miscellaneous infrastructure (Administrative Building, Laborator, boundary, y Building, Staff Quarters, Guard Rooms, Internal roads and pathways,	The new land is adjacent to the intake site and belongs to I&WD. The coordinates of the proposed WTP location are 22.98622 <sup>0</sup> Lat and 86.765107 <sup>0</sup> Long. The Topography is undulating and ground level of the site and surroundings are about 140 m above the mean sea level. The land is connected by the same approach road used for intake site to the nearby villages. As per local enquiries carried out during field visits, the site is not prone to flooding, and is barren land. The proposed WTP site is

Infrastructure	Function	Description	Location
		Electrical Sub- station). Provision of supervisory control and data acquisition (SCADA) (The operation of the entire Water Treatment plant shall be fully automated with PLC and SCADA system installed in place with provision of manual overriding)	required to be developed including proper drainage infrastructure considering the undulating topography
Primary Transmission Main	Primary Transmission main of approximately 22.36 km to transmit treated water from the WTP to GLSR	The treated water from the WTP will be conveyed to GLSR. Since, the location of the (Intake and) WTP is on one side of the Project area, a single transmission main will be laid with progressively reduced diameters is proposed to feed the proposed GLSR.	The Primary transmission main will be laid along the edge of the roads. The rising main is proposed to be laid primarily through open cut method. However, the laying of the rising main through open cut method may not be feasible at major road crossings and congested market areas. About 150 m of the Primary transmission main out of total 22.36 km length is proposed to be laid by trenchless methods
Ground Level Storage Reservoir (GLSR)	Store treated water from WTP for supply to ground level storage reservoirs (GLSR)	Reservoir storage capacity is 2500 KL	Latitude 23.0715° N Longitude. 86.9056° E Average GL 110 m above msl. The identified site of GLSR is at Gobindapur mouza of Indpur block and located on easily accessible SH 2. The land of GLSR is privately owned land and procured from private owner(s). There are no notable sensitive environmental features in and around the site.

#### D. Work Completed and Undergoing

28. Following activity completed and undergoing upto May 2024,
- Bathymetric Survey is completed
  - Topography Survey completed including new WTP land near intake.
  - Finalization of Intake Well and WTP site Location done
  - Resistivity Survey is completed.
  - Geotechnical Survey is completed.
  - Test pile and load testing completed. 27 nos. pile in land portion and 58 nos. in water portion is completed.
  - 07 Nos. pile cap completed out of 17 Nos. & 06 Nos. pier cap completed out of 17 Nos

- At WTP site- Clariflocculator 1- 5th lift wall of flocculator area casted and 6th lift wall is in progress. 3rd lift wall with launder casted & 4th lift reinforcement work is in progress.
- At WTP site- Clariflocculator 2- Upto 3rd lift RCC completed with launder. 4th lift reinforcement and shuttering work is in progress.
- Staff Quarter- RCC of tie beam completed & above column reinforcement work is in progress.
- Construction work started at GLSR site.
- 70 Nos. PCC for Isolated footings completed out of 70 Nos. 70 Nos. column footing completed out of 70 Nos. GLSR base Raft RCC completed and W5 wall casting completed up to base raft at Gobindpur GLSR.
- CWRM of 700 mm dia laid 8.873 KM completed
- CWRM pipe Total Procured 9.559 KM.

29. Photo illustration of present activity at sites are shown in **Appendix 10**.

30. **Implementation Schedule.** The project is being implemented on a design build and operation (DBO) contract. Bids was invited on 11<sup>th</sup> April 2018, and the contract started on 24<sup>th</sup> January 2019. The Operation and Maintenance period is for 2 years.

Figure 1: Proposed Subproject Components, Raw Water and Primary Transmission Main Alignment



Figure 2: Demarcated WTP area



**Figure 3: Demarcated Electrical Sub-station area for Intake**



**Figure 4: Photograph of Proposed Mukutmanipur Reservoir Intake Location**



**Figure 5: Proposed New Water Treatment Plant Site**



**Figure 6: Proposed GLSR Site at Gobindapur Village**



Figure 7: Layout Diagram of Proposed New Water Treatment Plant

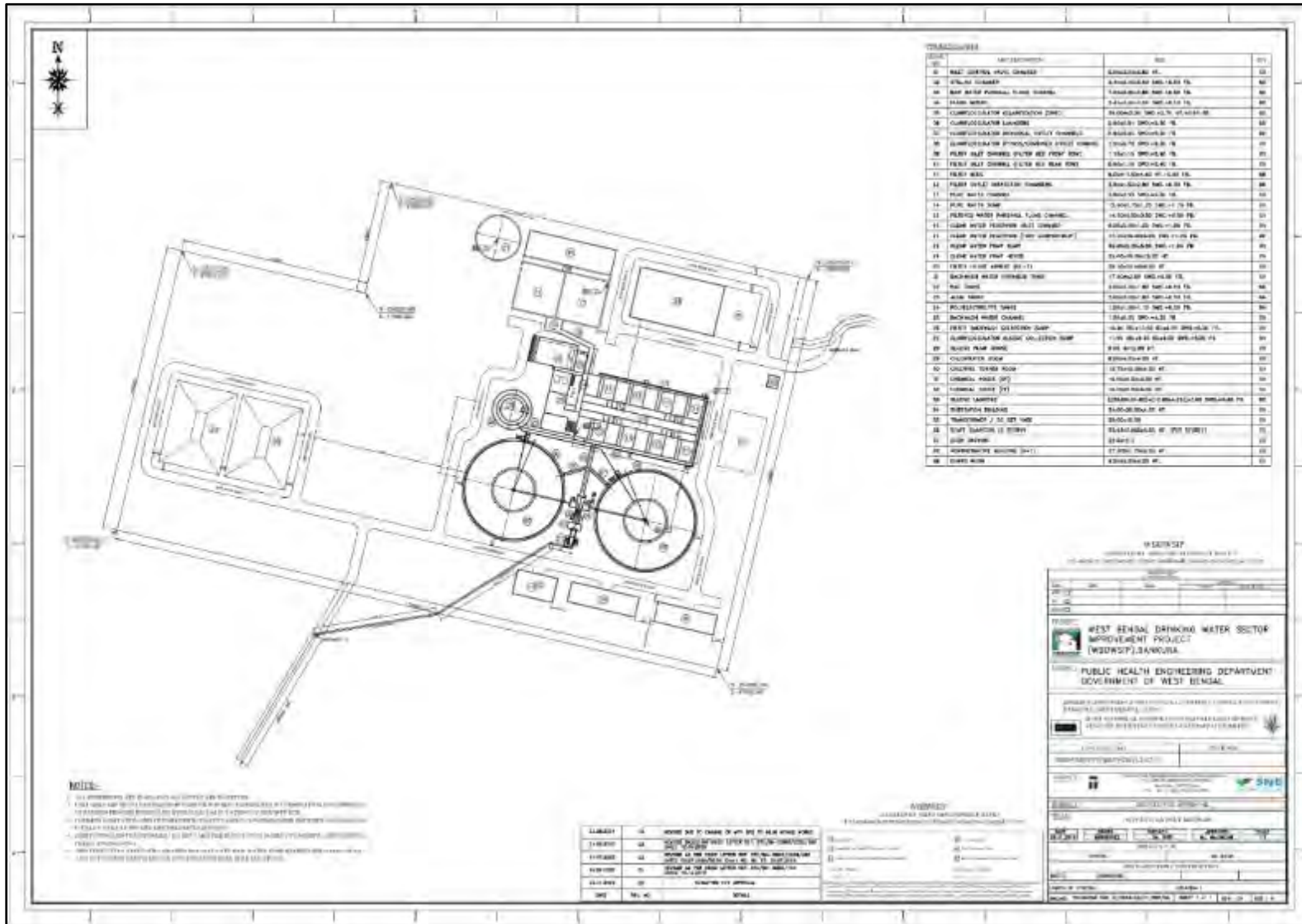
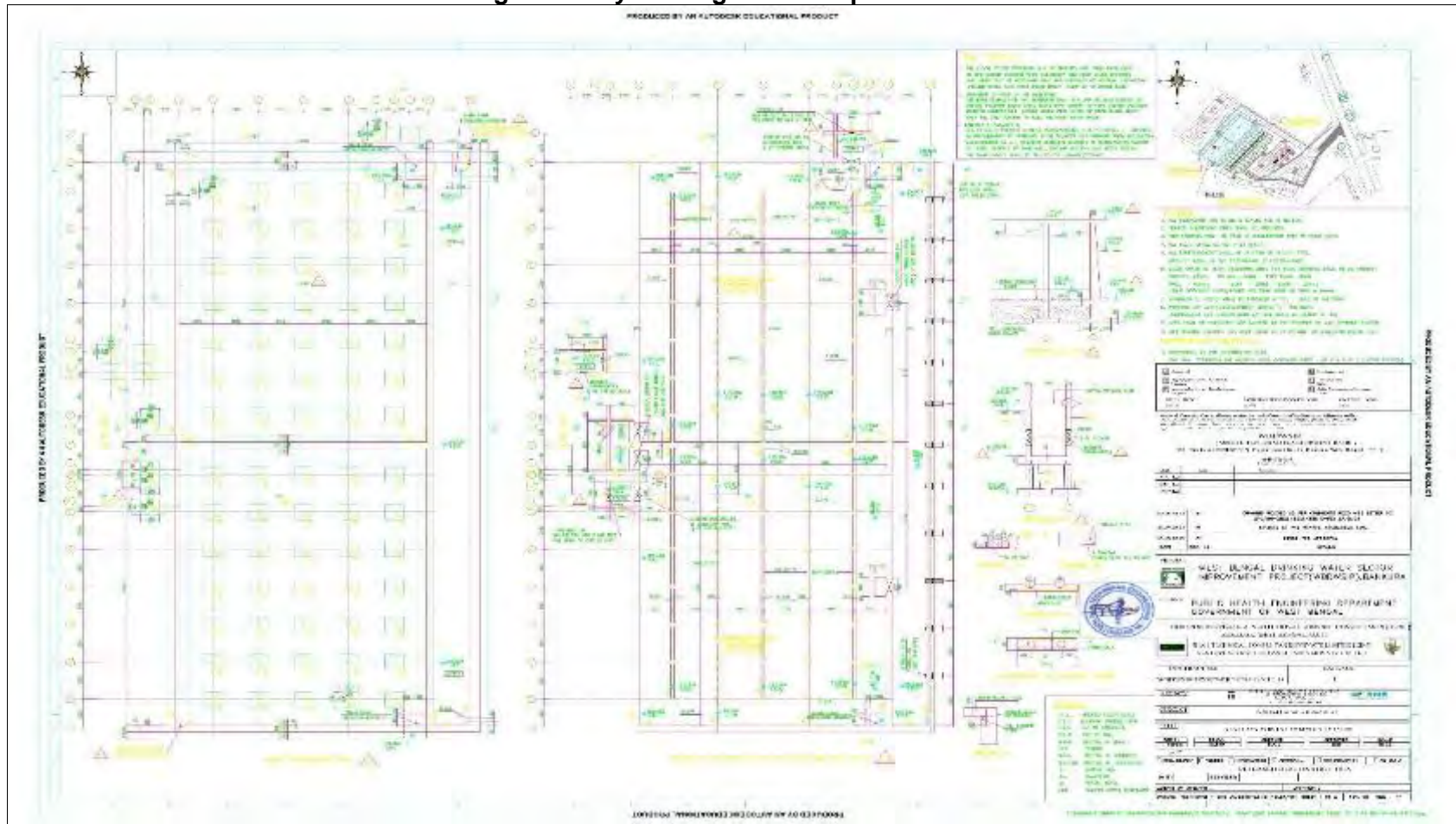


Figure 8: Layout Diagram of Proposed GLSR



### III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

#### A. ADB Policy

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

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

- (i) **Category A.** Projects could have significant adverse environmental impacts. An EIA is required to address significant impacts.
- (ii) **Category B.** Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.
- (iii) **Category C.** Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.
- (iv) **Category FI.** Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all projects will result in insignificant impacts.

33. **Environmental Management Plan.** An environmental management plan (EMP), which addresses the potential impacts and risks identified by the environmental assessment, shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the project's impact and risks.

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

- (i) for environmental category A projects, draft EIA report at least 120 days before Board consideration;
- (ii) final or updated EIA and/or IEE upon receipt; and
- (iii) environmental monitoring reports submitted by the implementing agency during project implementation upon receipt.

35. **Consultation and Participation.** ADB SPS require borrower to conduct meaningful consultation<sup>9</sup> with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. The consultation process and its results are to be documented and reflected in the environmental assessment report.

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<sup>9</sup> As per ADB SPS, 2009, meaningful consultation means a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues

36. **Grievance Redress Mechanism.** ADB SPS require borrowers to establish a mechanism to receive and facilitate resolution of affected people's concerns, complaints, and grievances about the subproject's performance. The grievance mechanism shall be scaled to the risks and adverse impacts of the subproject.

37. **Monitoring and Reporting.** Borrower shall monitor, measure and document the implementation progress of the EMP. If necessary, the borrower shall identify the necessary corrective actions, and reflect them in a corrective action plan. Borrower shall prepare and submit to ADB semi-annual environmental monitoring reports that describe progress with implementation of the EMP and compliance issues and corrective actions, if any. For sub projects likely to have significant adverse environmental impacts during operation, reporting will continue at the minimum on an annual basis until ADB issues a project completion report.

38. **Unanticipated Environmental Impacts.** Where unanticipated environmental impacts become apparent during subproject implementation, ADB SPS requires the borrower to update the environmental assessment and EMP or prepare a new environmental assessment and EMP to assess the potential impacts, evaluate the alternatives, and outline mitigation measures and resources to address those impacts.

39. **Occupational Health and Safety.** ADB SPS requires the borrower<sup>10</sup> to ensure that workers<sup>11</sup> are provided with a safe and healthy working environment, taking into account risks inherent to the sector and specific classes of hazards in the subproject work areas, including physical, chemical, biological, and radiological hazards. Borrower shall take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work, including: (i) identifying and minimizing, so far as reasonably practicable, the causes of potential hazards to workers; (ii) providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) providing appropriate equipment to minimize risks and requiring and enforcing its use; (iv) training workers and providing them with appropriate incentives to use and comply with health and safety procedures and protective equipment; (v) documenting and reporting occupational accidents, diseases, and incidents; and (vi) having emergency prevention, preparedness, and response arrangements in place. In addition, COVID 19 risks and protection measures are pointed out under mitigation measures and EMP.

40. **Community Health and Safety.** ADB SPS requires the borrower to identify and assess risks to, and potential impacts on, the safety of affected communities during the design, construction, operation, and decommissioning of the subproject, and shall establish preventive measures and plans to address them in a manner commensurate with the identified risks and impacts.

41. **Physical Cultural Resources.** Borrower is responsible for siting and designing the subproject to avoid significant damage to physical cultural resources. ADB SPS requires that such resources likely to be affected by the subproject are identified, and qualified and experienced experts assess the subproject's potential impacts on these resources using field-based surveys as an integral part of the environmental assessment process. When the proposed location of a subproject component is in areas where physical cultural resources are expected to be found as

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<sup>10</sup>In case where responsibility is delegated to subproject contractors during construction phase, borrower shall ensure that the responsibilities on occupational health and safety are included in the contract documents

<sup>11</sup>Including nonemployee workers engaged by the borrower/client through contractors or other intermediaries to work on project sites or perform work directly related to the project's core functions.

determined during the environmental assessment process, chance finds procedures shall be included in the EMP.

42. **ADB SPS International Best Practice Requirements.** ADB SPS requires that, during the design, construction, and operation of the project, the executing agency shall apply pollution prevention and control technologies and practices that are consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines {IFC's General EHS Guidelines<sup>12</sup>, WHO Interim Guidance (and its updates) on Water, Sanitation, Hygiene and Waste management for the COVID 19 virus and Sector Specific (Water and Sanitation) Guidelines<sup>13</sup>}. These standards contain performance levels and measures that are normally acceptable and applicable to projects. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of India regulations differ from these levels and measures, the PMU and PIUs will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU and PIUs will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

## **B. National Environmental Laws**

43. **Environmental Assessment.** The Government of India EIA Notification of 2006 (replacing the EIA Notification of 1994), sets out the requirement for Environmental Assessment in India. This states that Environmental Clearance is required for specified activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts.

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

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

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

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<sup>12</sup><https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES>

<sup>13</sup><https://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERES>

47. **Applicable Environmental Regulations.** Besides EIA Notification 2006, there are various other acts, rules, policies and regulations currently in force in India that deal with environmental issues that could apply to infrastructure development. The specific regulatory compliance requirements of the subproject are shown in **Table 9**.

**Table 9: Applicable Environmental Regulations**

Law	Description	Requirement
Environment (Protection) Act, 1986 and Central Pollution Control Board (CPCB) Environmental Standards.	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards	<b>Appendix 2</b> provides applicable standards for ambient air quality. <b>Appendix 3</b> provides vehicular emission norms
Noise Pollution (Regulation and Control) Rules, 2000 amended up to 2010.	Rule 3 of the Act specifies ambient air quality standards in respect of noise for different areas/zones.	<b>Appendix 4</b> provides applicable noise standards.
Air (Prevention and Control of Pollution) Act, 1981, amended 1987 and its Rules, 1982.	- Applicable for equipment and machinery's potential to emit air pollution (including but not limited to diesel generators and vehicles); - CTE and CTO from WBPCB; - Compliance to conditions and emissions standards stipulated in the CTE and CTO.	All relevant forms, prescribed fees and procedures to obtain the CTE and CTO can be found in the WBPCB website ( <a href="http://www.wbpcb.gov.in">www.wbpcb.gov.in</a> ). CTE for WTP obtained. Amendment of CTE due to change in WTP location is also obtained ( <b>Appendix 16</b> )
Direction of West Bengal Department of Environment under the Air Act, 1981 Direction No. EN/3170/T-IV-7 /001/2009 dated: 10 December 2009	- issued based on a study by WBPCB with help of ADB on air pollution from construction activities - lays out norms for control of air pollution from construction activities - prescribes two sets of norms: preventive measures, and practices to be discarded - failure to comply will lead to legal action, stoppage of work etc., -All construction activities under WBDWSIP shall follow the norms	<b>Appendix 6</b> provides the pollution control measures indicated in the direction
West Bengal Inland Fisheries Act, 1984 (Amendment) Act, 1997	Act to conserve, develop, propagate, protect, exploitation of inland fish and fisheries. -No discharge of wastewater, pollutants into inland water bodies that may affect fish. -Prohibits conversion of fishery area (any water area, naturally or artificially depressed land, irrespective of ownership, measuring 0.035 hectares (ha) or more, which retains water for more than 6 months and capable of being used as fishery) for any other purpose. - prohibits filling up fishery areas to convert into solid land, e. g., for any construction. -Prohibits dividing water area into parts to make any part less than 0.035 ha. -if conversion/ filling up is for development works, prior permission is required	Project sites is not located in such areas

Law	Description	Requirement
Municipal Solid Wastes Management Rules, 2016	Rules to manage municipal solid waste generated; provides rules for segregation, storage, collection, processing and disposal.	Solid waste generated at proposed facilities shall be managed and disposed in accordance with the MSWM Rules
Construction and Demolition Waste Management Rules, 2016	Rules to manage construction and to waste resulting from construction, re-modelling, repair and demolition of any civil structure. Rules define C and D waste as waste comprising of building materials, debris resulting from construction, re-modelling, repair and demolition of any civil structure.	Construction and demolition waste generated from the project construction shall be managed and disposed as per the rules <b>(Appendix 5)</b>
Labor Laws	The contractor shall not make employment decisions based upon personal characteristics unrelated to job requirements. The contractor shall base the employment relationship upon equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment or retirement, and discipline. The contractor shall provide equal wages and benefits to men and women for work of equal value or type.	<b>Appendix 7</b> provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works.
West Bengal Trees (Protection and Conservation in Non-Forest Areas) Act, 2006	This Act has put restriction on felling of trees in the State unless until permitted by the Tree Officer. Any person desiring to fell a tree shall apply in writing to the tree officer for permission in that behalf. It further defines clauses for planting adequate number of trees, planting in place of fallen/destroyed trees, preservation of trees and adoption of trees.	In case of tree felling NOC needs to be obtained from concerned dept. No tree felling is anticipated as per finalized design.
Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010	The Rules designate areas within a radius of 100 meters (m) and 300 m from the “protected property” as “protected area” and “controlled area” respectively. No development activity (including mining operations and construction) is permitted in the “protected area” and all development activities likely to damage the protected property are not permitted in the “controlled area” without prior permission of the Archaeological Survey of India (ASI). Protected property includes the site, remains, and monuments protected by ASI or the State Department of Archaeology.	There are no protected properties near project area. However, in case of chance finds, the contractors will be required to follow a protocol as defined in the Environmental Management Plan (EMP).

Law	Description	Requirement
Hazardous Waste Rules 2016	Responsibilities of the occupier for management of hazardous and other wastes: (1) For the management of hazardous and other wastes, an occupier shall follow the following steps, namely, (a) prevention; (b) minimization; (c) reuse, (d) recycling; (e) recovery, utilisation including co-processing; (f) safe disposal. (2) The occupier shall be responsible for safe and environmentally sound management of hazardous and other wastes. (3) The hazardous and other wastes generated in the establishment of an occupier shall be sent or sold to an authorised actual user or shall be disposed of in an authorised disposal facility. (4) The hazardous and other wastes shall be transported from an occupier's establishment to an authorised actual user or to an authorised disposal facility in accordance with the provisions of these rules. (5) The occupier who intends to get its hazardous and other wastes treated and disposed of by the operator of a treatment, storage and disposal facility shall give to the operator of that facility, such specific information as may be needed for safe storage and disposal. (6) The occupier shall take all the steps while managing hazardous and other wastes to- 6 (a) contain contaminants and prevent accidents and limit their consequences on human beings and the environment; and (b) provide persons working in the site with appropriate training, equipment and the information necessary to ensure their safety.	Contractor to comply all the requirements of this Act during construction works.

### C. Other Permission from Statutory Authorities

48. Clearances / permissions to be obtained prior to start of construction. **Table 10** shows the list of clearances/permissions required for project construction. This list is indicative and the contractor should ascertain the requirements prior to start of the construction, and obtain all necessary clearances/permission prior to start of construction. PMU/PIU will be overall responsible for supervision in getting all clearances and provide details to ADB through semi-annual report.

**Table 10: Clearances and permissions required for Construction activities**

Sr. No	Construction Activity	Statute under which Clearance is Required	Implementation	Supervision	Remarks
1	Permission for Abstraction of raw water	Abstraction of raw water from	PIU	PIU and PMU	Irrigation and Waterways Dept. (IWD)

Sr. No	Construction Activity	Statute under which Clearance is Required	Implementation	Supervision	Remarks
		Mukutmanipur Reservoir.			Govt. of West Bengal has given the permission for abstraction 44 MLD raw water from Mukutmanipur Barrage. <b>(Appendix 14)</b>
2	Tree Cutting	State forest department/ Revenue	PIU	PIU and PMU	No tree felling required. Will do as per requirement
3	Diesel Generators, Hot mix plants, Stone Crushers and Batching plants	Consent to operate under Air Act, 1981 from WBPCB	Contractor	PIU	Not required.
4	Storage, handling and transport of hazardous materials	Hazardous Wastes (Management and Handling) Rules, 2016 Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989 from WBPCB	Contractor	PIU	Not required till now.
5	Sand mining, quarries and borrow areas	Permission from District Collector / State Department of Mining	Contractor	PIU	Obtained from licensed quarries
6	New quarries and borrow areas	Environmental clearance under EIA Notification 2006	Contractor	PIU	Not required
7	Temporary traffic diversion measures	District traffic police	Contractor	PIU	Traffic management plan submitted and approved along with SEMP. Weblink of approved SEMP shown in <b>Appendix 17.</b>
8	Permits for Pipe Laying along PWD/ State Highways and National Highways	NOC from SH/ NH Authority and PWD	Contractor- PIU	PIU	Obtained

49. **ADB Safeguard Policy Statement Requirements.** During the design, construction, and operation of the project the PMU and PIUs will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety (EHS) Guidelines. These standards

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

## IV. DESCRIPTION OF THE ENVIRONMENT

### A. Methodology Used for Baseline Study

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

52. The literature survey broadly covered the following:

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

53. **Ocular Inspection.** Several visits to the project sites were made during IEE preparation period in 2016-2017 to assess the existing environment (physical, biological, and socioeconomic) and gather information with regard to the proposed sites and scale of the proposed project. A separate socioeconomic study was conducted to determine the demographic information, existing service levels, stakeholder needs and priorities. During updation of report (2019-24) several time field visit, discussion with stakeholder and generation of primary data with the help of respective contractor have been conducted by Environment safeguard team.

### B. Physical Resources

#### 1. Location, Area and Connectivity

54. Geographically Bankura district is situated between 22°38" North latitudes and 86°36" to 87°46" East longitudes. It is bounded by West Bardhaman and Hugli district to the East, Purulia to the West, District West Bardhaman to the North and Paschim Medinipur to the South. Bankura district is almost triangular in shape with a total area of 6,882 km<sup>2</sup>. Its north to south extension is of 112 km and that of east to west is of 120 km.

55. The population of the district is 3,596,674<sup>14</sup> of which male and female were 1,840,504 and 1,755,788 respectively. It is the 3<sup>rd</sup> least populated district in West Bengal after Alipurduar and Purulia, with Population Density of 523 persons/km<sup>2</sup>. The district has 22 Panchayet Samitis<sup>15</sup>, with 190 Gram Panchayats<sup>16</sup>, consisting of 3823 Villages and 6638 habitations. The total number of urban centres is 12, of which 3 are Municipalities (Bankura, Bishnupur and Sonamukhi), and the remaining 9 are Census towns, (Khatra, Ledisol, Jhanti Pahari, Kotulpur, Simlapal, Raipur Bazar, Ghutgarya, Barjora and Beliatore).

56. Average literacy rate of Bankura in 2011 were 70.95 % compared to 63.44% of 2001. If

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<sup>14</sup> District Census Handbook-2011.

<sup>15</sup> The Panchayat Samiti is the rural local self-government system at the block level. They form the middle level of the Panchayati Raj Institutions in India. It acts as a link between Village Panchayats (Gram Panchayats) and Zila Parishad (District council). Each district is divided into a number of blocks and each block consists of a number of adjoining villages (Gram Panchayat). For each block, again there is a Panchayat Samiti.

<sup>16</sup> Gram Panchayat is the organization of elected members of Gram Sabha of the village. A Gram Sabha consists of members that include every adult of the village or Gram.

things are looked out at gender wise, male and female literacy were 81.00% and 60.44% respectively. With regards to Sex Ratio in Bankura, it stood at 954 per 1000 male compared to 2001 census figure of 952. The details of Blocks within each Sub-division and the Municipalities are tabled below:

**Table 11: Administrative Divisions of Bankura District**

	<b>Sub-Division</b>	<b>Block Details</b>	<b>Municipality</b>
1	Bankura Sadar	Bankura-I, Bankura-II, Barjora, Chhatna, Gangajalghati, Mejia, Onda and Saltora	Bankura
2	Khatra	Indpur, Khatra, Hirbandh, Raipur, Sarenga, Ranibundh, Simlapal and Taldangra	-
3	Bishnupur	Indas, Joypur, Patrasayer, Kotulpur, Sonamukhi and Bishnupur	Bishnupur and Sonamukhi

57. The select two blocks Indpur and Taldangra blocks of Bankura District (hereinafter referred to as the Project area). Indpur is located at 23.1667°N and 86.9333°E. It has an average elevation of 118 m (387 ft). Indpur community development block spreads over from the central parts of the district to the western border with Purulia district. It belongs to the uneven lands/ hard ring rock area. Indpur community development block is bounded by Chhatna and Bankura I CD Blocks on the north, Onda and Taldangra CD Blocks on the east, Khatra and Hirbandh CD Blocks on the south and Pancha CD Block, in Purulia district, on the west.

58. Taldangra is located at 23°01'N and 87°07'E. Taldangra community development block is located in the south-eastern part of the district and belongs to the hard rock area. Taldangra community development block is bounded by Onda community development block on the north, Bishnupur community development block and Garhbeta II CD Block, in Paschim Medinipur district, on the east, Simlapal community development block on the south and Khatra and Indpur CD Blocks on the west

59. Total population of select 2 project blocks is 304,415 (rural 304.415 and urban nil) as per 2011 census. Scheduled Castes numbered 102,435 (33.64%) and Scheduled Tribes numbered 35,600 (11.69%) as per 2011 census. The project area does not have any Census town but has 16 Gram Panchayats. Administrative profile of the 2 blocks is given below:

**Table 12: Block-Wise Profile of the Project Area**

<b>General Information of Block</b>	<b>Project Blocks</b>	
	<b>Indpur</b>	<b>Taldangra</b>
Subdivision	Khatra	Khatra
Block Headquarter	Indpur	Taldangra
Geographical area (km <sup>2</sup> )	302.60	349.74
Panchayat Samity	1	1
No. of Gram Panchayats	7 (Bheduasole, Brahmandiha, Brajarajpur, Gourbazar, Hatgram, Indpur and Raghunathpur)	9 (Amdangra, Bibarda, Fulmati, Harmasra, Khalagram, Panchmura, Saltora, Satmouli and Taldangra)
No. of Inhabited Village	198	141
No. of Mouza	222	145
No. of Gram Samsad (Village Councils),	112	109

60. **Road Network and Connectivity.** The National Highway 60 (NH-60) connects NH-5 (At Balasore) to NH-34 (At Morgram). Within Bankura, it runs through Bishnupur, Bankura,

Gangajalghati and Mejia, an approximate distance of 93 km before crossing over to Ranigunj. State Highway-2, 4, 8 and 9 are the major State Highways connecting / interconnecting Bankura, with the rest of the districts. Details of the major <sup>17</sup> National/State Highways within the district and their connectivity as per available information are presented below:

**Table 13: Details of Major Roads in Bankura District**

	National / State Highway Number	Length (km)		Details of Major Blocks which Passing Through
		Total	In Bankura	
1	NH-60	446	93	Bishnupur, Onda, Bankura, Gangajalghati and Mejia
2	NH-60A	84	33	Bankura-II, Bankura-I
3	State Highway-2	323	117	Saltora, Chhatna, Bankura-II, Chhatna, Indpur to SH-4
4	State Highway-4	466	80	Hirbandh, Khatra to Sarenga
5	State Highway-7	289		Bishnupur, Joypur, Kotulpur
6	State Highway-8	292	112	Beliatore, Sonamukhi, Patrasayer and Indua
7	State Highway-9	251	82	Durgapur, Beliatore, Bankura, Onda, Taldangra, Simlapal, Sarenga, Raipur

61. Length of Roads maintained by different agencies in the Indpur and Taldangra Blocks of Bankura for the year 2013-14 are given below:

**Table 14: Roads Maintained by Different Agencies in the Indpur and Taldangra Blocks**

	Name of Block	Length of Road Maintained by Institutions (km)				Total Length (km)
		PWD	Zilla Parishad	Gram Panchayat	PMGSY	
1	Indpur	41.00	19.40	483.00	48.4	591.80
2	Taldangra	60.00	38.28	433.00	44.9	576.18
<b>Total</b>		<b>101.00</b>	<b>57.68</b>	<b>916.00</b>	<b>93.3</b>	<b>1167.98</b>

Source: 1) P.W.D. (Roads), Government of West Bengal; 2) Zilla Parishad, Bankura; 3) Panchayat Samity, Bankura; 4) Gram Panchayat, Bankura.

## 2. Physiography, Topography, Soil and Geology

62. **Physiography.** The district is described as the “connecting link between the plains of Bengal on the east and Chhotonagpur plateau on the west.” The areas to the east and north-east are low lying alluvial plains, similar to predominating rice lands of Bengal. To the west the surface gradually rises which gives way to undulating country, interspersed with rocky hillocks. Much of the district is covered with jungles. The regions of the district could be divided into broad three parts viz. 1) the hilly areas to the west, 2) the connecting undulating tract in the middle, and 3) the level alluvial plains to the east. The greater portion of the district consists of a rolling country covered by laterite and alluvium. While metamorphic or gneissose rocks are found to the extreme west, to the east there is a wide plain of recent alluvium. Strong massive runs of hornblendic varieties stretch across the region in tolerably continuous lines, the general strike being nearly east and west. The most characteristic geological feature of the district is the area of laterite and associated rocks of sand and gravel. At some places one finds hard beds of laterite. At other places, it is decomposed and reorganized. Locally, the ferruginous rock is called kankar. The calcareous concretions, commonly used as the sources of lime, are known as ghutin. The

<sup>17</sup> Public Works Department, Government of West Bengal. Road-State Highway.

Gondwana system is represented in the northern portion of the district, south of the Damodar, between Mejia and Biharinath Hill. The beds covered with alluvium contain seams of coal belonging to the Raniganj system.

63. **Topography.** The maximum elevation of the district from mean sea level is 448 metres. Topographically the district of Bankura is divided into 6 micro regions viz.:

- (i) Main Bankura Upland: characterized by undulating terrain with many hills and ridges along the north-western boundary of the district and having a gradual descent from the Chhotonagpur plateau.
- (ii) Bankura Upland: continuation from the main Bankura Upland over a small tract in the south-east corner.
- (iii) Bankura–Bishnupur Radh Plain: the elevation rises gradually with undulating topography but abruptly in hilly tract towards the west extending between the western hilly tract and eastern alluvial plains. The hillocks range in the region from 90 m to 180 m.
- (iv) Patrasayer Plain: a fertile plain with a gradual slope towards the south-west located in the north-east part.
- (v) Silai Plain: a plain with few undulations in the west extending to the south-central part.
- (vi) Middle Kasai Basin: mainly a plain shaped by the Kasai River which flows from north-west to south-east and covers the north-western part of the district.

64. There are three distinct geomorphic units with characteristic morphological assemblages in Bankura. These are:

- (i) **The Hilly Terrain in the West:** the terrain consists of crystalline rocks of Archean age, characterized by hillocks, low ridges and valleys. Susunia Hills (493m) and Biharinath Hillas (447.8 m) have the highest surface elevation of the unit. There are other small hills such as Mejhia Karo around Gangajalghati block and in other blocks e.g. Khatra, Ranibundh, Raipur. The average elevation of these hills ranges between 100 – 150m above mean sea level. The entire geomorphic unit is the continuation of Chhotonagpur plateau.
- (ii) **The Eastern Plain:** the eastern part of the district comprising the blocks of Bishnupur, Kotulpur, Indus etc. is flat land which promotes intense cultivation. The surface elevation of this unit ranges between 10-50m above mean sea level with a gentle slope. At places, the flat land shows dissected topography and is devoid of natural swamps or lakes.
- (iii) **The Marginal Undulating Tract:** this is relevant in the central part of the district where hilly terrain of the western part slowly merges into plain alluvial land. This geomorphic unit is favourable for the growth of forest. The morphology of this unit presents a highly dissected topography where the average surface elevation is of the order of 100 m above mean sea level.

65. **Soil.** Soil of Bankura district can be broadly grouped into three principal types (Groundwater Resources Assessment and Management of the Bankura District, CSME, 1993) viz. (1) Red Soil (2) Alluvial Soil and (3) Laterite Soil.

66. Typical red soil has limited distribution in the south central, south-eastern and south western parts of the district around Bishnupur, Kotulpur and Raipur blocks respectively. These are the red-coloured sedimentary soils (i.e. formed from residual parent materials) found mainly on laterites supporting Sal vegetation. They are also found along the margins of small hills bare of vegetation. Brown soils form a group within this class which are also sedimentary in nature, mainly

derived from sandstone, granite gneiss and schist.

67. The alluvial soils, which have wide distribution in the east-central and south-eastern parts of the district, are grouped according to soil association as Damodar-Rajmahal riverine, Damodar flatlands, Damodar highlands etc. The oldest soil amongst them is unaffected by floods and siltation and shows profile development, whereas the younger or newer alluvial soil, found mostly in the Damodar flatland areas is enriched by silt deposition during floods. Such areas are characterized by high water table, a heavy sub-soil and occurrence of brown concretions at shallow depths.

68. The laterite soils have wide distribution in the south-central to the south-western part of the district. Such soils are distinguished from the red soils by the occurrence of ferruginous concretions in a definite layer, whereas in the red soils they are distributed throughout the profile.

69. According to the textural types, soils of the district can be classified under the following types: (1) sandy (2) sandy loam (3) loam (4) sandy clay loam (5) clay loam (6) clay. clay, clay dominated loam and loamy soils are mostly confined to the flood plains of the Damodar and the Dwarkeswar rivers through sporadic occurrences. This type of occurrences is also seen in other small river valleys. The district as a whole is covered generally by sandy loam.

70. **Geology.** The geology of Bankura district is characterized broadly in four litho units as under:

- (i) Crystalline granite gneiss of Archaean age is exposed in the Western part of the district covering Blocks of Chhatna, Bankura-I and II, Indpur, Khatra, Hirbunndh, Gangajalghati, Ranibunndh, Sarnga and parts of Saltora and Mejia.
- (ii) Sedimentary Sandstone and Shale of lower Gondwana age occupy the northern and north-western parts of the district as small patches, covering parts of Saltora and Mejhia blocks.
- (iii) Quaternary alluvium occupies the eastern and south-eastern parts of the district covering Bishnupur, Sonamukhi, Kotulpur, Indus, Joypur and Patrasayer Blocks.
- (iv) The marginal tract covering Simlapal, Taldangra, Onda and parts of Barjora and Bishnupur blocks is covered by laterites and Quaternary alluvium underlain by basement rock at shallow depth within 40 m.

### 3. Climatic Conditions

71. The climate of the State is tropical and humid except in the northern hilly region which is close to the Himalayas. The temperature in the mainland normally varies between 24°C-40°C during summer and 7°C-26°C during the winter. The average rainfall in the State is about 1,750 mm. West Bengal is divided into six agro-climatic zones namely Hill zone, Tarai zone, Old Alluvial and New Alluvial zones, Laterite zone and Saline coastal zone. Birbhum, Bankura, Puruliya, Paschim Medinipur districts falls under Red Laterite zone and generally undulating, coarse textured, susceptible to erosion, acidic soil.

72. Bankura is generally arid compared to other parts of Bengal. Annual average rainfall in the district is 1400 mm and the temperature vary from a maximum of  $\geq 44^{\circ}\text{C}$  and minimum of  $\leq 6^{\circ}\text{C}$ . The climate in the western portion of the district is drier than the eastern regions. From March to May, the hot westerly winds prevail and the day time temperatures are oppressive. The north-westerly winds are frequent during the early part of March (locally called as "Kal Baisakhi") and help to mitigate the excessive heat.

73. The rainy season sets during the month of June and lasts till September, but the climate is pleasant. The rainfall is maintained primarily by cyclonic storms, which originate from the Bay of Bengal, situated to the south-east. The winter sets in November and extends till February and the temperatures during the period are far more pleasant and enjoyable. The rainfall recorded at the various metrological stations, in and around Bankura district during the winter, summer and rainy seasons is tabled below:

**Table 15: Rainfall Data Recorded in Various Metrological Stations**

	Station	Years recorded	Average Rainfall in Bankura (mm)			
			November to February	March to May	June to October	Average Annual
1	Bankura	43 - 46	50.8	169.7	1207.5	1428.0
2	Bishnupur	21 - 22	50.0	200.9	1234.2	1485.1
3	Gangajalghati	15 - 16	45.2	147.1	1185.7	1378.0
4	Indus	16 - 17	43.2	209.3	1128.8	1381.3
5	Khatra	20 - 21	52.1	159.3	1293.9	1505.3
6	Kotulpur	16 - 17	47.5	172.7	1170.9	1391.1
7	Mejhia	20 - 21	36.3	134.6	1125.7	1296.6
8	Onda	16 - 17	34.8	131.8	1116.3	1282.9
9	Raipur	15 - 16	47.8	203.7	1300.2	1551.7
10	Sonamukhi	15 - 16	51.3	166.6	1119.1	1337.0
Average			<b>46.0</b>	<b>169.7</b>	<b>1188.2</b>	<b>1403.6</b>

Source: Metrological stations, in and around Bankura district.

74. **Vulnerability to Earthquakes.** As per the report published by National Institute of Disaster Management (NIDM) in 2013, West Bengal experiences earthquakes at a relatively lower frequency of the seismic hazard zonation map. As per the map of Bureau of Indian Standards West Bengal lies in seismic zones II-IV. Entire Bankura district and the project area falls in Zone III, which is classified as Moderate Damage Risk Zone in India.

75. **Vulnerability to Drought.** As per the report published by National Institute of Disaster Management (NIDM) in 2013, the districts of Bankura, Purulia, Birbhum and parts of Paschim Medinipur have been affected by drought at regular intervals, mainly due to deficient rainfall and adverse soil conditions. Every summer many parts of Purulia, Bankura, Paschim Medinipur, and Birbhum (covering the south-western part of the state) suffer water shortage with respect to the entire state.

#### 4. Surface Water

76. **Rives and River Basin Systems of Bankura.** The drainage basin system of Bankura is controlled primarily by the Damodar, Sali, Dwarekeshwar, Silabati and Kangshabati rivers. All have a south-easterly flow and are almost parallel to each other. A brief discussion on each of the major rivers is outlined below. Further assessment for possible adverse impacts on aquatic species from construction and operations of the water intake and jetty will be conducted during implementation of the project.

77. **The Damodar river** rises in the Palamu Hills of Chhotanagpur in Jharkhand at about 609 m above mean sea level. After flowing generally in a south-easterly direction for 540 km (240 km in Jharkhand and the rest in West Bengal), it joins the river Hoogly about 50 km below Kolkata. The river's principal tributary, the Barakar, joins it just upstream of the Jharkhand-West Bengal border. The Damodar has a number of tributaries and sub-tributaries, namely, Barakar, Konar,

Bokaro, Haharo, Jamunia, Ghari, Guaia, Khadia and Bhera, with Barakar being the prime tributary. The catchment area of the river is about 22,000 km<sup>2</sup> of which about 19,000 km<sup>2</sup> are in uplands and 3,000 km<sup>2</sup> in plains which are of deltaic nature. The catchment is irregular in shape and somewhat elongated in the lower reach. The river slope is 1.86 m/km for the first 241 km; 0.57 m/km in the next 167 km and 0.16 m/km in the lowest reach. Due to the particular topography of the catchment area, River Damodar used to inundate annually large tracts of Burdwan, Hoogly and Howrah Districts in the state of West Bengal. To mitigate the recurrent floods, dams were constructed at Tilaiya (on Barakar River in 1953), Konar (on Konar River in 1955), Maithon (on Barakar in 1957) and Panchet (on Damodar in 1959).

78. **The Sali River** is an important tributary of Damodar River that drains the northern part of Bankura district. It originates from a few miles west of Kora hill, halfway between Mejia and Bankura, and flows northwest to south-east and meets the Damodar at Samsar village in Indas Block. The total length of the Sali river is 81 km.

79. **The Dwarekeshwar River.** The largest river flowing through Bankura is the Dwarakeswar River. The river originates from Tilboni hills (445 m), in neighbouring Purulia district, entering Bankura near Chhatna. The total length of the river within Bankura is 132 km, and its catchment area is 4430 km<sup>2</sup>. The Silai (or Shilabati) is the largest tributary of Dwarakeswar and it joins Dwareshwar near Ghatal (in Paschim Medinipur). The two together are known as Rupnarayan River, which flows through Hooghly. The other tributaries of Dwarakeswar River are the Gandheswari, the Kukhra, and the Berai.

80. **The Silabati River (also known as Silai).** The Silabati River (also known as Silai) originates in the terrain of the Chhota Nagpur Plateau (Puncha Block) in Purulia district. It flows in a south-easterly direction through the districts of Bankura and West Midnapore. The length of the river within Bankura is 63 km. There is a small reservoir on the Silabati near Khatra known as Kadam Deuli Dam where a canal from Mukutmanipur-Kangsabati dam meets the river. The major tributaries are Jyopanda, Purandar and Chamkakhali.

81. **The Kangsabati River** (also variously known as the Kasai and Cossye) rises from the Chotanagpur plateau and passes through the districts of Purulia, Bankura and Paschim Medinipur before draining to the Bay of Bengal. After rising at Murguma near Jhalda in the Chhotonagpur plateau in Purulia district, the river passes by Purulia, Khatra and Ranibandh in Bankura district, and then enters Paschim Medinipur in the Binpur area. It is joined by Bhairabanki. At Keshpur the river splits into two. The northern branch flows through the Daspur area as Palarpai and joins the Rupnarayan River. The other branch flows in a south-easterly direction and on joining the Kaliaghari River forms the Haldi River, which flows into the Bay of Bengal at Haldia. The total length of the river within the district is 51 km. Major tributaries are Bhairabanki and Tarafeni.

82. **Characteristics of the rivers.** Though the rivers are seasonal, the river course in itself allows a huge potential for the sub-surface water to be tapped. The extent of availability can be formalized only with requisite geo-hydrological study. While the need to harness the surface water flows of the rivers can well be understood, it must be appreciated that studies must also involve regarding river water characteristics, particularly of credible importance is the shifting of rivers, which could critically affect any WS Scheme contemplated.

83. **Surface Water quality.** Raw water quality tests of Mukutmanipur reservoir were carried out by the Public Health Engineering Department. It is being noted from the water quality test

results that all the chemical quality parameters are well within the permissible values,<sup>18</sup> excepting iron. So, only conventional treatment process is adequate to meet potable water standards. No special or tertiary treatment is required.

84. Iron content marginally exceeds the desirable value, but well within the permissible limit (value detected 0.41 mg/L, desirable limit 0.3 mg/L, permissible value 1.0 mg/L). The chlorine added for disinfection (pre and post) will oxidize a portion of the iron present and in the process, it is expected that the iron content will come down within/ closer to the desirable value.

**Table 16: Surface Water Quality of Mukutmanipur Reservoir**

	Parameters	Unit	Desirable Limit as per BIS 10,500	Permissible Limit as per BIS 10,500	Test Results According to Sample Collection Date		
					4/8/2015	2/9/2015	6/9/2015
1	Temperature	°C	-	-	27	-	-
2	Turbidity	NTU	5	10	95	39.4	37.6
3	pH	-	6.5	8.5	7.6	6.84	6.93
4	TDS	mg/L	500	2000	90	57.6	54.2
5	Alkalinity	mg/L	200	600	34	79.128	74.732
6	Calcium (Ca)	mg/L	75	200	20	-	-
7	Total Hardness (CaCO <sub>3</sub> )	mg/L	200	600	80	56	60
8	Chloride (Cl)	mg/L	250	1000	52	-	-
9	Iron (Fe)	mg/L	0.3	0.3	0.41	0.09	0.08
10	Residual Chlorine	mg/L	0.2	0.2	Nil	-	-
11	Colour	Hazen	5	15	56	-	-
12	Odour	-	-	Nil	Nil	-	-
13	Fluoride (F)	mg/L	1	1.5	BDL	-	-
14	Magnesium	mg/L	30	100	8	-	-
15	Sulphate	mg/L	200	400	40	-	-
16	Nitrate	mg/L	45	100	18	-	-
17	Aluminium (Al)	mg/L	0.03	0.2	0.002	-	-
18	Manganese (Mn)	mg/L	0.1	0.3	0.16	-	-
19	Phenolic Compound	mg/L	0.001	0.002	BDL	-	-
20	Coliform Bacteria (CFU/100ml), Max	-	NIL/100ml	-	540	-	300
21	Escherichia Coli	-	NIL/100ml	-	120	-	-
22	Non-Faecal Coliform (CFU/100ml), Max	-	NIL/100ml at 37°C	-	320	-	-
24	Faecal Coliform MPN/100	-	-	-	-	-	40

Source: PHED.

85. Surface water quality of Mukutmanipur (Kangsabati) Reservoir is attached as **Appendix 20**.

86. Recently surface water quality monitoring for intake point on Mukutmanipur reservoir has been carried out. Results are shown below.

87. Results are compared with CPCB standard of category C. All parameters are more or less within the standard.

<sup>18</sup> Drinking Water IS 10500:2012 BIS.

**Table 17: Surface Water Quality of Mukutmanipur Reservoir intake site**

Sl. No.	Parameters	Unit	Location: Intake Point (Mukutmanipur Reservoir) Date of sampling- 20.03.24	Category-A	Category-B	Category-C	Category-D	Category-E
1.	pH (max)	(min-6.5)	8.14	8.5	8.5	8.5	8.5	8.5
2.	DO (minimum)	Mg/l	5.6	6	5	4 min	4	--
3.	BOD (3D, 27° C)	Mg/l	<2	2	3	3	--	--
4.	O & G	Mg/l	<1.0	--	--	0.1	0.1	--
5.	Total Hardness as CaCO <sub>3</sub>	Mg/l	78.4	300	--	--	--	---
6.	Chloride as Cl	Mg/l	17.6	250	--	600	--	600
7.	Nitrate as NO <sub>3</sub>	Mg/l	<0.5	20	--	50	--	--
8.	Fluorides as F	Mg/l	<0.1	1.5	1.5	1.5	--	--
9.	Turbidity	NTU	9.8	--	---	--	---	---
10.	COD	Mg/l	20	--	---	--	---	--
11.	Total Alkalinity	Mg/l	90	--	---	--	---	---
12.	Total Coliform	MPN/100 ml	100					
13.	Faecal coliform	MPN/100 ml	96					

**NOTE:**

CPCB- Category A-Drinking water without conventional treatment but after disinfection.

Category B- Water for outdoor bathing

**Category C-Drinking water with conventional treatment followed by disinfection**

Category D- Water for fish culture and wild life propagation

Category E- Water for irrigation, industrial cooling and controlled waste disposal

## 5. Ground Water

88. **Hydrogeology and Ground Water Potential.** The diverse geology of Bankura district controls the hydro-geological condition of the district. According to Central Ground Water Board (CGWB), in areas underlain by hard crystalline and Gondwana rocks, the groundwater occurs under:

- (i) Unconfined condition in the weathered residuum down to the depth of about 15 meters below ground level (mbgl), with maximum to 25 mbgl;
- (ii) Semi-confined to confined condition in the fractured zones in the depth span of 30-60 mbgl. Resistivity survey shows that in some places a deeper fracture zone is also expected to occur at a depth span of 80-100 mbgl.
- (iii) Groundwater in the unconfined condition is generally developed through open wells in the weathered zone and the available discharge can meet the domestic need but is insufficient for any large-scale development of groundwater. Groundwater from the zone of secondary porosities i.e. weathered zone is developed through bore wells yielding 45-150 lpm.

89. About two thirds of the district is covered by alluvium. Older alluvium and laterites occur in central–southern part of the district. Groundwater exploration carried out in the area indicates that the thickness of the alluvial sediments increases eastward from 36 m in the marginal part to 150 m in the eastern most part. Potential aquifers exist between 30 and 95 mbgl and the discharge

of the wells tapping such aquifers varies from 20 to 124 m<sup>3</sup>/hr, with drawdown ranging from 6 to 13 m. Depth to water level in the older alluvium varies from 6 to 15 mbgl during pre-monsoon period.

90. The dug-wells in the laterites usually dry up in summer, but those wells which have penetrated through the laterites to underlying bedrock are found to also contain water during the summer months.

91. A number of flowing tube wells exists along the banks of the Darakeswar, Joypanda and Silai rivers. These tube wells are 30-70m deep (30-50 m diameter) and free flow discharge of 23-30 lpm. These wells are used for small-scale irrigation.

92. Recent alluvium occupies the eastern and north central parts of the district and extends down to a depth of about 300 m bgl. The thickness of the alluvium increases eastwards. Potential granular zones exist in the depth span of 30-270 mbgl, yielding about 80-150 m<sup>3</sup>/h with a drawdown between 6 to 10 m. In general, transmissivity of the deeper aquifer ranges from 272 – 806 m<sup>2</sup>/day and storability from  $1.019 \times 10^{-3}$  to  $2.1 \times 10^{-4}$ .

93. Long-term water level trend analysis from some hydrograph stations shows either falling (between 0.4 to 1.88 m/y) or rising (0.7 to 1.39 m/y) trends in water levels in the pre-monsoon period. During the post-monsoon period, falling (0.05 to 1.34 m/y) and rising (0.03 to 1.11 m/y) trends occur.

94. A detailed study on Groundwater Resources Assessment and Management of the Bankura District, West Bengal was carried out by Centre for Study of Man and Environment (CSME, 1990-1993) under Department of Science and Technology, Government of India. The sponsored project revealed that:

- (i) Groundwater occurs under unconfined condition in the hard rock areas of the district and the potential aquifers comprise two units viz. a weathered residuum which is 10 to 20 m thick, and an underlying fractured hard rock to a depth of at least 50 m.
- (ii) In the laterite and older alluvium, occupying about 30 percent of the district in Onda, Taldangra, Simlapal, Raipur, parts of Bankura, Bishnupur, Sonamukhi block, and groundwater occurs under unconfined condition.

95. **Annual rate of water-level fluctuation.** Maximum in Chhatna, Ranibandh, Raipur, Bishnupur, Jaypur, Indus and Kotulpur (4 m to 6 m). There are some patches in Bankura I, Bankura-II, Barjora, Gangajalghati and Khatra, where the fluctuation is between 4 m to 6 m. In the rest of the district the annual water-level fluctuation is 2 m to 4. In central Taldangra water-level fluctuation is negligible.

96. Change of water level at Indpur block it is seen that water level decreases up to 2 m in peak summer and rises up to 1m during rainy season. The reason is due to less infiltration by virtue of being hard rock disposition. Average pre-monsoon water level is 8.20m, post-monsoon water-level is 5.50 m. The water-level condition of Taldangra block is comparatively good. The water-level decreases only from 0.5 m to 1 m during peak summer and rises 1 m during post-monsoon period.

## 6. Groundwater Quality Status

97. According to CGWB the high concentrations of fluoride and iron in groundwater area serious problem in the district. Groundwater in 10 blocks namely Taldangra, Simlapal, Raipur, Indpur, Bankura II, Saltora, Barjora, Hirabundh, Chhatna and Gangajalghati is affected

sporadically by high concentrations of fluoride in groundwater i.e. more than the permissible limit (>1.5 mg/L). This occurs in different hydro-geological formations namely:

- (i) In fractured granite at depths of 40 m to 50 m.
- (ii) In older alluvium sediments at depths of 40 m to 50 m.

98. In Bankura district, quite high concentrations of iron in groundwater have been found (up to 9.5 mg/L). Though iron content in drinking water may not affect the human system as a simple dietary overload, but in the long run prolonged accumulation of iron in the body may result in homo-chromatosis, a disease in which tissues are damaged. It is generally recognized that concentrations above 0.3mg/L in household water can lead to staining of clothes during washing and may therefore be unsuitable for use.

99. Groundwater in the upper reaches of the district and flanks is of calcium bicarbonate type, while in the lower reaches, the groundwater is of calcium chloride type with relatively high TDS (CSME, 1993).

100. Blocks affected by fluoride contamination. As per the Water Quality Monitoring System, out of the 22 Blocks a total of 17 Blocks have been identified which have had recurrence of fluoride contamination. Pictorial representation of the fluoride affected blocks is presented below where the light blue dots denote fluoride contamination between 1.0–1.5 mg/L, whereas the brown dots denote fluoride contamination beyond 1.5 mg/L.

101. **Sources of Fluoride.** Fluoride in the groundwater is geogenic (A.K. Yadav et al. 2009). Generally, most groundwater sources have higher fluoride concentrations than surface water. The high concentrations are a result of dissolution of minerals such as fluorite, apatite and biotite from the local bedrock. Low concentrations of calcium also allow increased fluoride concentrations, controlled by precipitation of the mineral fluorite. The geology, chemical weathering and composition of bedrocks/soils/sediments play a major role in fluoride contamination of ground water. The Geological Survey of India has also observed that the Precambrian terrain with fractured/shear zones are possible locale for fluoride contamination of groundwater in parts of Purulia<sup>19</sup> and Bankura Districts.

102. Assessment of affected habitations based on <sup>20</sup>IMIS Data. Habitation wise water quality data available from the NRDWP site were compiled to get an overview of status of water quality situation with special emphasis on Fluoride concentration. The data compiled for last four years (2013-17) is summarized and tabulated below:

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<sup>19</sup> District adjoining Bankura in West Bengal.

<sup>20</sup> Integrated Management Information System as maintained by Ministry of Drinking Water and Sanitation.

**Table 18: Compiled Summary of Fluoride Contamination in Bankura, 2013-2017**

	Name of Blocks	Number of Samples Tested	Fluoride Concentration				Affected Habitation with Fluoride Concentration	
			> 1.5 (mg/L)		1.0 - 1.5 (mg/L)		>1.5 (mg/L)	1.0 - 1.5 (mg/L)
			No.	%	No.	%		
1	Bankura I	1854	2	0.11	29	1.56	2	18
2	Bankura II	2657	25	0.94	95	3.58	19	53
3	Barjora	2751	18	0.65	35	1.27	13	20
4	Bishnupur	2368	0	0.00	3	0.13	0	3
5	Chhatna	5250	67	1.28	198	3.77	47	137
6	Ganjagalghati	5007	26	0.52	259	5.17	20	107
7	Hirabandh	1684	10	0.59	53	3.15	10	41
8	Indpur	2651	7	0.26	36	1.36	7	27
9	Indus	2077	2	0.10	2	0.10	2	2
10	Jaypur	2054	0	0.00	0	0.00	0	0
11	Khatra	1842	6	0.33	4	0.22	5	4
12	Kotulpur	1737	0	0.00	2	0.12	0	2
13	Mejia	867	4	0.46	61	7.04	4	23
14	Onda	3378	1	0.03	1	0.03	1	1
15	Patrasayer	1704	0	0.00	0	0.00	0	0
16	Raipur	2462	11	0.45	29	1.18	5	22
17	Ranibundh	2104	0	0.00	6	0.29	0	5
18	Saltora	1969	43	2.18	131	6.65	31	59
19	Sarenga	1425	2	0.14	0	0.00	2	0
20	Simlipal	2149	167	7.77	68	3.16	95	57
21	Sonamukhi	1704	1	0.06	0	0.00	1	0
22	Taldangra	3140	21	0.67	33	1.05	12	19
<b>Total</b>		<b>52834</b>	<b>413</b>	<b>0.78</b>	<b>1046</b>	<b>1.98</b>	<b>276</b>	<b>600</b>

103. Summing up the last four years' data, as compiled, it has been observed that out of 52834 water samples tested across the 22 blocks, fluoride concentration above 1.5mg/L was observed in 413 samples (0.78%). Total 276 habitations are affected by high fluoride contamination. These samples were tested mainly from tube-wells. Also, an estimated 1046 (1.98%) samples showed fluoride concentration between 1.0 mg/L and 1.5 mg/L.

104. Based on the water quality test results and analysis, it may be inferred that the pattern of fluoride contamination in the district varies from being severely affected to unaffected. A matrix has been framed to separate out the Blocks which are critically affected by fluoride contamination from those which are only moderately affected or unaffected.

105. Based on the analysis, high fluoride concentrations are noted in 10 blocks, namely Bankura II, Barjora, Chhatna, Ganjagalghati, Hirabandh, Mejia, Raipur, Saltora, Simlipal and Taldangra which are considered as severely affected<sup>21</sup>. The blocks, which are moderately affected are Bankura-I, Indpur, Indus, Khatra, Onda, Sarenga and Sonamukhi. The 5 blocks which are unaffected with fluoride contamination are Bishnupur, Joypur, Kotulpur, Patrasayer and Ranibandh.

<sup>21</sup> The rationale for severely affected blocks has been assessed based on the consideration that the % of samples tested with Fluoride Content > 1.5mg/Liter is more than 0.4%.

106. Apart from fluoride, about 68% of the groundwater samples show iron concentration above the permissible drinking water standard (0.3 mg/L). E-Coli and Coliform counts were also present above the permissible limit in samples tested. Details of other quality parameters based on IMIS data (from 2013-2017) is tabled below:

**Table 19: Summary of Water Quality Parameters**

Year	Samples Tested	Samples with			
		Coliform >[MPN/100ml]	E-Coli > [MPN/100ml]	Fe > 0.3 (mg/L)	Hardness >200 (mg/L)
2013-14	14536	6927	1739	6984	895
	Range	1 –60 MPN/ 100 ml	0.06 –90 MPN/100 ml	0.31 –8.70mg/L	602 –5001mg/L
2014-15	26807	6236	2010	20091	2451
	Range	0.6 –9.0 MPN/100 ml	0.2 –90 MPN/100 ml	0.31 –9.64mg/L	604 –4700mg/L
2015-16	9383	4876	962	7374	617
	Range	1.0 –9.0 MPN/100 ml	0.02–110 MPN/100	0.31 –9.68mg/L	604 –1844mg/L
2016-17	2114	722	4	1557	65
	Range	4 –1600 MPN/100 ml	2 –17 MPN/100 ml	0.31 –8.65mg/L	68 –12365mg/L
<b>Total</b>	<b>52840</b>	<b>18761</b>	<b>4715</b>	<b>36006</b>	<b>4028</b>
Percentage of Samples Tested Positive (%)		<b>35.5</b>	<b>8.92</b>	<b>68.1</b>	<b>7.6</b>

## 7. Air Quality

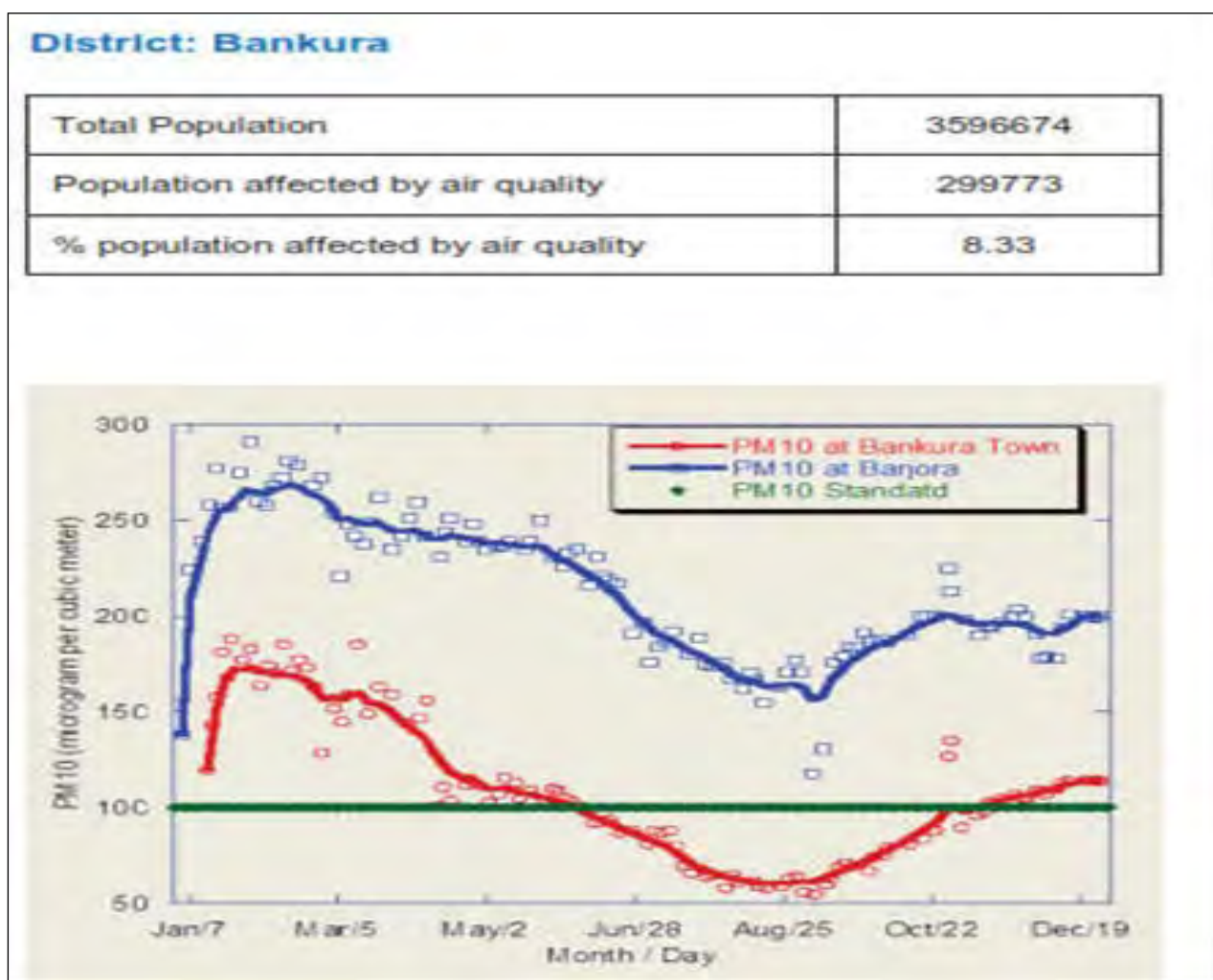
107. West Bengal State Pollution Control Board (WBPCB) monitors air and noise pollution in the State. WBPCB have monitoring stations located at various places across the state covers major cities, district headquarters and industrial locations. Systematic estimation of the air quality in West Bengal started in the year 1998. In its current phase, the WBPCB monitors the air quality parameters in 12 districts during the period October 2012-December 2016.

108. West Bengal has good air quality in most places for most of the time. Nevertheless, emissions from industrial sources and road traffic affect air quality in the districts. Around 32 per cent of the state population live in these locations. Both large and small urban settlements are affected by poor air quality. The entire state, throughout the year, hardly ever experience non-compliant air quality for any of the air pollutants other than the Particulate Matters. NO<sub>2</sub>, the gaseous air pollutant sourced from high temperature industrial burning processes and automobile exhaust emissions, occasionally miss the standard during winter months in the city area.

109. Air quality scenario of Bankura district is presented in tabular form in **Table 20** followed by graphical presentation (**Figure 9**) of the annual behaviour of the indicator pollutants during year 2016 and the estimated population exposed to such air quality in those districts.

**Table 20: Air Quality in Respect of Four Traditional Parameters in Bankura District and Yearly Days of Non-Compliance**

Year	PM10 ( $\mu\text{g}/\text{m}^3$ )			PM2.5 ( $\mu\text{g}/\text{m}^3$ )			SO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )			NO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )		
	Value	Standard	% days of NC	Value	Standard	% days of NC	Value	Standard	% days of NC	Value	Standard	% days of NC
2013	85	60	35	Not Done	40	Not Done	7	50	0	40	40	0
2014	69	60	13	Not Done	40	Not Done	8	50	0	54	40	0
2015	99	60	43	Not Done	40	Not Done	8	50	0	55	40	0



**Figure 9: Trend of PM10 in Bankura during 2016**

**Baseline and During Construction Air, Noise and Surface Water Monitoring**

110. Base line and during construction air quality monitoring has been done in GLSR (base line) and Intake (during construction) locations. Also, noise level monitoring done at same locations where air quality monitoring carried out. During construction surface water quality monitoring has been conducted by the contractor on monthly basis. The results obtained are given in **Table 21, 22** and **23** respectively. The map given below is showing environmental monitoring locations.

### Locations of Environmental Monitoring Point



**Table 21: Air quality Monitoring Results – Baseline & During construction**

Site No.	Date of Monitoring	Site Location	Parameters (Government Standards)				
			PM10 µg/m <sup>3</sup>	PM2.5 µg/m <sup>3</sup>	NO <sub>2</sub> µg/m <sup>3</sup>	SO <sub>2</sub> µg/m <sup>3</sup>	CO mg/m <sup>3</sup>
1	04.06.2019 (Baseline)	GLSR site-Gobindapur	118	64	26	5.7	0.389
2	12.04.2021 (Base line)	Intake site	67.83	33.19	38.57	7.9	0.362
3	10.06.2021 (During Construction)	Intake site	40.0	16.0	17.9	<4	0.232
4	17.12.2021 (During Construction)	Intake site	89.91	46.32	38.11	9.82	0.485
5	11.04.2022 (During Construction)	Intake site	48.0	22.0	26.7	6.8	0.572
6	20.10.2022 (During Construction)	Intake site	45.0	22.0	21.2	5.5	0.492
7	20.10.2022 (During Construction)	GLSR Gobindapur	47.0	21.0	24.5	5.0	0.515
8	23.01.2024 (During Construction)	Intake site	96	55	26.3	6.8	0.721
<b>Permissible limit (as per CPCB)</b>			<b>100</b>	<b>60</b>	<b>80</b>	<b>80</b>	<b>2</b>

(Project data generated)

111. Both PM10 and PM2.5 (base line) are above the standard only at GLSR site, while rest of the

parameters at work locations are within the standard. Baseline air quality monitoring at GLSR site has been conducted during dry season, before onset of monsoon; thereby dust particles were high in the sample due to absence of precipitation for a long time. In intake site air quality parameters (both baseline and during construction) are always within the standard.

**Table 22: Noise quality result (for baseline and during construction data)**

Site No.	Date of Monitoring	Site Location	L <sub>eq</sub> (dBA) (Government Standard)	
			Day Time	Night Time
1	04.06.19 (Baseline)	GLSR Site- Gobindapur	60.1	52.9
2	04.06.19 (Baseline)	Intake- Kunar Bahal	51.1	44.7
3	12.04.21 (During Construction)	Intake	49.5	36.4
4	10.06.2021 (During Construction)	Intake site	49.5	34.4
5	17.12.2021 (During Construction)	Intake site	57.7	43.3
6	11.04.2022 (During Construction)	Intake site	58.6	40.8
7	18.10.2022 (During Construction)	Intake site	57.8	44.6
8	20.10.2022 (During Construction)	GLSR Gobindapur	52.2	42.5
9	23.01.2024 (During Construction)	Intake	56.9	46.2
<b>Permissible limit (as per CPCB) (For residential category)</b>			<b>55</b>	<b>45</b>

(Project data generated)

112. Noise level was above the standard at GLSR location both during day and night time. Noise level at intake site was marginally above the limit during construction period Dec 2021, April 2022, October 2022, and January 2024.

113. By analysing the surface water quality data, all the parameters are found within the limit except BOD (in few cases) and Oil and Grease for few occasions. Concentration of both the parameters showing higher value than the baseline, may be due to baseline sample has been taken during monsoon month, thereby dilution of concentration was noted; while during construction monitoring has been done during winter and summer months. Point source of pollution due to construction activities was also not ruled out. Based on the overall quality of the parameters observed, the said reservoir water can be considered as Class C<sup>22</sup> as per CPCB surface water criteria.

<sup>22</sup> Class C water can be suitably used for drinking water purpose after conventional treatment followed by disinfection.

**Table 23: Surface Water Quality Result (baseline and during construction monitoring)**

Site Location	SI No	Parameter	Unit	Baseline Monitoring	During Construction Monitoring Results										Surface water quality criteria as per CPCB & IS 2296*
				Date of Sampling: January'21	Date of Sampling: February'21	Date of Sampling: March'21	Date of Sampling: April'21	Date of Sampling: May 21	Date of Sampling: June '21	Date of Sampling: July '21	Date of Sampling: August '21	Date of Sampling: Jan'24	Date of Sampling: Feb'24	Date of Sampling: March '24	
Intake Point- Mukutman ipur Reservoir	<b>Physical and Chemical Parameters</b>														
	1	pH	Unit	7.14	7.46	7.85	6.93	6.81	6.48	6.91	7.31	8.14	8.14	8.14	6.0 – 9.0
	2	Oil & Grease	mg/l	3.0	3.20	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<1.4	<1.4	<1.4	0.1
	3	Chloride	mg/l	18.32	16.39	12.54	16.8	7.1	6.5	9.5	10.63	17.6	17.6	17.6	600.0
	4	Fluoride	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	<0.1	<0.1	<0.1	1.5
	5	DO	mg/l	4.80	5.06	5.16	5.06	5.30	5.12	5.16	5.06	5.6	5.6	5.6	4.0 Min
	6	BOD	mg/l	6.5	8.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<2	<2	<2	3.0
	7	COD	mg/l	62.0	89.28	19.84	20.0	26.18	19.53	19.36	18.75	20	20	20	-
	8	Nitrate-N	mg/l	3.0	3.5	2.8	2.5	2.5	2.3	2.9	3.1	<0.5	<0.5	<0.5	50.0
	9	Total Alkalinity	mg/l	70.0	76.0	72.0	121.6	136.34	109.3	112.8	83.1	90	90	90	-
	10	Total Hardness as CaCo3	mg/l	72.0	79.20	76.44	77.0	79.25	73.51	71.32	75.21	78.4	78.4	78.4	-
	<b>Microbiological Parameter</b>														
11	Faecal Coliform	MPN/100ml	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	201	202	100	5000
12	Total Coliform	MPN/100ml	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	90	90	96	-

Monitoring carried out by DBO contractor,

Note: \* - Class C- drinking water with conventional treatment followed by disinfection

## C. Ecological Resources

114. The eastern portion of the district forms part of the rice plains of West Bengal. The land under rice cultivation contains the usual marsh weeds of Gangetic plain. Aquatic plants and water weeds are found in ponds, ditches and still streams. Around human habitations there are shrub species such as *Glycosmis*, *Polyantha sub-rosa*, *Clerodendron infortunatum*, *Solanum torvum*, and various other species of the same genus, besides *Trema*, *Streblus* and *Ficus hispida*. The larger trees are papal, banyan, red cotton tree (*Bombax malabaricum*), mango (*Mangifera indica*), jiyal (*Odina Wodier*), *Phoenix dactylifera*, and *Borassus flabellifer*. Other plants found include *Jatropha gossypifolia*, *Urena*, *Heliotropium* and *Sida*. Forests or scrub jungles contain *Wendlandia exserta*, *Gmelina arborea*, *Haldina cordifolia*, *Holarrhena antidysenterica*, *Wrightia tomentosa*, *Vitex negundo* and *Stephegyne parvifolia*.

115. The western portion of the district is higher. The uplands either bare or are covered with scrub jungle of *Zizyphus* and other thorny shrubs. This thorny forest gradually merges into sal (*Shorea robusta*) forest. Low hills are covered with *Miliusa*, *Schleichera*, *Diospyros* and other trees.

116. Some of the common trees of economic interest found in the district are: *Alkushi (Mucuna pruriens)*, *Amaltas (Cassia fistula)*, *Asan (Terminalia tomentosa)*, *Babul (Acacia nilotica)*, *Bair (Zizyphus jujuba)*, *Bael (Aegle marmelos)*, *Bag Bherenda (Jatropha curcas)*, *Bichuti (Tragia involucrate)*, *Bahera (Terminalia belerica)*, *Dhatura (Datura stramonium)*, *Dhaman (Cordia macleoidii)*, *Gab (Diospyros embyopteris)*, *Harra (Terminalia chebula)*, *limli (Tamarindus indica)*, *Kuchila (Strychnos nux-vomica)*, *Mahua (Bassia latifolia)*, *Palas (Butea frondosa)*, *Sajina (Moringa pterygosperma)*, *Kend (Diospyros melanoxylon)*, *Mango*, *Date-palm*, *Nim*, *Papal*, *Banyan*, *Red cotton tree* and *Jiyal*.

117. The project area forms part the rice plains of West Bengal. The land under rice cultivation contains the usual marshy weeds of Gangetic plain. Aquatic plants and water weeds are found in ponds, ditches and still streams.

### 1. Terrestrial Plants at Project Sites

118. There is no such dense vegetation at the project sites. Most are agricultural land. Some scattered small patches of plants were observed in the road side and adjacent area. There is no such endangered or threatened plant has been observed. The common plants are as following:

**Table 24: Common Plants at Project Sites**

Name of the Family	Name of the Species
Anacardiaceae	<i>Buchanania lanzan</i>
	<i>Semicarpu sanacardium</i>
	<i>Odina woodies</i>
Asclepiadiaceae	<i>Calotropis gigantea</i>
Burseraceae	<i>Boswellia serrata</i>
Caesalpiniaceae	<i>Cassia fistula</i>
Dipterocarpaceae	<i>Sorear obusta</i>
Fabaceae	<i>Butea monosperma</i>
	<i>Dalbergia latifolia</i>
	<i>Dalbergia sissoo</i>
	<i>Samanea saman</i>
	<i>Albizia lebbeck</i>
Lecythidaceae	<i>Careya arborea</i>

Name of the Family	Name of the Species
Leguminosaceae	<i>Pterocarpus marsupium</i>
Mimosaceae	<i>Acacia catechu</i>
Myrtaceae	<i>Syzygium cumini</i>
Palmae	<i>Phoenix acaulis</i>
	<i>phoenix dactylifera</i>
	<i>Borassus flabellifer</i>
Poaceae	<i>Dendrocalamus strictus</i>
Rhamnaceae	<i>Ziziphus mauritiana</i>
	<i>Ziziphus zuzuba</i>
Verbinaceae	<i>Vitex negunda</i>
Meliaceae	<i>Azadirachta indica</i>
Cornaceae	<i>Alangium lamarckii</i>
Moraceae	<i>Streblus asper</i>

## 2. Aquatic Plants

119. The Reservoir, which are primarily rained have very little vegetal growth. The water surface was cleared of all weeds. There were no visible swamps within the study area. There is no such endangered or threatened plant has been observed. The different types of semi aquatic and aquatic plants were observed during the survey, growing are listed below:

**Table 25: List of Macrophytes in and Around Intake of the Mukutmanipur Reservoir**

Name of the Family	Name of the species
	<b>Algae</b>
<b>Characeae</b>	<i>Chara</i> sp.
	<i>Nitella</i> sp.
	<b>Dicot</b>
<b>Najadaceae</b>	<i>Najas minor</i>
	<i>Najasindica</i>
<b>Scrophulariaceae</b>	<i>Limnophilarepens</i>
	<b>Monocot</b>
<b>Hydrocharitaceae</b>	<i>Hydrillaverticillata</i>
	<i>Vallisneriaspiralis</i>
<b>Aponogetonaceae</b>	<i>Aponogetonundulatus</i>
<b>Cyperaceae</b>	<i>Scirpusarticulatus</i>

## 3. Phytoplankton and Zooplankton

120. Mukutmanipur reservoir, phytoplankton diversity was greatly concerned at consumer level of reservoir ecosystem. In this reservoir, chiefly contributed classes were Chlorophyceae, Cyanophyceae, Bacillariophyceae, Charophyceae, Xanthophyceae and Dinophyceae. Enormous growth and density of Cyanophyceae was due to the richness of nitrogen and phosphates.

121. The Zooplankton of the Mukutmanipur Reservoir consists of Rotifera, Copepoda, Cladocera, Protozoa and Ostracoda. Total 39 genera were recorded which were available in the reservoir during the present study. Of which 12 genera of Rotifera, 12 genera of Copepoda, 10 genera of Cladocera, 3 genera of Protozoa and 2 genera of Ostracoda contributed to zooplankton density.

## 4. Common Fish

122. The studies on fish diversity observed the occurrence of about 36 species. The order

Cypriniformes was dominant with 15 species, followed by Siluriformes with 5 species, Channiformes with 4 species, and Mastacembeli- formes and Perciformes with 1 species each. There is no such locally threatened fish species has been observed.

## **5. Fauna in the Project Area**

123. Generally, Rats, Chhachunder, Mongoose, Dogs and Pigs are commonly found near core zone. Snakes and lizards are also common. Different varieties of birds found in core zone are Anjan, Kabutar, Koel, Maina, Sparrows. No endangered species are found near the core zone.

124. Discussion with the DFO and other forest officials of Kanshabati south and Bankura south reveal the fact that the high vegetative growth around the area supports variety of faunal species in the buffer zone. Prominent wild species include wild black napped hare, spotted deer, wild boar, fox squirrel, mongoose in buffer zone. Amongst birds the bulbul, the white-breasted kingfisher, magpie robin, spotted dove and myna are prominent. Amongst reptiles, several poisonous like cobra, viper, krait and non-poisonous snakes (like boa, rat snakes, green whip, Bronze backed tree snake, etc.) are abound in this area. The garden lizard and monitor lizard are also seen. Variety of butterflies (like common grass yellow/ common jezebel) and insects (such as beetles, spiders, red ants, and flies) are spotted in abundance in the study zone.

## **6. Forest**

125. The total geographical area of the district of Bankura is 6882.00 km<sup>2</sup> and the total area of forest of this district is 1,45,006.56 ha (1450.06 km<sup>2</sup>) which constitutes 21.5% of total geographical area of the district coverage. A total area of 7305.76 ha has been declared as reserved forests under section 20 of Indian Forest Act. An area of 43643.87 ha of protected forests area has been covered under 438 proposals for declaring as reserved forests.

126. Bankura district forest is pre dominantly Sal and its associated species and plantation forest of Eucalyptus and Akashmoni. Bankura holds one of the best qualities of Sal Forest in West Bengal particularly at Radhanagar, Sonamukhi and Patrasayer and the entire Bishnpur sub- divisional jurisdiction. Its flora bio-diversity increased substantially over time. From the geographical, socioeconomic and environmental consideration, the district offers lot of scope for development of this activity. In view of Govt. supports for development of this sector, long term potential for development through credit may be estimated at 2500 ha for next 5 years with annual phasing of 500 ha.

127. The district is covered under the programmes of National Waste Land Development Board. IWDP is being implementation in 7 blocks viz. Indpur, Chhatna, Saltora, Khatra, Hirbunth, Gangajalghati and Ranibandh. Various schemes and projects like NREGS, 13<sup>th</sup> Finance Commission, CSS Elephant Project are being implemented to improve the living conditions of the forest fringe area population. Elephant depredation is a very major problem in Bankura in view of very fast-growing elephant population and seasonally moving elephant start straying back in Bankura for longer time and the number of residential elephants has also increased significantly. All-out efforts are being made with the help of local forest protection committee to tackle the problem with a human face to mitigate the problem and it is an on-going process.

128. State Government has implemented social forestry project in the district covering roadside, riverside, railway embankment plantation etc. West Bengal Forest Development Corporation, pulpwood Development Corporation are also working for forest and wasteland development in the district during the past years. Govt. has stressed for biotic plantation distribution of seeding

etc. in the district.

129. The total forest area is spread over 27 territorial Range under three forest divisions. Forest area of Indpur range is 5997.656 Ha (Bankura S division) and that of Taldangra range is 7484.080 ha (Panchyat S.C Div). In forest areas, majority of the population depend on the forest for various purposes like grazing, firewood, collection of Sal leaves and seeds, mushrooms etc. Since the pressure on the forests is high, some minimum amount of forest degradation has almost become unavoidable. However, the Joint Forest Management (JFM) has taken roots in the district and its contribution for greening and conserving the forests of the district is immense. The JFM aims all round development of forest fringe areas.

130. All the proposed project sites are vacant and there is no notable tree cover, except the GLSR site where there are few trees of local species. No tree felling is anticipated after final design. The WTP and other project sites are not in close proximity of reserve forest land. There is sufficient available ROW along the pipe lying routes and no forest area will be affected.

### 7. Archaeological/Protected Monuments and Other Cultural Properties.

131. There is no notified Archaeological/Protected Monuments and other Cultural properties within project influence area.

## D. Economic Development

### 1. Land Use

132. The distribution of the particular types of land use in Bankura district depends largely on natural factors like the distribution of water and soil. It also depends on the traditional preferences and Government policies of zoning and land use planning decisions. Among food crops, paddy is the most widespread crop. The following table shows the land utilization statistics of the district for the last five years (Table 26).

**Table 26: Land Use Characteristics of Bankura District**

	Land Use Class	Subclass	Subclass Total (acre)	Class Total (acre)
<b>A.</b>	<b>Built Up Area</b>			<b>177964.10</b>
	A1.	Urban Settlement	6539.23	
	A2.	Rural Settlement	165937.87	
	A3.	Commercial Area	34.07	
	A4.	Industrial Area	2782.48	
	A5.	Abandoned Airstrip	27.67	
	A6.	Ash Pond	586.69	
	A7.	Archaeological Site	23.53	
	A8.	Area Under Infrastructural Development	271.98	
	A9.	Brick Kiln	541.77	
	A10.	Clay Quarry	94.15	
	A11.	Coal Mining Area (Active/Disused)	132.03	
	A12.	Eco Tourism	11.38	
	A13.	Gravel/Stone Quarry	720.13	
	A14.	Pebble Quarry	200.54	
	A15.	Stone Crushers	60.59	
<b>B.</b>	<b>Agricultural Land</b>			<b>1013534.81</b>
	B1.	Single Crop	603427.63	
	B2.	Single Crop (Boro)	140.60	
	B3.	Single Crop (Rabi)	739.03	

	Land Use Class	Subclass	Subclass Total (acre)	Class Total (acre)
	B4.	More Than One Crop	403360.30	
	B5.	Vegetables	5867.24	
<b>C.</b>	<b>Forest</b>			<b>357869.85</b>
	C1	Notified Forest Area (As Per SOI Toposheet 1970's)	305200.22	
	C2.	Plantation	50590.64	
	C3.	Plantation (Under Regeneration)	2078.98	
<b>D.</b>	<b>Waste Land</b>			<b>76454.5</b>
	D1.	With Scrub	26228.20	
	D2.	Without Scrub	41997.10	
	D3.	Gullied	3214.88	
	D4.	Sandy Area-Riverine	1096.41	
	D5.	Stony Waste/Barren Rocky	3917.92	
<b>E.</b>	<b>Waterbodies</b>			<b>92446.82</b>
	E1.	<b>River</b>	<b>60767.96</b>	
	Land Use Class	<b>Subclass</b>	<b>Subclass Total (acre)</b>	Class Total (acre)
	E2.	<b>Canal</b>	<b>3656.71</b>	
	E3.	<b>Reservoir/Lakes/Ponds/Tanks</b>	<b>28022.15</b>	
	GRAND TOTAL			<b>1718270.08</b>

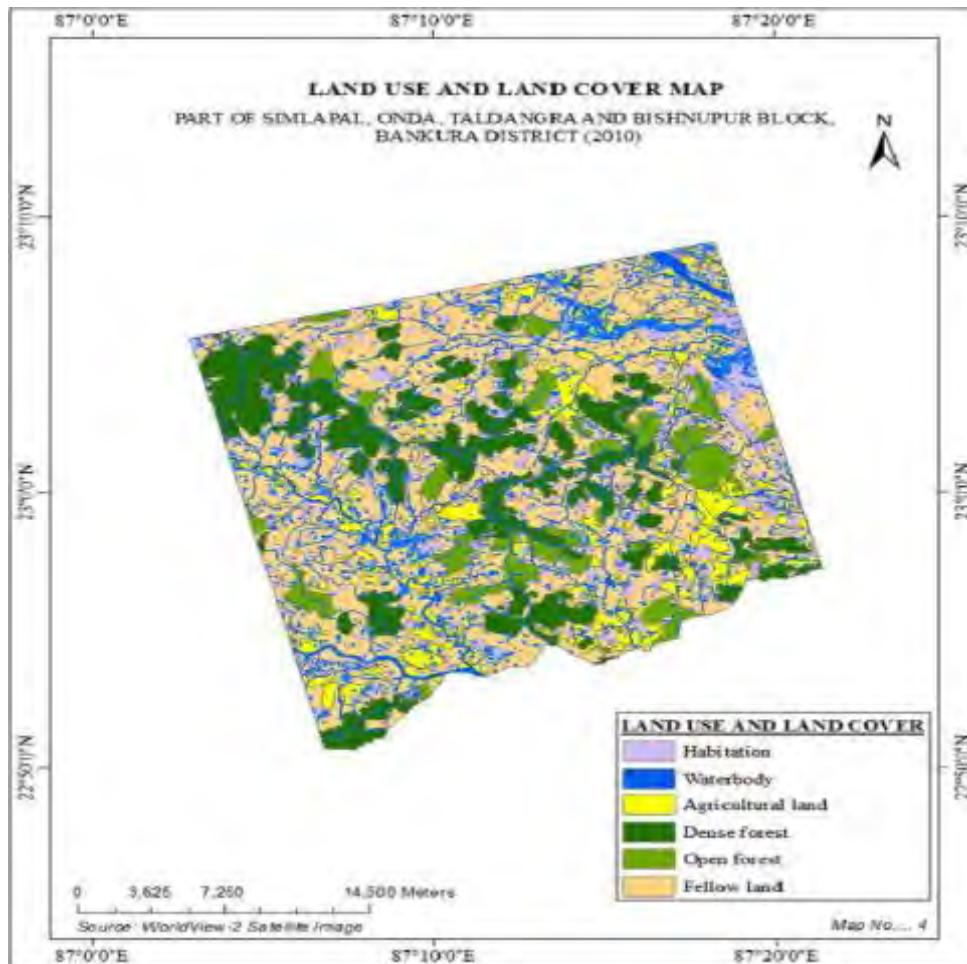
Source: West Bengal Land Revenue Department.

133. The land use pattern of the district and select 2 blocks are given below (**Table 27**).

**Table 27: Land Use Characteristics of Indpur and Taldangra Blocks**

Land Use Category	Indpur Block (Acre)	Taldangra Block (Acre)
Built Up Area	7016.51	7150.80
Agricultural Land	54902.05	42614.33
Forest	9817.01	29697.89
Waste Land	5777.38	4297.19
Water bodies	1840.69	1352.96
<b>Grand Total</b>	<b>79353.65</b>	<b>85113.18</b>
Source: West Bengal Land Revenue Department		

**Figure 10: Land Use and Land Cover Map Bankura District**



## 2. Industry and Agriculture

134. **Agriculture.** In spite of presence of small and marginal farmers, agriculture accounts almost 70 per cent of the district's total income. Due to land reforms, usage of high fertile and hybrid crops, the district has overcome its poor state as was to be in the past. Only 60 to 65 per cent of the total land area of the district is fertile due to availability of sufficient water supply either by canal or deep tube wells. Agricultural land of the district is of three types- Sali, Suna and Tara or Danga. 'Sali' is suitable for growing of aman rice, 'Suna' for various crops like 'aus' kharif, sugarcane, cotton, tobacco, mustard etc. 'Suna' is also used for production of fine kind of rice. Remaining lands of the district is not cultivable due to undulation of land and morum soil.

135. Agriculture in the district is largely dependent of monsoon. Drought constitutes a major hazard in the district. Intermittent gaps of in precipitation and moisture stress during the monsoon gives rise to serious setback in production during the Kharif, which is the main stay of Agriculture in the district. Farmers are working hard to get more production of crop with their limited area of land. Seed farms are working jointly. Fertilizers are available at every village. The main agricultural crop is paddy and it is produced in the 90.0 per cent of the total cultivated area of the district. Wheat, barley, jute and potato are the other important agricultural products of the district.

136. **Agriculture scenario in Indpur Block.** In 2013-14, persons engaged in agriculture in Indpur community development block could be classified as follows: bargadars 2.82%, patta

(document) holders 6.88%, small farmers (possessing land between 1 ha and 2 ha) 10.11%, marginal farmers (possessing land up to 1 ha) 25.60% and agricultural labourers 54.59%. In 2013-14, the total area irrigated in Indpur community development block was 6,290 ha, out of which 3,570 ha was by canal water, 850 ha by tank water, 1,800 ha by river lift irrigation, 40 ha by open dug wells and 30 ha by other methods. In 2013-14, Indpur community development block produced 3,573 ton of Aman paddy, the main winter crop, from 1,611 ha, 284 ton of wheat from 128 ha and 182 ton of potatoes from 7 ha. It also produced pulses and mustard.<sup>23</sup>

137. **Agriculture scenario in Taldangra Block.** In 2013-14, persons engaged in agriculture in Taldangra community development block could be classified as follows: bargadars 8.06%, patta (document) holders 17.16%, small farmers (possessing land between 1 and 2 ha) 5.44%, marginal farmers (possessing land up to 1 ha) 16.38% and agricultural labourers 52.97%. In 2013-14, the total area irrigated in Taldangra community development block was 16,984 ha, out of which 12,262 ha was by canal water, 1,435 ha by tank water, 1,300 ha by river lift irrigation, 232 ha by deep tube well, 1,350 ha by shallow tube well, 5 ha by open dug wells and 400 ha by other methods. In 2013-14, Taldangra community development block produced 4,429 ton of Aman paddy, the main winter crop, from 1,922 ha, 4,424 ton of Aus paddy from 1,921 ha, 1,474 ton of Boro paddy from 503 ha, 549 ton of wheat from 329 ha and 40,671,000 ton of potatoes from 879 ha. It also produced pulses and mustard.

### 3. Horticulture

138. Land utilization pattern reveals that only 59.5 percent of total land is under cultivation. The district has a vast area of cultivable wasteland comprising 2 percent of total geographical area. A part of that is acidic-alkaline or sand cast. These areas offer scope for further development.

139. On the other hand, the agro-climatic condition of the district is suitable for plantation/horticulture. Mulberry and Arjun plantation and horticultural crops such as mango, guava, cashew nut, jackfruit, banana, papaya, citrus fruits etc. can be grown in large scale. There is also scope for development of floriculture, medicinal and aromatic plants in the district. Total area under horticultural crops in the district is around 4775 ha and that under mulberry and Arjun plantation is 4606 ha.

140. Area of culturable wasteland in the district is 18846 ha, a major part of which can be utilized for the purpose. There are seven seed farms, one Horticultural Research and Development Centre at Taldangra and about two hundred and fifty seed-dealers in the district. Systematic identification of areas to be covered under plantation/horticulture, getting timely supply of planting materials and other inputs like technical advice, marketing arrangement, market information enabling the farmers to fetch remunerative price are the need of the day. The activity will help marginal and small farmers, to generate employment, improve nutritional standards through development of wasteland and soil conservation by peripheral plantation.

### 4. Animal Husbandry

141. In animal husbandry, Bankura district occupies a moderate position in the State. Major problem relating to milk production and meat are shortage of green fodder and inadequate supply of improved breed of animals. By promoting fodder cultivation, encouraging farmers towards crop diversification for fodder cultivation, increasing awareness through exposure visits and conducting

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<sup>23</sup> Wikipedia. Indpur (community development block). [References 14. District Statistical Handbook 2014 Bankura.](#)

health camps, the above problem could be overcome. Dairy development is one of the major economic activities in the district.

## **5. Fishery**

142. Pisciculture is an important factor of economic development of Bankura. District Bankura ranked first in pisciculture within West Bengal. The district provides a majority amount of fish production during the last five years, but still due to some unavoidable reasons, regularly find fishes purchased from Andhra Pradesh in most of the district's fish markets. Ramsagar of Bankura district is widely known destination with about 200 hatcheries. Recently a modern fish production unit has been started at Mukutmanipur.

143. Under Rashtriya Sam Vikas Yojana (RSVY), nearly 81 hectares of pond area have been excavated. The scheme has been implemented through fishermen's groups in a participatory mode. The fishermen's groups have been encouraged to share a small part of the produce with the Primary Schools to make it a part of the mid-day meal. This has created a stake of community at large in the project.

144. As far as activities of fishery sector in Bankura are concerned, fish-breeding industries in Ramsagar and surrounding zone requires special mention. Transaction of about ₹6-7 crores through spawn production of about 50,000 million numbers in 225 to 250 numbers of hatcheries per annum occurs in that zone. About 1500 to 2000 numbers of workers are directly involved in production system and many other enterprises have grown by co-related activities. Spawn purchasers from different parts of India come here every year to purchase various types of spawn.

## **6. Industry**

145. An overwhelming agro-economic base and low urbanization and industrialization characterize the district of Bankura. The district is broadly divided into two regions – the alluvial plains in the east and the undulating tract to the west. Within the district and even within these regions, the villages vary not only in their geographical features but also in their physical forms and composition their economic and social life patterns. Agricultural activities and most its employment and priority is being accord to its development.

146. The mines and minerals play a vital role in the economy of Bankura. Mines and minerals-based ventures have already come up on the stretch of land from Bankura to Saltora. In areas like Chhatna, Saltora Khatra, Ranibandh, Bankura to Indpur stretch and Raipur, Taldangra, the prospects for setting up of mines and minerals-based industries are, indeed bright subject to environmental clearance.

147. The community development blocks like Bishnupur, Sonamukhi, Patrasayer, Indus, Joypur, Kotulpur have been setting up Agriculture based Industries like rice and oil mills. There is scope for more. The climate is also conducive for food processing ventures.

148. The forest wealth of Khatra and Ranibandh areas has always been remarkable. Various types of medicated trees are available in these forests which are largely exported to neighbouring districts and also outside the State. There are serious scopes to develop industries in connection with the available medicated trees which will generate employment opportunities for local inhabitants. Due to lack of water and undulated alluvial sandy soil, huge lands are remaining vacant which can be upgraded by using modern techniques. The plants which need little water may be planted in these areas. Moreover, new species of herbs and medicinal plants may be planted in the

vacant areas and unutilized forest lands.

149. Cottage and Small-Scale Industry constitutes a major segment of district's economy. It provides maximum employment opportunity next to agriculture and this accounts nearly 9 per cent of the total income of the district. This field could be developed more by using modern technology and other infrastructure facilities. Effort has been taken up for the improvement designs, marketing assistance and finance etc. specially in case of brass and bell metal craft, conch shell products, fishing hook, pottery and leather products etc. through different development agencies. Rural people of tribal areas are engaged in Babui Rope making and Sal leaf production.

150. The major large-scale industrial unit in the district is Mejia Thermal Power Project. It has got All India recognition and is under the management of Damodar Valley Corporation (DVC). The cottage and small-scale industry also constitute the major segment of the district's economy. In case of cottage industry, Bankura plays a dominant role in West Bengal. The silk products of Bishnupur are India famous and are also exported internationally. Tassar, Matka, Garad and Cotton Chadars (scarf) are produced in this district. The total products like the Conch shell products of Bishnupur and Bankura (Sadar) Sub-Divisions are famous in this state. The Brass and Bell Metal products, Wood Carved products, Soft Stone products, Clay products are also produced in the district. The Terracotta toys of the district are world famous and are exported to different parts of the country and also exported to different countries outside India

## 7. Infrastructure

151. **Transport.** The major modes of Transport in Bankura is Road and Rail transport. By road, it is connected to the other districts of West Bengal. By rail, Bankura is served by the South- Eastern division of Indian Railways. The existing railway track passing through the district has a direct connectivity to the important nearby places like Kolkata, Asansol, Kharagpur, Ranchi, Tatanagar and Dhanb.

152. In 2013-14, Indpur community development block had 7 originating/ terminating bus routes. The nearest railway station is 15 km from the community development block headquarters. The Kharagpur-Adra line of South Eastern Railway passes through this CD Block. There is a station at Bheduasole. State Highway 2 (West Bengal) running from Bankura to Malancha (in North 24 Parganas district) passes through this community development block.<sup>24</sup>

153. In 2013-14, Taldangra community development block had 10 originating/ terminating bus routes. The nearest railway station is 25 km from the community development block headquarters. National Highway 14, (old numbering National Highway 60), running from Morgram to Kharagpur, passes through this community development block. State Highway 2 (West Bengal) running from Bankura to Malancha (in North 24 Parganas district) and State Highway 9 (West Bengal) running from Durgapur (in Bardhaman district) to Nayagram (in Paschim Medinipur district) pass through this community development block.

154. **Trade and Commerce.** Due to lack of adequate industries, trade and commerce of the district didn't flourish as other districts of the state. Jhantipahari, Chhatna, Bankura, Onda, Gangajalghati, Beliatore, Ramsagar, Barjora, Asaria, Pakhanna, Maliara, Kotulpur and Patrasayer are the main centres for transaction in paddy and rice. In Sonamukhi, Raipur and

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<sup>24</sup> Wikipedia. Indpur community development block). [References 19. List of State Highways in West Bengal.](#)

Sarenga jute is purchased and sold. Sonamukhi, Indus and Kotulpur are also the important trading centres of the district where potato and sugarcane are purchased and sold.

155. **Electricity and Power:** In Bankura district, the per capita consumption of commercial energy like coal, petroleum and electricity is very low as compared to the adjoining districts. Since last Five-Year Plan, the demand of electricity from the rural area has strongly emerged, out of 3,826 numbers of mouza in the district 2,412 mouzas have declared electrified up to 31 March 2000.

156. The existence of Mejhia Thermal Power Plant within the district and other thermal power plants in Durgapur and Kolaghat can be a boon for the proposed industries for Bankura, as transmission-loss can be minimum due to proximity of the district to these power plants. The electrical grid in the district is well-knit with the existence of two numbers of 132/33/11 KV sub-station and 24 numbers of 33/11 KV sub-station. On the other hand, per capita domestic consumption of electricity is also very low compared to the adjoining districts. Thus, abundance of electricity can be used for setting up of industries in the entire district. 197 or 89% of mouzas in Indpur community development block and 141 or 97% of mouzas in Taldangra community development block were electrified by 31 March 2014.

## 8. Mineral Resources

- (i) **Coal:** The coal mines are situated in Saltora, Mejhia, Barjora and Gangajalghati area. Mejhia itself holds 10 coal mines.
- (ii) **Copper:** The district has a deposit of copper at Damdi, Mukutmanipur, Khatra, Sarong, Nilgiri and Narayanpur. Near Kangsaboti Dam, a 2 km. long ridge of copper has been found.
- (iii) **Tungsten:** It's a rare metal with vast demand in India and other countries. Chhendapathar and Porapahar have the deposit of this metal in the whole state.
- (iv) **Cayanite:** This is another valuable mineral used in heater, high temperature instruments etc. At Balarampur (near Mukutmanipur), a huge amount of deposit (20 km long) has been found.
- (v) **Cheoline:** An excessive deposit of cheoline can be found at Jalahari Pahar, Dhatar, Malti, Thakurdungry etc. and in many places of Taldangra police station.
- (vi) **Mica:** Bankura is one of the three districts of West Bengal in which mica is available. Almost 100 numbers of pegmatite have been found in Khatra, Indpur, Bankura Town, Gangajalghati and jhilimily though most of them are in the form of either small shaped sheets or powdered form.

## 9. Education

157. Bankura district had a literacy rate of 70.26% as per the provisional figures of the Census of India 2011. Bankura Sadar subdivision had a literacy rate of 69.56%, Khatra subdivision 69.79% and Bishnupur subdivision 71.60%.

158. In 2013-14, Indpur community development block had 169 primary schools with 12,400 students, 13 middle schools with 1,741 students, 12 high schools with 7,364 students and 13 higher secondary schools with 10,695 students. Indpur community development block had 1 general college with 2,096 students and 254 institutions for special and non-formal education with 8,297 students. Indpur community development block had 7 mass literacy centres.

159. In 2013-14, Taldangra community development block had 172 primary schools with

12,132 students, 15 middle schools with 2,363 students, 10 high schools with 6,384 students and 15 higher secondary schools with 13,486 students. Taldangra community development block had 1 general college with 2,337 students, 3 professional/ technical institution with 486 students and 244 institutions for special and non-formal education with 7,237 students.

#### 10. Healthcare in Indpur and Taldangra Blocks

- (i) In 2014, Indpur community development block had 1 rural hospital, 3 primary health centres and 1 private nursing home with total 55 beds and 5 doctors. It had 27 family welfare subcentres and 1 family welfare centre. 7,120 patients were treated indoor and 211,362 patients were treated outdoor in the hospitals, health centres and subcentres of the community development block.
- (ii) In 2014, Taldangra community development block had 1 rural hospital, 4 primary health centres and 1 private nursing home with total 74 beds and 11 doctors. It had 26 family welfare sub centres and 1 family welfare centre. 8,207 patients were treated indoor and 300,423 patients were treated outdoor in the hospitals, health centres and subcentres of the community development block.

### E. Socio Cultural Resources

#### 1. Demography

160. The population of the district<sup>25</sup> is 3,596,674 of which male and female were 1,840,504 and 1,755,788, respectively. It is the 3<sup>rd</sup> least populated district in West Bengal after Alipurduar and Purulia, with Population Density of 523 persons/km<sup>2</sup>. Average literacy rate of Bankura in 2011 were 70.95 % compared to 63.44% of 2001. If things are looked out at gender wise, male and female literacy were 81.00% and 60.44%, respectively. With regards to Sex Ratio in Bankura, it stood at 954 per 1000 male compared to 2001 census figure of 952.

161. Total population of select 2 project blocks is 304,415 (rural 304.415 and urban nil) as per 2011 census. Scheduled Castes numbered 102,435 (33.64%) and Scheduled Tribes numbered 35,600 (11.69%) as per 2011 census. Main language spoken in the project area is Bengali.

**Table 28: Demographic Characteristics**

Demographic Parameters	West Bengal State	Bankura District	Indpur Block	Taldangra Block
Total Population (2011)	91,276,115	3,596,674	156,522	147,893
Male	46,809,027	1,838,095	80,556	74,999
Female	44,467,088	1,758,579	75,966	72,894
Geographical Area (km <sup>2</sup> )	88,752	6,882	116.14	172.73
Total Households	20,380,315	765,536	31,668	31312
Decadal Growth Rate (2001-11) (%)	13.84	12.64	13.57	14.87
Sex ratio (Per 1000)	950	954	943	972
Population Density, (per km <sup>2</sup> )	1028	523	512	490
Literacy Rate (%)	76.26	70.95	67.42	70.87
Literacy Rate (male) (%)	81.69	81.00	79.87	75.44
Literacy Rate (female) (%)	70.54	60.44	55.30	55.81
% of Urban Population (%)	31.87	8.3	0	0
SC Population (%)	23.5	32.65	40.59	26.30

<sup>25</sup> District Census Handbook-2011.

Demographic Parameters	West Bengal State	Bankura District	Indpur Block	Taldangra Block
ST Population (%)	5.8	10.25	9.59	13.93
Total Workers (%)	38.08	40.77	40.50	42.20
Male Workers (%)	57.07	57.17	69.63	67.99
Female Workers (%)	18.08	23.62	30.29	13.50
Main Workers (%)	28.14	25.48	20.01	23.05
Marginal Workers (%)	9.94	15.29	20.49	19.15
Cultivators (%)	14.72	21.12	20.24	21.89
Agricultural Labourers (%)	29.32	44.15	53.53	56.55
Household Industry Workers (%)	7.09	4.19	3.31	3.58
Other Workers (%)	48.87	30.54	22.92	17.99

Source: Census 2011.

## F. History, Culture and Tourism

162. The earliest signs of human habitation in the area were at Dihar. By about 1000 BC chalcolithic people had settled on the north bank of the Dwarakeswar.

163. In later pre-historic times this area was inhabited by various Proto-Australoid and a few Proto-Dravidian tribes. The tribes were spread across different strata of development – food-gathering, hunting, animal-rearing and agriculture. Bankura district was part of Rarh in ancient times.

164. From around 7<sup>th</sup> century AD till around the advent of British rule, for around a millennium, history of Bankura district is identical with the rise and fall of the Hindu Rajas of Bishnupur.

165. Romesh Chunder Dutt wrote in the late 19<sup>th</sup> century, “The ancient Rajas of Bishnupur trace back their history to a time when Hindus were still reigning in Delhi, and the name of the Musalmans was not yet heard in India. Indeed, they could already count five centuries of rule over the western frontier tracts of Bengal before Bakhtiyar Khilji wrested the province from the Hindus. The Musalman conquest of Bengal, however, made no difference to the Bishnupur princes. these jungle kings were little known to the Musalman rulers of the fertile portions of Bengal, and were never interfered with. For long centuries, therefore, the kings of Bishnupur were supreme within their extensive territories. At a later period of Musalman rule, and when the Mughal power extended and consolidated itself on all sides, a Mughal army sometimes made its appearance near Bishnupur with claims of tribute, and tribute was probably sometimes paid. Nevertheless, the Subahdars of Murshidabad, never had that firm hold over the Rajas of Bishnupur which they had over the closer and more recent Rajaships of Burdwan and Birbhum. As the Burdwan Raj grew in power, the Bishnupur family fell into decay; Maharaja Kirti Chand of Burdwan attacked and added to his zamindari large slices of his neighbour’s territories. The Marathas completed the ruin of the Bishnupur house, which is an impoverished zamindari in the present. day.”

166. The area around Bishnupur was called Mallabhum the core area would cover present day Bankura police station area (excluding Chhatna), Onda, Bishnupur, Kotulpur and Indas. In olden days, the term was used for a much larger area, which probably was the furthest extent of the Bishnupur kingdom. In the north it stretched from Damin-i-koh in Santhal Parganas to Midnapore in the south. It included the eastern part of Bardhaman and parts of Chota Nagpur in the west. Portions of the district appear to have been originally the homes of aboriginal tribes, who were gradually subdued. The Khatra region was Dhalbhum, the Raipur region was Tungbhum, and the Chhatna region was Samantabhum. They were eventually overshadowed by the Malla kings of Bishnupur. There also are references in old scripts to Varahabhumi or Varabhumi (present day

Barabhum) on whose borders run Darikesi river, and Sekhara mountain (probably present day Pareshnath).

167. Adi Malla was the founder of the Malla dynasty. Adi Malla ruled in Laugram for 33 years and has been known as the Bagdi Raja. He was succeeded by his son, Jay Malla, who invaded Padampur and captured the fort, then the power-centre. Jay Malla extended his domains and shifted his capital to Bishnupur. The subsequent kings steadily extended their kingdom. Among the more renowned are: Kalu Malla, the fourth in line, Kau Malla, the sixth in line, Jhau Malla, the seventh in line, and Sur Malla, the eighth in line, who defeated the Raja of Bagri, a place now in northern Midnapore. He was followed by 40 other kings, all of whom were known as Mallas or Mallabaninath, which means lords of Mallabhum or Mallabani. Family records show that they were independent of foreign powers.

168. Bir Hambir, the 49th ruler of the Malla dynasty who flourished around 1586 AD and ruled in 16th-17th century, was a contemporary of the Mughal emperor Akbar. Bir Hambir was both powerful and pious. He was converted to Vaishnavism by Srinivasa. There is mention in two Vaishnava works, Prem-vilasa of Nityananda Das (alias Balaram Das) and Bhakti Ratnakara of Narahari Chakrabarti, about Srinivasa and other bhaktas (devotees) being robbed by Bir Hambir, when they were travelling from Vrindavan to Gaur with a number of Vaishnava manuscripts. However, Bir Hambir was so moved by Srinivasa's reading of Bhagavata that he converted to Vaishnavism and gave Srinivasa a rich endowment of land and money. He introduced the worship of Madan Mohan in Bishnupur.

169. Raghunath Singh, who followed Bir Hambir, was the first Bishnupur Raja to use the Kshatriya title Singh. It is said that he was conferred upon with this title by the Nawab of Murshidabad. Bishnupur kingdom had entered its golden age. With exquisite palaces and temples built during the period that followed Bishnupur was reputed to be the most renowned city in the world, more beautiful than the house of Indra in heaven. However, it has also been recorded that while these royal patrons of Hindu art and religion were busy building temples they had lost much of their independence and sunk to the position of tributary princes. Raghunath Singh built the temples of Shyam Rai, Jor Bangla and Kalachand between 1643 and 1656.

170. Bir Singh built the present fort, the temple of Lalji in 1658, and seven big lakes named Lalbandh, Krishnabandh, Gantatbandh, Jamunabandh, Kalindibandh, Shyambandh and Pokabandh. His queen, Siromani or Chudamani, built the temples of Madan Mohan and Murali Mohan in 1665. He walked up alive all his sons, eighteen in number. The youngest, Durjan, alone escaped, having been kept in hiding by the servants.

171. Durjan Singh built the Madan Mohan temple in 1694. According to family records, the kings of Bishnupur continued to pay tribute to the Muslim rulers but they were free to do things internally. There was no interference by the Muslim rulers in the internal affairs of Bishnupur. This is also confirmed by Muslim historians. The status of the Raja of Bishnupur was that of a tributary prince, exempted from personal attendance at the court at Murshidabad, and represented there by a resident. The Bishnupur Rajas who were at the summit of their fortunes towards the end of the 17th century, started declining in the first half of the 18th century. First, the Maharaja of Burdwan seized the Fatehpur Mahal, and then the Maratha invasions laid waste their country.

172. While they failed to take the fort and pillage the treasury, the Marathas harried the less protected parts of the kingdom. The Maratha chief, Sheobhat, made Bishnupur his headquarters in 1760 during the invasion of Shah Alam. The Marathas fell with their heaviest weight on border principalities such as Bishnupur and Birbhum. Exactions of a hundred sorts reduced the once

powerful kingdom to poverty. The tenants fled and the country became desolate.

173. Chaitanya Singh was another pious ruler unfit to face the difficulties. As he was too involved in religious matters, he did not have time for administrative matters. He faced internal feuds. Damodar Singh, a cousin of his, tried to gain power. He was able to convince the court at Murshidabad about his capabilities. Initially, Siraj ud-Daulah lent him forces but he was unable to capture Bishnupur. Later, after the British defeated Siraj, Mir Jafar lent him stronger forces. He succeeded in taking Bishnupur, and Chaitanya Singh escaped to Kolkata with the idol of Madan Gopal, but the British restored the latter to power. However, intrigue and litigation continued for many years. Litigation ruined the Bishnupur Raj family and eventually in 1806, the estate was sold for arrears of land revenue and bought up by the Maharaja of Burdwan.

174. **British Administration.** In the year 1760, Bishnupur was ceded to the British with the rest of Burdwanchakla. The Marathas had laid the country waste and famine of 1770 completed the misery of the kingdom. People swept away, cultivation failed and there was lawlessness everywhere due to lack of powerful administration as once the powerful king had been reduced to the status of a mere zamindar. Making Suri the capital, Bishnupur was united with Birbhum in 1787 but rebellious situation prevailed. Till 1793, Bankura continued to be part of Birbhum, when it was transferred to the Burdwan collectorate.

175. Towards the end of the 18th century, when Bankura was part of Jungle Mahals, certain portions of the district around Raipur were affected by the Chuar rebellion. The disturbances of the Chuars in 1832 in the western part of the district led to the disbandment of the Jungle Mahals in 1833. Bishnupur was transferred to Burdwan. In 1872, the parganas of Sonamukhi, Indas, Kotulpur, Shergarh and Senpahari were transferred from Manbhum to Burdwan. In 1879, the district acquired its present shape with the thanas (Police Stations) of Khatra and Raipur and the outpost of Simlapal being transferred from Manbhum, and the thanas of Sonamukhi, Kotulpur and Indas being retransferred from Burdwan. However, it was known for some time as West Burdwan and it came to be known as Bankura district from 1881 onwards only. Since then there has been no change either in the physical boundary of the district or in the administration of justice.

176. **Tourist Attractions.** Bankura has gained wide appeal as a popular tourist destination. The district can legitimately take pride in having a wide range of spots attracting tourists for a variety of reasons ranging from Arts and Architecture, Terracota temples, dense virgin forests, hills and the scenic spots at Mukutmanipur etc.

177. Bankura district, falling under Eastern Chhotanagpur Plateau, looks like handpicked by Mother Nature and is blessed with old brown hills, murmuring rivers, ancient temples- all bearing testimony to a rich and resourceful culture and tradition.

178. Situated in the western part of the State of West Bengal it comes under the Burdwan division and it forms a part of what is popularly known as Rarh area in Bengal. Bishnupur town deserves a special mention in that the town hosts a good many temples like Madan Mohan temple, Shyam Roy temple and a short distance away at Jairambati the famous temple dedicated to Sarada Devi -Holy Mother for crores of devotees of the Ramakrishna Monastic Order. The town also has its own distinct musical tradition known as Bishnupur Gharana.

179. The hill at Biharinath and at Susunia are spots of natural wonder and ideal for trekking and going foot-loose.

180. Mukutmanipur is situated in the confluence of river Kansabati and Kumari has the second


largest earthen Dam in India. Hemmed in by hillocks all around, the still waters of the lake offer a hypnotic visual of the azure sky above and is a delight for lovers of nature in its pristine beauty.


**G. Subproject Site Environmental Features**

181. The table below shows the site environmental features.

**Table 29: Site Environmental Features**

Infrastructure	Location and Environmental Features	Site Photographs
<p><b>Raw water intake with approach bridge and substation</b></p>	<p>The Raw water source is Mukutmanipur reservoir. It is located at approximately 3.2 kilometer (km) upstream of the confluence of River Kangsabati and River Kumari about 12 km from Khatra town in the district of Bankura. The proposed intake site is located at Satsol Mouza of Khatra block. The coordinate of the site are 22.984015<sup>0</sup> N latitude and 86.781074<sup>0</sup> E Longitude. Substation for intake is located at Kunarbahal Mouza adjacent to intake.</p> <p>There are no notable pollution sources near the intake. There are no wastewater disposal points in the upstream vicinity of the intake. Mukutmanipur reservoir has abundant water throughout the year even during lean period. Quality of river water is in general of acceptable quality as per IS: 10500 specification, which can be used for potable purposes after conventional treatment and disinfection.</p> <p>The Irrigation and Waterways Department (IWD) has given the permission for withdrawal of 44 million liters per day (MLD) raw water.</p>	<p><b>Proposed Intake Point – Mukutmanipur Reservoir</b></p> 
<p><b>Raw water main and Water Treatment Plant (WTP)</b></p>	<p>About 650-meter-long raw water main is proposed to follow the shortest possible route, keeping in view the velocity considerations to avoid silting and other physical considerations. Based on an assessed velocity (of minimum 1.2m/s and maximum 1.8m/s), the indicative pipe diameter of 800 mm.</p> <p>The 44 MLD WTP is being constructed at Kunar Bahal &amp;</p>	<p><b>New Water Treatment Plant</b></p> 

Infrastructure	Location and Environmental Features	Site Photographs
	<p>Jhanti Pahari Mouza adjacent to Intake site. The proposed land belongs to I&amp;WD and has been transferred to PHED. The coordinates of the site are 22.9862210 N and 86.765107 E. The Topography is undulating and ground level of the site and surroundings are about 140 m above msl. The land is connected by an approach road to the nearby villages. As per local enquiries carried out during field visits, the site is not prone to flooding, and is barren land.</p> <p>The proposed WTP site is required to be developed including proper drainage infrastructure considering the undulating topography</p>	
<p><b>Intermediate GLSR</b></p>	<p>Latitude.23.0715 N Longitude. 86.9056 E. Average GL is 110m above msl. Reservoir storage capacity is 2500 KL</p> <p>The identified site of GLSR is located in the Gobindapur mouza of Indpur block and easily accessible by SH 2. The land of GLSR is privately owned land and purchased from private owner(s). Overall, there are no notable sensitive environmental features in and around the site.</p>	 <p style="text-align: center;"><b>Proposed GLSR site</b></p>

Infrastructure	Location and Environmental Features	Site Photographs
<p><b>Primary Transmission Mains</b></p>	<p>Primary Transmission main of approximately 22.36 km is to be laid to transmit treated water from the WTP to GLSR. The location of the intake and WTP is on one side of the Project area, a single pipeline has been considered. Transmission main will have laid with progressively reduced diameters is expected to feed the proposed GLSR</p> <p>The Primary transmission main will be laid along the edge of the roads. Pipe is proposed to be laid primarily through open cut method. However, the laying of the rising main through open cut method may not be feasible at major road crossings and congested market areas. It will also cross Hatirampur canal and River Silabati. Permission from Irrigation department obtained for crossing of primary transmission mains over the Canal and Silabati river.</p> <p>About 150 m of the primary transmission main out of total 22.36 km length is proposed to be laid by trenchless methods at congested areas.</p> <p>No tree felling is anticipated after final design.</p>	 <p><b>Laying of pipelines has to be done along the edge of the road</b></p>

## V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

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

183. Screening of potential environmental impacts are categorized into four categories considering subproject phases: location impacts and design impacts (pre-construction phase), construction phase impacts and operations and maintenance phase impacts and mitigation is devised for any negative impacts

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

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

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

186. The ADB rapid environmental assessment checklist in [http://www.adb.org/documents/guidelines/environmental assessment/eaguidelines002.asp](http://www.adb.org/documents/guidelines/environmental%20assessment/eaguidelines002.asp) has been used to screen the project for environmental impacts and to determine the scope of the IEE. **Appendix 1** shows REA checklist of the project.

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

### A. Pre-Construction Impacts – Design and Location

188. **Design of the Proposed Components.** Technical design of the (i) intake facilities at river; (ii) raw water main, (iii) water treatment plant; (iv) clear water mains, (v) Intermediate Ground

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

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

189. **Water Source Sustainability.** The source of raw water supply is Mukutmanipur reservoir which has abundant reserve of water throughout the year and principal source of water supply schemes for the Bankura and adjacent Purulia districts. The proposed Intake is located at Satsol mouza of Khatra block.

190. Mukutmanipur reservoir has abundant flow throughout the year even during lean seasons. WBPHEd already has a water supply scheme of 6.09 MLD from Mukutmanipur reservoir commissioned in the year 2008 for supplying water to Khatar and Ranibandh blocks serving approximately 73,600 persons in 72 Mouzas and is performing satisfactorily. The reservoir is also the source of another two proposed surface water based piped water supply schemes of PHED:(i) 27 MLD in Khatra, Hirbandh and Ranibandh blocks of Bankura district and (ii) 65 MLD for Manbazar and Bunduan blocks of adjacent Purulia district. Based on the Mukutmanipur reservoir data of 2005-16 and considering the lowest water storage during lean season as on 1<sup>st</sup> June before onset of monsoon: the average water storage calculated is 86,440 million litres per day (MLD). The total ultimate abstraction for the WTP is 44 MLD upto design year 2050 which comprises only 0.03% of the total volume of available water during lean season (February to May). Therefore, the reservoir water is sufficient to meet the demand of the project during lean period. Quality of raw water is, in general, of acceptable quality and that which can be used for potable purposes after conventional treatment and disinfection. This further justifies considering the Mukutmanipur reservoir as the potential sustainable source of raw water. There are no notable pollution sources near the intake. There are no wastewater disposal points in the upstream vicinity of the intake. The IWD has already given a permission of drawl of 44 MLD raw water for drinking water purpose under the Bankura water supply project.

191. **The Mukutmanipur Reservoir Water Quality and Suitability as Drinking Water Source.** Water quality tests of Mukutmanipur reservoir were carried out by the Public Health Engineering Department (**Table 16** in previous section). It is noted from the water quality test results that all the chemical quality parameters are well within the permissible values, except iron. So, only conventional treatment process is adequate to meet potable water standards. No special or tertiary treatment is

required. Iron content marginally exceeds the desirable value, but well within the permissible limit (value detected 0.41 mg/L, desirable limit 0.3 mg/L, permissible value 1.0 mg/L). Monitoring is also carried out by DBO contractor (ref. **Table 17, 23** in previous section). Conventional water treatment and disinfection which is proposed in the project is adequate to make the water usable for drinking purposes. A regular water quality regime needs to be established for checking the raw water quality. The water supplied to the consumers at all times must meet the drinking water standards (**Appendix 8**).

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

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

194. The average dose of chlorine for pre-chlorination will be about 4mg/L and that for post-chlorination will be about 2 mg/L. With the design capacity of WTP 44 MLD (9.7 mgd), nearly 275 kg of chlorine will be consumed daily. Chlorine cylinders (called tonners of capacity 900 kg) will be procured from nearest manufacturing unit and stored at the site. Tonners sufficient for a month will be stored in the storage; i.e. 12-15 cylinders will be stored at the WTP.

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

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

196. **Energy Efficiency.** Owing to almost flat topography of the project area, the water supply system requires pumping (using the electrical energy) to transport and supply water at requisite terminal pressure to the consumers. The raw water from the reservoir intake will be pumped to WTP inlet; within WTP it is mostly gravity flow, but requires energy to operate. From clear water reservoir at the WTP, water will be pumped to GLSR located centrally at Gobindapur at Indpur block.

197. To optimize the power consumption, the hydraulic design shall follow optimal approach, and the following shall also be considered in design and selection of pumping systems. According to Manual for the Development of Municipal Energy Efficiency Projects in India (jointly developed

by Bureau of Energy Efficiency (BEE) and International Finance Corporation in 2008), energy savings, at minimum, of 25% to 40% is possible with appropriate measures. The following measures shall be considered and incorporated into the subproject designs:

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

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

- (i) Provision of recirculation system for backwash water – backwash water from filter beds will be recirculated to WTP inlet and mixed with raw water; this arrangement will minimize wastage of water, which otherwise would have disposed to open drains, and also avoids the pollution of receiving water body.
- (ii) Provision of sludge drying - accumulated sludge from clariflocculator will be flushed to sludge drying beds, for natural drying.
- (iii) Dried sludge will be used as soil conditioner. Periodic testing of dried sludge will be conducted to ensure that it does not contain heavy metals that make it unsuitable for food crops. Tests will be conducted to confirm the concentrations below the following standards. As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Municipal Solid Waste Management and Handling Rules, 2000, 2016 have been adopted here. The MSWMH Rules stipulate that “In order to ensure safe application of compost, the following specifications for compost quality shall be met, namely:

<b>Parameters</b>	<b>Concentration Not to Exceed<sup>a</sup></b> (mg/kg dry basis, except pH value and C/N ratio)
Arsenic	10.00
Cadmium	5.00
Chromium	50.00
Copper	300.00
Lead	100.00
Mercury	0.15
Nickel	50.00
Zinc	1000.00
C/N ratio	20-40
pH	5.5-8.5
<sup>a</sup> Compost (final product) exceeding the above stated concentration limits shall not be used for food crops. However, it may be utilized for purposes other than growing food crops.	

199. **Tree Cutting at Selected Project Sites.** The identified GLSR site has few trees. However, no tree felling is anticipated after final survey and design. Following measures need to be implemented to compensate for the loss of any tree cover.

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

200. **Development of Water Treatment Plant Site.** The WTP site identified and proposed is near to Mukutmanipur reservoir and belongs to the IWD, Govt. of West Bengal. The Ground level of the site and surroundings 140 m above msl. The Topography is undulating. As per local enquiries carried out during field visits, the site is not prone for flooding, and barren land. The vulnerability mapping of the district for flood prone areas also indicates that the site is not prone to flooding. The proposed WTP site is required to be developed including proper drainage infrastructure.

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

202. **Site Selection of Construction Work Camps, Stockpile Areas, Storage Areas, and Disposal Areas.** Priority is to locate these near the project location. However, if it is deemed necessary to locate elsewhere, sites considered do not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems. Residential areas are not be considered for setting up construction camps to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposals near forest areas, water bodies, or in areas which will inconvenience the community. All locations are included in the design specifications and on plan drawings. Material stockpiles will be protected by bunds during the monsoon to arrest the silt laden runoff into rivers/ drains. The subproject is likely to generate soil from excavations, which needs to be disposed safely or utilized locally.

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

## **B. Construction Impacts**

204. Main civil works in the subproject include construction of Intake with Fixed Type Jetty with arrangement for housing pumping machineries, water treatment plant, ground level storage reservoirs, pumping stations, at the identified sites. These works are confined to sites, and construction includes general activities like site clearance, excavation for foundations, and creation of concrete structures are one of the major construction activities for this project, as many of the subproject components are fixed to concrete plinths and most are housed in buildings with at least some concrete structural elements. Most such structures are constructed from reinforced concrete, where steel reinforcing rods and bars are placed and attached by hand to create an interior skeleton for the foundations, walls, columns, plinths, etc., and heavy-duty metal and timber/plywood formwork is bolted around the outside to build a mould into which pre-mixed concrete is poured. Once the concrete has set, the formwork is removed, and the concrete surface is finished by masons by hand if necessary. Some buildings, such as the pumping station,

facilities, etc., may be constructed from brick work, in which case this work can be done using standard house-building techniques.

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

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

207. Subproject also includes laying of approximately 22.36 km (as per final survey) long Primary Transmission Main pipeline from WTP to Intermediate GLSR. It is proposed to lay the pipeline partly by trenchless technology, especially at the junctions where the pipeline crosses busy roads. In the other sections, it will be laid by open cut method. Appropriate trenchless technology will be adopted by the contractor such as modern micro tunnelling with boring pipe jacking technique. Although the main purpose of trenchless here is to lay the pipelines at the sections where it crosses main roads to avoid road closures and traffic disruptions, other important issues such as large-scale public inconvenience, safety, and blocking access to properties, business and houses are considered while selecting the sections for trenchless approach.

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

209. Although pipe laying work involves quite simple techniques of civil work, the invasive nature of excavation and pipeline alignment in the built-up areas results in impacts to the environment and sensitive receptors such as residents, businesses, and the community in general. These anticipated impacts are temporary and for short duration, however, needs to be mitigated. At congested market/commercial area and main road where day time traffic movement is more, pipe laying will be carried out at night time. Management plan for night works developed and discussed in para 220.

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

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

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

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

213. **For All Construction Works**

- (i) Comply with the air pollution / dust control measures for construction activities stipulated by the “Direction of West Bengal Department of Environment under the Air Act, 1981 Direction No. EN/3170/T-IV-7 /001/2009 dated: 10 December 2009” (Ref **Appendix 6**);
- (ii) Provide a dust screen around the construction sites at GLSR and WTP work sites;
- (iii) Damp down the soil and any stockpiled material on site by water sprinkling;
- (iv) Use tarpaulins to cover the loose material (soil, sand, aggregate etc.) when transported by trucks;
- (v) Clean wheels and undercarriage of haul trucks prior to leaving construction site/quarry;
- (vi) Control dust generation while unloading the loose material (particularly aggregate, soil) at the site by sprinkling water and unloading inside the barricaded area;
- (vii) Stabilize surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition

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

**214. For Pipeline Works**

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

**215. Surface Water Quality.** Run-off from stockpiled materials and chemicals from fuels and lubricants during construction works can contaminate downstream surface water quality of the streams. Project area is flat/undulating and receives considerable rainfall, although mostly confined during the monsoon months. The WTP site is located adjacent to intake site. It is important that runoff from the construction areas, which may contain silt and chemical traces do not enter these water bodies. Impacts are temporary, and may not be significant, but needs to be mitigated. Construction contractor is required to:

- (i) All earthworks be conducted during the dry season to prevent the problem of soil run-off during monsoon season;
- (ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
- (iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils

- (iv) will be disposed, only designated disposal areas shall be used;
- (iv) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
- (v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
- (vi) Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling;
- (vii) Dispose any wastes generated by construction activities in designated sites; and
- (viii) Conduct surface quality inspection according to the EMP/SEMP.

216. **Pollution of Reservoir Water During Construction.** Construction of intake well within the Mukutmanipur reservoir, and construction of pipe-supporting bridge may lead to degradation of water quality due to increase in turbidity and chemical contamination from fuels and lubricants used in construction work. Increase in silt content and water turbidity, chemical quality can affect the aquatic life, silting/chocking of spill ways/ canals etc., Though the work is small scale, to ensure that any negative impacts are mitigated, the contractor is required to:

- (i) Select a construction methodology that is least disturbing, and appropriate for the in-situ soil condition, and able to complete the construction work in minimum time
- (ii) Schedule the construction works during low flow period and ensure that works is completed during the same period to prior to onset of monsoon
- (iii) Erect temporary barriers to form enclosed construction area with least disturbance
- (iv) Allow adequate time settle the distributed solids to prior to pumping out water; only clear/clarified water shall be pumped back into the water body/reservoir; any silt laden water should be pumped to a silt pond
- (v) Avoid/minimize use of fuels, chemicals and lubricants; ensure no spillage; and have an equipment spill and containment plan and appropriate materials on-site
- (vi) Clean up the site after construction; excavated soil, debris, material shall be cleared from the river bed/bank properly
- (vii) Conduct water quality inspection according to the Environmental Monitoring Plan (EMP)/ SEMP

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

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

218. **Generation of Construction Wastes.** Solid wastes generated from the construction activities are excess excavated earth (spoils), discarded construction materials, cement bags, wood, steel, oils, fuels and other similar items. Domestic solid wastes may also be generated from the workers' camp. Improper waste management could cause odour and vermin problems, pollution and flow obstruction of nearby watercourses and could negatively impact the landscape. Construction waste will be disposed in line with the guideline issued by WB Pollution Control Board. Contractor in consultation

with PHED has identified disposal sites for stockpile. Stockpiles is not situated such that they obstruct natural water pathways. Stockpiles is not exceeded 2 m in height unless otherwise permitted by the Engineer. Generally, PHED allows 1.2m height. The following mitigation measures to minimize impacts from waste generation will be implemented by the contractor:

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

219. **Noise and Vibration Levels.** GLSR site, WTP cum booster pumping station, and primary transmission main laying routes are located predominantly in a rapidly developing area. All these sites are located close to habitation areas, where there are houses, schools and hospitals, religious places and businesses. The sensitive receptors are the general population in these areas. Increase in noise level may be caused by excavation, particularly breaking of cement concrete or bitumen roads for laying of pumping main, operation of construction equipment like concrete mixers, and the transportation of equipment, materials, and people. Vibration generated from construction activity, for instance from the use of pneumatic drills, have impact on nearby buildings. This impact is negative but short-term, and reversible by mitigation measures. The construction contractor is required to:

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

220. **Management Plan for Night works.** Following requirements should be fulfilled for construction works at night hours-

- (i) Night works should be avoided at construction sites specially in residential areas and should be performed only when day works are not possible due to excessive traffic/public/pedestrian movement, site of cultural or religious importance, where there is huge crowd during day hours or any other unavoidable circumstances.
- (ii) Limit construction activities at night. When necessary, ensure that night work is carefully scheduled and the community is properly informed so they can take necessary measures. Consult community regarding appropriate timing of noisy activities and avoid noisy activities at night. Use noise-control methods (barriers/ shelter/ muffling devices) and maintain a buffer zone if possible. Minimize project transportation, particularly heavy vehicles, through residential areas. Use of high noise generating equipment shall be stopped during night time.
- (iii) Safety gear can greatly affect worker visibility. The decision and maneuver distance – how long it takes a driver to notice the worker and make any path or speed changes – is over 5 times greater with reflective clothing than with regular, dark-colored – or even orange-colored – clothes. With this increased decision and manoeuvre distance, workers, motorists, and equipment are much less likely to have a collision – chances of damage, injury, or death are reduced.
- (iv) Reflective clothing is not the only available technique to increase visibility at night. Flashing lights on a worker’s body or clothing, reflective tape on equipment, and especially proper work area lighting are all good ways to increase visibility.
- (v) Proper lighting at night includes several different levels and designations of lighting. In order to understand appropriate lighting levels for night work, we first need to talk about how it is measured. Lighting is typically measured by what are called “foot-candles”. One foot-candle is the luminance cast on a 1 square foot surface by a single candle’s light.
- (vi) Visibility & Training: There are two main ways to ensure that motorists and workers experience the safest possible night-time work zone. First is proper safety training, and second is improving visibility throughout the work zone and especially at critical areas like traffic control workers’ stations and on any people or equipment.
- (vii) Through proper training and lighting, night time construction can happen as safely as construction in the daytime. This allows contractors and agencies to take advantage of working with fewer delays for the travelling public and for construction workers to work more safely in lower volume traffic.
- (viii) Preferably electrical connections are available for running equipment otherwise sound proof/super silent Diesel Generator set should be available
- (ix) Sound level should not increase as per following-

Type of area of work	Maximum noise level dB(A)
Industrial	70
Commercial	55
Residential	45
Silence zone	40

- (x) Illumination should be as follows-

Minimum illumination (lx)	Areas to be illuminated	Type of work activity
54	Illumination throughout the work area	General work area lighting, and performance of visual tasks of large size, or medium contrast, or low require accuracy
108	Illumination of work area and areas adjacent to equipment	Performance of visual tasks of medium size, or low to medium contrast, or medium required accuracy
216	Illumination of task	Performance of visual tasks of small size, or low contrast or high required accuracy or fine finish

- (xi) As far as possible ready-mix concrete from batching plant to be used, otherwise the concrete should be prepared away from residential areas and brought to the site;
- (xii) All the noise activity like hammering, cutting, crushing, running of heavy equipment should be done in day time and avoided in night time;
- (xiii) Workers engaged in night works should have adequate rest/sleep in day time before start of night works;
- (xiv) Worker engaged for night works should have previous experience of night works and should be physically fit for such works including clear vision in night;
- (xv) All the necessary provisions of traffic aids such as traffic signals, road signage, barricades, cautions boards, traffic diversion boards etc. should be available with fluorescent/retro-reflective arrangements;
- (xvi) Workers should be trained before start of night works about risks and hazards of night works and their mitigation measures and should be provided all the protective aids (PPEs) including fluorescent/retro-reflective vests;
- (xvii) Horns should not be permitted by equipment and vehicles;
- (xviii) Workers should not shout and create noise;
- (xix) First aid and emergency vehicles should be available at site;
- (xx) Emergency preparedness plan should be operative during night works;
- (xxi) Old persons and pregnant women and women having small kids should not work in night time;
- (xxii) All the vehicles and equipment being used at night works should have adequate type of silencers/enclosures/mufflers to reduce noise;
- (xxiii) All the vehicles should be checked for working head lamps, tail lamps, inner lights etc. before start of night works;
- (xxiv) PIU site engineers and contractors' safety personnel should closely monitor the safety of works continuously and noise and illumination levels on hourly basis and maintain photographic and videographic records as well as register the observations;
- (xxv) Night works should be stopped early in the morning at least one hour before start of pedestrian/traffic movement;
- (xxvi) After completion of night works all the site should be cleaned and maintained obstruction free for day time movement of vehicles and pedestrians;
- (xxvii) Drivers and workers should be alert and responsive during night works;
- (xxviii) All the wages to workers working in night hours should be as per the applicable labour acts;
- (xxix) Avoid any nuisance which may create problems to nearby habitants and work peacefully during night hours; and
- (xxx) Night works should not be conducted near hospitals and during peak seasons such

as peak tourist season, students' exam times etc.

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

222. **Hauling (Material, Waste/debris and Equipment) Activities**

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

223. **Pipeline Works**

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

224. **Socio-Economic – Income.** Only GLSR site is under private ownership, is required to be purchased at market price with the willingness of the land owners to sell their property for the project. Land purchase process has been completed. Resettlement and social issues are being studied in a parallel resettlement planning study of this subproject. Blocking of access to the business / livelihood activities, especially during pipeline laying along the roads, may impact the income of households. However, given the alignment of pipeline, trenchless technology for road crossing, and also the measures suggested for ensuring accessibility during pipeline works, no notable

impact is envisaged.

225. **Socio-Economic – Employment.** Manpower is required during the 36-months construction stage. This can result in generation of temporary employment and increase in local revenue. Thus, potential impact is positive and long-term. The construction contractor is required to:

- (i) Employ local labour force as far as possible
- (ii) Secure construction materials from local market.

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

- (i) Comply with all national, state and local labour laws (see **Appendix 7**);
- (ii) Develop and implement site-specific occupational health and safety (OHS) Plan and Supplementary H & S plan for COVID 19 issues as per the “Standard Operating Procedure for Prevention and Risk Minimization of Corona Virus Disease (COVID-19) at the Facilities and Work Sites” developed by PMU (**Appendix 18**) which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use personal protective equipment; (c) OHS Training<sup>26</sup> and COVID 19 awareness H & S training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;
- (iii) Ensure that qualified first-aid is provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
- (iv) Provide medical insurance coverage for workers;
- (v) Secure all installations from unauthorized intrusion and accident risks;
- (vi) Provide health and safety orientation training including COVID 19 awareness to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
- (vii) Provide health and safety orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
- (viii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
- (ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
- (x) Ensure moving equipment is outfitted with audible back-up alarms;
- (xi) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general

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<sup>26</sup> Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

- public as appropriate;
- (xii) Disallow worker exposure to noise level greater than 85 db(A) as for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.
- (xiii) Provide supplies of potable drinking water;
- (xiv) Provide clean eating areas where workers are not exposed to hazardous or noxious substances
- (xv) Overall, the contractor should comply with International Finance Corporation's Environment, Health and Safety (EHS) Guidelines<sup>27</sup> on Occupational Health and Safety.

227. Standard Operating Procedure (SOP) for the project and Supplementary H & S plan for COVID 19, which is standalone document to be followed by contractor has been prepared for the project and specific package, which cover,

- General instruction to follow to prevent the spread of COVID-19 in construction workplace
- Detail (step-by-step) work procedure to getting the workplace ready under COVID-19 situation
- Worksite prevention practice and disinfection procedure at work site, office, during meeting, travelling, etc.
- Timely vaccination of workers
- Precaution taken at workmen habitat/ camp
- Control measures taken for deploying new workmen at site
- Use of PPEs: face mask – hand gloves, maintaining social distancing, disinfection, requirement of awareness covered under the H & S plan.

228. **Work within Reservoir.** Since during construction of intake worker should have to work within Reservoir, special precaution particularly using safety equipment and training on swimming and mitigation under emergency situation is necessary.

229. Guidelines for Safety during Monsoon/Heavy Rainfall is attached as **Appendix 9**.

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

- (i) Restrict construction vehicle movements to defined access roads and demarcated working areas (unless in the event of an emergency)
- (ii) Enforce strict speed limit (20-30 kmph) for playing on unpaved roads, construction tracks
- (iii) Night-time driving will be by exception only, as approved by the PIU to minimise driving risk and disturbance to communities
- (iv) Adopt standard and safe practices for micro tunnelling
- (v) Temporary traffic control (e.g. flagmen) and signs will be provided where necessary to improve safety and provide directions
- (vi) All drivers will undergo safety and training

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<sup>27</sup> International Finance Corporation, World Bank Group EHS Guidelines. [General EHS Guidelines - 2.0 Occupational Health and Safety](#).

- (vii) Public access to all areas where construction works are on-going will be restricted through the use of barricading and security personnel
- (viii) Warning signs, blinkers will be attached to the barricading to caution the public about the hazards associated with the works, and presence of deep excavation
- (ix) The period of time when the pipeline trench is left open will be minimized through careful planning
- (x) Control dust pollution – implement dust control measures as suggested under air quality section
- (xi) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.
- (xii) Provide road signs and flag persons to warn of on-going trenching activities.

231. **Construction Camps.** Contractor may require to set up construction camps – for temporary storage of construction material (pipes, cement, steel, fixtures, fuel, lubricants etc.), and stocking of surplus soil, and may also include separate living areas for migrant workers. The contractor is encouraged to engage local workers as much as possible. Outside works will be not allowed due to widespread of COVID 19 infection. Operation of work camps can cause temporary air, noise and water pollution, and may become a source of conflicts, and unhealthy environment if not operated properly. Potential impacts are negative but short-term and reversible by mitigation measures. The construction contractor is required to:

- (i) As far as possible located the camp site within the work sites (at Intake, GLSR and WTP sites); if any camp to be established outside these, then select a camp site away from residential areas (at least 50 m buffer shall be maintained);
- (ii) Avoid tree cutting for setting up camp facilities;
- (iii) Ensure that a proper compound wall is provided, and erect a wind/dust screen around;
- (iv) Camp site shall not be located near (100 m) water bodies, flood plains flood prone/low lying areas, or any ecologically, socially, archeologically sensitive areas;
- (v) Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit;
- (vi) Provide proper temporary accommodation with proper materials, adequate lighting and ventilation, appropriate facilities for winters and summers; ensure conditions of liveability at work camps are maintained at the highest standards possible at all times;
- (vii) Consult PIU before locating project offices, sheds, and construction plants;
- (viii) Minimize removal of vegetation and disallow cutting of trees;
- (ix) Ensure conditions of liveability at work camps are maintained at the highest standards possible at all times; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GI sheets, tarpaulins, etc., shall not be allowed as accommodation for workers;
- (x) Camp should be protected from COVID 19 health risk. All Health and safety procedure to follow for operation of camp (H & S plan for COVID 19 will be used as ref. document) during stay, cooking, eating, use of toilet- common space etc.
- (xi) Self- hygiene, disinfection of entire camp and toilet, maintaining of social distancing to be continued for protection from COVID 19 infection
- (xii) Camp shall be provided with proper drainage, there shall not be any water accumulation;
- (xiii) Provide drinking water, water for other uses, and sanitation facilities for employees;
- (xiv) Prohibit employees from cutting of trees for firewood; contractor should be provided proper facilities including cooking fuel (oil or gas; fire wood not allowed);
- (xv) Train employees in the storage and handling of materials which can potentially cause

- soil contamination;
- (xvi) Recover used oil and lubricants and reuse or remove from the site;
- (xvii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; provide a compost pit for bio- degradable waste, and non-biodegradable/recyclable waste shall be collected and sold in local market;
- (xviii) Remove all wreckage, rubbish, or temporary structures which are no longer required;
- (xix) At the completion of work, camp area shall be cleaned and restored to pre-project conditions, and submit report to PIU; PIU to review and approve camp clearance and closure of work site.

### **C. Operation and Maintenance Impacts**

232. Operation and Maintenance of the water supply system will be carried out by Public Health Engineering Department directly or through an external operator. Operation will involve treatment of water in the WTP, disinfection with chlorine, conveying clear water by pumping from booster pumping station to centrally located Intermediate Booster Pumping Station for distribution in their respective zones via distribution system (comprising of overhead tanks and distribution pipes) that will be developed through another subproject under the WBDWSIP.

233. During its operation phase, WTP will treat about 9.7 million gallons (44 million liters) of water every day. The main impact of WTP operation is from (i) generation of wastewater and sludge, (ii) noise from operation of pumps and motors, (iii) chlorine gas leakage risk, and (iv) consumption of electricity. All of these are duly considered in the design of WTP, and various measures such as the following are already incorporated into the project design:

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

234. Since backwash water is recovered and recirculated in the WTP, no wastewater will be generated from water treatment process. Water treatment process will generate approximately Maximum volume of sludge generation = 650 m<sup>3</sup>/day (solids content in sludge = 15000 kg/day) – during monsoon when TSS content is maximum (300 mg/l). Average volume of sludge generation = 325 m<sup>3</sup>/day (solids content in sludge = 7500 kg/day) – average TSS content is considered to be 150 mg/l (this is also on the higher side) sludge from sedimentation of particulate matter in raw water, flocculated and precipitated material resulting from chemical coagulation, residuals of excess chemical dosage, plankton etc.; and waste from rinsing and back washing of filter media containing debris, chemical precipitates, straining of organic debris and plankton. In the WTP, sludge will collect, thickened and disposed of or reused as soil conditioner. Sludge will be tested periodically for heavy metal concentration.

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

236. During the system design life (15/30 years for mechanical/civil components) it shall not require major repairs or refurbishments and should operate with little maintenance beyond routine actions required to keep the equipment in working order. The stability and integrity of the system will be monitored periodically to detect any problems and allow remedial action if required. Any repairs will be small-scale involving manual, temporary, and short-term works involving regular checking and recording of performance for signs of deterioration, servicing and replacement of parts.

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

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

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

239. Biological hazards are among the environmental risks that may adversely impact the health and wellness of the workers and the community. Breakouts of diseases such as diarrhea, flu or pandemics such as the COVID-19 shall be avoided. Designs and implementation of treatment systems shall ensure that disease-causing pathogens or viruses are disinfected and will not cause any health issues. The World Health Organization has released an interim guidance on Water, Sanitation, Hygiene and Waste Management for the COVID-19 virus. Measures on managing wastewater and faecal waste and keeping water supplies safe is critical to avoid the start or spread of any disease.

240. The residents of the project area will be the major beneficiaries of the improved water supply system, as they will be provided with a constant supply of better-quality water, piped into their homes at an appropriate pressure. The project will improve the over-all health condition of the project area by controlling water borne diseases, so people should spend less on healthcare and lose fewer working days due to illness. Their economic status should also improve, as well as their overall health. This should also improve the environment of these areas, should deliver

major improvements in individual and community health and well-being.

## VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

### A. Overview

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

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

### B. Public Consultation

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

#### 1. Consultation during Project Preparation

244. Institutional consultations were conducted with the project agencies, and Government Departments such as PHED, Block Development Officer, Khatra, Panchyat Samity members, Pollution Control Board, Planning, Health and Sanitation wing officials etc. The subproject proposal is formulated in consultation with the local bodies in the project area to suit their requirements.

245. Focus-group discussions with affected persons and other stakeholders were conducted to learn their views and concerns. A socio-economic household survey has been conducted in the project area, covering sample households, to understand the household characteristics, health status, and the infrastructure service levels, and also the demand for infrastructure services. General public and the people residing along the project activity areas were also consulted during visits to the project sites. Important issues or concerns that were raised by the stakeholders during consultations along with photographs and attendance sheets are provided in **Appendix 11**. Further a project-level consultation workshop is also conducted in the project area during pre-construction phase at Gobindapur village near GLSR site on 11<sup>th</sup> October, 2019. Total 35 number of local community people attended the workshop, out of which number of female participants were 14.

**Table 30: Summary of public consultation held for bulk water supply project**

Sl. No.	Date	Location	Gram Panchayat	Water Works	Total No. of Participants	No. of Female Participants
1.	11.10.19	Gobindapur village	Bheduasole	GLSR	35	14

246. It has been observed that people are very happy about the project as the project area

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

## 2. Consultation during Construction

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

248. Summary of public consultations including FGDs conducted during construction phase is attached (sample) in the **Appendix 11**. Details of locations where the consultations were conducted during construction period and the number of participants present during the consultation process are given below. The process will be continued throughout the implementation period. Public consultation details upto 2024 are attached in Semi Annual Environment Monitoring report.

**Table 31: Summary of public consultation held for bulk water supply project**

Sl. No.	Date	Location	Gram Panchayat	Water Works	Total No. of Participants	No. of Female Participants
1.	23-12-2020	Tilabani more	Hirbandh	--	6	1
2	26-12-2020	Supur market	Supur	--	18	1
3	26-12-2020	Hatirampur market	Baharamuri	--	20	1

## C. Information Disclosure

249. Executive summary of the final approved IEE will be translated in Bengali and made available at the offices of PMU, PIU, Block offices, and also displayed on their notice boards. Hard copy of the IEE will be accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE in English and Executive Summary in Bengali will be placed in the official website of the PHED, PMU after approval of the IEE by Government and ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

250. Public information campaigns to explain the project details to a wider population will be conducted. Public disclosure meetings will be conducted at key project stages to inform the public of progress and future plans. Prior to start of construction, the PMU/PIU will issue Notification on

the start date of implementation in local newspapers A board showing the details of the project will be displayed at the construction site for the information of general public.

251. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction. The road closure together with the proposed detours will be communicated via advertising, pamphlets, radio broadcasts, road signage, etc.

## VII. GRIEVANCE REDRESS MECHANISM

### A. Project Specific Grievance Redress Mechanism

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

254. Affected persons have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaints/suggestion boxes or through telephone hotlines at accessible locations, by e-mail, by post, or by writing in a complaint register in GP office or PMU or PIU office. Careful documentation of the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area, and how the problem was resolved is recorded. The names of the persons to be included in the Field Level GRM are already suggested. The Sample Grievance Registration Form has been translated in Bengali (**Appendix 13**). Notification was issued on constitution and function of GRC. GRC Notifications of PMU, PIU levels are attached in **Appendix 12**.

255. PMU / HSGO together with PIU Safeguard Officers are entrusted the joint responsibility for timely grievance redressal on safeguards and gender issues and for registration of grievances, related disclosure, and communication with the aggrieved party. The affected persons are encouraged to seek a complaint registration number through the PIU.

256. The Grievance Redress Mechanism provides an accessible, inclusive, gender-sensitive and culturally appropriate platform for receiving and facilitating resolution of affected persons' grievances related to the project. A two-tier grievance redress mechanism is conceived, one, at project level and another, beyond project level. For the project level GRM, a Grievance Redress Cell has been established at PIU; the safeguards officers of the ESSU PIU, supported by the social safeguards specialist of DSICS is responsible for conducting periodic community meetings with affected communities to understand their concerns and help them through the process of grievance redressal including translating the complaints into Bengali or English, recording and registering grievances of non-literate affected persons and explaining the process of grievance redress mechanism. All expedient and minor grievances will be resolved at field level; should the PIU fail to resolve any grievance within the stipulated time period, the PMU will be consulted and suggested actions by PMU taken by PIU with DSISC support, within specified time. PIU is also responsible for follow-through for each grievance, periodic information dissemination to complainants on the status of their grievance and recording their feedback (satisfaction/ dissatisfaction and suggestions). In the event that certain grievances cannot be resolved at project level, they are referred to the District Steering Committee (DSC), which also acts as Grievance Redress Committee (GRC), particularly in matters related to land purchase/acquisition, payment of compensation, environmental pollution etc. Any higher than district level inter-departmental coordination or grievance redress required will be referred to the state level Steering Committee (**Appendix 12** for notification).

257. The GRM aims to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. All grievances – major or minor, will be registered. In case of grievances that are immediate and urgent in the perception of the complainant, the contractor, and supervision personnel from the PIU supported by design,

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

258. The DSISC has been set up to monitor project implementation in each district. In its role as a GRC, the DSISC will meet every month (if there are pending, registered grievances), determine the merit of each grievance, and resolve grievances within specified time upon receiving the complaint-filing which the grievance will be addressed by the state-level Steering Committee. The Steering Committee will resolve escalated/unresolved grievances received. Grievances remaining unresolved by Steering Committee may be referred by affected persons to appropriate courts of law. The multi-tier GRM for the project is outlined below (**Figure 11**), each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required. The GRC will continue to function throughout the project duration. The PMU has issued notifications to concerned PHE Divisions to establish the respective PIU (and field) level GRCs, with details of composition, process of grievance redress to be followed, and time limit for grievance redress at each level.

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

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

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

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

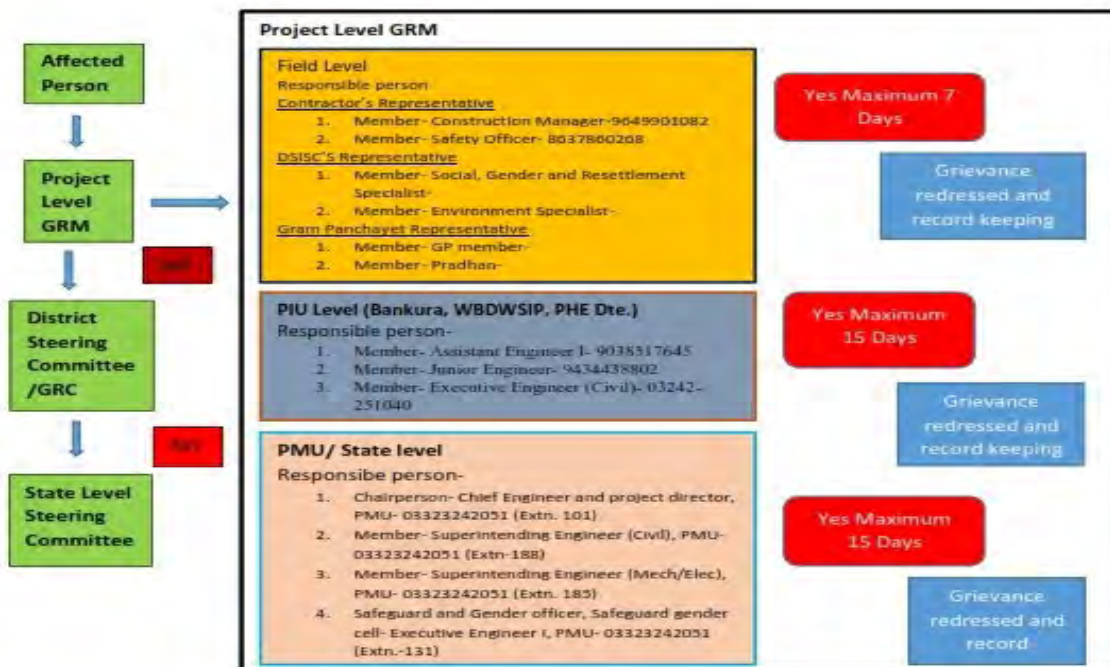
263. **Recordkeeping.** Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were addressed and final outcome will be kept by PIU (with the support of DSISC) and submitted to PMU.

264. **Information Dissemination Methods of the Grievance Redress Mechanism.** The PIU, assisted by DSISC is responsible for information dissemination to affected persons on grievance redressal procedure. GP/coverage area/affected area-wide public awareness campaigns ensure that awareness on grievance redress procedures is generated through the consultation and participation plan. Public awareness campaign has been conducted to ensure that awareness on the project and its grievance redress procedures is generated. The PIU assistant safeguard officers (environment and social) is assisted by DSISC safeguards specialists with information/collateral/ awareness material etc., and in conducting project awareness campaigns. The campaign ensures that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per agreed entitlement matrix including who to contact and when, where/ how to register grievance, various stages of grievance redress process, time likely to be taken for redressal of minor and major grievances, etc. Grievances received and responses provided will be documented and reported back to the affected persons. The number of grievances recorded and resolved and the outcomes will be displayed/ disclosed in the PMU and PIU offices, GP/concerned local panchayat notice boards and on the web, as well as reported in the semi-annual environmental and social monitoring reports to be submitted to ADB. A Sample Grievance Registration Form has been attached in **Appendix 13**.

265. **Periodic review and documentation of lessons learned.** The PMU ESC will periodically review the functioning of the GRM and record information on the effectiveness of the mechanism, especially on the PIU's ability to prevent and address grievances.

266. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) is being borne by the PMU. Cost estimates for grievance redress are included in resettlement cost estimates. The grievance redressal process is shown in **Figure 11**.

**Figure 11: Grievance Redressal Process**



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

## VIII. ENVIRONMENTAL MANAGEMENT PLAN

### A. Environmental Management Plan

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

269. The EMP guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between PHED, project management unit (PMU), project implementing unit (PIU), consultants and contractors. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensure that safety recommendations are complied with. The EMP includes a monitoring program to measure the environmental condition and effectiveness of implementation of the mitigation measures. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

270. The contractor submits to PIU, for review and approval, a site-specific environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; (iii) monitoring program as per SEMP; and (iv) budget for SEMP implementation. No works are allowed to commence prior to approval of SEMP. Contractor has submitted SEMP for the construction activities that has commenced. **Appendix 17** shows link of approved updated SEMP for package Bk-01. At present construction work continued at site (site photo **Appendix 10**).

271. A copy of the EMP/approved SEMP kept on site during the construction period at all times. The EMP included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

272. For civil works, the contractor is required to (i) carry out all of the mitigation and monitoring measures set forth in the approved SEMP; and (ii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer has prepared from time to time to monitor implementation of this IEE and SEMP. The contractor has allocated budget for compliance with these SEMP measures, requirements and actions.

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

**Table 32: Design Stage Environmental Impacts and Mitigation Measures**

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
Design of water supply system	Source sustainability and efficiency	(i) Discontinuation of current unsafe and unsustainable ground water sources and creating a new comprehensive surface water (Mukutmanipur reservoir) based water supply system (ii) Recovering wash water from treatment process to optimize the water use (iii) Treatment and reuse of sludge from treatment process (iv) Designing the entire system to maintain optimal flow and terminal pressure, and optimizing the overall energy usage (v) Reducing the incidence of water borne diseases by providing (vi) 100% population including urban poor with potable water supplies (vii) Preparation and implementation of a water quality surveillance program including development of a laboratory as part of the project by design, build and operate (DBO) contractor to ensure that supplied water meets the drinking water standards (viii) Development of laboratory with all necessary environment, health and safety measures and adopting international standard procedures for water quality testing (ix) Using low-noise and energy efficient pumping systems (x) Installing the noise-producing pumps and motors etc., in enclosed buildings with noise reducing walls, and also maintaining (xi) adequate buffer to the nearby inhabited areas (xii) Provision of appropriate personal protection equipment to the workers and staff (xiii) Conduct assessment for possible adverse impacts on aquatic species from construction and operations of the water intake and jetty	DBO Contractor/ project implementation unit (PIU)	Project Costs
Chlorine usage as	Chlorine handling and application risk – health	(i) In final design, the following measure are provided at the chlorine application unit:	DBO Contractor/ PIU	Project Costs

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
disinfectant at Water Treatment Plant (WTP)	and safety risk to workers and general public	(ii) Chlorine neutralization pit with a lime slurry feeder (iii) Chlorine absorption and neutralization facility (iv) Proper ventilation, lighting, entry and exit facilities (v) Visible and audible alarm facilities to alert chlorine gas leak (vi) Facility for isolation in the event of major chlorine leakage (vii) Eye wash and shower facility (viii) Personal protection and safety equipment for the operators in the chlorine plant (masks, oxygen cylinders, gloves, etc.,) (ix) Provide training to the staff in safe handling and application of chlorine; this shall be included in the contract of Chlorinator supplier (x) Supplier of Chlorinator equipment shall provide standard operating manual for safe operation and as well as maintenance and repairs; preferably these shall be provided both in English and Bengali Languages.		
Layout plan of WTP and GLSR	The replantation of one-year tree plantation	Minimize removal of trees by adopting to site condition and with appropriate layout design of GLSRs No need of permission for tree cutting	DBO Contractor/PIU	Project Costs

**Table 33: Pre-Construction Stage Environmental Impacts and Mitigation Measures**

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
Utilities	Telephone lines, electric poles and wires, water lines within proposed project area	(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) Require construction contractors to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services. (iii) Require contractors to prepare spoils (waste) management plan and traffic management plan (approved plan attached in SEMP)	Design, build and operate (DBO) Contractor in collaboration with project implementation unit (PIU) and with approval of project management unit (PMU)	(i) List of affected utilities and operators; (ii) Bid document to include requirement for a contingency plan for service interruptions (example provision of water if disruption is more than 24 hours), waste management plan and traffic management plan	Project Cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
Construction work camps, stockpile areas, storage areas, and disposal areas.	Conflicts with local community; disruption to traffic flow and sensitive receptors	(i) Prioritize areas within or nearest possible vacant space in the project location; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems; (iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community. (v) For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, written consent from landowners (not lessees) will be obtained; (b) debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located within 50 m downwind side of the site; and (d) site is minimum 250 m away from sensitive locations like settlements, ponds/lakes or other water bodies.	DBO Contractor to finalize locations in consultation and approval of PIU	(i) List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas. (ii) Written consent of landowner/s (not lessee/s)	Project Cost
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation	(i) Obtain construction materials only from government approved quarries with prior approval of PIU;	DBO Contractor to prepare list of approved quarry sites and sources of	(i) List of approved quarry sites and sources of materials;	Project cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
	resulting in accelerated erosion, disturbance in natural logging, and water pollution drainage patterns, ponding and water	(ii) PIU to review, and ensure that proposed quarry sources have all necessary clearances/permissions in place prior to approval (iii) Contractor to submit to PIU on a monthly basis documentation on material obtained from each source (quarry/ borrow pit) (iv) Avoid creation of new borrow areas, quarries etc., for the project; if unavoidable, contractor to obtain all clearances and permissions as required under law prior to approval by PIU	materials with the approval of PIU		
Consents, permits, clearances, No Objection Certificates (NOCs), etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works	(i) Obtain all necessary consents, permits, clearance, NOCs, etc. prior to award of civil works ( <b>Ref Appendix 16 for WTP-CTE &amp; approved SEMP – link mentioned in Appendix 17</b> ) (ii) Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (iii) Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc. (iv) Include in detailed design drawings and documents all conditions and provisions if necessary	PIU and PMC	Incorporated in final design and communicated to contractors.	Cost of obtaining all consents, permits, clearance, NOCs, etc. prior to start of civil works responsibility of PIU.
Asbestos	Health risk due to	(i) Obtain details on	DBO Contractor in	Detailed construction	No cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
Cement Pipes	exposure to asbestos materials	location of underground asbestos cement pipes (ii) Locate the new pipe carefully to avoid encountering asbestos cement pipes (iii) Leave the asbestos cement pipes undisturbed in the ground.	coordination with PIU and PMC	drawings showing alignment of asbestos cement pipes	required. Mitigation measures are part of terms of reference (TOR) of PIU and DSISC

**Table 34: Construction Stage Environmental Impacts and Mitigation Measures**

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
Environmental Management Plan (EMP) Implementation Training and OHS plan including COVID 19 H & S plan	Irreversible impact to the environment, workers, and community	(i) Project manager and all key workers will be required to undergo training on EMP implementation including spoils/waste management, Standard operating procedures (SOP) for construction works; occupational health and safety (OHS) including COVID 19 H & S awareness, core labour laws, applicable environmental laws, etc.	Design, Build and Operate (DBO) Contractor	Project Cost / Project Management Unit (PMU) cost
Air Quality	Emissions from construction vehicles, equipment, and machinery used for installation of pipelines resulting to dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulphur oxides, particulate matter, nitrous oxides, and hydrocarbons.	<b><u>For all construction works</u></b> (i) Comply with the Direction of West Bengal Department of Environment under the Air Act, 1981 in controlling air pollution from construction activities. (ii) Comply with the air pollution / dust control measures for construction activities stipulated by the "Direction of West Bengal Department of Environment under the Air Act, 1981 Direction No. EN/3170/T-IV-7 /001/2009 dated: 10 December 2009 (iii) Damp down the soil and any stockpiled material on site by water sprinkling; (iv) Use tarpaulins to cover the loose material (soil, sand, aggregate etc.) when transported by trucks; (v) Provide a dust screen around the	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>construction sites at ground level storage reservoir (GLSR) and WTP work sites.</p> <p>(vi) Clean wheels and undercarriage of haul trucks prior to leaving construction site/quarry</p> <p>(vii) Control dust generation while unloading the loose material (particularly aggregate, soil) at the site by sprinkling water and unloading inside the barricaded area</p> <p>(viii) Stabilize surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition</p> <p>(ix) Use tarpaulins to cover the loose material (soil, sand, aggregate etc.) when transported by trucks;</p> <p>(x) Apply water and maintain soils in a visible damp or crusted condition for temporary stabilization</p> <p>(xi) Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process</p> <p>(xii) Cover the soil stocked at the sites with tarpaulins</p> <p>(xiii) Control access to work area, prevent unnecessary movement of vehicle, public trespassing into work areas; limiting soil disturbance will minimize dust generation</p> <p>(xiv) Ensure that all the construction equipment, machinery is fitted with pollution control devices, which are operating correctly, and have a valid pollution under control (PUC) certificate</p> <p><b><u>Pipeline Works</u></b></p> <p>(i) Barricade the construction area using hard barricades (of 2 meter or m height) on both sides and provide dust/wind screen (such geo textile fabric) up to 3 m height (1 m above the hard barricading)</p> <p>(ii) Initiate site clearance and excavation work</p>		

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>only after barricading of the site is done</p> <p>(iii) Confine all the material, excavated soil, debris, equipment, machinery (excavators, cranes etc.), to the barricaded area</p> <p>(iv) Limit the stocking of excavated material at the site; remove the excess soil from the site immediately to the designated disposal area</p> <p>(v) Undertake the work section wise: 100 – 200 m section should be demarcated and barricaded</p> <p>(vi) Conduct work sequentially - excavation, pipe laying, backfilling; conduct pipe testing section-wise (for a minimum length as possible) so that backfilling, stabilization of soil can be done.</p> <p>(vii) Remove the excavated soil of first section to the disposal site; as the work progresses, sequentially, by the time second section is excavated, the first section will be ready for back filling, use the freshly excavated soil for back filling, this will avoid stocking of material, and minimize the dust.</p> <p>(viii) Backfilled trench at any completed section after removal of barricading will be the main source of dust pollution. The traffic, pedestrian movement and wind will generate dust from backfilled section. Road restoration shall be undertaken immediately.</p>		
Surface Water Quality	<p>Mobilization of settled silt materials and chemical contamination from fuels and lubricants during construction can contaminate nearby surface water quality</p> <p>Ponding of water in the pits/foundation Excavations</p>	<p>(i) All earthworks be conducted during the dry season to prevent the problem of soil run-off during monsoon season;</p> <p>(ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;</p> <p>(iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, only designated disposal areas shall be used;</p> <p>(iv) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;</p>	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		(v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies; (vi) Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling (vii) Dispose any wastes generated by construction activities in designated sites; and (viii) Conduct surface quality inspection according to the EMP. (ix) Create a temporary drainage channel around the work area to arrest the entry of runoff from upper areas into the work area (x) Pump out the water collected in the pits/excavations to a temporary sedimentation pond; dispose off only clarified water into drainage channels/streams after sedimentation in the temporary ponds (xi) Consider safety aspects related to pit collapse due to accumulation of water		
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	(i) Plan activities in consultation with PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; (ii) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach; (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimize sound impact to surrounding sensitive receptor; (iv) Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s. (v) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity; (vi) Plan activities in consultation with PIU so that	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;</p> <p>(vii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimize sound impact to surrounding sensitive receptor;</p> <p>(viii) Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s.</p> <p>(ix) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity</p> <p>(x) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach;</p> <p>(xi) Consult local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.</p>		
Landscape and aesthetics – waste generation	Impacts due to excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers, spoils, oils, lubricants, and other similar items.	<p>(i) Prepare and implement a Construction Waste Management Plan</p> <p>(ii) As far as possible utilize the debris and excess soil in construction purpose, for example for raising the ground level or construction of access roads etc.,</p> <p>(iii) Stockpiles, lubricants, fuels and other materials should be located away from steep slopes and water bodies;</p> <p>(iv) Avoid stockpiling any excess spoils at the site for long time. Excess excavated soils should be disposed of to be approved designated areas immediately;</p> <p>(v) If disposal is required, the site shall be selected preferably from barren, infertile lands; site should be located away from residential areas, forests, water bodies and any other sensitive land uses</p>	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>(vi) Domestic solid wastes should be properly segregated in biodegradable and non-biodegradable for collection and disposal to designated solid waste disposal site; create a compost pit at workers' camp sites for disposal of biodegradable waste; non-biodegradable / recyclable material shall be collected separately and sold in the local recycling material market</p> <p>(vii) Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed of in disposal sites approved by local authorities/ WBPCB;</p> <p>(viii) Prohibit burning of construction and/or domestic waste;</p> <p>(ix) Ensure that wastes are not haphazardly dumped thrown within and around the project site and adjacent areas; provide proper collection bins, and create awareness to use the dust bins.</p> <p>(x) Conduct site clearance and restoration to original condition after the completion of construction work; PIU to ensure that site is properly restored prior to issuing of construction completion certificate</p>		
Existing Infrastructure and Facilities	Disruption of service and damage to existing infrastructure at specified project location	<p>(i) Prepare a list of affected utilities and operators if any;</p> <p>(ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of service</p>	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.
Ecological Resources Terrestrial	Loss of vegetation and tree cover	<p>(i) Minimize removal of vegetation and disallow cutting of trees;</p> <p>(ii) If tree-removal will be required, obtain tree-cutting permit and</p> <p>(iii) Plant 5 native trees for every one that is removed.</p>	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.
Accessibility	Traffic problems and conflicts near project locations and haul road	<p><b>Hauling (material, waste/debris and equipment) activities</b></p> <p>(i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in</p>	Construction Contractor	Cost for implementation of mitigation measures

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>the immediate vicinity of delivery sites</p> <ul style="list-style-type: none"> <li>(ii) Schedule transport and hauling activities during non-peak hours;</li> <li>(iii) Locate entry and exit points in areas where there is low potential for traffic congestion;</li> <li>(iv) Drive vehicles in a considerate manner</li> <li>(v) Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.</li> </ul> <p><b>Pipeline Works</b></p> <ul style="list-style-type: none"> <li>(i) Confine work areas along the roads to the minimum possible extent; all the activities, including material and waste/ surplus soil stocking should be confined to this area. Proper barricading should be provided; avoid material/ surplus soil stocking in congested areas – immediately removed from site/ or brought to the as and when required</li> <li>(ii) Leave spaces for access between mounds of soil to maintain access to the houses / properties</li> <li>(iii) Provide pedestrian access in all the locations; provide wooden/metal planks over the open trenches at each house to maintain the access.</li> <li>(iv) Inform the affected local population 1-week in advance about the work schedule</li> <li>(v) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum.</li> <li>(vi) Keep the site free from all unnecessary obstructions; (vii) Coordinate with Traffic Police for temporary road diversions, where necessary, and for provision of traffic aids if transportation activities cannot be avoided during peak hours</li> </ul>		responsibility of contractor.
Socio-Economic - Employment	Generation of temporary employment and increase in local	<ul style="list-style-type: none"> <li>(i) Employ local labour force as far as possible</li> <li>(ii) Comply with labour laws</li> </ul>	DBO Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
Occupational Health and Safety	Occupational hazards which can arise during work	<p>(i) Comply with all national, state and local core labour laws (see <b>Appendix 7</b> of this initial environmental examination or IEE) Labour License and WC Policy obtained and attached in SEMP. Develop and implement site-specific occupational health and safety (OHS) Plan and Supplementary H &amp; S plan for COVID 19 which will include measures such as: (a) excluding public from the site; (b) maintaining social distancing for protection from COVID 19 infection; (c) ensuring all workers are provided with and use personal protective equipment like helmet, gumboot, safety belt, gloves, nose/ face mask and ear plugs; (d) OHS Training and COVID 19 awareness H &amp; S training for all site personnel; (e) documented procedures to be followed for all site activities including follow of SOP for COVID 19 as developed for the project and H &amp; S plan; and (f) documentation of work-related accidents;</p> <p>(ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;</p> <p>(iii) Provide medical insurance coverage for workers;</p> <p>(iv) Secure all installations from unauthorized intrusion and accident risks; Provide supplies of potable drinking water;</p> <p>(v) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;</p> <p>(vi) Provide health and safety orientation training including COVID 19 risk and mitigation to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;</p>	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>(vii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;</p> <p>(viii) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;</p> <p>(ix) Ensure moving equipment is outfitted with audible back-up alarms;</p> <p>(x) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to and easily understood by workers, visitors, and the general public as appropriate</p> <p>(xi) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.</p> <p>(xii) Standard Operating Procedure (SOP) for the project and Supplementary H &amp; S plan for COVID 19 prepared which cover,</p> <ul style="list-style-type: none"> <li>o General instruction to follow to prevent the spread of COVID-19 in construction workplace</li> <li>o Detail (step-by-step) work procedure to getting the workplace ready under COVID-19 situation</li> <li>o Worksite prevention practice at work site, office, during meeting, travelling, etc.</li> <li>o Precaution taken at workmen habitat/ camp</li> <li>o Control measures taken for deploying new workmen at site</li> <li>o Use of PPEs: face mask – hand gloves, maintaining social distancing, disinfection,</li> </ul>		

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>requirement of awareness covered under the H &amp; S plan.            (Separate H &amp; S plan for COVID 19 as supplementary document developed and keep as standalone document to mitigate COVID 19 health risk)</p>		
Asbestos Cement Materials	Health risks associated with asbestos cement pipes	Leave asbestos cement pipes in-situ untouched	DBO Contractor	Contractor costs
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste transportation	<p>(i) Restrict construction vehicle movements to defined access roads and demarcated working areas (unless in the event of an emergency)            (ii) Enforce strict speed limit (20-30 kilometre per hour or kmph) for playing on unpaved roads, construction tracks            (iii) Night-time haulage will be by exception only, as approved by the PIU to minimize driving risk and disturbance to communities            (iv) Adopt standard and safe practices for micro tunnelling            (v) Temporary traffic control (e.g. flagmen) and signs will be provided where necessary to improve safety and provide directions            (vi) All drivers will undergo safety and training            (vii) Public access to all areas where construction works are on- going will be restricted through the use of barricading and security personnel            (viii) Warning signs, blinkers will be attached to the barricading to caution the public about the hazards associated with the works, and presence of deep excavation            (ix) The period of time when the pipeline trench is left open will be minimized through careful planning            (x) Control dust pollution – implement dust control measures as suggested under air quality section</p>	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		(xi) Maintain regularly the vehicles and use of manufacturer- approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. (xii) Provide road signs and flag persons to warn of on-going trenching activities.		
Work Camps and worksites	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants  Unsanitary and poor living conditions for workers	(i) As far as possible located the camp site within the work sites (at intake, GLSR and WTP sites); if any camp to be established outside these, then select a camp site away from residential areas (at least 50 m buffer shall be maintained) (ii) Avoid tree cutting for setting up camp facilities (iii) Ensure that a proper compound wall is provided, and erect a wind/dust screen around (iv) Camp site shall not be located near (100 m) water bodies, flood plains flood prone/low lying areas, or any ecologically, socially, archeologically sensitive areas (v) Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit (vi) Provide proper temporary accommodation with proper materials, adequate lighting and ventilation, appropriate facilities for winters and summers; ensure conditions of liability at work camps are maintained at the highest standards possible at all times; (vii) Consult PIU before locating project offices sheds, and construction plants; (viii) Minimize removal of vegetation and disallow cutting of trees (ix) Ensure good living conditions at work camps are maintained at the highest standards possible at all times; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GI sheets,	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>tarpaulins, etc., shall not be allowed as accommodation for workers</p> <p>(x) Camp should be protected from COVID 19 health risk. All Health and safety procedure to follow for operation of camp (H &amp; S plan for COVID 19 will be used as ref. document) during stay, cooking, eating, use of toilet- common space etc.</p> <p>(xi) Self- hygiene, regular disinfection of entire camp and toilet, maintaining of social distancing to be continued for protection from COVID 19 infection</p> <p>(xii) Camp shall be provided with proper drainage, there shall not be any water accumulation</p> <p>(xiii) Provide drinking water, water for other uses, and sanitation facilities for employees</p> <p>(xiv) Prohibit employees from cutting of trees for firewood; contractor should be provided proper facilities including cooking fuel (oil or gas; fire wood not allowed)</p> <p>(xv) Train employees in the storage and handling of materials which can potentially cause soil contamination</p> <p>(xvi) Recover used oil and lubricants and reuse or remove from the site</p> <p>(xvii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; provide a compost pit for biodegradable waste and non-biodegradable/recyclable waste shall be collected and sold in local market</p> <p>(xviii) Remove all wreckage, rubbish, or temporary structures which are no longer required</p> <p>(xix) At the completion of work, camp area shall be cleaned and restored to pre-project conditions, and submit report to PIU; PIU to review and approve camp clearance and closure of work site</p>		
Impacts due to night works (as per nature of	Occupational and community hazards which can arise during	(i) Night works should be avoided at construction sites specially in residential areas and should be performed only when day works are not possible due to excessive	Contractor	Cost for implementation of mitigation measures

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
works and feasibility at site)	work at night in extreme and unavoidable cases	<p>traffic/public/pedestrian movement, site of cultural or religious importance, where there is huge crowd during day hours or any other unavoidable circumstances.</p> <p>(ii) Limit construction activities at night. When necessary, ensure that night work is carefully scheduled and the community is properly informed so they can take necessary measures.</p> <p>(iii) Consult community regarding appropriate timing of noisy activities and avoid noisy activities at night. Use noise-control methods (barriers/ shelter/ muffling devices) and maintain a buffer zone if possible. Minimize project transportation, particularly heavy vehicles, through residential areas. Use of high noise generating equipment shall be stopped during night time.</p> <p>(iv) Safety gear can greatly affect worker visibility. The decision and manoeuvre distance – how long it takes a driver to notice the worker and make any path or speed changes – is over 5 times greater with reflective clothing than with regular, dark-colored – or even orange-colored – clothes. With this increased decision and maneuver distance, workers, motorists, and equipment are much less likely to have a collision – chances of damage, injury, or death are reduced.</p> <p>(v) Flashing lights on a worker's body or clothing, reflective tape on equipment, and especially proper work area lighting are all good ways to increase visibility.</p> <p>(vi) Proper lighting at night includes several different levels and designations of lighting.</p> <p>(vii) Visibility &amp; Training: There are two main ways to ensure that motorists and workers experience the safest possible night-time work zone. First is proper safety training, and second is improving visibility throughout the work zone and especially at critical areas like traffic control workers' stations and on any people or equipment.</p> <p>(viii) Through proper training and lighting, night time construction can happen as safely as construction in the daytime. This allows contractors and agencies to take advantage of working with fewer delays for the travelling public and for construction workers to work more safely in lower volume traffic.</p>		responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<ul style="list-style-type: none"> <li>(ix) Contractors should have hand held noise level meter for measurement of noise during night hours</li> <li>(x) Contractors should have hand held lux meter for the measurement of illumination during night hours</li> <li>(xi) Preferably electrical connections are available for running equipment's otherwise sound proof/super silent Diesel Generator set should be available</li> <li>(xii) Sound level should not increase as per EMP</li> <li>(xiii) Illumination should be adequate as required according to nature of works</li> <li>(xiv) As far as possible ready-mix concrete from batching plant to be used, otherwise the concrete should be prepared away from residential areas and brought to the site</li> <li>(xv) All the noise activity like hammering, cutting, crushing, running of heavy equipment's should be done in day time and avoided in night time</li> <li>(xvi) Workers engaged in night works should have adequate rest/sleep in day time before start of night works</li> <li>(xvii) Worker engaged for night works should have previous experience of night works and should be physically fit for such works including clear vision in night</li> <li>(xviii) All the necessary provisions of traffic aids such as traffic signals, road signage, barricades, cautions boards, traffic diversion boards etc. should be available with fluorescent /retro-reflective arrangements</li> <li>(xix) Workers should be trained before start of night works about risks and hazards of night works and their mitigation measures and should be provided all the protective aids (PPEs) including fluorescent/retro-reflective vests</li> <li>(xx) Horns should not be permitted by equipment and vehicles</li> <li>(xxi) Workers should not shout and create noise</li> <li>(xxii) First aid and emergency vehicles should be available at site</li> <li>(xxiii) Emergency preparedness plan should be operative during night works</li> <li>(xxiv) Old persons and pregnant women and women having small kids should not work in night time</li> </ul>		

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>(xxv) All the vehicles and equipment being used at night works should have adequate type of silencers/enclosures/mufflers to reduce noise</p> <p>(xxvi) All the vehicles should be checked for working head lamps, tail lamps, inner lights etc. before start of night work.</p> <p>(xxvii) PIU site engineers and contractors' safety personnel should closely monitor the safety of works continuously and noise and illumination levels on hourly basis and maintain photographic and videographic records as well as register the observations;</p> <p>(xxviii) Night works should be stopped early in the morning at least one hour before start of pedestrian/traffic movement;</p> <p>(xxix) After completion of night works all the site should be cleaned and maintained obstruction free for day time movement of vehicles and pedestrians;</p> <p>(xxx) Drivers and workers should be alert and responsive during night works;</p> <p>(xxxi) All the wages to workers working in night hours should be as per the applicable labour acts;</p> <p>(xxxii) Avoid any nuisance which may create problems to nearby habitants and work peacefully during night hours; and</p> <p>(xxxiii) Night works should not be conducted near hospitals and during peak seasons such as peak tourist season, students' exam times etc.</p>		
Chance Finds	There are no protected properties in the subproject sites. However, in case of chance finds, contractors will be required to follow a protocol as defined in the mitigation measures.	<p>(i) Consult Archaeological Survey of India (ASI) or West Bengal State Archaeology Department to obtain an expert assessment of the archaeological potential of the site</p> <p>(ii) Include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available.</p> <p>(iii) In case of chance finds, works must be stopped immediately until such time chance finds are cleared by experts</p>	DBO Contractor	Contractor cost
Submission of	Unsatisfactory	(i) Appointment of EHS Supervisor to ensure EMP	DBO Contractor	Contractor cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
EMP implementation report	compliance to EMP	implementation (ii) Timely submission of monitoring reports including pictures		
Post-construction clean-up	Damage due to debris, spoils, excess construction materials	(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ii) All excavated roads shall be reinstated to original condition. (iii) All disrupted utilities restored (iv) All affected structures rehabilitated/compensated (v) The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up. (vi) All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be top soiled and re-vegetation using the guidelines set out in the revegetation specification that forms part of this document. (vii) The contractor must arrange the cancellation of all temporary services. (viii) Request PIU to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work.	DBO Contractor	Cost for implementation of mitigation measures responsibility of contractor.

**Table 35: Operation Stage Environmental Impacts and Mitigation Measures**

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

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		(v) Maintain the mechanical parts as per the maintenance plan to avoid any hazards (vi) Ensure that all safety apparatus at WTP including personal protection equipment is in good condition all times; and are at easily accessible and easily identifiable place; periodically check the equipment, and conduct mock drills to deal with emergency situations (vii) Ensure that backwash recirculation system and sludge management system are operated as per the manual		
Check for blockage and leakage problems reducing the water losses	Loss of water, increased demand and inconvenience to consumers and general public	Effectiveness of leak detection and water auditing to reduce the water losses	DBO Contractor	Operating costs
Occupational health and safety	Health, social and economic impacts on the workers	(i) Provide appropriate PPE and training on its proper use and maintenance. (ii) Provide specific training on COVID 19 issues and availability of relevant specific PPEs for protection (COVID 19 H & S plan as ref material) (iii) Strictly follow H & S protocol as developed for COVID 19 pandemic (iv) Use fall protection equipment when working at heights. (v) Maintain work areas to minimize slipping and tripping hazards. (vi) Implement a training program for operators who work with chlorine regarding safe handling practices and emergency response procedures. Prepare escape plans from areas where there might be a chlorine emission. (vii) Install safety showers and eye wash stations near the chlorine equipment and other areas where hazardous chemicals are stored or used. (viii) Prohibit eating, smoking, and drinking except in designated areas.	DBO Contractor	Operating costs
Increased in sewage generation	Water pollution and impacts on public health and environment	(i) Sanitation and sewerage / septage facilities needs to be improved/ provided in the project area to suit the increased sewage generation	PHED and respective local bodies	To be identified

**Table 36: Construction Stage Environmental Monitoring Plan**

Monitoring field	Monitoring location	Monitoring Parameters	Frequency	Responsibility	Cost and Source of Funds
Construction disturbances, nuisances, public and worker safety,	All work sites	Implementation of dust control, noise control, traffic management and safety measures. Site inspection through approved checklist	Weekly during construction	Supervising staff and safeguards specialists	No costs required
Ambient air quality	2/3 locations (WTP, intake and GLSR/ pipeline sites)	PM10, PM2.5 NO2, SO2, CO	(i) Once before start of construction.  (ii) Quarterly (3-times) during construction (for seasons: pre-monsoon, post-monsoon and winter) (3-year period considered)	DBO Contractor	Cost for implementation of monitoring measures responsibility of contractor (20 samples x 9000 per sample = 180,000)
Ambient noise	4 locations (Intake, WTP and GLSR, pipeline sites)	Day time and night time noise levels	(i) Once before start of construction  (ii) Quarterly (3-times) during construction (for seasons: pre-monsoon, post-monsoon and winter) (3-year period considered)	DBO Contractor	Cost for implementation of monitoring measures responsibility of contractor (40 samples x 1350 per sample = 54,000)
Reservoir water quality	One location (Reservoir intake point)	pH, TDS, Oil and grease, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalinity	(i) Once before start of construction  (ii) Monthly (yearly 12 times) (3-year construction period considered)	DBO Contractor	Cost for implementation of monitoring measures responsibility of contractor (37 samples x 5405 per

Monitoring field	Monitoring location	Monitoring Parameters	Frequency	Responsibility	Cost and Source of Funds
					sample =200,000)

**Table 37: Operation Stage Environmental Monitoring Plan**

Monitoring Field	Monitoring Location	Monitoring Parameters	Frequency	Responsibility	Cost and Source of Funds
Monitoring of quality of water supplied to consumers	Consumer end- random sampling in all zones	pH, Nitrite, Nitrate, Turbidity BOD, Total Alkalinity, Total coliform and Faecal coliform	Monthly once	DBO Contractor / PHED	O&M costs (water quality will be tested at the internal laboratory part of WTP)
Monitoring of quality of reservoir water	Intake location	pH, TDS, Oil and grease, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalinity pesticides, heavy metals	Monthly once	DBO Contractor/ PHED	O&M costs (water quality will be tested at the internal laboratory part of WTP)
Sludge quality and suitability as manure	WTP	Analysis for concentration of heavy metals and confirm that value is within the following limits (all units are in mg/kg dry basis except pH)  <input type="checkbox"/> Arsenic - 10.00 <input type="checkbox"/> Cadmium - 5.00 <input type="checkbox"/> Chromium - 50.00 <input type="checkbox"/> Copper - 300.00 <input type="checkbox"/> Lead - 100.00 <input type="checkbox"/> Mercury - 0.15 <input type="checkbox"/> Nickel - 50.00 <input type="checkbox"/> Zinc - 1000.00 <input type="checkbox"/> PH - 5.5-8.5	Yearly once	DBO Contractor/ PHED	O&M costs (testing to be done at an accredited external laboratory)
Chance Finds	Areas protected by ASI or West Bengal State Archaeology Department	Chance finds protocol	Before finalization of detailed design, consult with ASI or West Bengal State Archaeology Department	DBO Contractor	Cost for implementation of monitoring measures responsibility of contractor

## B. Implementation Arrangements

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

275. **Safeguards Compliance Responsibilities.** A safeguard and gender cell (SGC) have established in PMU with the overall responsibility of ensuring compliance with ADB SPS to ensure consistency with PAM. SGC is headed by a head, safeguards and gender officer (HSGO) and report to the project director directly. The HSGO has overall responsibility in implementation of the resettlement framework, EARF, resettlement plans, EMPs, SEMP, GESI action plan, and appropriate monitoring and reporting responsibilities. Key environmental safeguard tasks and responsibilities at the PMU level are as follows:

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

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

- (i) Review and finalize REA checklist and classify the project;
- (ii) Review and confirm project selection/ design; ensure compliance with exclusion criteria and project environmental selection guidelines;
- (iii) Review and finalize IEE reports including EMPs prepared/updated by PIUs/DSISCs;
- (iv) Oversee public consultation and information disclosure activities; ensure timely disclosure;
- (v) Provide advise/support in obtaining government clearance/ approvals;
- (vi) Review and confirm that IEEs/EMPs are included in bids and contracts;
- (vii) Review and confirm SEMPs prepared by contractor;
- (viii) Oversee the implementation of SEMP by contractors and ensure corrective actions,

- where necessary;
- (ix) Review and approve quarterly environmental monitoring reports submitted by PIU/DSISCs;
- (x) Conduct site visits of project facilities and work sites to oversee implementation;
- (xi) Prepare semi-annual environmental monitoring reports and submit to PMU SGC HSGO;
- (xii) Oversee grievance redress process; advise on critical grievance related to environmental issues and concerns; and
- (xiii) Organize training and capacity development programs.

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

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

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

- (i) Assist PIU in identifying projects/components in compliance with the project exclusion criteria and selection guidelines stipulated in EARF;
- (ii) Prepare environmental screening checklists and submit to PMU for categorization; update checklist and category as and when required to reflect project changes, and report to PMU;
- (iii) Work closely with PIU and design teams to include environmental considerations in project location, design and technical specifications;
- (iv) Identify statutory clearance / permissions / approvals required for subproject; assist PIU in obtaining them;
- (v) Assist in including standards/conditions, if any, stipulated in regulatory clearances, consents in the project design;
- (vi) Update IEE and EMP to reflect any changes in subproject during detail design / implementation; IEE shall reflect the final project design;
- (vii) Lead / assist PIU in public consultation in compliance with the EARF; reflect inputs from public consultation in IEEs, EMPs, and project design;
- (viii) Advise/assist PIU in disclosing relevant information on safeguards to stakeholders, affected people etc.;
- (ix) Assist / ensure all EMP measures related project design and location and included

- in the detailed designs;
- (x) Integrate EMP into the bid and contract documents (for DBO contracts, include full IEE including EMP in bids);
- (xi) Advise contractor in preparation of SEMP as per the final design, prior to start of construction;
- (xii) Ensure that all necessary clearances/permission (including those required by Contractor) are in place prior to start of construction;
- (xiii) Monitor implementation of SEMP;
- (xiv) Ensure Contractors including subcontractors, if any, comply with the measures set forth in the EMP;
- (xv) Assist PIU in establishing GRM for the Project;
- (xvi) Assist PIU in grievance redress, advise the contractor on appropriate actions on grievances, ensure timely resolution and proper documentation;
- (xvii) Identify, if any, non-compliance or unanticipated impacts; initiate corrective actions, report to PMU;
- (xviii) Review and approve monthly monitoring reports submitted by Contractor; consolidate and prepare quarterly environmental monitoring reports (EMR) and submit to PMU; and
- (xix) Conduct training and capacity building activities (workshops, hands-on trainings, visits etc.,) in EMP implementation.

279. **Civil works contracts and contractors.** IEEs are included in bidding and contract documents. The PMU and PIUs has ensured that bidding and contract documents include specific provisions requiring contractors to comply with: (i) all applicable labour laws and core labour standards on (a) prohibition of child labour as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste; and (c) elimination of forced labour; and with (ii) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS and COVID -19 management, to employees and local communities surrounding the project sites. The contractor has already appointed an Environment, Health and Safety (EHS) supervisor to implement SEMP. The EHS Supervisor has updated the EMP and submit a SEMP for approval of PIU. Contractors will carry out all environmental mitigation and monitoring measures outlined in EMP, approved SEMP and their contracts. Key responsibilities of the EHS supervisor are:

- (i) Prepare SEMP and submit to PIU for approval prior to start of construction;
- (ii) Conduct orientation and daily briefing sessions to workers on environment, health and safety including risk and protection measures for COVID 19;
- (iii) Ensure that appropriate worker facilities are provided at the work place and labour camps as per the contractual provisions;
- (iv) Records accidents and undertake remedial actions;
- (v) Implement SEMP measures and report to PIU/DSISC if any new impacts are surfaced; seek guidance from as required in EMP implementation;
- (vi) Conduct environmental monitoring (air, noise etc.,) as per the monitoring plan
- (vii) Ensure conduct of water quality surveillance program;
- (viii) Prepare monthly EMP monitoring reports and submit to PIU;
- (ix) Work closely with PIU safeguard officer and consultants to ensure communities are aware of project-related impacts, mitigation measures and GRM; and
- (x) Address any public compliance and grievances effectively and in timely manner.

### **C. Capacity Building and Training**

280. PMU HSGO and PIU SOs are trained by PMC and DSISC's safeguards experts on

safeguards issues related to the project, GESI action plan and GRM. The EARF, RF, IPPF and GESI action plan provided indicative capacity building program which included modules on: (i) introduction and sensitization to ADB SPS on environmental, involuntary resettlement and indigenous people policies and requirements; (ii) project related requirements as provided in the EARF, Resettlement Framework, IPPF and GESI action plan, (iii) review, updating and preparation of the IEEs, SEMP, Resettlement Plans, DDRs and IPPs (as required) upon the completion of project detailed design; (iv) improved coordination within nodal departments; (v) monitoring and reporting system; and (vi) project GRM. Briefings on safeguards principles, GRM and GESI action plan will also be conducted to the contractors upon their mobilization by PIU Safeguard Officers supported by DSISCs.

281. The following **Table 38** presents the outline of capacity building program to ensure EMP implementation. The estimated cost is ₹200,000 (excluding trainings of contractors which are part of EMP implementation cost during construction) to be covered by the project's capacity building program. The detailed cost and specific modules are customized for the available skill set after assessing the capabilities of the target participants and the requirements of the project by the Environmental Specialist of PMC.

**Table 38: Outline Capacity Building Program on Environmental Management Plan Implementation**

Description	Target Participants and Venue	Estimate (₹)	Cost and Source of Funds
1. Introduction and Sensitization to Environmental Issues (1 day) <ul style="list-style-type: none"> <li>- ADB Safeguards Policy Statement</li> <li>- Government of India and West Bengal applicable safeguard laws, regulations and policies including but not limited to core labour standards, OHS, etc.</li> <li>- Incorporation of EMP into the project design and contracts</li> <li>- Monitoring, reporting and corrective action planning.</li> </ul>	All staff and consultants involved in the project At PMU (combined program for all subprojects)	50,000	Included in the overall program cost-PMU
2. EMP implementation (1 day) <ul style="list-style-type: none"> <li>- EMP mitigation and monitoring measures</li> <li>- Roles and responsibilities</li> <li>- Public relations, - Consultations</li> <li>- Grievance redress</li> <li>- Monitoring and corrective action planning</li> <li>- Reporting and disclosure</li> <li>- Construction site standard operating procedures (SOP)</li> <li>- Health &amp; safety, specifically health risk from COVID 19.</li> <li>- Chance find (archaeological) protocol</li> <li>- AC pipe protocol</li> <li>- Traffic management plan</li> <li>- Waste management plan</li> </ul>	All PIU staff, contractor staff and consultants involved in the subproject at PIU - Bankura	100,000 (Lump sum)	Included in subproject cost estimates-PMU

Description	Target Participants and Venue	Estimate (₹)	Cost and Source of Funds
– Site clean-up and restoration			
3. Contractors Orientation to Workers (1/2 day) – Environment, health and safety in project construction – Health impact and protection from COVID 19	Once before start of work, and thereafter regular briefing every month once. Daily briefing on safety prior to start of work All workers (including unskilled laborers)	50,000	Contractor's cost

#### D. Monitoring and Reporting

282. Immediately after mobilization and prior to commencement of the works, the contractor has submitted a compliance report to PIU that all identified pre-construction mitigation measures as detailed in the EMP are undertaken. Contractor has confirmed that the staff for EMP implementation (EHS supervisor) is mobilized. PIU has reviewed, and approve the report and permit commencement of works.

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

284. Based on monthly and quarterly reports and measurements, PMU (assisted by PMC) will submit semi-annual Environmental Monitoring Report (SEMR). Once concurrence from the ADB is received the report will be disclosed on PHED/PMU websites. Template of Semi-Annual Environment Monitoring Report (SEMR) is enclosed as **Appendix 19**.

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

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

#### E. Environmental Management Plan Implementation Cost

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

**Table 39: Cost Estimates to Implement the Environmental Management Plan**

	Particulars	Stages	Unit	Total No.	Rate (₹)	Cost (₹)	Costs Covered By
A.	Implementation staff						

	Particulars	Stages	Unit	Total No.	Rate (₹)	Cost (₹)	Costs Covered By
1	Environmental, health and safety (EHS) Supervisor	Construction	per month	36	50,000	1,800,000	Design, build and operate (DBO) contract
	<b>Subtotal (A)</b>					<b>1,800,000</b>	
	<b>B. Mitigation Measures</b>						
1	Consent for establishments and consent for operation from West Bengal Pollution Control Board (WBPCB)	Pre-construction	Lump sum			50,000	Project cost- PMU
2	Provision for tree cutting and compensatory plantation measures (1: 5 ratio replantation)	Construction	Per tree	100	1,000	100,000	DBO contract
3	Traffic management at work sites (Pavement Markings, Channelizing Devices, Arrow Panels and Warning Lights)	Construction	Lump sum	-	-	200,000	DBO contract
4.	Civil Works (Water Sprinkling for dust suppression; Barricading; Rain Water Harvesting for water conservation etc.)	Construction	Lump sum	-	-	100,000	DBO contract
5	Arrangement of resources for prevention of health risk from COVID 19 pandemic	Construction	Provision - Lump sum	-	-	200,000	Contractor's cost supported from Project cost on actual basis
	<b>Subtotal (B)</b>					<b>650,000</b>	
	<b>C. Monitoring Measures</b>						
1	Air quality monitoring	Construction	per sample	20	9,000	180,000	DBO contract
2	Noise levels monitoring	Construction	Per sample	40	1,350	54,000	DBO contract
3	Surface water monitoring	Construction	Per sample	37	5405.4	200,000	DBO contract
4	Source water quality, water quality at consumer end, sludge quality	Operation	Lump sum / year	-	-	20,000	DBO Contract
	<b>Subtotal (C)</b>					<b>454,000</b>	
	<b>D. Capacity Building</b>						
1	Introduction and sensitization to environment issues	Pre-construction	Lump sum			50,000	PMU
2	Training on environmental management plan (EMP) implementation Preparation of plans and protocols (traffic	Pre-construction	lump sum			100,000	PMU

	Particulars	Stages	Unit	Total No.	Rate (₹)	Cost (₹)	Costs Covered By
	management plan, waste (spoils) management plan etc.,						
3.	Contractors Orientation to Workers on EMP implementation	Prior to dispatch to worksite	Lump sum			50,000	DBO contract
	<b>Subtotal (D)</b>					<b>200,000</b>	
	<b>Total (A+B+C+D)</b>				<b>₹</b>	<b>2,354,000</b>	

DBO Contractor Cost - ₹ 2,904,000.00  
 PMU Cost - ₹. 200,000.00  
**Total - ₹.31,04,000.00**

## IX. CONCLUSION AND RECOMMENDATIONS

288. The process described in this document has assessed the environmental impacts of all elements of the proposed bulk water supply subproject for Indpur and Taldangra blocks of Bankura district. All potential impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations have been reviewed and incorporated into the site planning and design process wherever possible. Thus, environmental impacts resulting from project design or location were not considered significant.

289. The main design impacts of water supply system in general are due to abstraction of water. The Raw water source is Mukutmanipur reservoir, which has abundant quantity of water throughout the year, even during the lean flow season. The Quality of raw water is good and is suitable for drinking water supply after conventional treatment and disinfection.

290. The subproject components like raw water intake and WTP are closely located respectively in the Satsol mouza and Kunar Bahal & Jhanti Pahari mouza of Khatra block. GLSR is located centrally in the Gobindapur mouza of Indpur block. All the facilities are located in rapidly developing areas, which are surrounded by residential and commercial areas.

291. Previously proposed WTP land has evolved with some critical issues, like the approach road as it belonged to few tribal families. Despite several initiatives taken up by the department the issue remained unresolved. Thereafter, after careful searching, the project executing agency has decided to shift the WTP location to the 9.35 acres Government vested land belongs to I&WD located at Kungarbahal and Jhantipahari Mouza under Khatra Block. The proposed site is adjacent to intake site and there is no as such any impacts on environment.

292. The GLSR site is privately owned, the purchase process is completed and work continued at present. There are few trees at GLSR site, Tree feeling is not anticipated after final designing. Of the approximately 22.36 km length (after final survey) of Primary transmission main, an estimated 150m will be laid by trenchless method, especially at sections crossing main roads, congested areas. The social impacts (access disruptions) due to construction activities are minimal. Overall, there are no notable sensitive environmental features in the project sites. NOC obtained from concerned Dept. for construction of pipe carrying bridge over Hatirampur canal and Silabati River.

293. Construction activities are confined to the selected sites, and the interference with the general public and community around is minimal. There will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.), mining of construction material, occupational health and safety aspects including COVID 19 risks and prevention. During the construction phase of pipeline work along the public roads, impacts will arise from the construction dust and noise; disturbance to residents, businesses, traffic by the construction work, and from the need to dispose of large quantities of waste soil. The social impacts (access disruptions) due to construction activities are minimal. To minimize social impact at congested commercial / market place and main road pipe laying will be done at night. Accordingly, night work management plan is developed. Trenchless technology is suggested at critical sections where pipeline crosses the main transportation corridors. These are the general impacts of construction in semi-urban, rural and habitation areas, and there are well developed methods of mitigation that are suggested in the EMP.

294. Anticipated impacts of water supply during operation and maintenance will be related to

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

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

296. The project's grievance redress mechanism has provided the citizens with a platform for redressal of their grievances, and describes the informal and formal channels, time frame, and mechanisms for resolving complaints about environmental performance.

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

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

299. Groundwater in these two blocks is contaminated with fluoride and water level is depleting. The project will benefit the general public by contributing to the long-term improvement of water supply system and community liability in the project blocks of Indpur and Taldangra. The potential adverse environmental impacts are mainly related to the construction period, which can be minimized by the mitigating measures and environmentally-sound engineering and construction practices.

300. Therefore, as per ADB SPS, the project is classified as environmental Category B and does not require further environmental impact assessment. However, to conform to government guidelines WTP requires consent for establish (CTE) and consent for operate (CTO) from West Bengal Pollution Control Board. Consent to Establish (CTE) is already obtained from West Bengal Pollution Control Board.

301. This IEE report has been updated covering the planned night work time management under the project and minor change in pipeline length. No additional impact is expected. The updated report reviewed and approved by PMU and will be send to ADB for approval

302. **Recommendations.** PMU, PIUs, and contractors to ensure that: (i) package wise details and evidences such as photographs/display board for grievance redress mechanism (GRM)/health and safety (H&S) measures taken at work sites due to COVID 19 pandemic are

included in monthly monitoring report; and (ii) ensure that efficient implementation of the H&S Plan developed by the project in response to COVID-19 pandemic. Important protocols or measures in the H&S Plan are to ensure that the following are complied with at the offices and worksites of the project: (i) screening of employees and workers; (ii) record keeping of screening results; (iii) availability and use of appropriate PPEs; (iv) social distancing; (v) proper office set up reconfiguration to ensure social distancing; (vi) new office and work site meeting arrangements; and (vii) regular disinfection of work areas, vehicles and equipment; among others. PIU safeguards officer with the assistance of the safeguard experts of PMC/DSISCs and Contractors' EHS officers of all districts are reminded to take precautions, provide continuous induction and continue conducting regular safeguards implementation trainings including implementation monitoring of regular usage of PPEs and COVID-19 related safety measures. Key reminders for the PMU, PIUs, contractors, and workers to comply with the following occupational health and safety measures as stated in the agreed OHS Plan:

- (i) Ensure project staff, consultants, contractors, and workers have in their mobile devices the Aarogya Setu App, which is a mobile application developed and recommended by the government to proactively reach out to and inform the users of the app regarding risks, best practices and relevant advisories pertaining to the containment of COVID-19;
- (ii) Mandatory isolation of the personnel or workers, either asymptomatic or showing symptoms, who have had direct contact with anyone tested positive for COVID-19. Follow the isolation procedures issued by the government;
- (iii) Proper disposal of used PPE following guidelines and procedures issued by the government;
- (iv) Conduct daily briefing on the developments of COVID-19 in the state or country, either through emails, meetings or daily toolbox talks;
- (v) When possible, allow work from home arrangement based on the nature of jobs;
- (vi) If necessary, pick up and drop off facility be extended to staff (based on the distance of the staff residence from office and on availability of safe mode of transport);
- (vii) Avoid face to face meetings – critical situations requiring in-person discussion must follow social distancing. Do not convene in-person meetings of more than 10 people;
- (viii) If possible, conduct all meetings via conference calls. Recommend use of cell phones, texting, web meeting sites and conference calls for project discussions;
- (ix) Contractor to help its workers arrange a systematic procurement of all daily needs and groceries at worksites. This will avoid each and every worker going to shops for these daily needs;
- (x) Contractor to arrange for contactless payment of wages to workers, where possible;
- (xi) Allow distributed breaktimes for workers to maintain social distancing and reduce contact;
- (xii) Remind employees and workers to maintain good health by getting adequate sleep; eating a balanced and healthy diet, avoiding alcohol/smoking; and consuming plenty of fluids; and
- (xiii) Remind employees and workers to extend their adherence to the H&S protocols at their respective homes. Infection may happen beyond the borders of offices and work sites.
- (xiv) Complete vaccination for all workers.

**Appendix 1: Rapid Environmental Assessment Checklist**  
**Country / Project Title:** India / West Bengal Drinking Water Sector Improvement Project  
(WBDWSIP)

Indpur and Taldangra Blocks of Bankura District: Bulk Water Supply Sub-Project

**UPDATED**

**Instructions:**

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

**Sector Division: Sub-Project Urban Development**

SCREENING QUESTIONS	Yes	No	REMARKS
<b>Water Supply</b>			
<b>A. Project Siting Is the project area</b>			
• Densely populated?		√	Project area is not densely populated
• Heavy with development activities?		√	Mostly rural area. No heavy development activity is noticed
• Adjacent to or within any environmentally sensitive areas?		√	No as such environmental sensitive areas nearby
• Cultural heritage site		√	Few religious places are observed but no cultural heritage site is located nearby the project area
• Protected Area		√	No protected area nearby
• Wetland		√	No designated wetland within the project area
• Mangrove		√	
• Estuarine		√	
• Buffer zone of protected area		√	
• Special area for protecting biodiversity		√	No Special area for protecting biodiversity
• Bay		√	
<b>B. Potential Environmental Impacts Will the Project cause</b>		√	
• Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture and soil erosion runoff?		√	Not expected as per site conditions. Water surveillance program will be included to monitor the raw water quality.
• Impairment of historical / cultural monuments / areas and loss/ damage to these sites?		√	No impact expected. No cultural monuments and historical sites near project locations.
• Hazard of land subsidence caused by excessive ground water pumping?		√	Not applicable; subproject does not involve groundwater abstraction. Water from the reservoir to be used and with no risk of land

SCREENING QUESTIONS	Yes	No	REMARKS
			subsidence.
• Social conflicts arising from displacement of communities?		√	Project does not involve land acquisition/displacement. No social conflicts envisaged
• Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		√	Project involves new surface water source development on Mukutmanipur reservoir which has abundant quantity of water throughout the year, even during the lean flow season (February to May). NOC for abstraction of 32 MLD water from the Mukutmanipur dam for this project has been obtained from IWD, rest 12 MLD also obtained later. There is no ground water abstraction as a part of this sub project.
• Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		√	Quality of raw water is in general, of acceptable quality and that can be used for potable purposes after conventional treatment and disinfection. Water quality testing should be done before treatment and after treatment.
• Delivery of unsafe water to distribution system?		√	Water will be treated and disinfected prior to supply the water treatment plant will ensure all quality criteria set by CPCB for drinking water standards.
• Inadequate protection of intake works or wells, leading to pollution of water supply?		√	Water quality surveillance program will be included to monitor the raw water quality.
• Over pumping of ground water, leading to salinization and ground subsidence?		√	Not applicable; subproject does not involve groundwater abstraction
• Excessive algal growth in storage reservoir?		√	Regular cleaning of storage tanks will be conducted during operation
• Increase in production of sewage beyond capabilities of community facilities?		√	Sanitation and sewerage system will be improved/ developed in the project area
• Inadequate disposal of sludge from water treatment plants?		√	Appropriate provisions for sludge drying and disposal is included in the project
• Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		√	Adequate buffer is available; all the pumping stations will be located in enclosed buildings with noise control walls to minimize noise propagation. A green belt area will be developed surrounding the boundary wall of the water treatment plant. Trees with thick canopy will be planted in order to reduce the noise levels reaching the nearby surroundings.
• Impairments associated with transmission lines and access roads?	√		Temporary impairments are anticipated along the new transmission line routes during construction stage.
• Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		√	Measures for safe handling, storage and usage of chlorine are included.
• Health and safety hazards to workers from the management of chlorine used for disinfection and		√	Operation and Maintenance recommended by the manufacturers, and the existing norms and guidelines for ensuring the safety of workers will

SCREENING QUESTIONS	Yes	No	REMARKS
other contaminants?			be followed. Measures for safe handling, storage and usage of chlorine are included.
• Dislocation or involuntary resettlement of people		√	There is no resettlement of people for project implementation.
• Social conflicts between construction workers from other areas and community workers?		√	The contractor will be utilizing the local labour force as far as possible; in case if it is unavoidable, labour camps and facilities will be provided appropriately. No conflicts envisaged
• Noise and dust from construction activities?	√		All the construction machineries employed will comply with noise emission standards of Central Pollution Control Board (CPCB). Dust suppression measures such as water sprinkling will be employed
• Increased road traffic due to interference of construction activities?	√		Excavation and laying pipelines along public roads will interfere with the traffic. Construction material transport will increase traffic on the local roads. Proper traffic management and construction planning will be ensured to minimize the interference
• Continuing soil erosion/silt runoff from construction operations?	√		Construction work during monsoon shall be carried out with due care so that silt run off due to construction operation is prevented. No construction will be allowed during rains.
• Delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		√	The Contractor shall prepare an O&M manual for approval of the Employer and training will be given to the staff operating the plant to ensure proper O&M.
• Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		√	Not envisaged. Online monitoring of process water is proposed as part of the subproject and ensured by the Contractor. Care should be taken during O&M period to ensure that corrosive chemicals are not entered in distribution networks.
• Accidental leakage of chlorine gas?		√	There is risk that inappropriate handling, storage or use of chlorine may cause serious accidents due to leakage causing severe health risks. Measures for safe handling, storage and usage of chlorine are included
• Excessive abstraction of water affecting downstream water users?		√	The Mukutmanipur reservoir stores enough water throughout the year the year, and the water abstraction for the project is negligible even during lean seasons and hence extraction will not affect any downstream users.
• Competing uses of water?		√	Project involves new source development. Adequate capacity of raw water is already available.
• Increased sewage flow due to increased water supply	√		Sanitation and sewerage need to be improved
• Increased volume of sullage (wastewater from cooking and washing) and sludge from	√		Sanitation and sewerage need to be improved. Additional wastewater and appropriate sludge treatment and disposal facility will be part of this

SCREENING QUESTIONS	Yes	No	REMARKS
wastewater treatment plant			subproject.

Climate Change and Disaster Risk Questions	Yes	No	Remarks
The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.			
Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes?		√	As per local enquiries carried out during field visits and from the vulnerability mapping of the district for flood prone areas indicate that the subproject components are not located in the flood prone/tropical cyclone areas. Entire Bankura district and the project are a fall in Zone III, which is classified as Moderate Damage Risk Zone in India.
Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., changes in rainfall patterns disrupt reliability of water supply; sea level rise creates salinity intrusion into proposed water supply source)?		√	Unlikely, as reservoir contains significant quantities of water; although there will be change in flow due to these events, but may be insignificant. Water quality surveillance program will be included to monitor the raw water quality.
Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		√	No
Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by using water from a vulnerable source that is relied upon by many user groups, or encouraging settlement in earthquake zones)?		√	No

**Appendix 2: National Ambient Air Quality Standards**

	Pollutants	Time Weighted Average	Concentration in Ambient Air		Method of Measurement
			Industrial, Residential, Rural and Other Areas	Ecologically Sensitive Areas	
1	Sulphur Dioxide (SO <sub>2</sub> ) microgram per cubic meter (µg/m <sup>3</sup> )	Annual 24 hours	50 80	20 80	Improved West and Geake-Ultraviolet fluorescence
2	Nitrogen Dioxide (NO <sub>2</sub> ) µg/m <sup>3</sup>	Annual 24 hours	40 80	30 80	Modified Jacob and Hochheiser (Na-Arsenite) Chemiluminescence
3	Particulate Matter (Size less than 10 µm) or PM <sub>10</sub> µg/m <sup>3</sup>	Annual 24 hours	60 100	60 100	Gravimetric -TOEM -Beta attenuation
4	Particulate Matter (Size less than 2.5 µm) or PM <sub>2.5</sub> µg/m <sup>3</sup>	Annual 24 hours	40 60	40 60	Gravimetric -TOEM -Beta attenuation
5	Carbon Monoxide (CO) mg/m <sup>3</sup>	8 hours 1 hours	02 04	02 04	Non-dispersive Infra-Red (NDIR) Spectroscopy

**Emission limits for New DG sets up to 800 KW  
(As per Environment (Protection) (Third Amendment) Rules, 2013)**

TABLE

Power Category	Emission Limits (g/kW-hr)			Smoke Limit (light absorption coefficient, m <sup>-1</sup> )
	NOx+HC	CO	PM	
Upto 19 KW	≤ 7.5	≤ 3.5	≤ 0.3	≤ 0.7
More than 19 KW upto 75 KW	≤ 4.7	≤ 3.5	≤ 0.3	≤ 0.7
More than 75 KW upto 800 KW	≤ 4.0	≤ 3.5	≤ 0.2	≤ 0.7

Note:

- The abbreviations used in the Table shall mean as under: NO<sub>x</sub> – Oxides of Nitrogen; HC – Hydrocarbon; CO – Carbon Monoxide; and PM – Particulate Matter.
- Smoke shall not exceed above value throughout the operating load points of the test cycle.
- The testing shall be done as per D2 – 5 mode cycle of ISO: 8178- Part 4.
- The above mentioned emission limits shall be applicable for Type Approval and Conformity of Production (COP) carried out by authorised agencies.
- Every manufacturer, importer or, assembler (hereinafter referred to as manufacturer) of the diesel engine (hereinafter referred to as 'engine') for genset application manufactured or imported into India or, diesel genset (hereinafter referred to as 'product'), assembled or imported into India shall obtain Type Approval and comply with COP of their product(s) for the emission limits which shall be valid for the next COP year or, the date of implementation of the revised norms specified above, whichever earlier.  
*Explanation.*- The term 'COP year' means the period from 1st April to 31st March.
- Stack height (in metres), for genset shall be governed as per Central Pollution Control Board (CPCB) guidelines.

**DIESEL GENERATOR SETS : STACK HEIGHT**

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

$$H = h + 0.2 \times \sqrt{\text{KVA}}$$

H = Total height of stack in metre

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

KVA = Total generator capacity of the set in KVA

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

For Generator Sets	Total Height of stack in metre
50 KVA	Ht. of the building + 1.5 metre
50-100 KVA	Ht. of the building + 2.0 metre
100-150 KVA	Ht. of the building + 2.5 metre
150-200 KVA	Ht. of the building + 3.0 metre
200-250 KVA	Ht. of the building + 3.5 metre
250-300 KVA	Ht. of the building + 3.5 metre

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

Source : Evolved By CPCB  
[Emission Regulations Part IV:COINDS/26/1986-87]

### Appendix 3: Vehicle Exhaust Emission Norms

#### 1. Passenger Cars

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

#### 2. Heavy Diesel Vehicles

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

CO = Carbon Monoxide, g/kmhr = grams per kilometer-hour, HC = Hydrocarbons, NOx = oxides of nitrogen, PM = particulates matter.

Source: Central Pollution Control Board

**Appendix 4: National Ambient Air Quality Standards in Respect of Noise**

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

## Appendix 5: Extract from Construction and Demolition Management Rules, 2016

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

### NOTIFICATION

New Delhi, the 29<sup>th</sup> March, 2016

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

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

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

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

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

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

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

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

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

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

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

building of infrastructure including alteration in these entities.;

- (c) **"construction and demolition waste"** means the waste comprising of building materials, debris and rubble resulting from construction, re-modeling, repair and demolition of any civil structure;
  - (d) **"de-construction"** means a planned selective demolition in which salvage, re-use and recycling of the demolished structure is maximized;
  - (e) **"demolition"** means breaking down or tearing down buildings and other structures either manually or using mechanical force (by various equipment) or by implosion using explosives.
  - (f) **"form"** means a Form annexed to these rules;
  - (g) **"local authority"** means an urban local authority with different nomenclature such as municipal corporation, municipality, nagarpalika, nagarnigam, nagarpanchayat, municipal council including notified area committee and not limited to or any other local authority constituted under the relevant statutes such as gram panchayat, where the management of construction and demolition waste is entrusted to such agency;
  - (h) **" schedule"** means a schedule annexed to these rules;
  - (i) **"service provider"** means authorities who provide services like water, sewerage, electricity, telephone, roads, drainage etc. often generate construction and demolition waste during their activities, which includes excavation, demolition and civil work;
  - (j) **"waste generator"** means any person or association of persons or institution, residential and commercial establishments including Indian Railways, Airport, Port and Harbour and Defence establishments who undertakes construction of or demolition of any civil structure which generate construction and demolition waste.
- (2) Words and expressions used but not defined herein shall have the same meaning defined in the ACT.

**(4) Duties of the waste generator -**

- (1) Every waste generator shall prima-facie be responsible for collection, segregation of concrete, soil and others and storage of construction and demolition waste generated, as directed or notified by the concerned local authority in consonance with these rules.
- (2) The generator shall ensure that other waste (such as solid waste) does not get mixed with this waste and is stored and disposed separately.
- (3) Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar and shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodeling work and keep the concerned

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

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

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

**(5) Duties of service provider and their contractors -**

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

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

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

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

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

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

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

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

- (5) shall get the collected waste transported to appropriate sites for processing and disposal either through own resources or by appointing private operators;
- (6) shall give appropriate incentives to generator for salvaging, processing and or recycling preferably in-situ.
- (7) shall examine and sanction the waste management plan of the generators within a period of one month or from the date of approval of building plan, whichever is earlier from the date of its submission;
- (8) shall keep track of the generation of construction and demolition waste within its jurisdiction and establish a data base and update once in a year;
- (9) shall devise appropriate measures in consultation with expert institutions for management of construction and demolition waste generated including processing facility and for using the recycled products in the best possible manner;
- (10) shall create a sustained system of information, education and communication for construction and demolition waste through collaboration with expert institutions and civil societies and also disseminate through their own website;
- (11) shall make provision for giving incentives for use of material made out of construction and demolition waste in the construction activity including in non-structural concrete, paving blocks, lower layers of road pavements, colony and rural roads.

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

- (1) The site for storage and processing or recycling facilities for construction and demolition waste shall be selected as per the criteria given in **Schedule I**;
- (2) The operator of the facility as specified in sub- rules (1) shall apply in **Form I** for authorization from State Pollution Control Board or Pollution Control Committee.
- (3) The operator of the facility shall submit the annual report to the State Pollution Control Board in **Form II**.
- (3) Application of materials made from construction and demolition waste in operation of sanitary landfill shall be as per the criteria given in **Schedule II**.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**FORM – I**

See [Rule 7 (2)]

**Application for obtaining authorisation**

To,  
The Member Secretary

\_\_\_\_\_ Name of the local authority or Name of the agency :  
appointed by the municipal authority

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

## Appendix 6: Department of Environment's Direction Under Air Act, 1981 For Control of Air Pollution from Construction Activities in West Bengal



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

No. EN/3170/T-IV-7/001/2009

Dated: December 10<sup>th</sup>, 2009.

### **DIRECTION**

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

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

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

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

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

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

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

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

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

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

## **Appendix 7: Salient Features of Major Labor Laws Applicable to Establishments Engaged in Construction of Civil Works**

1. Workmen Compensation Act, 1923 - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.
2. Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days' wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.
3. Employees' PF and Miscellaneous Provisions Act, 1952 - The Act provides for monthly contributions by the employer plus workers @10 % or 8.33 %. The benefits payable under the Act are: (a) Pension or family pension on retirement or death as the case may be; (b) deposit linked insurance on the death in harness of the worker; (c) payment of PF accumulation on retirement/death etc.
4. Maternity Benefit Act, 1951 - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.
5. Contract Labour (Regulation and Abolition) Act, 1970 - The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labour.
6. Minimum Wages Act, 1948 - The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employment.
7. Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.
8. Equal Remuneration Act, 1979 - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making disc
9. Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing ₹3,500/- per month or less. The bonus to be paid to employees getting ₹2,500/- per month or above up to ₹3,500/- per month shall be worked out by taking wages as ₹2,500/- per month only. The Act does not apply to certain establishments. The newly set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.
10. Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

11. Industrial Employment (Standing Orders) Act, 1946 - It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer on matters provided in the Act and get the same certified by the designated Authority.
12. Trade Unions Act, 1926 - The Act lays down the procedure for registration of trade unions of workmen and employees. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.
13. Child Labour (Prohibition and Regulation) Act, 1986 - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in Building and Construction Industry.
14. Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979 - The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.
15. The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996 - All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

### Appendix 8: Drinking Water Standards

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

	Max		adverse effects on domestic use.		
13.	Copper (mg/L, Cu) Max	0.05	Astringent taste discoloration and corrosion of pipes fittings and utensils will be caused beyond this.	1.5	-
14.	Manganese (mg/L, Mn) Max	0.1	Beyond this limit taste/appearance are affected, has adverse effect on domestic use and water supply structure	0.3	-
15.	Sulphate (mg/L, SO <sub>4</sub> ) Max.	200	Beyond this causes gastro intestinal irritation when magnesium or sodium are present	400	May be extended up to 400 provided magnesium (as Mg) does not exceed 30
16.	Nitrate (mg/L, NO <sub>3</sub> ) Max.	45	Beyond this methaemoglobinemia takes place.	100	-
17.	Fluoride (mg/L, F) Max.	1.0	Fluoride may be kept as low as possible. High fluoride may cause fluorosis.	1.5	-
18.	Phenolic Compounds (mg/L C <sub>6</sub> H <sub>5</sub> OH) Max.	0.001	Beyond this, it may cause objectionable taste and odour	0.002	-
19.	Mercury (mg/L Hg) Max	0.001	Beyond this the water becomes toxic	No Relaxation.	To be tested when pollution is suspected
20.	Cadmium (mg/L, Cd) Max	0.01	Beyond this the water becomes toxic	No Relaxation.	To be tested when pollution is suspected
21.	Selenium (mg/L, Se) Max	0.01	Beyond this the water becomes toxic.	No Relaxation.	To be tested when pollution is suspected
22.	Arsenic (mg/L, As) Max.	0.01	Beyond this the water becomes toxic	No Relaxation	To be tested when pollution is suspected
23.	Cyanide	0.05	Beyond this the water becomes toxic	No Relaxation	To be tested when pollution is suspected
24.	Lead (mg/L Pb) Max.	0.05	Beyond this the water becomes toxic	No Relaxation	To be tested when pollution is suspected
25.	Zinc (mg/L, Zn) Max.	5	Beyond this limit it can cause astringent taste and an opalescence in water	15	To be tested when pollution is suspected
26.	Anionic detergents (mg/L, MBAS) Max	0.2	Beyond this limit it can cause a light froth in water	1.0	To be tested when pollution is suspected
27.	Chromium (mg/L, Cr <sub>6+</sub> )	0.05	May be carcinogenic above this limit	-	-
28.	Polynuclear	-	May be carcinogenic	-	-

	Aromatic Hydrocarbons (mg/L, PAH) Max				
29.	Mineral oil (mg/L)	0.01	Beyond this limit, undesirable taste and odour after chlorination takes place	0.03	To be tested when pollution is suspected
30.	Pesticides (mg/L) max	Absent	Toxic	0.001	-
Radioactive materials					
31.	Alpha emitters Bq/L Max	-	-	0.1	-
32.	Beta emitters Pci/L Max	-	-	1.0	-
33.	Alkalinity (mg/L,) Max	200	Beyond this limit, taste becomes unpleasant	600	-
34.	Aluminum (mg/L, Al) Max	0.03	Cumulative effect is reported to cause dementia	0.2	
35.	Boron (mg/L) Max	1.0	-	5.0	-

## Appendix 9: Guidelines for Safety during Monsoon/Heavy Rainfall

Excavation and refilling of earth are common activities, which, if not carefully executed may pose problems to the safety of works as well as passers-by and road users during the impending Monsoon.

Normal and heavy rainfall event affect our ongoing works, It should be our conscientious effort to ensure that such events do not prove to be problematic to people and structures in town. During monsoon PIU/DSISC should ensure that any further excavation work is taken up only after ensuring that the earlier work is in safe stage. It is desired that Construction Manager & Ex En PIU should inspect all sites during rains and take proactive actions.

Some of the precautions and mitigation measures to be taken are discussed below-

1. The execution of works having deep excavation in smaller lanes and congested areas should be completed well before monsoon. The works of deep excavation during monsoon should not be preferably taken up or extensive care should be taken for execution of such works.
2. The settlement in refilled trenches of sewerage and water supply lines may occur during monsoon. DSISC and PIU team should inspect all sites after a storm to identify such reaches and take immediate corrective action by proper refilling and compacting. It is responsibility of all engineers to look after this activity during monsoon and ensure corrective actions from Contractor's side.
3. The contractor's crew should be equipped with vehicle, gum boots, raincoats, torch etc. to tackle such situation during and after rains. Adequate quantities of earth, debris and gravel should be stacked at strategic places so that no time is lost in procuring such material.
4. In trenches where pipe laying has been done and duly tested and approved, refilling should be done and all surplus material relocated to safe disposal sites such that it does not obstruct traffic or waterways.
5. All open ends of WS pipelines should be firmly plugged to prevent debris from entering the pipeline.
6. Drains are primary or secondary carriers of storm water. Any unutilized construction material should be relocated to allow free passage of storm water. Surplus earth should be suitably and immediately be relocated to avoid earth from falling into the drain so that choking does not occur.
7. Overhead works should not be carried on in-weather conditions that threaten the safety of workers. More frequent checks on scaffold and bracings should be done during monsoon season.
8. Additional precautions should be taken of the power lines, ignorance and carelessness can cause major accidents and casualty.
9. Take preventive measures for water logging in working areas by providing dewatering pumps. Place bright and reflective warning signs.
10. Inspection should also be carried out before resumption of work after a shower/rain.
11. Storage of Construction Material: Steel & Cement are vital ingredients for quality construction work but in absence of proper storage, especially during monsoon, cement and steel may rapidly decline in quality and strength. Care should be taken to protect these materials and use of any exposed material should be allowed only after conducting fresh tests. Improper storage of such material should be reported to SE PIU/CM of DSISC and use of any apparently affected material should be done after permission of SE PIU//CM.

## **Additional Precautions**

1. Adequate set up and resources such as dewatering pumps, electrical routings etc should be planned ahead. Water logging on main roads to be avoided, where construction works are going on.
2. Ensuring the monsoon specific PPE's issued in adequate and are used during monsoon.
3. Use of electric extension box should be avoided; extension cables (if used) should not be wet and damaged. Cables connections should be only weatherproof/waterproof. Electrical and HSE personnel of contractor should visit permanent and running sites regularly. Transparent protective sheets/rain sheds should be placed for the power distribution boards.
4. Welding machines, bar cutting machines etc. should be kept in dry conditions; should not stand in water logged area. Brakers and Drill machines should not be used when raining; dirt/mud should be scrubbed with cloth.
5. Special Trainings to all drivers and operators on safe practices and all vehicles/ equipment's maintenance checks to be more frequent.
6. High boom equipment to be stopped during blowing of high-speed wind and rain storm. Arresting of parked vehicles, equipment during monsoon should be done.
7. All chemicals should be stored as per MSDS, chemicals to be protected from water ingress. Chemical waste should be disposed for preventing overflow of chemicals.
8. At labor camps following precautions should be taken:-
  - Maintaining hygiene & proper housekeeping.
  - Additional health check-up camp to identify seasonal diseases
  - Preventive measures on mosquito/parasite breeding mainly in work locations and camps
  - Frequent cleaning of toilets
  - To avoid water borne diseases, high level of cleanliness to be maintained, drinking water containers need to be cleaned and kept covered. Walk areas and pathways to be covered with Murom and soft rock particles (to avoid soft soil conditions).
  - Obstacle free approach to rest sheds, camp and toilets.
  - Proper illumination, provision of battery-operated emergency lights
  - No bonfires inside resting sheds. No use of wood.

SE-PIU and CM-DSISC should oversee the arrangements to effectively deal with the eventuality.

EHS officer of contractor should visit each site and camps more frequently. Contractor/EHS officer will also impart training on safe working methods during Monsoon and will keep a daily watch on weather conditions to share with site team to act accordingly.

Contractor should organize Monsoon Health Camps and Monitor Workmen Habitat and Hygiene.

## Appendix 10: Photo Illustration of Recent Activity at Site



**Gents' toilet facility at Intake site**



**Ladies' toilet facility at Intake site**



**Emergency contact number display board at Intake site**



**GRM display board at Intake site**



Emergency assembly point at Intake site



COVID poster at Intake site



First aid box facility at Intake site



Safety signage at Intake site



Corona Safety signage at Intake site



Project information display board at Intake site



**Medical health check up**



**Tool box talk at pipe laying site**



**Pipe laying Activity at Supur More**



**Third Party Inspection of Hydra**



**Intake approach bridge under construction**



**Clariflocculator 2 at WTP under construction**




**Staff Quarters under construction**






**Gobindpur GLSR under construction**

## Appendix 11: Summary of Public Consultation

### A. Done Earlier Report period

Date	Place	No. of Participants	Key Issues Discussed	Photographs
28.08.17	<b>Bheduasole Gram Panchayat Office</b>	<p>Male :23 Female 29 Total : 52</p> <p><b>Key Participants:</b> 1. Officials Asian Development Bank headed by Ms. Neeta Pokhrel  2. Superintendent Engineer, Executive Engineer, Asst. Engineer &amp; Sub Asst. Engineers of PHED Bankura Division  3. Pradhan and other Gram Panchayat Members of Bheduasole Gram Panchayat headed by the Panchayat Pradhan</p>	<p>Public Health &amp; Engineering Dept. Of West Bengal Govt. with the Financial support of Asian Development Bank Is going to undertake a Water Supply Project in selected Districts of West Bengal. The project has been named as West Bengal Drinking Water Sector Improvement Project (WBDWSIP). Treated Surface Water will be supplied to every household of the project area through separate pipe connection. The Project aims to provide 70 litres per capita per day of potable water through metered household connections on a 24/7 basis to each household. PHED district offices will be responsible for operating, maintaining and monitoring the bulk water systems, whereas the Gram Panchayat (GP) will operate and maintain the distribution network. The Zilla Parishad (ZP), administrative body at the district level, and Panchayat Samiti (PS), administrative body at the block level, will be involved in coordinating, technical support and monitoring role at the district and block level, respectively. Affordability of water tax has been a pertinent question raised both by the Gram Panchayat members and the community - however almost all agreed to pay the water charges if they get the facility of household water connections. They agreed that it will help in reducing time taken for water collection as well health expenditures. The Gram Panchayat members expressed concern regarding the adequacy/sufficiency of OHRs per Gram Panchayat; it was clarified by PHED personnel present during the consultation that as per the command zone/area it covers most of the part and the rest will be covered by nearby OHRs of another Zone. On-time completion of the project was another concern of the Panchayat Members and it was told that the project work will not take longer than 3 years.  Creating job opportunities was the other question of the Gram Panchayat Members – it was mentioned that the existing PHE workers will be given first preference, further if there is requirement, then workers from the local community can be employed during the construction phase.</p>	

Date	Place	Proposed Work	No. of Participants	Concerns / Issues Discussed	Photographs
28.08.17	<b>Mouza: Hatirampur</b>	Laying of 22 km Transmission Line from Water Treatment Plant to Intermediate Pumping Station at Gobindapur	Male: 10 Female: 2 Total : 12	<p>Benefits and Importance of Treated Surface Water were discussed.</p> <p>Door step water connection will be a great relief for the village women as it will reduce their Time Poverty.</p> <p>The participants were said that if they face any problem related to supply of water, they can inform the Gram Panchayat Office.</p> <p>In the question of affordability, the respondents said that, If all the people get better service then everyone will gladly pay the water tariff.</p> <p>Local tube wells are checked periodically through Panchayats and health dept. officials. But due to High Concentration of Iron it tastes poor.</p> <p>During Construction Phase access to road side shops will be assured through adequate measures.</p> <p>Steps will be taken to control traffic congestion during pipe laying work in market areas</p>	 

Date	Place	Proposed Work	No. of Participants	Concerns / Issues Discussed	Photographs
28.08.17	Village: Supur	Laying of 22 km Transmission Line from Water Treatment Plant to Intermediate Pumping Station at Gobindapur	Male: 15 Female: 3 Total : 18	<p>Local people were found aware about the upcoming water supply project in their area. Role of ADB and PHED were discussed with them.</p> <p>It was suggested by the participants that, door step Water Connection to be provided to each household without any prejudice and local influence and no partiality or preferences should be allowed in this context.</p> <p>How the Arsenic / Fluoride contaminates the Ground Water was discussed with them. It was mentioned that, why treated surface water is safer than ground water in all respects.</p> <p>The participants were informed that, during construction phase any grievances will be mitigated on priority basis.</p> <p>It was said by the participants that, local people will extend their full support for successful implementation of the project.</p>	

Participant's List



Halimrajan Nagar

S.No	NAME	Male/Female	Control No	Signature
1	Surya Prasad	M	9547716303	Surya
2	Kishor Prasad	M	7602051801	Kishor
3	Santosh Kumar	M	8016780306	Santosh
4	Rajesh Kumar	M	9685454393	Rajesh
5	Rajesh Kumar	M	7603354107	Rajesh
6	Chandan Chakraborty	M	8972730660	Chandan
7	S. Mandal	M		
8	S. Mandal	F		
9	Hareesh Kumar	M	9564337633	Hareesh
10	Rajesh Kumar	M	8071034306	Rajesh
11	Ujjwala Chakraborty	F		
12	Ujjwala Chakraborty	F	8047057423	
13				
14				
15				
16				
17				

Participant's List

20-01-2024



No.	Name	Gender	Comments	Signature
1	Latha Devi	M		
2	Pala Devi	F		
3	Aravinda Chari	M		
4	Kandam Devi	F		
5	Ramesh Chari	M		
6	Kandam Praveen	M		
7	Sankha Devi	M		
8	Manjula Devi	F		
9	Lakshmi Devi	M	9322474104	Lakshmi Devi
10	Praveen Chari	M	9322474104	Praveen
11	Chandrasekhar	M		
12	For other list	M		
13	Sankha Devi	M		
14	Taha Kalandi	M		
15	Praveen Chari	M		
16	Praveen Chari	M	9322474104	Praveen
17	Praveen Chari	M	9322474104	Praveen
18	Talukda Sarda	M		

Date	Place	Participants	Key Issues Discussed	Photographs
29 August 2017	Proposed site of GLSR <b>Gram</b> <b>Panchayat:</b> Bheduasole <b>Block:</b> Indpur <b>Mouza:</b> Gobindapur	Land Sellers (7) ADB Officials (2) PHED Engineers of Bankura Division (2)  Consultant (1)	<p>Consultation with the land sellers revealed that, they are aware about the side effects of consuming untreated ground water. Local tube wells are checked periodically through Panchayats and health dept. officials. Yet, the quality of the water is not satisfactory due to various reasons like high concentration of iron, salinity and poor taste.</p> <p>Upon consultation, all the land sellers said that, they are willing to sell their parcel of land at Govt. Price. They have not been forced rather they are happy for having the opportunity to be a part of the project.</p> <p>The proposed land is laid vacant for several years, they do not have any income from the land. Cultivation was done this year after several years due to better monsoon. It is a rain-fed plot.</p> <p>All the land sellers have their own livelihood and a permanent place to live so they will not suffer if they are being compensated at actual Govt. Price of the land.</p> <p>It was further added that, the amount they will receive from the Govt. will enable them to secure their future</p> <p>They assure their full co-operation in land purchase process.</p>	 

**B. Consultation during Updation of IEE**

**Summary of Current Public Consultations**

BLOCK	MOUZA	GP	OHR/GLSR ZONE CODE	Number of Participants	Concerned/ Issues discussed	Photographs
Indpur Block	Gobindapur Mouza	Bheduasole Gram Panchayat	Venue-Gobindapur Village (GLSR Site) Date-11 <sup>th</sup> October, 2019	Community people (35) Male- 21 Female-14	Given brief description of the project to the consumers. They were very happy to listen about the project and wanted to raise their supporting hand. Local people were found aware about the upcoming water supply project in their area.	
Hirbandh	--	Hirbandh G P	Tilabani More (23.12.20)	Total 6, Female 1	Collected information of total number of tube wells including working and non-working condition present in this GP. Most of the tube wells are in very bad condition. Role of ADB and PHED were discussed with them. Water borne diseases, fluoride contamination of ground water and benefits of treated surface water were discussed.	
Khatra	--	Supur G P	Supur Market (26.12.20)	Total 18, Female 1	Women of the villages said that door to door water connection will save their time. Availability of local labour during construction time was discussed. Sufficient amount of labours available in the villages. Discussed to villagers about willingness to pay for safe water.	

BLOCK	MOUZA	GP	OHR/GLSR ZONE CODE	Number of Participants	Concerned/ Issues discussed	Photographs
Hirbandh	--	Baharamuri	Hatirampur Market (26.12.20)	Total 20, Female 1	<p>Most of them are very poor people and they will have facing problem for paying.</p> <p>Villagers also said that due to scarcity of water sanitation is not maintained properly.</p> <p>Collect information about drainage and sewerage problems of the villages.</p> <p>Collect information about the forest area. They said forest area situated 1.5 away from the project area. There is no man-animal conflict.</p> <p>Discussed about dust pollution, noise pollution, disturbance, road diversion (Traffic control) during construction time.</p>	 

### Photograph of Public Consultation





**Photographs of Public Consultation: During Construction**



**Hatirampur Market**

West Bengal Drinking Water Sector Improvement Project  
Attendance Sheet for Consultation with APs under Package- BK/01

District: Bardhaman

Block: Hindbani

Date: 26-12-2020

Village: Hindbani Hat

Location: Hindbani market

No. of Participants: 20

Male: 19

Female: 1

Sl No.	Name	Sex	Social Category	Profession	Contact Number	Signature
1	Gangul Halder	M	A	shop owner	7477677469	Gangul Halder
2	Sanku Patra	M	C	H	7602767610	Sanku Patra
3	Nayan Pramanik	M	OBC	H	9732101406	Nayan Pramanik
4	Bidyut Mandal	M	A	H	978754523	Bidyut Mandal
5	Sukdeb Mandal	M	A	H	9732048237	Sukdeb Mandal
6	Nayan Pramanik	M	A	H	8942955474	Nayan Pramanik
7	Pradyumn Choudhary	M	A	H	9547195166	Pradyumn Choudhary
8	S. Nikhil Choudhary	M	OBC	H	-	S. Nikhil Choudhary
9	Swapan Pramanik	M	OBC	H	9116477498	Swapan Pramanik
10	Bansu Pramanik	M	OBC	H	-	Bansu Pramanik

11	Arashati Haldar	M	G	SHY OWNER	9816610025/44	Arashati Haldar
12	Dimplecha Khan	M	G	4	9685258207	Dimplecha Khan
13	সত্যজিৎ সান্দাল	M	G	4	9200539767	সত্যজিৎ সান্দাল
14	Bhaskar Mondal	M	ABC	4	9800278279	Bhaskar Mondal
15	নসিম মল্লিক	M	SC	4	9635074654	নসিম মল্লিক
16	Dipak Mondal	M	G	4	8298762503	Dipak Mondal
17						
18						
19	Consultation organized & conducted by:					
20	Hasanul Islam	M	G	Social support	9051841215	Hasan
21	Utallya Chatterjee	M	G	Social support	8700656633	Utallya
22	Sakshi Maiti	F	G	Consultation support	9685155969	Sakshi
23	Subhira Haque	M	G	Research support	8240450799	Subhira Haque
24						
25						



Supur Market

West Bengal Drinking Water Sector Improvement Project  
 Attendance Sheet for Consultation with APs under Package- BK01

District: Bankura

Block: Khadka

Date: 22-12-2020

Village: Supur

Location: Supur Market

No. of Participants: 18

Male: 17

Female: 1

Sl. No.	Name	Sex	Social Category	Profession	Contact Number	Signature
1	Hariharan Mondal	M	A	Shop owner	7602149628	[Signature]
2	Chaitra Rajak	M	SC	"	9832735040	[Signature]
3	Jyoti Mondal	M	SC	"	9802548000	[Signature]
4	Sant Mondal	M	SC	"	8016374091	[Signature]
5	Sanjoy Bhuiya	M	SC	"	9641963378	[Signature]
6	Karshil Mondal	M	OBC	"	7602665280	[Signature]
7	[Signature]	M	OBC	"	9609533709	[Signature]
8	[Signature]	M	SC	"	9679071117	[Signature]
9	[Signature]	M	OBC	"	8509080371	[Signature]
10	[Signature]	M	SC	"	8509763352	[Signature]

11	Ura 44507400	M	OBC	Other minor	8159926473	Ura 44507400
12	Chakrabarti Deb.	M	OBC	4	8759089083	Chakrabarti Deb.
13	Shanti Das	M	OBC	4	9800683044	Shanti Das
14	Bell Bannurik	M	OBC	4	7023085002	Bell Bannurik
15						
16						
17						
18	Consultation Organized & Conducted by					
19	Ahmedul Islam	M	C	Social expert	9051941215	Ahmedul Islam
20	Uttam Chatterjee	M	C	Social support coordinator	990650633	Uttam Chatterjee
21	Saheli Maiti	F	C	social support coordinator	9638185969	Saheli Maiti
22	Fahim Hossain	M	C	social support coordinator	8240450799	Fahim Hossain
23						
24						
25						



Tilabani More

West Bengal Drinking Water Sector Improvement Project  
 Attendance Sheet for Consultation with APs under Package- BK/01

District: Bankura  
 Village: Talalaam  
 No. of Participants: 6

Block: Hirbandh Date: 23-12-2020  
 Location: Talalaam More  
 Male: 5 Female: 1

Sl. No.	Name	Sex	Social Category	Profession	Contact Number	Signature
1	<u>Asanul Islam</u>	<u>M</u>	<u>G</u>	<u>social worker</u>	<u>90518 11215</u>	<u>Rham</u>
2	<u>Utakya chatterjee</u>	<u>M</u>	<u>A</u>	<u>social worker</u>	<u>990659633</u>	<u>chatterjee</u>
3	<u>Ujjwal Roy</u>	<u>M</u>	<u>A</u>	<u>tailor</u>	<u>7602594135</u>	<u>(Ujjwal Roy)</u>
4	<u>Sunit Mondal</u>	<u>M</u>	<u>A</u>	<u>shop owner</u>	<u>9046 4064245322</u>	<u>Sunit Mondal</u>
5	<u>Pabun Pabun Mondal</u>	<u>M</u>	<u>A</u>	<u>shop owner</u>	<u>9938 55586</u>	<u>Pabun Pabun Mondal</u>
6	<u>Saheli Maity</u>	<u>F</u>	<u>A</u>	<u>designer</u>	<u>9888186969</u>	<u>Maity</u>
7						
8						
9						
10						

**WEST BENGAL DRINKING WATER SECTOR IMPROVEMENT PROJECT (WBDWSIP)**

**ATTENDANCE SHEET FOR PUBLIC CONSULTATION**

District- BANKURA

Block- INDPUR

Venue- GORINDAPUR VILLAGE  
(GLSR SITE)

Duration of discussion- 45 minutes

Date- 11/10/2019

Time- 11.00 a.m.

No. of participants- 35 (Male- 21 Female- 14 )

Sl. No.	Name	Sex	Address	Contact Number
1.	কুমার মন্ডল	M	"	9579806650
2.	স্বপ্নীক মন্ডল	M	"	9932538702
3.	সীতালতা মন্ডল	M	"	9002389823
4.	স্বপ্নীক মন্ডল	M	"	
5.	Manoranjan Bala	M	gobindapur	9679886514
6.	স্বপ্নীক মন্ডল	M	17	X
7.	স্বপ্নীক মন্ডল	M	17	V
8.	স্বপ্নীক মন্ডল	M	17	X
9.	স্বপ্নীক মন্ডল	F	"	
10.	স্বপ্নীক মন্ডল	F	"	"
11.	স্বপ্নীক মন্ডল	F	"	3
12.	স্বপ্নীক মন্ডল	F	"	3
14.	Smit K. Bani	M		6295777039
15.	স্বপ্নীক মন্ডল	F		
16.	স্বপ্নীক মন্ডল	F		

Sl. No.	Name	Sex	Address	Contact Number
17.	Khadirun Bawa	M.	Gobindpur	
18.	बाबन बाईबा	M	"	
19.	अशक्त बाईबा	M	"	
20.	सुभाष बाईबा	M	"	
21.	अशक्ति बाईबा	M	"	
22.	Gasudeo Bawa	M	"	
23.	दोयदेव बाबा	M	Gobindpur	
24.	सुलली बाईबा	F	"	
25.	शशिमा बाईबा	F	"	
26.	सुशिक्षिता बाईबा	F	"	
27.	सुशील बाईबा	M	"	
28.	विमल	M	"	
29.	अशक्ति बाईबा	F	"	
30.	अशक्त बाईबा	M	"	
31.	सुशिक्षिता बाईबा	F	"	
32.	विमला बाईबा	F	"	
33.	अशक्त बाईबा	F	"	
34.	सुशिक्षिता बाईबा	M	"	8967545934
35.	Saafar Bawa	M.		9641970455

**PHOTOGRAPHS OF STAKEHOLDER CONSULTATIONS**



## Appendix 12: GRC Notification and Committee State & District Level Steering committee

1

### Public Health Engineering Department West Bengal Drinking Water Sector Improvement Project (WBDWSIP)

**Minutes of the 1st Meeting of State Level Steering Committee on West Bengal Drinking Water Sector Improvement Project (WBDWSIP) under the Chairmanship of Chief Secretary, West Bengal in the Conference Hall, Nabanna, 13<sup>th</sup> Floor, Howrah, held on 16.04.2019 at 11:00AM.**

The list of Members present is attached as Annexure-A

Chief Secretary, Government of West Bengal took the chair and initiated the discussions.

2) Principal Secretary, Public Health Engineering Department apprised the committee that after the approval of Government of West Bengal and the Department of Economic Affairs, Government of India, Loan agreement with Asian Development Bank was signed on 03.10.2018 for an amount of 240 Million US Dollar as Loan and 3 million US Dollar as Grant under Japanese Fund for Poverty Reduction (JFPR) for execution of 3 (three) Water Supply Projects in Arsenic affected areas of North 24 Parganas district, salinity affected areas of Purba Medinipur district and fluoride affected areas of Bankura district under WBDWSIP. The objective of the Project is to deliver safe, sustainable and inclusive drinking water services in the aforesaid project districts with provision of 100% house hold metered connection to provide 24 X 7 water supply. One Project Management Unit (PMU) headed by Chief Engineer & Project Director and 3 (Three) Project Implementation Units (PIU) headed by Superintending Engineer under P.H. Engineering Department have been established for timely implementation of the Project.

3) Chief Engineer & Project Director described the details of the project through a power point presentation and highlighted the following points in respect of three subprojects:

- i) In Bankura district, the DPR for Bankura district has been prepared considering 8 (eight) blocks namely Taldangra, Indpur, Gangajalghati, Mejhia, Sonamukhi, Patrasayer, Joypur and Kotolpur. But presently the 4 (four) blocks, namely Taldangra, Indpur, Gangajalghati and

Mejhia will be covered fully through piped water supply with the financial assistance from ADB. The proposal for remaining 4(four) blocks will be taken up with ADB for additional funding as the ADB officials advised in their *aide memoire* during their last consultation mission on 26-27 March, 2019.

- ii) In **Purba Medinipur district**, DPR for 4(four) Blocks namely Nandakumar, Chandipur, Nandigram-I and Nandigram-II has been prepared. But presently 2(Two) Blocks namely Nandigram –I and Nandigram –II will be covered fully through piped water supply with the financial assistance from ADB. But the Water Treatment Plant will be constructed for catering to all 4(four) blocks as mentioned above. The proposal for remaining 2(Two) blocks will be taken up with ADB for additional funding.
- iii) In **North 24 Parganas and South 24 Parganas districts**, Haroa and Bhangar-II blocks will be covered fully through piped water supply but Water Treatment Plant is considered for Barasat-II block also. The cost of distribution network for Barasat-II block is not considered under this Loan assignment. Now one DPR has been prepared for distribution network of Barasat-II Block for proposal initiation with ADB.
- iv) Presently 4 (four) Consultancy firms and 3 (three) NGOs have been engaged to assist PMU and 3(three) PIUs as per ADB approved Project Administration Manual (PAM). Moreover, Technical Assistance (TA) Consultant has also been engaged by the ADB for Smart Water Management.
- v) Purchase of Private land for construction of Intake Structure, Water Treatment Plant and Overhead reservoirs is under process for all the schemes. The land parcels lying with other Government Department are also being processed for Inter Departmental Transfer. All efforts will be taken to get the required parcels of land in possession of PHED well in advance so that project implementation is not affected for want of site at any stage.
- vi) Communication has been made with WBIDC for issuance of confirmation to Damodar Valley Reservoir Regulatory Commission

(DVRRC) regarding drawal of 70MLD water from Durgapur Barrage to get the drawal permission from DVRRC. The same was issued by WBIDC on 29.06.2018 addressed to Member Secretary DVRRC but DVRRC again asked for reconfirmation regarding the present requirement. The matter will be taken up again with WBIDC and also referred to me&W Department for taking up with DVRRC for expeditious action.

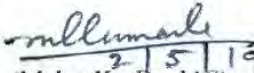
- vii) Postings of Sr. Accounts Officer at PMU and Accounts Officer at PIU-Purba Medinipur is required to be made on urgent basis as the loan disbursement and expenditures have already been started. The ADB officials highlighted the issue during their last mission. AGWB has already replied that there is no sanctioned post of Sr Accounts Officer/Accounts Officer under the Administrative Control of Works Miscellaneous Section and no scope to provide any regular Sr A.O./A.O. for the post. Proposal for re-designation of Sr Accounts Officer/Accounts Officer Post as Divisional Accounts Officer have been submitted to Finance Department for approval in consultation with the Financial Advisor, PHE Department. The Additional Secretary, Finance Department informed that he will look into the proposal of PHED.
- 4) Additional Chief Secretary, Irrigation and Waterways Department assured that the issues related to I & W Department will be taken care of on priority basis for smooth implementation of the project.
- 5) Additional Chief Secretary, Panchayets & Rural Development Department informed that necessity of piped water supply in other water quality affected blocks of North 24 Parganas, South 24 Pargana, Purba Medinipur and Bankura districts also needs to be looked into on urgent basis. The Principal Secretary, PHE Department informed that at present PHE Department has taken up a few surface water based water supply schemes which include ADB and JICA assisted schemes to provide safe and sustainable drinking water in the quality affected blocks of West Bengal under different Programmes which will be commissioned within the next 2 to 3 Years. The present population

covered through piped water supply scheme in west Bengal is about 58% and once the ongoing schemes are commissioned the coverage would reach 72%.

- 6) Principal Secretary, PHE Department proposed that the Principal Secretaries of P.W. Department, Land and Land Reforms Department and Urban Development & Municipal Affairs Departments may also be incorporated as members of the committee for more effective coordination and collaboration for timely commissioning of projects. In addition, Superintending Engineer/Executive Engineer, PWD, PW (Roads) and ADM (LR)/ DLLRO of the Project districts may also be included as invitee members of the District Level Steering Committee. The Chief Secretary agreed with the proposal. The revised list of members of State Level and District Level Steering Committee is attached as Annexure-B.

Chief Secretary advised that PHED must prepare an action plan and shelf of projects so that the entire state is covered with piped water supply schemes within the next 6 to 7 years by fixing priority in the quality affected blocks. He further advised that proposals for the remaining blocks to be covered under this project may be initiated by the PHE Department as early as possible.

There being no other issues for discussion, the meeting ended with vote of thanks to and from the Chair.

  
2 | 5 | 19  
(Malay Kr. De. IAS)

Chief Secretary  
Government of West Bengal





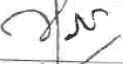

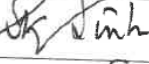


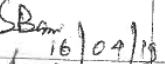
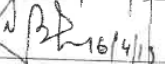
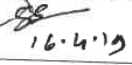
Meeting on 16.04.2019- 1<sup>st</sup> State Level Steering Committee

Subject:-WBDWSIP

Venue:-CS- Conference hall, Nabsanna

Time:-11:00am

Attendance Sheet: -

Sl. No	Name	Signature	Email
1	Chief secretary		
2	Additional Chief Secretary, P & RD Department		
3	Additional Chief Secretary, I & WD Department		
4	Additional Chief Secretary, Finance Department		
5	Principal Secretary, PHE Department		
6	Engineer- In – Chief, PHED		
7	Chief Engineer & P. D. WBDWSIP, PHE St.		pd.pmu.adb@wbphed.gov.in
8	Dr. Sudip K. Sinha Addl. Secretary, Finance		sudipkumar.sinha@yahoo.in
9	Subhanis Ray		Se. PIU/PMU, adb@wbphed.gov.in
10	Debarshi Bhowmik		SE PIU/PMU Pgm
11	Sujoy Barua		SE/PIU, Bankura
12	Nityananda Khan		SE/ME/PMU, seme.pmu.adb@wbphed.gov.in
13	Saunak San		ce.s.pmu.adb@wbphed.gov.in
14			
15			
16			

Annexure-R

D/O  
16/5/19

1024  
23-05-2019

Superintending Engineer,  
PIU, North 24-Parganas  
WBDWSIP, P.H.E. Dept.  
Govt. of West Bengal

**Government of West Bengal**  
**Public Health Engineering Directorate**  
**Project Management Unit, West Bengal Drinking Water Sector Improvement Project**  
Utility Building, 1<sup>st</sup> Floor, (Premises No.-09/1-0024)  
AA-1A, (Tank No.-3), New Town Kolkata-700 156  
Phone No.-(033) 2324-2095, E-mail:- [pd.pmu.adb@wbphed.gov.in](mailto:pd.pmu.adb@wbphed.gov.in);  
[pmu.adb@wbphed.gov.in](http://pmu.adb@wbphed.gov.in)

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Memo No. PMU/WBDWSIP/PHED/218/2019 Date: 16.05.2019

**NOTIFICATION**

In order to address social, environmental and any other project or sub project related grievances in the implementation of Piped water supply schemes in the districts of Bankura, North & South 24 Parganas, Purba Medinipur under West Bengal Drinking Water Sector Improvement Project, PHE Dte with the assistance of Asian Development Bank (ADB), a common grievance redress mechanism has been developed for Project Management Unit.

The following members constitute the Grievance Redressal Committee to resolve the grievances at the PMU level:

1. Chair person- Chief Engineer & Project Director, PMU
2. Member-Superintending Engineer (Civil), PMU
3. Member-Superintending Engineer (Mech/Elec.), PMU,
4. Safeguards and Gender Officer, Safeguards Gender Cell- Executive Engineer-I PMU.

The functions of GRC at PMU level are as follows:-

1. Accept Grievances of the Aggrieved parties through telephone hot lines at accessible location, email, post at PMU office
2. Address and Facilitate resolution of Grievances not resolved at the field and PIU level within stipulated time.
3. PMU HSGO together with PIU safeguard officers will have the joint responsibility for timely grievance redress on safeguards and gender issues and for registration of grievances, related discloser, and communication with the aggrieved party.
4. Resolve grievances and suggest corrective measures or solutions for their redressal to PIU for implementation within the specified time (within 15 days).
5. If grievances cannot be resolved at the project level they will be referred to the District Steering Committee (DSC), which will also act as Grievance Redressal Committee particularly in matters related to land purchase and or acquisition, payment of compensation, and environmental pollution among others.

Open  
 Grievance  
 Social  
 Safety  
 27/5/19

PMU Level



6. Any matter deemed higher than the district level or that may require inter departmental coordination, the required grievances redress will be referred to the state level steering committee.
7. Careful documentation of the name of the complainant and date of receipt of complaint, address and contact details of complainant, location of the problem area and how the problem was resolved and report the same in the Quarterly Progress Report and Semi Annual Safeguard Monitoring report to be submitted to ADB.
8. Periodically Review the functioning of the GRM at the field and PIU level.

The GRC will continue to function throughout the project duration.

Atk. 16.05.19  
Chief Engineer & Project Director,  
PMU, WBDWSIP, P.H.E. Dte.,  
Govt. of West Bengal.

Memo No. PMU/WBDWSIP/PHED/...../.....

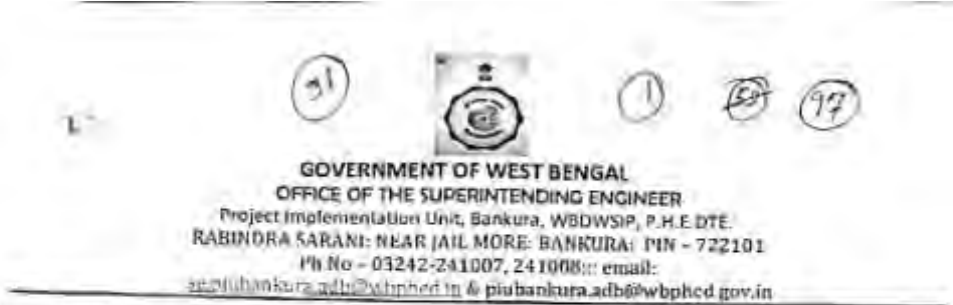
Date: 16.05.2019.

**Copy forwarded for information to :-**

1. The Superintending Engineer, Civil / (M/E), PMU, WBDWSIP, PHE Dte.
2. The Superintending Engineer, PIU, North 24 Parganas, / Purba Medinipur / Bankura, WBDWSIP, PHE Dte. with a directive to constitute the GRC at the PIU level and Field level as suggested in PAM approved by ADB.
3. The Executive Engineer-I, PMU, WBDWSIP, PHE Dte.
4. The Executive Engineer, PIU, North 24 Parganas/ Purba Medinipur/ Bankura, WBDWSIP, PHE Dte.

Atk. 16.05.19  
Chief Engineer & Project Director,  
PMU, WBDWSIP, P.H.E. Dte.,  
Govt. of West Bengal.

## PIU Level GRC - Bankura



Memo No. 443 /SE/PIU-Bankura

Dated Bankura the 08/01/2019

### NOTIFICATION

In order to address social, environmental and any other project or sub project related grievances in the implementation of Asian Development Bank (ADB) assisted Piped water supply schemes in the district of Bankura under West Bengal Drinking Water Sector Improvement Project (WBDWSIP), a project level Grievance Redress Mechanism has been developed at PIU Level for PIU, Bankura, WBDWSIP, PHE Dte with the following members:

1. Chairperson- Executive Engineer (Civil), PIU, Bankura, WBDWSIP, PHE Dte.
2. Member- Executive Engineer (E/M), PIU, Bankura, WBDWSIP, PHE Dte.
3. Assistant Safeguard and Gender Officer – Assistant Engineer, Head Quarters, PIU, Bankura, WBDWSIP, PHE Dte.
4. Assistant Environmental Officer – Assistant Engineer – I, PIU, Bankura, WBDWSIP, PHE Dte.
5. Junior Safeguard and Gender Officer – Junior Engineer, PIU, Bankura, WBDWSIP, PHE Dte.
6. Junior Environmental Officer – Junior Engineer, PIU, Bankura, WBDWSIP, PHE Dte.
7. Social/Gender/Resettlement Specialist, DSISC, PIU, Bankura, WBDWSIP, PHE Dte.

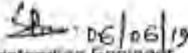
The function of GRC at PIU level are as follows-

1. Accept Grievances of the Aggrieved persons through grievance redress/ suggestion forms in complaints/ suggestion boxes or through telephonic hotlines at accessible locations, by e-mail, by post, or by writing in a complaint register in PIU office.
2. Careful documentation of the name of the complainant, date of receipt of the complaint, address/ contact details of the aggrieved person, location of the problem area etc.
3. Address and facilitate resolution of Grievances not resolved at the field level within stipulated time (7 days).
4. The Assistant safeguard Officer, PIU, Bankura supported by the Social safeguard specialist of DSISC, PIU, Bankura will be responsible for conducting meeting with the affected/ aggrieved person (s) to understand their concerns and help them through the process of grievance redressal including translating the complaints into Bengali or English, recording and registering grievances of non literate affected persons and explaining the process of grievance redress mechanism.
5. If the PIU level GRC fails to resolve the Grievance, the matter may be conveyed to the GRC established within PMU and the actions suggested by them to be taken up/ followed by this GRC.
6. PMU HSGO together with PIU safeguard officers will have the joint responsibility for timely Grievance Redressal on safeguards and Gender Issues and for registration of Grievances, related disclosure and communication with the aggrieved party.
7. If Grievance cannot be resolved at the Project Level, they will be referred to the District Steering Committee (DSC) which will also act as Grievance Redressal Committee, particularly in matter related to Land purchase and or Acquisition, payment of the compensation and environmental pollution among others.
8. Any matter deemed higher than the district level or that may require inter-departmental coordination, the required Grievance redress will be referred to the State Level Steering Committee.
9. The GRC at PIU, Bankura will also be responsible for follow-through for each grievance, periodic information dissemination to complainants on the status of their grievances and recording their feedback (satisfaction / dissatisfaction and suggestions).

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10. Periodically Review the functioning of the GRM at this end as well as field level.

The GRC will continue to function throughout the project duration.

  
06/06/19  
Superintending Engineer  
PIU, Bankura, WBDWSIP, PHE Dte

Memo No. 443 / SE/PIU-Bankura

Dated Bankura the 6/6/2019

**Copy forwarded for information and necessary action:-**

- 1) The Chief Engineer & Project Director, WBDWSIP, PHE Dte.
- 2) Executive Engineer (Civil), PIU, Bankura, WBDWSIP, PHE Dte.
- 3) Executive Engineer (E/M), PIU, Bankura, WBDWSIP, PHE Dte.
- 4) Assistant Engineer (HQ), PIU, Bankura, WBDWSIP, PHE Dte.
- 5) Assistant Engineer - I, PIU, Bankura, WBDWSIP, PHE Dte.
- 6) Junior Engineer-I, PIU, Bankura, WBDWSIP, PHE Dte.
- 7) Junior Safeguard and Gender Officer – Junior Engineer, PIU, Bankura, WBDWSIP, PHE Dte.
- 8) Junior Environmental Officer – Junior Engineer, PIU, Bankura, WBDWSIP, PHE Dte.
- 9) The Team Leader, DSISC, PIU, Bankura, WBDWSIP, PHE Dte.
- 10) Social/Gender/Resettlement Specialist, DSISC, PIU, Bankura, WBDWSIP, PHE Dte.
- 11) Support Staff (I & II) - Environmental and Social Safeguards, DSISC, PIU, Bankura, WBDWSIP, PHE Dte.

  
06/06/19  
Superintending Engineer  
PIU, Bankura, WBDWSIP, PHE Dte

Scanned by CamScanner

## GP Level GRC Notification



### GOVERNMENT OF WEST BENGAL

#### OFFICE OF THE SUPERINTENDING ENGINEER

Project Implementation Unit, Bankura, WBDWSIP, P.H.E.DTE.

RABINDRA SARANI: NEAR JAIL MORE: BANKURA: PIN - 722101

Ph No - 03242-241007, 241008 :: email:se\_bank\_wvs@wbphed.gov.in,  
se\_piubankura.adb@wbphed.in& piubankura.adb@wbphed.gov.in

Memo No. 905 /SE/PIU-Bankura

Dated Bankura the 24 / 10 /2019

#### Notification

In order to address Social, environmental and any other project or subproject related grievances in implementation of Asian Development Bank (ADB) assisted piped water supply schemes in the district of Bankura under West Bengal Drinking Water Sector Improvement Project (WBDWSIP), a field level Grievance Redress Mechanism has been developed for different packages under this project with the following members.

1. Safeguard officer from PIU (AE, PHE)- Chairperson
2. Gram-Panchayet Pradhan of the concerned G.P - Member
3. Support Environment safeguard - Member
4. Support Social Safeguard - Member
5. Panchayet Member of the concerned G.P - Member
6. Health and Safety officer from contractor's side- Member

The function of GRC at field level are as follows: -

1. Accept Grievances of the aggrieved persons through grievance redress / suggestion forms in complaints / suggestion boxes or through telephonic hotlines at accessible locations, by e-mail, by post, or by writing in a complaint register in PIU office.
2. Careful documentation of the name of the complainant, date of receipt, address / contact details of the aggrieved person, location of the problem area etc.
3. Address and facilitate resolution of Grievances within stipulated time (7 days).
4. Safety officer of Contractor supported by the Social safeguard support and Environmental Safeguard Support of DSISC, PIU, Bankura will be responsible for conducting meeting with the affected / aggrieved person(s) to understand their concerns and help them through the process of grievance redressal including translating the complaints into Bengali or English, recording and registering grievances of non - literate affected persons and explaining the process of grievance redress mechanism.
5. If the Field level GRC fails to resolve the Grievance, the matter may be conveyed to the PIU level GRC and the actions suggested by them to be taken up / followed by this GRC.
6. Field level GRC will have the primary responsibility for timely Grievance Redressal on safeguards and Gender Issues and for registration of Grievances, related disclosure and communication with the aggrieved party.

## New GRC & Safeguard Officers- Project and Bankura



West Bengal Drinking Water Sector Improvement Project  
(Asian Development Bank funded)

### PROJECT MANAGEMENT UNIT

Public Health Engineering Department,  
Government of West Bengal

Utility Building, 1st Floor, AA-1A (Tank No. 3), New Town, North 24 Parganas, - 700156



Memo No. PMU/WBDWSIP/PHED/94/356

Dated : 01-04-2024

#### OFFICE ORDER

Public Health Engineering Department (PHED) has established a dedicated "Safeguard and Gender Cell(SGC)" at Project Management Unit (PMU) level to ensure the implementation of Environmental and Social Safeguards as per ADB's Safeguard Policy Statement (SPS), 2009 and requisite requirements under Loan No.3696-IND.

#### Environment, Social and GESI- PMU

	Designation	Name	Contact details	Status
1	Superintending Engineer (Civil), PMU, WBDWSIP, Head SGS	Mr.Subhabrata Kundu	+91-9163236066	Available since- January 2024
2	Environment Specialist, PMC	Dr. Ardhendu Mitra	+919830415953	Available since- December 2018
3	Social, Gender & Resettlement Specialist, PMC			


  
AYESHA RANI A, IAS  
Sr. Special Secretary, PHED and  
Project Director, PMU, WBDWSIP

Memo No. PMU/WBDWSIP/PHED/94/356

Dated : 01-04-2024

Copy forwarded for information to :

- 1) Chief Engineer, PMU, WBDWSIP, PHED
- 2) Superintending Engineer, (Civil), PMU, WBDWSIP, PHED
- 3) Superintending Engineer, (M/E), PMU, WBDWSIP, PHED
- 4) The Executive Engineer -I /II, PMU, WBDWSIP, PHED
- 5) All PIUs, North 24 Paragans, /Bankura/ Purba Medinipur
- 6) Dy. Team Leader, PMC / Dr.Ardhendu Mitra, Environmental Specialist,PMC, /

  
AYESHA RANI A, IAS  
Sr. Special Secretary, PHED and  
Project Director, PMU, WBDWSIP

Page 1 of 1



West Bengal Drinking Water Sector Improvement Project  
(Asian Development Bank funded)

**PROJECT MANAGEMENT UNIT**

Public Health Engineering Department,  
Government of West Bengal

Utility Building, 1st Floor, AA-IA (Tank No. 3), New Town, North 24 Parganas, - 700156



Memo No. PMU/WBDWSIP/PHED/94/355

Dated : 01-04-2024

**OFFICE ORDER**

Public Health Engineering Department (PHED) has established a dedicated "Environment and Social Safeguard Unit (ESSU)" at Project Implementation Unit (PIU) level, Bankura to ensure the implementation of Environmental and Social Safeguards as per ADB's Safeguard Policy Statement (SPS), 2009 and requisite requirements under Loan No. 3696-IND.

**Environment, Social and GESI- PIU, Bankura**

	Designation	Name	Contact details	Status
1	Executive Engineer, PIU Bankura	Mr.Pritwish Bhattacharya	+91-9330851223	Available since- September 2022
2	Assistant Engineer-I, PIU Bankura	Mr.Srinjay Das	+91-9007398555	Available since- Feb 2024
3	Team Leader, DSISC, Bankura	Mr.Arvind Kumar Pandeya	+91-7631900046	Available since- December 2023
4	Social, Gender and Resettlement Specialist, DSISC, Bankura	Mr.Hasanul Islam	+91-9051841215	Available since- December 2019
5	Environmental Specialist, DSISC, Bankura			

*Ar*

**AYESHA RANI A, IAS**  
Sr. Special Secretary, PHED and  
Project Director, PMU, WBDWSIP

Memo No. PMU/WBDWSIP/PHED/94/355

Dated : 01-04-2024

Copy forwarded for information to :

- 1) Superintending Engineer, PIU, WBDWSIP, PHED

*Ar*

**AYESHA RANI A, IAS**  
Sr. Special Secretary, PHED and  
Project Director, PMU, WBDWSIP

### Appendix 13: Sample Grievance Registration Form

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

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

Date	Place of registration	Project Toxwn Project:			
Contact information/personal details					
Name		Gender	* Male * Female	Age	
Home address					
Place					
Phone no.					
E-mail					
Complaint/suggestion/comment/question Please provide the details (who, what, where, and how) of your grievance below: If included as attachment/note/letter, please tick here:					
How do you want us to reach you for feedback or update on your comment/grievance?					

#### FOR OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)	
Mode of communication: Note/letter E-mail Verbal/telephonic	
Reviewed by: (Names/positions of officials reviewing grievance)	
Action taken:	
Whether action taken disclosed:	Yes No
Means of disclosure:	

অভিযোগ নিবন্ধন ফর্মের নমুনা

..... প্রকল্পকে বাস্তবায়িত করার লক্ষে অভিযোগ, পরামর্শ, অনুসন্ধান এবং মন্তব্যের জন্য স্বাগত।

আমরা অভিযোগকারীকে অভিযোগ সহ নাম জানাতে উৎসাহিত করি এবং আপনার সাহচর্যে এসে এর শোধন ও প্রতিক্রিয়া জানাতে সক্ষম হই।


অবশ্যই আপনি আপনার ব্যক্তিগত বিষয় বিস্তারিত ভাবে যুক্ত করতে ইচ্ছাপ্রকাশ করবেন। যে তথ্য আপনি দেবেন, তা অবশ্যই গোপন থাকবে। তাই অনুগ্রহ করে আপনার নাম লিখে / টাইপ করে জানান।

তারিখ	নিবন্ধনের জায়গা	প্রকল্পের শহর প্রকল্পঃ		
যোগাযোগের তথ্য / বিস্তারিত ব্যক্তিগত তথ্য				
নাম		লিঙ্গ	পুরুষ মহিলা	বয়স
বাড়ির ঠিকানা				
জায়গা / স্থান				
ফোন নং				
ই-মেল				
যেকোন অভিযোগ / পরামর্শ / মন্তব্য / প্রশ্ন অনুগ্রহ করে নিচে বিস্তারিতভাবে (কে, কি, কোথায় এবং কেমন করে) আপনার অভিযোগ জানান				
যদি কোন সংযুক্তি / চিরকুট / চিঠি অন্তর্ভুক্ত করতে চান, অনুগ্রহ করে সেখানে টিক দিন।				
আপনার অভিযোগ / মন্তব্যের হালনাগাদ (আপডেট) বা প্রতিক্রিয়া কিভাবে পেতে চান?				

Office ব্যবহারের জন্যঃ

অভিযোগ নিবন্ধনকারী আধিকারিকের নামঃ	
যোগাযোগ ব্যবস্থাঃ	
চিরকুট / চিঠি-	
ই-মেল-	
মৌখিক / টেলিফোন-	
নিবন্ধকৃত অভিযোগ পর্যালোচনাকারী আধিকারিকের নাম ও পদঃ	
অভিযোগের বিরুদ্ধে গৃহীত ব্যবস্থা-	
গৃহীত ব্যবস্থা প্রকাশ্যে আনা হয়েছে কি না	হ্যাঁ না
প্রকাশের উপায়	

**Appendix 14- Permission letter of water abstraction from IWD**

  
Government of West Bengal  
Irrigation & Waterways Department  
Jalashankar Bhawan, Salt Lake, Kolkata - 700 091  
Ph & Fax- 033 2321 5211, email: ds-wat@srwbwd.gov.in

*E.M.L. to PHE O/C*

Sl. No. 2901  
(45807/5018/01)

Date: 27/6/2017

To: Sri B. Mukhopadhyay  
Deputy Secretary to the  
Government of West Bengal

To: The Engineer-in-Chief,  
Public Health Engineering Department  
Government of West Bengal  
N.S. Building, 6<sup>th</sup> floor,  
1, K.S. Roy Road, Kolkata - 700007.

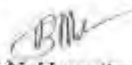
**Sub:** Permission of Irrigation & Waterways Department for drawal of 32 MLD of raw water from Mukutmonipur reservoir for drinking water purpose under the Bankura Water Supply Project (Phase-II) of PHE Department.

**Ref:** His D.O. letter No. PHE/EIC/289/2017-18 dated 15.06.2017


50.

This department earlier accorded 'No Objection' to PHE department, GoWB for drawal of 100 MLD of raw water from Mukutmonipur reservoir through a RCC intake well within the reservoir area at Mouza- Jambh, Block- Manbazar-I, Dist.- Purulia to cater the need of drinking water of the people of the northern portion of Purulia district. It is understood that out of allocated 100 MLD of raw water, at present 68 MLD is the requirement for phase-I work of the aforesaid JICA assisted drinking water supply project of PHE department for Purulia. It is proposed vide D.O. letter under reference to utilize the balance 32 MLD out of total allocation of 100 MLD for their Bankura Water Supply Project (Phase-II).

In view of above, I am directed to convey the 'No Objection' of this department towards drawal of 32 MLD of raw water out of above mentioned 100 MLD allocation through the already existing intake structure stated above. All other conditions, stated in department's approval letter no. 270-1/1-4M-48/12 dated 10.06.15 will be applicable for this proposed drawal of 32 MLD of raw water.

Yours faithfully,  
  
(B. Mukhopadhyay)  
Deputy Secretary to the  
Government of West Bengal

Permission letter of water abstraction of additional 12 MLD from IWD

  
Government of West Bengal  
Irrigation & Waterways Department  
Jalasampad Bhawan, Salt Lake - 700 091

*Water Abstraction  
Permission file  
25/01/21*

Memo No. 06 - 1 Dated: 14<sup>th</sup> January, 2021  
L-4M-48/2012

From: Joint Secretary to the  
Government of West Bengal

To: Principal Secretary  
Public Health Engineering Department  
Government of West Bengal  
6<sup>th</sup> Floor, New Secretariat Building  
Kolkata - 700 001

Sub: *Permission for drawal of additional 12 MLD raw water from Kangsabati reservoir at Mukutmonipur, District: Bankura for drinking water purpose for Indpur-Taldangra block piped water supply schemes in Bankura District under WBDWSIP.*

Ref: Memo No. PMU/WBDWSIP/PHED/140/844 dated 28.11.2020 of Chief Engineer & Project Director, PMU, WBDWSIP, P.H.E. Dte.

Sir,

In inviting reference to above, I am directed to convey 'No Objection' of this Department in connection drawal of additional 12 MLD raw water in addition to already approved drawal of 32 MLD from Kangsabati reservoir at Mukutmonipur, District: Bankura for drinking water purpose for Indpur-Taldangra block piped water supply schemes in Bankura District under WBDWSIP, subject to fulfilment of the following terms & conditions:

- 1) Available draft for drawal of water will depend on the prevailing water level of the reservoir. I&WD will no way liable to maintain required water level of the dam near and around the intake structure to ensure availability of water.
- 2) Prior intimation may please be issued to the Engineer-in-Charge, Irrigation & Waterways Directorate (Executive Engineer, Kangsabati Canal Division No.II, Irrigation & Waterways Directorate) before augmentation of the drawal arrangement.

*In B. Sangupta  
CA-1  
This is kept kept  
in record  
25/1/21*

Received  
*Kantil*  
25-01-2021  
Without Content Check  
For BSIC, Bankura

- 3) Public Health Engineering Department has to restore damages to impounding storage reservoir of Mukutmonipur Dam, if any occurred during execution of the proposed work.

Yours faithfully,

*Sd/-*  
(M. Chakraborty)  
Joint Secretary to the  
Government of West Bengal

Memo No.06/1(1) - I

Dated: 14<sup>th</sup> January, 2021

Copy forwarded for kind information to the:

Sr. P.A. to Additional Chief Secretary  
Irrigation & Waterways Department  
Government of West Bengal  
Jalasampad Bhavan, 1<sup>st</sup> Floor  
Saltlake 700 091

*Sd/-*  
(M. Chakraborty)  
Joint Secretary to the  
Government of West Bengal

Memo No.06/2(3) - I

Dated: 14<sup>th</sup> January, 2021

Copy forwarded for information and necessary action to the:

1. Chief Engineer (South West)  
Irrigation & Waterways Directorate  
Government of West Bengal  
Khasjungle, P.O - Abas  
District: Paschim Midnapore, PIN - 721 102  
- This has reference to his Memo No. 461-CI(SW) dated 16.12.2020.
2. Superintending Engineer, Kangsabati Circle - I  
Irrigation & Waterways Directorate  
Government of West Bengal  
Kenduadihi, P.O.- Kenduadihi  
District: Bankura, PIN- 722 102
3. Executive Engineer, Kangsabati Canal Division No.II  
Irrigation & Waterways Directorate  
Government of West Bengal  
P.O - Khatra, District: Bankura, PIN -722 140

*Sd/-*  
(M. Chakraborty)  
Joint Secretary to the  
Government of West Bengal

Memo No.06/3(2) - I

Dated: 14<sup>th</sup> January, 2021

Copy forwarded for information and necessary action to the:


1. Chief Engineer & Project Director, PMU, WBDWSIP  
Public Health Engineering Directorate  
Government of West Bengal  
PMU Head Office, Utility Building  
1<sup>st</sup> Floor (Premises No. 09/1-0024)  
AA-1A (Tank No. 3), New Town  
District: North 24 Parganas, PIN - 700 156
  
2. Superintending Engineer, PIU, Bankura, WBDWSIP  
Public Health Engineering Directorate  
Government of West Bengal  
Rabindra Sarani, Tamlibandh,  
District: Bankura, PIN - 722 101

*m. chakraborty*  
14/1/2021  
(M. Chakraborty)  
Joint Secretary to the  
Government of West Bengal

*Memo No. 42/SE/PIU/Bankura*  
*Copy forwarded for information & n.s. to:*  
*1) The AD(C), PIU, Bankura, WBDWSIP.*  
*2) The Team Leader, DSSE, Bankura.*

*[Signature]*  
25/01/21

**Appendix 15: Intake, Substation, GLSR and new WTP land details  
Land possession certificate for Intake and Sub-station under BK/01**

  
**Government of West Bengal**  
**Office of the Block Land & Land Reforms Officer**  
**Khatra:Bankura**  
Tel. No.:03243-255697      Email ID:blrokhatra@gmail.com


---

**FORM FOR MAKING OVER POSSESSION**  
**PART-I**

In pursuance to order of the Land & Land Reforms And Refugee Relief and Rehabilitation Department, vide MemoNo:2751/LR-24012/159/2019GE(M) dtd.26.08.2019 as communicated by the ADM&DL&LRO, Bankura under his memo no.LM/4927/19,dated,Bankura the 06.09.2019 the following plot of land as per schedule annexed herewith having total area of 0.40 acres, is hereby assigned to the Public Health Engineering Department, Govt. of West Bengal for setting up of ADB assisted West Bengal Drinking Water Supply Improvement Project at Kumar-Bahal, P.S-Khatra in the district of Bankura subject to change of classification of land observing due procedure of law.

The Public Health Engineering Department will hold the land as sanctioned on the following terms & conditions given hereunder:-

- (i) The land will be reverted to the land & Land Reforms And Refugee Relief and Rehabilitation Department when no longer required by the Public Health Engineering Department, Govt. of W.B.
- (ii) If it is found that the land has not been utilized for a period of 3 (three) years from the date of taking over possession, the Land & Land Reforms And Refugee Relief and Rehabilitation Department may resume such quantum of land from the Public Health Engineering Department, Govt. of W.B.
- (iii) The Public Health Engineering Department, Govt. W.B. will not alienate the land.
- (iv) The Public Health Engineering Department, Govt. W.B. will not lease out or let out or transfer any portion or whole of the land at all.
- (v) If any portion of the land so sanctioned is found surplus to the requirement's at any stage for the purpose aforementioned, the said portion of the land shall revert to the Land & Land Reforms And Refugee Relief and Rehabilitation Department.
- (vi) If it is subsequently found that the subject land is involved in any court case, in Hon'ble court of law including W.B.L.R.T.T, than all concerned shall abide by orders as may be passed by such Hon'ble court or W.B.L.R.T.T.
- (vii) The Public Health Engineering Department, Govt. W.B. will not utilize the land for commercial purpose.
- (viii) If it is detected subsequently that land is being used for commercial purpose then the Public Health Engineering Department, Govt. W.B. Will be liable to pay full market value of the land as to be assessed on the date of such detection.

  
**Signature of B.L. & L.R.O, Khatra**  
**For and on behalf of Collector, Bankura District.**

Contd. to page-2

**PART-II**

**SCHEDULE OF LAND**

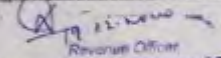
The Public Health Engineering Department, Govt. W.B. under District-Bankura, Sub-Division -Khatra, Block-Khatra receives the following land :

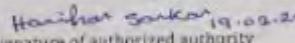
District	Block	Mouza	J.L.No.	Plot No.	Area (in acre)
Bankura	Khatra	Kumar-Bahal	159	1	0.40

**Declaration of Acceptance**

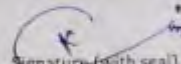
I, Harihar Sarkar, Jr.Engineer, PIU Bankura, WBDWSIP, P.H.E. Dte., District Bankura, hereby convey consent and acceptance without any reservation of the terms and conditions let down in the aforesaid order and take over possession of the plot of land mentioned therein for the Public Health Engineering Department, Govt. W.B. , for setting of ADB assisted West Bengal Drinking Water Supply Improvement Project at Kumar-Bahal, P.S-Khatra in the district of Bankura.

Signature and address of witness

1.   
Revenue Officer  
2. Block Land & Land Reforms Off-  
Khatra, Dist. Bankura

  
Signature of authorized authority  
Designation- Junior Engineer  
Address- PIU Bankura WBDWSIP, PHE Dte.  
Govt. of West Bengal

Signed & sealed and delivered by  
Name Koushik Chakraborty  
Designation S.R.O.-II & B.L. & L.R.O.


  
Signature (with seal) 19/02/2020

**Government of West Bengal  
Office of the Block Land and Land Reforms Officer  
Khatra, Dist.- Bankura.**

Memo. No. LM/ 301 /1(7) / LR / Kht./20 Dated- 19/02/2020.

Copy forwarded for kind information and necessary action to :-

1. CA to the District Magistrate, Bankura with request to place before the District Magistrate
2. The A.D.M & D.L & L.R.O, Bankura in ref. to his Memo No. - LM /4927/19 dated 06.09.2019.
3. The Sub Divisional Officer, Khatra
4. The Sub-Divisional Land & Land Reforms Officer, Khatra
5. The Block Development Officer, Khatra
6. The Revenue Inspector, G.P.
7. Sri Chandi Charan Roy, D.A. LT / S.T for kept in the office file.

  
Block Land and Land Reforms Officer  
Khatra, Bankura 19/02/2020

জেলা- ঝাঁকুড়া খতিয়ান নং- ১৪১ [ ০১১১৪১ ]  
 মৌজা- কুণ্ডরবাঘল জে.এল.নং- ১৪১ খানা- খাতড়া



(১) রাজস্ব- টাকা খতিয়ান তৈরির তারিখ - 14/02/2020  
 (২) জমির পরিমাণ(এ)- ০.৪০ (৩) মোট দাপের সংখ্যা- ১

	(৪) অগ্রস্বরের দখলকারের বিবরণ	(৫) ছর	(৬) মরব্বা
নাম-	জন রায় কপারিসরী	স্বায়ত	
ঠিকানা-	কুমারবাঘল, খাতড়া, ঝাঁকুড়া		

(৭) অগ্রস্বরের নিজ দখলীয় জমি

দাপ নং	জমির প্রেনী	মরব্বা	দাপের মোট পরিমাণ(এ)	দাপের মধ্যে অগ্রস্বরের অংশ	দাপের মধ্যে অগ্রস্বরের জমির অংশের পরিমাণ	
					একর	বেটর
১	দাপি		২৬২.৬৮	০.০০১৪	০.৪০	
মোট দাপের সংখ্যা- এক মাত্র						

Certified to be true Copy  
 [Signature]  
 Revenue Officer,  
 Bankura Land & Land Reforms Office  
 Khatra :: Bankura  
 17/02/2020

**Inter-Departmental Land Transfer of New WTP land under package- BK/01**

File No.IW-14015(17)/7/2021-SECTION(IW)-Dept. of IW



*Government of West Bengal  
Irrigation & Waterways Department  
Jalasampad Bhavan, 3rd Floor, Western Block  
Bidhannagar, Salt Lake City, Kolkata 700091  
e-mail: js-tech@wbiwd.gov.in*

Memo No. 287-(LAM)

Dated, 6<sup>th</sup> September, 2021

From: M. Chakraborty  
Joint Secretary to the  
Government of West Bengal

To: The Principal Secretary  
Land and Land Reforms &  
Refugee Relief and Rehabilitation Department  
e-mail: soelr@wb.gov.in

**Sub:** Relinquishment of Departmental land measuring more or less 9.347 acre comprising 2.446 acre in LR Dag No. 01(P) in Mouza Kungar Bahal, J.L. No. 159 and 6.901 acre in LR Dag No. 02(P) in Mouza Jhantipahari, J.L. No. 162, both under P.S. Khatra, District Bankura, in favour of the Land and Land Reforms & Refugee Relief and Rehabilitation Department for issuance of order for resumption by the District Magistrate & Collector, Bankura and transfer to Public Health Engineering Department for execution of their EAP project for Indpur-Taldangra piped water supply.

Sir,

I am directed to say that the Executive Engineer, PIU-Bankura, PHE Directorate vide his letter No. 57/EE/PIU-Bankura dated 21.06.2021 addressed to this Department has requested for inter-departmental transfer of more or less 9.347 acre of land belonging to this Department comprising 2.446 acre in LR Dag No. 01(P) in Mouza Kungar Bahal, J.L. No. 159, and 6.901 acre in LR Dag No. 02(P) in Mouza Jhantipahari, J.L. No. 162, both under P.S. Khatra, District Bankura for execution of their Indpur-Taldangra piped water supply scheme.

In this regard, the engineers of I&WD have verified the said plots of land and has identified the requisitioned plots as surplus and sparable.

The Chief Engineer (South West), Irrigation & Waterways Directorate has recommended towards relinquishment of the said plots of land in favour of Land and Land Reforms & Refugee Relief and Rehabilitation Department.

In the above context, I have been directed to communicate the relinquishment of the parcel of land measuring more or less 9.347 acre comprising 2.446 acre in LR Dag No. 01(P) in Mouza Kungar Bahal, J.L. No. 159 and 6.901 acre in LR Dag No. 02(P) in Mouza Jhantipahari, J.L. No. 162, both under P.S. Khatra, District Bankura in favour of Land and Land Reforms & Refugee Relief and Rehabilitation Department for issuance of order of resumption in favour of the DM & Collector, Bankura for formal transfer to the Public Health Engineering Department.

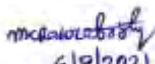
In connection with the instant relinquishment order, the following documents are being annexed hereto as a ready reference:

- a) Land Plan duly authenticated containing the schedule of plots of land being relinquished.
- b) Copy of relevant Records of Rights (RoR) of the plots of land.
- c) Requisition letter for the land vide No. 57/EE/PIU-Bankura dated 21.06.2021 of the Executive Engineer, PIU-Bankura, PHE Directorate.
- d) Recommendation of the Chief Engineer (South West), Irrigation & Waterways Directorate in his Memo No. 467-CI(SW) dated 06.08.2021.

Land & Land Reforms Department is hereby requested to issue necessary order for resumption of the relinquished plots of land.

Considering the urgency for implementation of this project as stated by the Chief Engineer, PMU, WBDWSIP, PHE Directorate during recent meeting with the Departmental Secretary, **permissive possession** may be handed over by the Executive Engineer, Kangsabati Canals Division No. II, Irrigation & Waterways Directorate to the authorized representative of Collector, Bankura in the interest of public service in anticipation of issuance of the formal order by the Land and Land Reforms & Refugee Relief and Rehabilitation Department.

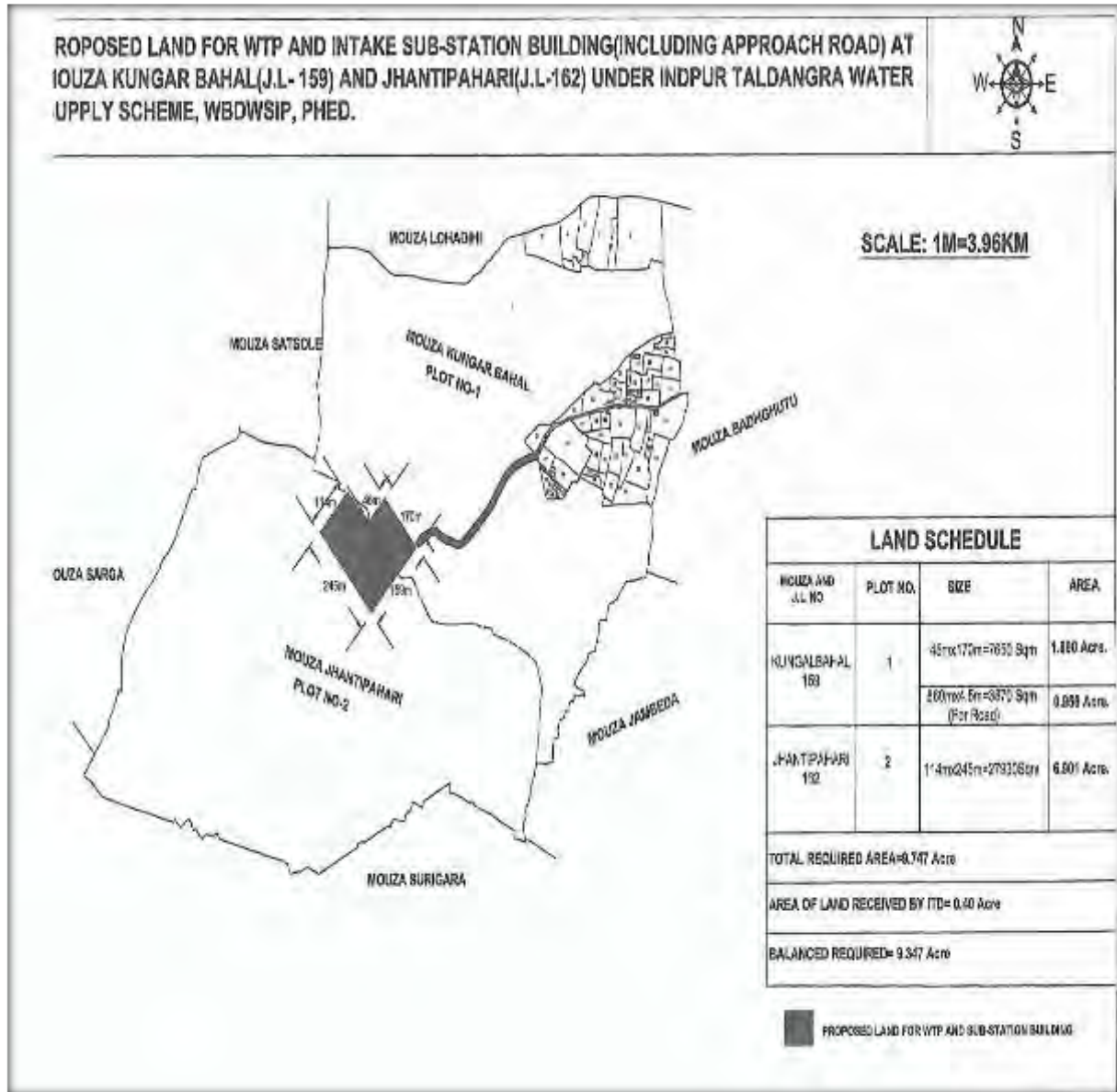
Encl: As stated

  
6/9/2021  
(M. Chakraborty)  
Joint Secretary to the  
Government of West Bengal


Memo No. 287 /1(2) - I (LAM)

Dated, 6<sup>th</sup> September, 2021

### Land Demarcation of New WTP Area



## Land details of GLSR land- purchase process completed



**GOVERNMENT OF WEST BENGAL**  
**OFFICE OF THE EXECUTIVE ENGINEER**  
Project Implementation Unit, Bankura, WBDWSIP, P.H.E.DTE.  
AAILAKUNDI :: KATJURIDANGA :: BANKURA :: PIN - 722102  
Ph No - 03242-241007, 241008 :: email: [ee.piubankura.adb@wbphed.in](mailto:ee.piubankura.adb@wbphed.in)

---

Memo No :- **13** (2) / AE (HQ) / PIU / Bankura Dated Bankura the : **12** / 08 / 2021

1) To  
The Project Manager  
Indpur Taldangra WSS – BKP – 01,  
Technofab Engineering- SN Envirotech JV

2) To  
The Project Manager  
Indpur Taldangra WSS – BKP – 2A  
Larsen & Toubro Ltd.

**Sub :-** Design, Construction and Operation-Maintenance of Intake, Water treatment plant, reservoirs, transmission mains for Indpur-Taldangra block in Bankura of reference Contract no. WBDWSIP / DWW / NCB / BK / 01 / 2018-2019

and

Design and Construction of Intermediate Pumping Station, Ground Storage Reservoirs, Overhead Reservoirs, Water Distribution Networks and Metering works in Indpur block including Secondary Transmission Mains to Indpur and Taldangra Blocks of reference Contract no. WBDWSIP/DWW/NCB/BK/02A/2018-2019.


**Ref :-** 1) Letter notice to proceed Memo No :- PMU / WBDWSIP / PHED / 65 / 72 , dated – 24.01.2019  
2) Letter notice to proceed Memo No :- PMU / WBDWSIP / PHED / 82 / 409, dated – 27.05.2019

Dear Sir,

With reference to the subject matter this is to state that the work of survey and geotechnical investigation and others miscellaneous work was completed earlier for the Intermediate Boosting Station of Indpur Block as tabulated below and now this is to request your good end to start construction work at the earliest for the said sites.

Sl No	Block	Mouza	JL No.	Plot No.	Area of Land	Rmark
1.	Indpur	Gobindapur	160	1222 & 123	1.56 acre	Registration Process Complete

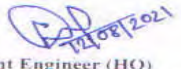
Thanking You,



Assistant Engineer (HQ)  
PIU-Bankura, WBDWSIP, PHE Dte.

Memo No :- **13** (2) / 1-2 / AE (HQ) / PIU / Bankura Dated Bankura the: / 08 / 2021  
Copy forwarded for information to:-

1) The Executive Engineer, PIU, Bankura, WBDWSIP, PHE Dte.  
2) The Team Leader, DSISC, PIU, Bankura, WBDWSIP



Assistant Engineer (HQ)  
PIU-Bankura, WBDWSIP, PHE Dte.

C:\Users\PHED\Desktop\Letter\A T BKT - 14\Land Hand Over Letter BKJA - Chhatrapur.docx Page 1 of 1



## Appendix 16: CTE from WBPCB

### Amendment of WTP CTE- PKG BK/01- New site



**WEST BENGAL POLLUTION CONTROL BOARD**  
(Department of Environment, Govt of West Bengal)  
**Paribesh Bhawan**  
Bldg. No. 10 A, Block-LA, Sector-III, Bidhannagar  
Kolkata - 700 098  
Tel : 0091 (033) 2335-9088 / 8861 / 8211 / 8073 / 6731  
2335-0261 / 8212 / 8213 / 7428 / 5975  
Fax : 0091 (033) 2335 6730 / 2813  
*Website : [www.wbpcb.gov.in](http://www.wbpcb.gov.in) e-mail : [wbpcbnet@wbpcb.gov.in](mailto:wbpcbnet@wbpcb.gov.in)*

Memo No: 710 - dr\_nc\_o/20/0054 Date: 28/10/2021

To  
The Executive Engineer ( Civil )  
PIU, Bankura WBDWSIP, Public Health Engineering Dto.  
Govt. of West Bengal  
Asilakundi, Katjuridanga,  
Dist-Bankura, Pin-722102

Sub.: Amendment of Consent to Establish(NOC) for installation of raw Water Treatment Plant (Capacity-44 MLD) abstracted from Mukutmanipur Dam for Indpur & Taldangra Block Water Supply Scheme (Phase-II) under WBDWSIP

Ref. (i) *Consent to Establish* certificate NO164607 issued vide memo no.221-dr\_nc\_o/20/0054 dated 16.03.2020  
(ii) Your letter Ref no. 145/EE/PIU-Bankura dated 17.09.2021.

Sir,

In reference to the above, this is to inform you that the following amendments are made in the above mentioned Consent to Establish certificate issued by this office:-

The State Board permitted for alternative land located at Kungarbahal Mouza, JL No.159, Plot No.01 and Jhantipahari Mouza, JL No.162, Plot No.02 both under P.S-Khatra, Dist-Bankura for treatment of raw water abstracted from Mukutmanipur Dam for execution of Indpur-Taldangra piped water supply scheme.

This letter may be treated as an annexure to the *Consent to Establish* certificate no. NO164607 dated 16.03.2020. All other terms & conditions of the above mentioned Consent to Establish will remain unchanged.

Yours faithfully,

  
28/10/21

Environmental Engineer  
Operation & Execution Cell  
Environmental Engineer  
W. B. Pollution Control Board  
Operation & Execution Cell

দুসল মুক্ত নিৰ্মল পদ্মা চাই

Original CTE of WTP

NOG. NO 164607  
**WEST BENGAL POLLUTION CONTROL BOARD**  
Parbati Bhawan  
10A, Block - LA, Sector III, Bidhanagar  
Kolkata - 700 110

221-da-mc-o/20/2014  
Date: 16/03/2020

From  
Member Secretary,  
West Bengal Pollution Control Board

To  
The Executive Engineer (Civil)  
PSU, Bankura WB.DW.SIP, Public Health Engineering Dte.  
Govt. of West Bengal  
Plot No. 02, Lahadiki Road, P.O. & P.S. - Khatra  
Dist - Bankura, Pin - 722140.

Sub: Consent to Establish (NOC) from Environmental Point of View  
452/EE/PSU - Bankura  
Your letter No. 08/02/2020

# WEST BENGAL

Dear Sirs,

In response to the application for Consent to Establish (NOC) for proposed Unit of Public Health Engineering Dte., Project Implementation Unit (PIU), Bankura, WB.DW.SIP, Govt. of West Bengal for manufacturing/storing/trading and Raw water Water Treatment Plant (Capacity 44 MLD) for independent Tada Bonga Block water supply scheme (Phase I) under WB.DW.SIP at Plot No. 02, Lahadiki Road, P.O. & P.S. - Khatra, Dist - Bankura, Pin - 722140 and Div. No. 2, F.L. No. 138, Plot No. 35 - 1688 Consent to Establish (NOC) from the environmental point of view and inform you that this Board hereby grants the Consent to Establish (NOC) from the environmental point of view of the above subject to the following conditions and special directions mentioned:

1. The quality of sewage and trade effluent to be discharged from your factory shall satisfy the permissible limit as prescribed in IS : 2450 (Pt. I) of 1974, and/or its subsequent amendment and Environment (Protection) Rules 1986.
2. Suitable measures to treat your effluent shall be adopted by you in order to reduce the pollutional load and the quality of the effluent satisfies the standards mentioned above.
3. You shall have to apply to this Board for its consent to operate and discharge of sewage and trade effluent according to the provisions of the water (Prevention & Control of Pollution) Act, 1974. No sewage or trade effluent shall be discharged by you without prior consent of this Board.
4. All emission from your factory shall conform to the standards as laid down by this Board.
5. No emission shall be permitted without prior approval of this Board and you shall apply to this Board for its consent to operate and atmospheric emission as per provision of the Air (Prevention & Control Pollution) Act, 1981.
6. No industrial plant, furnace, flues, chimneys, control equipment, etc. shall be constructed/reconstructed/rectified/erected without prior approval of this Board.

4430 No.16 4207

- (i) Water Pollution and Control of Polluted Area Act, 1971, if applicable.
- (ii) Water (Prevention and Control of Pollution) Act, 1974, if applicable.
- (iii) Environment Protection Act, 1986.
- (iv) Employment (Prohibition) Rules, 1980.
- (v) Industries (Management and Handling) Rules, 1986 and Amendment Rules, 2000.
- (vi) Manufacture, Storage and Transport of Hazardous Chemicals Rules, 1989 and Amendment Rules, 2008.
- (vii) Manufacture, Storage and Transport of Hazardous Waste (Management, Handling, and Disposal) Rules, 1989.
- (viii) The Public Liability Insurance Act, 1991 and Amendment Act, 1992.
- (ix) The Public Liability Insurance Rules, 1991 and Amendment Rules 1992.
- (x) Biomedical Waste (Management & Handling) Rules, 1986 and Amendment Rules 2000 if applicable.
- (xi) Hazardous Waste (Management and Handling) Rules 1989, if applicable and.
- (xii) Ozone Depleting Substances (Regulation & Control) Rules, 2000, if applicable.

SPECIAL CONDITION: Please see Annexure

Gross Capital investment of the project is Rs.473700000/-

Any violation of the above said conditions shall entail cancellation of the Consent to Establish (COE)

West Bengal  
 Member Secretary  
 WBPC  
 General Pollution Control Board  
 Dated: \_\_\_\_\_

Main No. \_\_\_\_\_

Copy forwarded for information to :-

1. Chief Inspector of Factories, Government of West Bengal, N. S. Baking, Kolkata-700 001
2. Director of Industries/Director of Cottage & Small Scale Industries, Government of West Bengal, N. S. Building, Kolkata-700 001
3. Guard file, West Bengal Pollution Control Board.
4. Environmental Engineer,
 

Asansol Sub-RO/WBPC Board	Himalaya Bhawan	Daha Road, Durgam	Dist. Hooghly
Vill. Pargua	Kalyani Expressway	P.O. Narsajpur	Dist. 24 Pgs. (N)
Sahid Khudiram Sarani	City Centre, Durgapur-16	Dist. Burdwan	10, Camac Street 2nd Floor Kolkata-700 017

Paribesh Bhawan	Block 05 at 40	Paribesh Nagar	
IDA, LA-Block, Sector-48	Fishi-Complex	Matigara, Siliguri	
Salt Lake City,	Adjacent to Priyambada	Dist.-Darjeeling	
Kolkata - 700 095	Housing Estate		
	P.O. - Kharanchok,		
	P.S. Durgachak		
	Haldia-721502		
	Dist. Purba Medinipur		

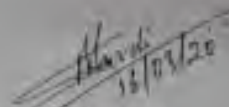
  

Setya Chowdhury	Asansol Sub-Regional Office	
Indoor Stadium	ADDA Commercial Market (2nd Floor)	
Bokulcher Banch Road	Opposite Asansol Fire Station	Member Secretary,
Mukta-732101	G.T. Road, Asansol-713 301	West Bengal Pollution Control Board

Annexure to NOC Sl. NO 164607

Special Conditions issued to Public Health Engineering Dte, Project Implementation Unit (PIU), Bankura WBDWSIP for installation of Raw river Water Treatment Plant (Capacity: 44 MLD) for Indpur & Taldanga Block Water Supply Scheme(Phase-II) under WBDWSIP at Plot No. 2, Dag no.2, J.L. No. 158, Mouza: Lohadiha, P.O. & P.S.: Khatra, District: Bankura.Pin- 722140.

- A. Emission: Nil
- B. Raw Water Treatment :- Raw river water: 44 MLD to be treated in Water Treatment Plant as per process description submitted by the unit and for bulk water supply for Indpur Taldanga Block under WBDWSIP.
- C. Solid Waste :-
- WTP sludge to be used as one of the raw material for making bricks as proposed by the unit and PVC/Plastic waste /gunny bags to be sold.
  - Plastic / PVC wastes to be sold to the State Board's authorized recyclers.
- D. General:
- At any instant, total quantity of Chlorine stored onsite shall be less than the threshold quantity of Chlorine as prescribed in the Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules.
  - The unit shall take all preventive and precautionary measure for controlling adverse impact of chlorine in case of any accidental release.
  - The unit shall take proper measures to control air, water and noise pollution.
  - This NDC is valid only subject to obtaining permission/clearances from the other Competent Authorities as applicable.
  - Ambient noise level not to exceed the permissible limit.
  - No addition/alteration/modification can be done without prior permission from the State Board.
  - The unit shall obtain Consent to Operate of the State Board before starting operation.
  - Good housekeeping to be maintained.
  - Adequate green belt around the unit to be developed.
  - This NDC is valid upto 31.03.2027 for setting up the Water Treatment Plant – 44 MLD capacity.

  
Environmental Engineer  
Operation & Execution Cell  
West Bengal Pollution Control Board

## COMPLIANCE OF CTE

Sl. No.	General Conditions of NOC for WTP	Compliance Status	Remarks
1	The quality of sewage and trade effluent to be discharged from your factory shall satisfy the permissible limits as prescribed in IS: 2490 (Pt 1) of 1974, and /or its subsequent amendment and Environment (Protection) Rules 1986.	Complied	It is a Zero Discharge facility
2	Suitable measures to treat your effluent shall be adopted by you in order to reduce the pollution at load so that the quality of the effluent satisfies the standards mentioned above.	Complied	Designed to meet regulatory requirements
3	You shall have to apply to this Board for its consent to operate and discharge of sewage and trade effluent according to the provisions of the water (Prevention & Control of Pollution) Act. 1974. No sewage or trade effluent shall be discharged by you without prior consent of this Board.	To be complied during operation phase	Consent to Operate will be obtained prior to operation
4	All emissions from your factory shall conform to the standards as laid down by this Board.	Not applicable presently	Regulatory compliance to air emissions will be ensured, as applicable
5	No emission shall be permitted without prior approval of this Board and you shall apply to this Board for its consent to operate and atmospheric emission as per provision of the Air (Prevention & Control Pollution) act, 1981.	To be complied during operation phase	Consent to Operate will be obtained prior to operation
6	No industrial plant, furnace. flues, chimneys., control equipment, etc. shall be constructed/ reconstructed/ erected/ re-erected without prior approval of this Board.	Not applicable	
7	You shall Comply with:		
	(i) Water (Prevention and Control of Pollution) Cess Act, 1977, if applicable.	Not Applicable	Repealed
	(ii) Water (Prevention and Control of Pollution) Cess Act, 1978, if applicable.	Not Applicable	Repealed
	(iii) Environment (Protection) Act, 1986	Complied	
	(iv) Environment (Protection) Rules, 1986	Complied	
	(v) Hazardous Wastes (Management and Handling) Rules, 1989 and Amended Rules, 2000	Complied	
	(vi) Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 and Amended Rules, 2000	Complied	Authorization for additional chlorine toners will be obtained prior to operation
	(vii) Manufacture, Use, Import and Storage and Hazardous Micro-Organisms, Genetically Engineered Organisms or Cell Rules. 1989	Not Applicable	
	(viii) The Public Liability Insurance Act, 1991 and Amended Act, 1992	Complied	Covered under all risk insurance policy
	(ix) The Public Liability Insurance Rules, 1991 and Amended Rules, 1993	Complied	Covered under all risk insurance policy

Sl. No.	General Conditions of NOC for WTP	Compliance Status	Remarks
	(x) Biomedical Wastes (Management & Handling) Rules, 1998 and Amended Rules 2000, if applicable.	Not Applicable	Minimal first-aid related bio-medical wastes are generated.
	(xi) Recycled Plastics Manufacture and Usage Rules 1999, if applicable and	Complied	
	(xii) Ozone Depleting Substances (Regulation & Control) Rules 2000, if applicable	Complied	Designed to meet regulatory requirements
<b>SPECIAL CONDITION:</b>			
A.	Emission - Nil	-	
B.	Raw Water Treatment	-	
	Raw river water: 44 MLD to be treated in Water Treatment Plant as per process description and for bulk water supply for Indpur and Taldangra under WBDWSIP		
C.	Solid Waste: WTP sludge to be used for landfilling and PVC/Plastic waste /gunny bags to be sold.	Complied	
D	General:		
	1. At any instant, total quantity of Chlorine stored onsite shall be less than the threshold quantity of Chlorine as prescribed in the Manufacture, Storage and Import of Hazardous Chemicals (MSHHC) Rules		Noted
	2. The unit shall take all preventive and precautionary measures for controlling adverse impact of chlorine in case of any accidental release	Considered under design	
	3. The unit shall take proper measures to control air, water and noise pollution.	To be complied during operation phase	
	4. This NOC is valid only subject to obtaining permission/clearances from the other Competent Authorities as applicable.	-	Noted
	5. Ambient noise level not to exceed the permissible limit.	Complied	Refer: Ambient Noise Monitoring data
	6. No addition/alteration/modification can be done without prior permission from the State Board.	Complied	
	7. The unit shall obtain Consent to Operate of the State Board before starting operation.	-	Noted
	8. Good housekeeping to be maintained.	Complied	
	9. Adequate green belt around the unit to be developed.	-	Noted
	10. This NOC is valid upto 31.03.2027 for setting up the Water Treatment Plant - 44 MLD capacity.	-	Noted

## Appendix 17: Link to Approved SEMP

### 2<sup>nd</sup> Updated SEMP- Package Bankura Bk-01

[http://wbdwsipmis.wbphed.gov.in/Updated\\_1\\_SEMP\\_Bankura\\_Pack\\_Bk01\\_October2021.aspx](http://wbdwsipmis.wbphed.gov.in/Updated_1_SEMP_Bankura_Pack_Bk01_October2021.aspx)

## Appendix 18: SOP for COVID 19 Management



**Standard Operating Procedure for Prevention and Risk Minimization of Corona Virus Disease (COVID-19) at the Facilities and Work Sites of**

**WEST BENGAL DRINKING WATER SECTOR IMPROVEMENT PROJECT (WBDWSIP)**

**Version 2 - 1 June 2020**

**Prepared by Project Management Unit,**

**Public Health Engineering Department,**

**Government of West Bengal**

**Phone:033-23242095;**

**Email: pd.pmu.adb@wbphed.gov.in**

**Utility Building, 1 st Floor, (Premises No. 09/1-0024), AA-IA (Tank No. 3), New Town, North  
24 Parganas, WEST BENGAL, Pin - 700156**

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**Annex 1: Pandemic Plan Site Acknowledgement Form**

**Annex 2: Regular Health Monitoring Template**

**Annex 3: Roles & Responsibilities Matrix for Managing COVID19 risks**

## I. SCOPE AND OBJECTIVE

1. The purpose of this Standard Operating Procedure (SOP) is to guide all staff, consultants/ service providers, and contractors engaged under the West Bengal Drinking Water Sector Improvement Project (WBDWSIP or the project) to prevent, minimize, and manage risks to workers and public at large at all project facilities and work sites, which could arise from exposure to Corona virus disease (COVID-19) when restarting/resuming projects and site activities post COVID-19 lockdown.

2. The requirements, restrictions, and guidance contained in this SOP are provided to enable all associated, including staff, consultants and contractors on effective planning and execution of pandemic-specific action and responses and minimize risks, and to comply with the National Directives & Local Authority guidelines on COVID-19.

3. Based on these SOPs, government requirements, and best practice references available, each contractor and service provider will prepare their own site specific risk assessment and based on that, a site-specific health and safety management plan (H&S plan), for COVID-19 affected period and submit to the Project Director for approval at the Project Management Unit (PMU) of the WBDWSIP prior to re-commencement of works and services under the project post COVID-19. The PMU approved H&S Plan will be accepted by the contractor/ service provider and the PMU for implementation throughout the COVID-19 affected period as part of the earlier approved environmental management plan (EMP) or contract of each service and works provider.

4. All contractors, service providers, and consultants must conduct detailed site-specific risk assessment for identification of risks and their evaluation/categorization as acceptable/ unacceptable risks based on which suitable mitigation measures need to be planned. While the overall risk categorization will be guided by the government issued present zone-wise model adopted by the Government (red zone, orange zone, green zone) during the lock-down period, stakeholders should carry out risk assessment based on the approach of scale/severity/probability/duration of potential impacts, which will be commensurate to the potential hazards associated with the activities at sites, and suitable mitigation measures shall be developed and planned around the different levels of risks anticipated during construction / operation phases. The contractors and service providers should keep in mind that once lockdown restrictions are lifted, the “green” zones in rural areas with weak healthcare systems could also change quickly. Migrant workers could offer potential pathways for the spread of the disease from high-risk zones to low risk zones and PMUs need to ensure that their workplaces do not become hotspots for the spread. The contractors/ service providers, with approval from PMU, shall update:

- The H&S plan as needed adopting a risk-based approach. For the work packages where maintenance of international good practices in COVID 19 aren't feasible, the outcome of the risk assessment shall determine re-organization, postponement, or cancellation.
- Assignment roles in Annex 3, as informed by the outcome of the risk assessment process for each specific work package.

5. The contractors, service providers, and staff, should also expand on risks in their site-specific H&S plan of any actions taken to address the risks “outside” their worksite, and include their protocols for (i) reporting to the government/health department if there are suspected cases, (ii) ambulance/transport service protocols if a worker needs to be brought to a health/quarantine facility, and (iii) communications with surrounding communities. Contractors and service providers with support from PMU and project implementation units (PIUs) should liaise with local health centers including primary healthcare facilities as part of the site wide health and safety

management plans including emergency situation management plan. These should also be identified and detailed in the site-specific H&S Plan.

6. Staff, contractors and consultants working under the project and using this SOP should in addition consult the Occupational Safety and Health Act (OSHA) guidelines relating to COVID-19 and guidelines as specified by credible international organizations such as the World Health Organization (WHO), to draw best practices and applicable lessons from other reference documents listed below:

- a. WHO Guidelines ([https://www.who.int/docs/default-source/coronaviruse/getting-workplace-ready-for-covid-19.pdf?sfvrsn=359a81e7\\_6](https://www.who.int/docs/default-source/coronaviruse/getting-workplace-ready-for-covid-19.pdf?sfvrsn=359a81e7_6));
- b. World Health Organization. 2020. Considerations for public health and social measures in the workplace in the context of COVID-19. Geneva. Available here: <https://www.who.int/publications-detail/considerations-for-public-health-and-social-measures-in-the-workplace-in-the-context-of-covid-19><sup>28</sup>;
- c. HM Government. 2020. Working safely during COVID-19 in construction and other outdoor work. Guidance for employers, employees and the self-employed. Available here: <https://assets.publishing.service.gov.uk/media/5eb961bfe90e070834b6675f/working-safely-during-covid-19-construction-outdoors-110520.pdf>;
- d. The Canadian Construction Association – COVID 19 Standard Protocols. Available here: <https://www.cca-acc.com/wp-content/uploads/2020/04/CCA-COVID-19-Standardized-Protocols-for-All-Canadian-Construction-Sites-04-16-20.pdf>;
- e. Indian Council of Medical Research (ICMR), Government of India;
- f. The Ministry of Home Affairs (MHA), Government of India;
- g. OSHA guidance on preparing workplaces for COVID 19;
- h. Guideline Department of Health & Family Welfare and Labour Department, Government of India;
- i. Guideline for prevention of COVID 19 Pandemic by Government of West Bengal;
- j. U.S. Department of Labor Occupational Safety and Health Administration; and
- k. The Epidemic Diseases (Amendment) Ordinance, 2020 (amends the Epidemic Disease Act, 1897)

7. All parties should note that these SOPs will be updated based on the changing government requirements and information/knowledge on COVID-19. For the latest updated copy of the SOP, the Contractors, service providers, consultants, staff and all stakeholders should refer to the project website, <https://wbdwsip.org/>, under Manuals and Guidelines, for the latest updated SOP, or email the Project Director at [pd.pmu.adb@wbphed.gov.in](mailto:pd.pmu.adb@wbphed.gov.in), or visit the PMU's office at WBDWSIP Project, Utility Building, 1st Floor, (Premises No. 09/1-0024), AA-IA (Tank No. 3), New Town, North 24 Parganas, West Bengal, Pin – 700156.

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<sup>28</sup> This guidance contains some risk factors and an approach to undertaking the risk assessment at workplaces.

## II. INTRODUCTION

### **Project Background**

8. Public Health Engineering Department (PHED), Government of West Bengal through its Project Management Unit and Project Implementing Unit is implementing the “West Bengal Drinking Water Improvement Project”. The Loan for WBDWSIP (ADB Loan 3696-IND) was signed between Government of India and the Asian Development Bank (ADB).

9. The project will provide safe, sustainable and inclusive drinking water as per the standards set by the Government of India in the arsenic, fluoride, and salinity affected selected areas of Bankura, North & South 24 Parganas, and Purba Medinipur districts of West Bengal (project districts). Project Director (PD) is the main authority of the project and PMU operates centrally from New Town, office under the guidance of PD and project management consultant (PMC) is there to support PMU.

10. All the three districts have individual PIU office headed by SE, PIU located at each district, which reports to PMU. Under each PIU, separate Design Construction Supervision and project Implementation Support Consultants (DSISC) team is available to support PIU in project implementation. Apart from there are NGOs in each district to take care different activities allotted to them.

11. It is pertinent to mention that all the districts under this project has basic components like water intake system, raw water rising main, Water Treatment plant, clear water rising main, pumping stations, overhead reservoirs (OHR), ground level storage reservoir (GLSR), distribution system, house metering connection and related electro-mechanical and SCADA system.

12. The project locations, package name and brief project’s components is mentioned below:

District name	Inputs (Package No.)	Brief Project Components
<b>North Parganas</b> 24	<b>DWW/N24P/01</b>	Design, Construction and Operation of Water Treatment-Plant, Transmission Main, Boosting Pumping Stations & Ground level reservoirs work in Haroa, Rajarhat, and Bhangar II.
	<b>DWW/N24P/02A</b>	Design and Construction of Overhead Reservoir including design, supply and laying of Water Supply Distribution Network in Haroa Block.
	<b>DWW/N24P/02B</b>	Design and Construction of Overhead Reservoir including design, supply and laying of Water Supply Distribution Network in Bhangar II Block.
<b>Bankura</b>	<b>DWW/BK/01</b>	Design, Construction and Operation-Maintenance of Raw Water Intake Well, Water Treatment Plant, Reservoir, Transmission Main for Indpur and Taldangra block in Bankura.
	<b>DWW/BK/02A</b>	Design and Construction of Intermediate Pumping Station, ground level reservoirs, overhead reservoirs, water distribution network and metering works in Indpur block including secondary transmission mains to Indpur block. transmission mains to Indpur block.

District name	Inputs (Package No.)	Brief Project Components
	DWW/BK/02B	Design and Construction of Intermediate Pumping Station, Secondary transmission mains, overhead reservoirs including water distribution network and metering works in Taldangra Block.
	DWW/BK/03	Design, Construction and Operation-Maintenance of Raw Water Intake Well, Water Treatment Plant, Raw and Clear Water Transmission Main for Mejhia and Gangajalghati Block in Bankura.
	DWW/BK/04	Design and Construction of Overhead Reservoir including Water Supply Distribution Network and Metering Works in Mejhia and Gangajalghati Blocks including Rehabilitation of Existing Scheme.
East Midnapore	DWW/EM/01	Design, Construction and Operation-Maintenance of Raw Water Intake Well, Water Treatment Plant, Raw and Clear Water Transmission Main for Nandakumar, Chandpur, Nandigram-I and II blocks in East Medinipur.
	DWW/EM/02	Construction of Intermediate Pumping Station, Secondary transmission mains, overhead tanks including water distribution network and metering works in Nandigram-I and Nandigram-II block in East Medinipur

13. There are following major offices and project sites are available where suitable remedial measures to be taken as per protocol indicated in this guideline.

**Under Office category:**

- a. PMU and PMC
- b. Three number PIU and DSISC offices
- c. NGO offices
- d. All site offices and camps of Contractors

**Under work components:**

- a. Intake locations included pump house and substations
- b. WTP locations
- c. Ground Level Storage Reservoirs (GSLRs) cum pump house
- d. Overhead reservoirs (OHRs)
- e. Pipelines: Raw water rising main, clear water rising main and distribution network system.

**Coronavirus Disease 2019 (COVID-19)**

14. Coronavirus Disease 2019 (COVID-19) is a respiratory disease caused by the SARS-CoV-2 virus. It was spread in many countries around the World Depending on the severity of COVID-19's international impacts, outbreak conditions—including those rising to the level of a pandemic—can affect all aspects of daily life, including travel, trade, tourism, food supplies, and financial markets.

15. To reduce the impact of COVID-19 outbreak conditions on businesses, workers, customers, and the public, it is important for all employers to plan now for COVID-19.

The virus is thought to spread mainly from person to-person, including:

- Between people who are in close contact with one another (within about 6 feet).
- Through respiratory droplets produced when an infected person coughs or sneezes. These droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs.

16. It may be possible that a person can get COVID-19 by touching a surface or object that has SARS-CoV-2 on it and then touching their own mouth, nose, or possibly their eyes, but this is not thought to be the primary way the virus spreads.

17. The people most at risk of COVID-19 infection are those who are in close contact with a suspect/confirmed COVID-19 patient and those who care for such patients.

18. This document gives advice on:

- general instruction to follow to prevent the spread or slow transmission of COVID-19 in workplace;
- detail procedure to getting the workplace and office ready under COVID-19 situation;
- worksite prevention practice;
- precaution taken at workmen habitat/camp;
- control measures taken for deploying new workmen at site;
- resources requirement;
- relevant induction and training;
- communication and advancement – COVID Update; and
- declaration – Medical fitness and Filling up work starting Checklist

### III. COVID 19 INFECTION SYMPTOMS

**a.** Most common symptoms:

- fever
- dry cough
- tiredness

**b.** Less common symptoms:

- aches and pains
- sore throat
- diarrhoea
- conjunctivitis
- headache
- loss of taste or smell
- a rash on skin, or discolouration of fingers or toes

**c.** Serious symptoms:

- difficulty breathing or shortness of breath
- chest pain or pressure
- loss of speech or movement

**d.** All concerned should be well briefed to seek immediate medical attention, and where they could go as per the H&S Plan, if they have serious symptoms. They could also call before visiting their doctor or health facility for information at Central help lines at 011 23978046, or West Bengal state helpline number at 1800313444222, 033 23412600, 1070.

**e.** People with mild symptoms like fever, dry cough, sore throat who are otherwise healthy should manage their symptoms at home. They should isolate themselves from other members at home and stay at separate room.

**f.** On average it takes 5–6 days from when someone is infected with the virus for symptoms to show, however it can take upto 14 days.

#### IV. GENERAL PREVENTION OF INFECTION AND TRANSMISSION OF COVID-19

- Preliminary medical checking of body temperature, symptoms of cold, cough, difficulty in breathing will be done before worker's entry in the project. Format for daily checking template is attached as **Annexure 2**. Pandemic plan Site acknowledgement form is attached as **Annexure 1**.
- Workers with underlying health conditions such as diabetes, respiratory illness, etc. will be screened before start of work, as part of pre-employment screening tests as specified under Section 10 of this SOP. Contractors and service providers should clearly outline if such health screenings will be undertaken on site through questioning. As needed for cases deemed to be found necessary for further testing, contractors and service providers should seek PMU's support to liaise with local health centers to facilitate these screening and even testing for COVID-19.
- Non-essential physical work that requires close contact between workers should not be carried out
- Work requiring skin to skin contact should not be carried out
- Plan all other work to minimize contact between workers
- Wash hands often with soap for at least 20 seconds<sup>29</sup>
- Brief and remind staff regularly to cover mouth and nose when coughing or sneezing<sup>30</sup>
- Use hand sanitizer (alcohol based as per norms) at office, workplace. Preferably use of contactless, sensor-based/pedal operated sanitizer to avoid minimum touching
- Regular filling of sanitizers container should be carefully monitored
- Avoid biometric system and head count practice to be followed - Contact less attendance system shall be used.
- Regular thermal screening to be carried out without contact through thermal scanner. Logbook to be maintained mentioning temperature of the staff. In case temperature is found above 100°F, staff should be advised to go home and consult doctor and take suitable measures accordingly.<sup>31</sup>
- No person should enter the work site other than the authorized persons mentioned by supervisor during start of work
- All must implement social/physical distancing by maintaining a minimum distance of 6-feet from others<sup>32</sup> at all times to eliminate the potential of cross contamination.
- Avoid face to face meetings – critical situations requiring in-person discussion must follow social distancing
- Conduct all meetings via conference calls, if possible. Do not convene meetings of more than 7 people. Recommend use of cell phones, texting, web meeting sites and conference calls for project discussion
- All individual work group meetings/ talks should follow social distancing.

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<sup>29</sup> Please refer to effective handwashing techniques should be demonstrated to workers and visual postings on site.

<sup>30</sup> Use of mask should be mandatory in line with local government guidance and international good practice

<sup>31</sup> Please refer to international best practice on use of thermal scanners in the shared referenced WHO Guidance.

<sup>32</sup> Social distancing may not be practical for undertaking certain specific activities within the workplace. It is therefore important to review the work method statements for these types of activities to assess impact and how to find safe ways of doing in line with best available guidance.

- At each job briefing/toolbox talk, employees are asked if they are experiencing any symptoms, and are sent home.
- Each worksite should have laminated COVID-19 safety guidelines, responsibility and contact list, and hand washing instructions displayed at multiple locations and clearly visible for all, in line with international good practice.<sup>33</sup>
- All restroom/toilet facilities should be cleaned<sup>34</sup>, and hand washing facility must be provided with soap, hand sanitizer and paper towels
- All surfaces should be regularly cleaned, including tabletops /surfaces, door handles, laptops, printers, records, etc.
- All common areas and meeting areas are to be regularly cleaned and disinfected at least once a day but preferably twice a day
- Provide for or ask workers to bring their own water bottle, and not share.
- Adequate toilets with required facilities should be provided at offices and work sites
- To avoid external contamination, recommend everyone to bring food from home or provide safe food options at site following protocols.
- Maintain Social Distancing separation during breaks and lunch.
- Cover coughing or sneezing with a tissue, then throw the tissue in the trash and wash hands, if no tissue is available then cough /sneeze into your upper sleeves or elbow. Do not cough or sneeze into your hands.
- Brief and remind adequately and regularly on cleaning hands after coughing or sneezing thoroughly by using soap and water (minimum for 20 seconds), and use adequate soap and good quality water or hand sanitizer. The Contractor shall ensure adequate quantities of sanitizer and soap are made available at all locations including site offices, meeting rooms, corridors, washrooms /toilets, etc. as appropriate.
- Brief and regularly remind to avoid touching eyes, nose, and mouth with hands.
- To avoid sharing germs, brief and remind staff to clean up after themselves, and DO NOT make others responsible for moving, unpacking and packing up their personal belongings
- If worker or family member is feeling ill, advise to stay home<sup>35</sup>
- Brief workers to refrain from smoking and other activities that weaken the lungs.
- In worst case scenario if any workers found to be COVID 19 positive, project manager/ employer need to report authority and take appropriate measures as per Government procedure. Tentative format for Roles& Responsibilities Matrix for Managing COVID19 risks and contact number etc. will be filled up by contractors is appended in **Annexure 3**.

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<sup>33</sup> Please check free downloadable copies at the WHO webpages.

<sup>34</sup> Check the international good practice methods for disinfecting such frequently used places at the workplace.

<sup>35</sup> The workers with no sick-leave would be supported with additional leave while affected by COVID-19 by the Contractor.

## V. DISINFECTION AND MANAGING RISKS AT OFFICE AND WORK SITE<sup>36</sup>

### a. *General*

19. All areas in the premises shall be disinfected, or fumigated completely using user friendly disinfectant mediums for all locations viz. Entrance, Meeting room, Conference halls, Cubicles, Cabins, Seating Area, Reception, Entrance Gate of Site, Pota Cabins, Building, Equipment, Washroom, Toilet, Sink, Walls, Open areas available, all other surfaces. Please note that fumigation of humans should not be carried out at any point in any premises.

20. For Disinfection 1% sodium hypochlorite or phenolic disinfectants is generally used. For metallic surfaces like doorknobs, handles, security locks, keys etc. 70% alcohol can be used to wipe down surfaces where the use of bleach is not suitable.

21. Disinfection should be done one to two times in a day and for meeting room it should be done before and after the meetings.

### b. *Preparedness prior to work resumption*

- Reconfiguration of offices to ensure physical/social distancing. Workstations or tables should be segregated at least 6 ft. apart;
- Contractors to ensure provision of safe and potable drinking water;
- Cleaning of all water coolers and testing the water quality (at outlet) for at least bacteriological contaminant should be ensured and reports should be recorded for reference;
- Heating, ventilation, and air conditioning (HVAC) system cleaning or changing of AC filters, Chillers / cooling water plants to be addressed;
- Entire office premises should have at least one round of pesticide control activity before resuming the office;
- Availability of hand sanitizers in strategic locations and stock of hand sanitizer liquids for refilling them. Preferably contactless, sensor-based/ pedal operated sanitizers to avoid minimum touching;
- The chemical having quaternary ammonium, sodium hypochlorite or hydrogen peroxide as active ingredient should be used for area disinfection;
- Disinfection of the whole work sites and offices before opening.
- Clean visibility dirty surfaces with soap and water prior to disinfection. Areas unoccupied for 7 or more days need only routine cleaning. Maintain existing cleaning practices for outdoor areas;
- Details of disinfection discussed below in section 5.3 and 8  
Guidance provided by CDC in disinfecting areas based on how long these were unoccupied to be followed ([https://www.cdc.gov/coronavirus/2019-ncov/community/pdf/ReOpening\\_America\\_Cleaning\\_Disinfection\\_Decision\\_Tool.pdf](https://www.cdc.gov/coronavirus/2019-ncov/community/pdf/ReOpening_America_Cleaning_Disinfection_Decision_Tool.pdf))
- Disinfection should be continued throughout the implementation of the project;
- Appropriate PPE like Face covers, Masks, Goggles, Gloves, Coats / Aprons, Shoes and appropriate disinfecting gadgets like sprayer, brush, etc. shall be made available at work site;
- Face Mask -FaceMask3 layeredIS16289 standard or equivalent;

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<sup>36</sup> Refer to International good practice within the referenced guidance documents.

- Gloves - Glove length should be 240 mm, Cuff should be beaded, Finger Thickness should be at least 5.7mil. AQL (Acceptable Quality Level) should be 1.5 ASTM D6319- 10 / EN 455, EN 374 & EN 388;
- Shoe Cover- Premium quality Disposable Shoe Covers. These shoe covers are used in Protected Areas (EPA) to prevent the dust on the shoes from contamination
- PPEs need to be washed and disinfected on regular basis.
- In case any COVID 19 symptoms arise for workers, used PPEs will be disposed as per biomedical waste disposal rule of Government of India and relevant international good practice guidance. PPEs disposed off in a bio-hazard bag (yellow bag). Inside would be sprayed with Sodium Hypochlorite (1%) and after tying the exterior will also be sprayed with the same. It would be disposed off at destination hospital. This shall again be followed by handwashing.
- Display board regarding the procedure of disinfection shall be displayed in local language with pictorial demonstration at entrances / prominent places.

**c. *Disinfection at work places and site offices***

- Maintain regular housekeeping practices, including routine cleaning and disinfecting of surfaces, equipment, and other elements of the work environment.
- Disinfection of entire office – Before start of office and after end of office walls – weekly once
- Disinfection of toilet – Atleast 3 times within work period with regular interval
- Disinfecting of surfaces (e.g desktop, laptop, desk, printer, chair, table, door, window, file rack) – Twice in a day - before and after use
- Disinfecting of door knobs, handles, locks – 2 times in a day
- Disinfection of hand tools – 2 times in a day
- When choosing cleaning chemicals for disinfection, projects shall consult with local authorities or *subject matter expert* for appropriate disinfectant against emerging viral pathogens of COVID19. The chemical having quaternary ammonium, sodium hypochlorite or hydrogen peroxide as active ingredient should be used for area disinfection.
- Follow the manufacturer’s instructions for use of all cleaning and disinfection products (e.g., concentration, application method and contact time, PPE).
- Focusing disinfection efforts on frequently touched surfaces such as handrails, door handles, etc.
- Conference rooms shall be disinfected before and after the meeting.
- Site offices shall be disinfected on daily basis and social distancing shall be followed at the projects
- Dining area shall be disinfected before and after the dining hours.

**d. *Managing risks During Meetings***

**i. Before Meeting**

- Consider whether a face-to-face meeting or event is needed, plan for an online meeting using MS teams, skype, or other mediums, or simply conference call.
- If the above step is not feasible, restrict the number participants with important and relevant people.
- Ensure sufficient supplies and materials, including tissues and hand sanitizer for all

participants. Have surgical masks available to offer anyone who develops respiratory symptoms.

- Maintaining social distancing of 6 ft to be mandatorily followed.
- Meeting room should be spacious (not cramped at all) and number of persons should be restricted accordingly so that social distancing can be maintained
- Advise participants in advance that if they have any COVID 19 symptoms like coughing, sneezing, breathening or feel unwell, they should not attend.

ii. **During and after the meeting**

- Briefly explain the participants on the actions being taken to prevent COVID-19
- Avoid handshake and practice ways to say hello without touching
- Sanitizer should be placed strategically so that it easily accessible to all participants. Preferably contactless, sensor-based/ pedal operated sanitizer to be placed to avoid minimum touching
- Mandatory use of masks by all meeting participants at all times for the entire duration of meetings, except when eating or drinking. During breaktimes like snack or meal times, maintain strict social distancing as well.
- Meeting should be specific and short duration time
- Encourage regular handwashing or use of an alcohol rub by all participants at the meeting
- Encourage participants to cover their face with the bend of their elbow or atissue if they cough or sneeze. Supply tissues and closed bins to dispose of them.
- Display dispensers of alcohol-based hand rub prominently around the venue.
- If there is space, arrange seats so that participants are at least one meter apart.
- Open windows and doors whenever possible to make sure the venue is well ventilated.
- Soon after the meeting, the area shall be disinfected and dust bins shall becleared.

## VI. PRECAUTION DURING AND AFTER TRAVEL TO/FROM WORKSITE

### a. *Before traveling*

- Make sure your organization and its employees have the latest information on areas where COVID-19 is spreading. Government mobile App – ‘Aarogya Setu’ or any other form of mobile tracking to be used by all for securing such information
- Based on the latest information, your organization should assess the benefits and risks related to upcoming travel plans at project site
- Avoid sending employees who may be at higher risk of serious illness (e.g. aged employees and those with medical conditions such as diabetes, heart and lung disease) to areas where COVID-19 is spreading.
- Make sure all persons travelling to locations reporting COVID-19 are briefed by a qualified professional (e.g. staff health services, health care provider or local health partner)
- Consider issuing employees who are about to travel with small bottles (under 100 ml) of alcohol-based hand rub. This can facilitate regular handwashing.

### b. *While traveling*

- Encourage employees to wash their hands regularly and stay at least one meter away from people who are coughing or sneezing
- Ensure employees know what to do and who to contact if they feel ill while traveling.
- Ensure that your employees comply with instructions from local authorities where they are traveling. If, for example, they are told by local authorities not to go somewhere they should comply with this. Employees should comply with any local restrictions on travel, movement or large gatherings.

### c. *Return from traveling*

- Travel may be prioritized based on risk categories e.g. No travel in containment zone; Restricted travel to Red Zone etc.
- Employees who have returned from an area where COVID-19 is spreading should monitor themselves for symptoms for 14 days and take their temperature twice a day.
- If they develop even a mild cough or low-grade fever (i.e. a temperature of 37.3°C or more) they should stay at home and self-isolate. This means avoiding close contact (one meter or nearer) with other people, including family members. They should also telephone their health care provider or the local health department/ local hospital, giving them details of their recent travel and symptoms.

## VII. WORK SITE PREVENTION<sup>37</sup>

### a. **Controlled access inside the project**

#### i. **Offices, camps**

- Prior to entry, a mandatory orientation be provided to the worker/ staff or personnel on the proper use, handling and disposal of disposable PPEs, particularly face masks.
- Mandatory requirement of wearing masks upon entry and maintained at all times
- Unauthorized entry is strictly prohibited. All the persons should report office/ camp follow the protocol of COVID 19 and if it is found in order then only, he/she will be allowed to join.
- Adopting queue system while entry to buildings, workplaces, passenger hoist, bus, etc.,
- Avoiding entry of new staff/ workmen from known hotspots of COVID 19
- Allocating separate isolation rooms for Staff and workers.
- Ensuring availability of registered medical practitioner as per tied up between contractors/ offices and local hospital/ health facility
- Ensuring doctor from a government approved dispensary / hospital / COVID 19 testing centers
- Contactless thermal scanning. Recording of temperature of each staff/ workers
- Contactless attendance system.

#### ii. **Intake, WTP, Reservoir, Pumping stations – fixed location**

- Prior to entry, at work site a mandatory orientation be provided to the worker or personnel on the proper use, handling and disposal of disposable PPEs, particularly face masks.
- Mandatory requirement of wearing masks upon entry and maintained at all times while at work sites.
- Pre-approval for deployment of new workmen from Project Manager (PM).
- Unauthorized entry is strictly prohibited. All the persons should report office/ PM follow the protocol of COVID 19 and if it is found in order then only, he/she will be allowed to join.
- Adopting queue system while entry to workplaces, bus, etc.,
- Avoiding entry of new workmen from known hotspots of COVID 19
- To obtain “Self-Declaration Form” from all workmen during screening to identify the COVID-19 risk level of workmen.
- Contactless thermal scanning
- Contactless attendance system.

#### iii. **Pipe laying locations - Linear project sites**

- Prior to start of work, a mandatory orientation be provided to the worker or personnel on the proper use, handling and disposal of disposable PPEs, particularly face masks.
- Mandatory requirement of wearing masks upon entry and maintained at all times while

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<sup>37</sup> Job specific Analysis (JSA) is critical for all the works under this section in line with the recommendations in footnote 1 of this SOP (see page 6) to inform the level of scope changes/sequencing to work schedules and re-engineering.

at work sites.

- Pre-approval for deployment of new workmen from Project Manager (PM).
- Unauthorized entry is strictly prohibited. All the persons should report office/ PM follow the protocol of COVID 19 and if it is found in order then only, he/she will be allowed to join.
- Avoiding entry of new workmen from known hotspots of COVID 19
- To obtain “Self-Declaration Form” from all workmen during screening to identify the COVID-19 risk level of workmen.
- Contactless thermal scanning
- Contactless attendance system.

**b.** Managing the social distancing while on deployment and working

**a.** Offices, camps

- At office, camp wherever feasible to ensure social distancing.
- Marking shall be made available to facilitate social distancing of 6 ft.
- Working in shifts to minimize crowding in one place wherever possible
- Discourage staff/ workers from using other staff's/ workers' phones, clothes, wallets, things or other work tools and equipment, as far as possible. These items should be disinfected before and after use
- All the trips in bus/ car should be planned in such a way that norms of travelling should be maintained
- Social distancing will be maintained while travelling in bus, car. Seating arrangement (at least one seat apart) will be depending on configuration of bus and car.
- Sanitize conveyance vehicle / bus of staff and workmen prior to start of each trip

**b.** WTP, Intake, Reservoir, Pumping stations – fixed location & pipe laying locations - Linear project sites

- Developing a strategy by contractor for workmen deployment at sites considering the social distancing requirements and COVID 19 risks which may include:
- Sequence of work - ensure the planning of work as per sequence of work with optimum number of workmen.
- Deploy workmen in different locations, wherever feasible to ensure social distancing.
- Marking shall be made available to facilitate social distancing of 6 ft.
- Staggered deployment of workmen in case of congested work locations
- Working in shifts to minimize crowding of workmen in one place wherever possible
- Plan for working during late shifts / late hours to minimize disruption to traffic / people contact in congested areas
- Discourage workers from using other workers' phones, clothes, wallets, things or other work tools and equipment, as far as possible. These items should be disinfected before and after use
- Clean the phones, clothes and other daily work tools on daily basis. Common property tools at the work sites should be disinfected before and after it is used by a particular worker.
- Identifying multiples access and egress pathways
- Before restarting Identifying multiple rest areas within the site premises considering number of workmen at the project
- All the trips in bus/ car should be planned in such a way that norms of travelling should be maintained

- Restricting the number of users in passenger hoist, bus, etc., Social distancing will be maintained while travelling in bus, car. Seating arrangement (at least one seat apart) will be depending on configuration of bus and car.
- Sanitize conveyance vehicle / bus of staff and workmen prior to start of each trip
- In addition to the regular PPE, nose masks and hand gloves for teams who are screening workmen, conducting medical checkup & disinfection and others those who need to work in proximity to a greater number of people.
- Masks (homemade<sup>38</sup> can be thought of) to be provided to all the persons/labourers on the worksite. The procedures to be followed for maximum precaution to protect all persons/labourers at all times.

*All types of PPE must be:*

- Properly fitted and periodically refitted, as applicable (e.g., respirators).
- Consistently and properly worn when required.
- Regularly inspected, maintained, and replaced, as necessary.
- Properly removed, cleaned, and stored or disposed of, as applicable.
- Re-usable PPE should be thoroughly cleaned after use and not shared between workers

**c.** Prevention at Workspace

- Make sure workplace clean and hygienic; all surface and worksite properly sanitized (*For office and all work sites*)
- Adequate provision of safe water should be made available for all staff and contact less water tap should be preferable (*For office and all work sites*)
- First day, before resuming the work on site post lockdown period, mandatory medical check-up for preliminary symptoms will be arranged for all workers. Only medically fit workers will be deployed at site and medical assistance will be arranged for unfit workers. Medical check-up camp also covering COVID 19 pool test should be arranged every month. (*For all work sites*)
- At the start of each shift, confirm with all employees that they are healthy and inform all workers / staffs of reusable and disposable PPE (*For office and all work sites*)
- Use of face masks at all times is mandatory, except when eating or drinking (*For office and all work sites*)
- Outside person should be strictly prohibited at office, camp and worksite (*For office and all work sites*)
- All construction workers will be required to wear cut-resistant gloves or the equivalent.
- Use of eye protection (reusable safety goggles/face shields) is recommended. The supply of eye protection equipment to the workers is considered as a standard part of PPE during construction works. (*For all work sites*)
- In work conditions where required social distancing is impossible to achieve, such employees shall be supplied with standard face mask, gloves, and eye protection. (*For office, camp and all work sites*)
- All employees shall drive to work site in a single occupant vehicle. Staff shall not ride together in the same vehicle (*For office and all work sites*)
- When entering in equipment or vehicle which not sure were the last person to enter, make sure that you wipe down the interior and door handles with disinfectant (with 1%

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<sup>38</sup> Advisory on use of Homemade Protective Cover for Face & Mouth by Govt. of India

sodium hypochlorite solution daily) prior to entry. Adequate quantity of the disinfectant shall be provided by the Contractor at all such site-specific locations. *(For office and all work sites)*

- Workers should maintain separation of 6 ft from each other. *(For office, camp and all work sites)*
- Multi person activities will be limited where feasible (two persons lifting activities) *(For all work sites)*
- Gathering places on the site such as sheds and/or break areas will be eliminated, and instead small break areas will be used with seating limited to ensure social distancing. *(For all work sites)*
- Contact the cleaning person of the worksite/ office/ camp and ensure proper COVID-19 sanitation processes. Increase cleaning/disinfection visits to at least 2 times a day. Cleaning person(s) to be provided with gloves, gown and face mask for each cycle of cleaning. The Contractor shall make available adequate supply of PPE and chemicals while the threat of COVID-19 continues. *(For office, camp and all work sites)*
- Clean all high contact surfaces a minimum of twice a day in order to minimize the spread of germs in areas that people touch frequently. This includes but is not limited to desks, laptops, key board, printer etc. and vehicles *(For office)*
- Maintain your good health by getting adequate sleep; eating a balanced, healthy diet, avoid alcohol; and consume plenty of fluids. *(For office and camp)*
- Continuation of works in construction project with workers available on site and no workers to be brought in from outside *(For all work sites)*
- The site offices shall have adequate ventilation. The air conditioning or ventilation systems installed at the site offices would have high-efficiency air filters to reduce the risk of infection. The frequency of air changes may be increased for areas where close personal proximity cannot be fully prevented such as control rooms, elevators, waiting rooms, etc. *(For office and camp)*
- The Contractor shall carry out contactless temperature checks for the workers prior to site entrance, during working hours and after site works to identify persons showing signs of being unwell with the COVID-19 symptoms. *(For all work sites)*.

**d.** Washing Facility

**i.** Offices, camps, work sites

- All worksites should have access to toilet and hand washing facility.
- Providing hand cleaning facilities at entrances and exits. This should be soap and water wherever possible or hand sanitizer if water is not available
- Preferably contactless, sensor-based/ pedal operated sanitizer to be placed to avoid minimum touching
- Washing facility with hot water, and soap at fire hydrants or other water sources to be used for frequent handwashing for all onsite employees
- All onsite workers must help to maintain and keep work sites clean
- If a worker notices soap or towels are running low or out, immediately notify supervisors
- Garbage bins will be placed next to the hand wash facility for discarding of used tissues/towels with regular removal and disposal facility (end of each day).

**e.** Cleaning Procedures

- Increase cleaning/disinfection visits to at least 2 times a day. Cleaning person(s) to be provided with gloves, gown and face mask for each cycle of cleaning.
- Each worksite should have enhanced cleaning and disinfection procedures that are posted and shared including sheds, gates, equipment, vehicles, etc. and shall

be posted at all entry points to the sites, and throughout the project site. These include common areas and high touch points like

- Taps and washing facilities (*office, camp and fixed work sites*)
- Toilet flush and seats (*office, camp and fixed work sites*)
- Door handles and push plates (*office, camp*)
- Handrails on staircases and corridors (*office*)
- Lift and hoist controls (*office*)
- Machinery and equipment controls (*work sites*)
- Food preparation and eating surfaces(*camps*)
- Telephone equipment / mobiles, Keyboards, printer, photocopiers and other office equipment (*office*).

## VIII. MANAGING COVID 19 RISKS in WORK-CAMPS

### a. **Cooking**

- Daily thermal screening and health check of the cooks and helpers at the guest houses and camps
- Cooking staff should be prohibited from reporting to work if they experience COVID 19 symptoms
- Cleaning and disinfection on daily basis once the cooking is over
- The cooks and helpers shall wear masks and hand gloves while preparation, serving food to the staffs and workmen
- Adequate provision of safe water should be made available for all staff and contact less water tap should be preferable
- After cooking food items should be covered

### b. **Dining**

- Staggered Timings shall be adopted to limit the no of workmen using the hall to maintain social distance
- Increase the Space of dining facility where possible
- Hand cleaning facilities or hand sanitizer should be available at the entrance of any room where people eat and should be used by workers when entering and leaving the area. Preferably contactless, sensor-based/ pedal operated sanitizer to be placed to avoid minimum touching
- Workers should sit 2 m apart from each other whilst eating and avoid all contact
- Hygiene conditions shall be ensured during serving of foods in Guest houses / Messes / Workmen Stay Places, so that common serving spoons etc. are not touched by all the staff/workmen taking food
- Only Persons serving food shall be allowed to handle the serving spoons, common utensils, etc.
- Tables should be cleaned between each use and sanitized
- All rubbish should be put straight in the bin and not left for someone else to clear up; only covered pedal operated bins should be used and the bins should be cleared and cleaned regularly, with strict adherence to safety protocols for disposal and hygiene maintenance
- All areas used for eating must be thoroughly cleaned and sanitized at the end of each break and shift, including chairs, door handles, etc.
- Regular inspection of the kitchen/ dining area to be conducted by the Admin/ EHS Officer personnel.

### c. **Usage of common facilities**

- Areas or places of high risk for transmission of virus such as doorknobs, handles, latches, handrails in common facilities shall be cleaned and disinfected at regular intervals

### d. **Disinfection**

- Disinfection of the workmen habitat in all the places shall be carried out on a periodical basis and closely monitored by camp in-charge and verified by health & safety officers.

**e. Toilet Facility**

- Restrict the number of people using toilet facility at any one time
- Sufficient toilets with facility need to be provided, separate for men and women
- Wash hands before and after using the facilities
- Enhance the cleaning regimes for toilet facilities particularly door handles, locks and the toilet flush
- Portable toilets should be avoided wherever possible, but where in use these should be cleaned and emptied more frequently
- Provide suitable and sufficient rubbish bins for hand towels with regular removal and disposal.

**a. Changing Facilities, Showers and Drying Areas**

- Introduce staggered start and finish times to reduce congestion and contact at all times
- Introduce enhanced cleaning of all facilities throughout the day and at the end of each day
- Consider increasing the number or size of facilities available on camp if possible
- Provide suitable and sufficient garbage bins in these areas with regular removal and disposal.

**b. Separate Staying arrangement for new workmen/women**

- New workmen shall not be accommodated in the same rooms as the existing workmen Dwelling units / rooms shall be suitably organized to ensure the avoidance of proximity of the workmen groups.

**c. Resources at workmen/women habitat**

- Limiting the number of workmen/women in dwelling units
- Contractor to arrange all daily need items and grocery at site itself and no worker is allowed to go to shops for daily need items.

**d. Hand washing facilities**

- Dedicated hand washing facilities with soap shall be kept at conspicuous locations in the workmen habitat with sign boards for DO's and DON'T's in hand washing.

**e. Promoting self-hygiene and cleanliness**

- Pictorial posters in local language shall be placed across the workmen habitat to create awareness on maintaining self – hygiene and respiratory hygiene

- Masks (homemade<sup>39</sup> can be thought of) to be provided to all the persons/labourers for use at the camp site as well as at the worksite. Increase cleaning/disinfection visits to at least 2 times a day. Cleaning person(s) to be provided with disposable gloves, gown and face mask for each cycle of cleaning.

**f. Quarantine and isolation rooms**

- Adequate number of rooms shall be identified and reserved to accommodate symptomatic workmen
- Facilities required within the Isolation rooms to be ensured in co-ordination with the local health facility.
- The types of PPEs shall be specified for Caregivers, Isolated person etc.

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<sup>39</sup> Advisory on use of Homemade Protective Cover for Face & Mouth by GOI

## IX. RESOURCE REQUIREMENT

22. Resources required specifically managing the COVID 19 risk shall be identified, planned, procured, and made available at site in adequate quantities. The resources which are required to manage COVID 19 risks may include:

- Thermal scanners. All persons at the worksite should have their temperature screened with Infrared Thermometer (handheld non-contact).
- Contactless attendance system.
- Liquid Soap & Hand washing arrangement at site in workmen habitat
- Contactless, sensor-based/ pedal operated sanitizer
- Team for cleaning & disinfection.
- Nose/ face masks for teams who are screening workmen, conducting medical check up & disinfection.
- Hand gloves for teams who are screening workmen, conducting medical check up & disinfection.
- Quarantine Facilities for accommodating symptomatic workmen.
- Additional rest areas at sites and dining spaces in Workmen habitat
- Ensure availability (even tie-up) of Ambulance equipped with all necessary items like nose masks, first aid kits, aprons, disinfect solutions etc.
- First aid kits with hand sanitizers and hand wash liquids shall be mandatory available in all the vehicle without any lapses.
- Regular notification by state government, district authority should be adhered and all the staff should be compulsorily made aware of that
- Job protection of workers during crisis period of COVID 19 pandemic needs to be ensured.

## X. INDUCTION AND TRAINING

### a. **Medical Check-up by Doctor**

- All workmen shall be subjected to stringent medical check-up by the medical practitioner before allowing for EHS Induction.
- The doctor shall consider the additional information provided by the workmen in the screening, while checking the workmen.

### b. **EHS Induction**

- Number of workmen participating in EHS Induction shall be restricted so as to maintain the social distance during training. EHS induction shall be reviewed at each project to include COVID 19 controls & Risk as per H&S Plan (Number of programs may be required to be increased in case more workmen and social distancing during induction).
- In addition to the regular EHS induction, workmen will be trained on COVID 19 risks and the precautionary measures, covering the following topics,
  - Symptoms of COVID 19
  - How virus spreads
  - System and management of symptoms for the cases detected
  - Importance of maintaining social distancing
  - Importance and DO's and DON'T's of hand washing
  - Overview of the precautionary measure taken at site for COVID 19
  - Roles & Responsibility of workmen specific to the precautions towards COVID 19
  - Reporting in case of symptoms similar to Flu

### c. **Importance and DO's and DON'T's of hand washing**

- Overview of the precautionary measure taken at site for COVID 19
- Roles & Responsibility of workmen specific to the precautions towards COVID 19
- Reporting in case of symptoms similar to Flu

### d. **Training & Awareness**

- All the staff members, Emergency Response Team (ERT) Members, Supervisor & all workmen shall be trained specific to COVID 19 risks and controls measures through regular interval CWT (contractor workmen training), Site specific Trainings & daily Tool box talks.
- PMU and PIU to ensure all workers get training on above requirements before start of any construction activity
- During construction period frequent visual and verbal reminders to workers can improve compliance with hand hygiene practices and thus reduce rates of infection. Handwashing posters should also be displayed at work site and labour camps

### e. **Emergency Contact**

- Provide emergency contact number at work site and labour camp for reporting COVID-19 symptoms.

## **XI. COMMUNICATION AND ADVANCEMENT: COVID-19 UPDATE**

23. The Contractor shall be in touch with the Department of Health & Family Welfare and Labour Department to identify any potential worksite exposures relating to COVID-19, including:

- Strictly follow the guidelines issues by Ministry of health
- Contractor strictly follow the instruction of PMU/ PMC and PIU relating to COVID 19 pandemic
- Other workers, vendors, inspectors, or visitors to the worksite with close contact to the individual
- Labour Camps / Work areas such as designated workstations or rooms /sheds
- Work tools and equipment
- Common areas such as break rooms, tables and sanitary facilities.

### **a. Screening:**

Apart from the regular information collected during the screening process, additional self-declaration form shall be obtained to identify the COVID-19 risk level of workmen. This information shall include:

- Place of his latest stay (to identify whether, it is a hotspot)
- Contact with any confirmed or suspected COVID 19 individual
- Contact with persons who have a travel history to hot spots
- Whether they have any symptoms for COVID 19

### **b. Daily Safety checks for Resuming of work after Lockdown**

- Monitor the workmen body temperature.
- Analyse the COVID symptoms.
- Before starting of work Hand sanitizer to be use by all.
- PEP Talk/Toolbox Talk conduct for all workmen before starting of work & covered the COVID precaution measures & site work safety.
- During Work Social distancing should be minimized.
- Regular interval Health check-up conduct for all workmen.
- Health hygiene should be ensured for all.

## XII. DOCUMENTATION BY CONTRACTOR

24. In addition to the approved H&S Plan, the contractor for each package under WBDWSIP must keep the following documents ready before re-starting of work:

- Roles, responsibilities and accountability matrix for each site, developed under the H&S Plan, clearly published or visibly shown at all sites for managing COVID 19 risks, including contact number of responsible persons. This should be included as part of their approved H & S plan (Template in Annexure 3).
- Filling up format for Medical Fitness on resuming the duty
- On-line Self-Declaration to be filled by employee resuming duties
- Self-attestation by persons/labour prior to work

25. Prior to starting a work, each labour /worker will self-attest to the supervisor:

- No signs of COVID-19 symptoms within the past 24 hours.
- No contact with an individual diagnosed with COVID-19. (contact means living with a positive person, being within 6 ft of positive person or sharing things of positive person)
- Not undergone quarantine or isolation (in case of any labourer /worker who has been quarantined or isolated previously, the engagement shall be only after obtaining the requisite clearance from trained and registered medical practitioner)

26. The engagement of workers falling in the high-risk category such as workers over the age of 55 years, with underlying medical conditions or health issues, etc. should be done only after obtaining the requisite clearance from trained and registered medical practitioners.<sup>40</sup>

27. The self-attestation would be verified in collaboration with trained and registered medical practitioners deployed at site through discussions with laborers /workers and/or preliminary checks such as temperature checks, etc. prior to their engagement at site.

28. In addition, the contractor shall mandatorily follow all medical test requirements for the workers prior to their engagement and/or mobilization at site as per the guidelines issued by the Central and State government agencies and WHO from time to time.

29. Persons/Labourers showing COVID-19 symptoms or not providing self-attestation shall be directed to leave the work site and report to the fever clinic/quarantine centre immediately. Labourers should be asked to not return to the work site until cleared by fever clinic/quarantine centre.

30. Contractors must identify personnel for and report every month the following:

- Filling up Checklist for Post lockdown work resumption compliances at Project Site;
- Filling of Daily Safety checks for resuming of work after Lockdown; and
- Initial submission of and conformation of prominent display on a monthly basis of IEC poster and responsibility matrix with contact details for display at each site.

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<sup>40</sup> Caution is needed to avoid exclusion from workplace on grounds of one's age. Although there could be a direct correlation of age and underlying health conditions, the emphasis should be on those with underlying health conditions and not necessarily on age.

## Annexure 1 Pandemic Plan Site XXXXX Acknowledgement Form

<b>Project Name:</b>		<b>Location</b>	
<b>Date:</b>		<b>Client Name:</b>	
<b>S. No.</b>	<b>Description</b>	<b>Yes ( ✓ ) NO (X)</b>	<b>Remarks</b>
1.	Temperature (Fever)		
2.	Cold		
3.	Cough		
4.	Difficulty in Breathing		
5.	Are you having any medical illness? (BP, Sugar, Cardiovascular, lung, obesity, kidney etc.)		
6.	Is any of your family members are suffering from above symptoms.		
7.	Have you met any confirmed COVID -19 person?		
8.	Is any of your neighbours are confirmed with Covid-19?		
9.	Is your locality falls in covid-19 containment / Red zone area?		
10.	Have you done hand sanitization before entering site?		
11.	Did you travel beyond your state boundaries earlier (holidays/weekly off)		
12.	Any history of international travel		
13.	Have you received - Nose mask & Hand sanitizer		
14.	Mode of travel used to reach site.		
15.	Whether social distancing (Min-6feet) maintained in case of public transport, site related activities and site office.		
16.	Are you aware about Resilience plan, MHA (Ministry of Home Affairs) updates, and National Directives, State Govt order, Local authority order on Covid-19?		

### Declaration by Employee

I \_\_\_\_\_ declare that the information given by me above is true and correct to the best of my knowledge.

Signature of Staff with Date: \_\_\_\_\_

Medical Professional at site Signature of Appropriate authority or any nearby assigned government approved dispensary/hospital

Signature of Admin. with Date: \_\_\_\_\_

Signature of PM/TL with Date: \_\_\_\_\_

Signature with Date

## Annexure 2: Regular Health Monitoring Template at Site XXX

<b>Project Name:</b>		<b>Location</b>	
Name:		Client Name:	
<b>S. No.</b>	<b>Description</b>	<b>Yes (✓) NO (X)</b>	<b>Remarks</b>
1.	Temperature (Fever)		Logbook to be maintained
2.	Cold		
3.	Cough		
4.	Difficulty in Breathing		
5.	Have you done hand sanitization before entering site?		
6.	Has the person wearing mask		
Signature of Staff with Date: _____  Signature of Admin. with Date: _____			

**Annexure 3: Roles & Responsibilities Matrix for Managing COVID 19 risks\* at Site  
XXXXX**

Process	TL/ DTL /PM	Accts & Admin	Office Manager/ Section Inch charge	All staff	EHSO	ERT Team	CM/ Super-visor	Workmen
Conducting Meeting regarding this H&S PLAN before restarting the Works								
Preparing a site-specific action plan								
Screening of workmen								
EHS Induction								
Access Control measures								
Training on COVID 19 response								
Disinfection								
Risk Control in Workmen Camp								
Social distancing in site office & facilities								
Pre-start up checks location / Area wise								
Promoting Self Hygiene & Respiratory Hygiene								
Display of posters for COVID 19 Response								
Organizing resources for COVID 19 response								
Maintaining social distance								
Monitoring of compliance								
Reporting in case of symptoms								
Checks for COVID during safe to start of activities								
Periodical review								
Emergency Response								

(\* Note- To be submitted by contractor of each package)

A - Accountability

R – Responsibility

EHSO- Environment, Health and Safety Officer, ERT – Emergency Response Team, PM- Project Manager,

CM- Construction Manager

**Individual/sin Charge and Responsible for the Activity at Site XXXXX  
(COVID-19 Resource Team Members)**

SN	Name	Occupation / Designation	Contact no	Company	Roles & Responsibility
1					
2					
3					
4					
5					
6					
7					
8					

-----End of SOP-----

## Appendix 19: Sample Semi Annual Environmental Monitoring Report Template

### 1. Introduction

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

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

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

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

<sup>a</sup> If on-going construction, include %physical progress and expected date of completion.

### 2. Compliance Status with National / State/Local Statutory Environmental Requirements<sup>a</sup>

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

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

<sup>b</sup> Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

<sup>c</sup> Specify if obtained, submitted and awaiting approval, application not yet submitted

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

### 3. Compliance Status with Environmental Loan Covenants

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

### 4. Compliance Status with the Environmental Management Plan (Refer to EMP Tables In Approved IEE/S)

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

### Package-wise Implementation Status

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

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.
- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as appendix all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below
- Provide the monitoring results as per the parameters outlined in the approved EMP (or site- specific EMP/construction EMP when applicable).
- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:
  - (i) **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).
  - (ii) **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).
- Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
- Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
- Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
- Identify designated areas for concrete works, chemical storage, construction materials, and refuelling. Attach photographs of each area.
- Confirm spill kits on site and site procedure for handling emergencies.
- Identify any chemical stored on site and provide information on storage condition.

**Attach photograph.**

- o Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
- o Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
- o Provide information on barricades, signages, and on-site boards. Provide photographs.
- o Provide information on Checking if there are any activities being under taken out of working hours and how that is being managed.

**Summary of Environmental Monitoring Activities (for the Reporting Period)<sup>a</sup>**

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

Attach Laboratory Results and Sampling Map/Locations

**Overall Compliance with CEMP/ EMP**

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

**5. Approach and Methodology for Environmental Monitoring of the Project**

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

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

- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used

- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

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

### Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 µg/m <sup>3</sup>	SO <sub>2</sub> µg/m <sup>3</sup>	NO <sub>2</sub> µg/m <sup>3</sup>

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m <sup>3</sup>	SO <sub>2</sub> µg/m <sup>3</sup>	NO <sub>2</sub> µg/m <sup>3</sup>

### Water Quality Results

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

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

### Noise Level Results

Site No.	Date of Testing	Site Location	LAeq (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LAeq (dBA) (Monitoring Results)	
			Day Time	Night Time

**7. Summary of Key Issues and Remedial Actions**

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


**8. Appendixes**

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

## Appendix 20: Kangsabati Reservoir (Mukutmanipur Reservoir) Surface Water Quality Data

Kangsabati Reservoir Data for the year 2005 (June to October)

Date	Reservoir Level (ft.)	Live Storage (Acre)	Inflow (cfs)	Date	Reservoir Level (ft.)	Live Storage (Acre)	Inflow (cfs)	Date	Reservoir Level (ft.)	Live Storage (Acre)	Inflow (cfs)	Date	Reservoir Level (ft.)	Live Storage (Acre)	Inflow (cfs)
06.06.05	243.33	16637	811	01.07.05	299.63	28064	1423	06.08.05	415.73	173292	571	01.10.05	437.30	219624	1812
08.06.05	243.33	16637	811	02.07.05	299.55	28069	1414	02.08.05	415.73	173292	571	03.10.05	437.10	219585	1791
09.06.05	243.33	16637	811	03.07.05	299.33	28065	1399	03.08.05	415.73	173292	571	04.10.05	437.30	219610	1782
14.06.05	243.33	16637	811	04.07.05	299.91	28095	1393	04.08.05	415.73	173292	571	05.10.05	437.30	219629	1801
15.06.05	243.33	16637	811	05.07.05	299.30	28089	1407	05.08.05	415.73	173292	571	06.10.05	437.30	219628	1799
15.06.05	243.33	16637	811	06.07.05	299.80	28120	1423	06.08.05	415.73	173292	571	07.10.05	437.30	219618	1801
16.06.05	243.33	16637	811	07.07.05	299.50	28111	1427	07.08.05	415.73	173292	571	08.10.05	437.30	219627	1801
17.06.05	243.33	16637	811	08.07.05	299.65	28131	1444	08.08.05	415.73	173292	571	09.10.05	437.30	219627	1801
18.06.05	243.33	16637	811	09.07.05	299.90	28174	1460	09.08.05	415.73	173292	571	10.10.05	437.30	219627	1801
19.06.05	243.33	16637	811	10.07.05	299.40	28174	1460	10.08.05	415.73	173292	571	11.10.05	437.30	219627	1801
20.06.05	243.33	16637	811	11.07.05	299.60	28223	1476	11.08.05	415.73	173292	571	12.10.05	437.30	219627	1801
21.06.05	243.33	16637	811	12.07.05	299.90	28259	1490	12.08.05	415.73	173292	571	13.10.05	437.30	219627	1801
22.06.05	243.33	16637	811	13.07.05	299.90	28299	1504	13.08.05	415.73	173292	571	14.10.05	437.30	219627	1801
23.06.05	243.33	16637	811	14.07.05	299.30	28317	1518	14.08.05	415.73	173292	571	15.10.05	437.30	219627	1801
24.06.05	243.33	16637	811	15.07.05	299.40	28355	1532	15.08.05	415.73	173292	571	16.10.05	437.30	219627	1801
25.06.05	243.33	16637	811	16.07.05	299.85	28394	1546	16.08.05	415.73	173292	571	17.10.05	437.30	219627	1801
26.06.05	243.33	16637	811	17.07.05	299.30	28398	1550	17.08.05	415.73	173292	571	18.10.05	437.30	219627	1801
27.06.05	243.33	16637	811	18.07.05	299.70	28445	1564	18.08.05	415.73	173292	571	19.10.05	437.30	219627	1801
28.06.05	243.33	16637	811	19.07.05	299.40	28482	1578	19.08.05	415.73	173292	571	20.10.05	437.30	219627	1801
29.06.05	243.33	16637	811	20.07.05	299.60	28529	1592	20.08.05	415.73	173292	571	21.10.05	437.30	219627	1801
30.06.05	243.33	16637	811	21.07.05	299.90	28576	1606	21.08.05	415.73	173292	571	22.10.05	437.30	219627	1801
01.07.05	243.33	16637	811	22.07.05	299.30	28623	1620	22.08.05	415.73	173292	571	23.10.05	437.30	219627	1801
02.07.05	243.33	16637	811	23.07.05	299.60	28670	1634	23.08.05	415.73	173292	571	24.10.05	437.30	219627	1801
03.07.05	243.33	16637	811	24.07.05	299.90	28717	1648	24.08.05	415.73	173292	571	25.10.05	437.30	219627	1801
04.07.05	243.33	16637	811	25.07.05	299.30	28764	1662	25.08.05	415.73	173292	571	26.10.05	437.30	219627	1801
05.07.05	243.33	16637	811	26.07.05	299.60	28811	1676	26.08.05	415.73	173292	571	27.10.05	437.30	219627	1801
06.07.05	243.33	16637	811	27.07.05	299.90	28858	1690	27.08.05	415.73	173292	571	28.10.05	437.30	219627	1801
07.07.05	243.33	16637	811	28.07.05	299.30	28905	1704	28.08.05	415.73	173292	571	29.10.05	437.30	219627	1801
08.07.05	243.33	16637	811	29.07.05	299.60	28952	1718	29.08.05	415.73	173292	571	30.10.05	437.30	219627	1801
09.07.05	243.33	16637	811	30.07.05	299.90	29000	1732	30.08.05	415.73	173292	571	31.10.05	437.30	219627	1801
10.07.05	243.33	16637	811	31.07.05	299.30	29047	1746								

  
 15/10/05  
 Assistant Engineer  
 Sub-Division Officer  
 K.L.B. Sub-Division-II  
 Mukutmanipur, Bankura

  
 14/10/05  
 Executive Engineer  
 Kangsabati Canal Div-II  
 Kharra, Bankura

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Kangsabati Reservoir Data for the year 2006 (June to October)


Date	Reservoir Level (ft.)	Use Storage (Acre)	Inflow (Acre)
01.06.06	401.10	49410	NA
02.06.06	401.10	40410	NA
03.06.06	401.10	40410	NA
04.06.06	401.10	40410	NA
05.06.06	401.10	42255	2855
06.06.06	401.30	47820	5603
07.06.06	404.00	67208	19470
08.06.06	406.80	93258	25760
09.06.06	407.40	100071	5363
10.06.06	407.45	91284	467
11.06.06	407.50	100675	1304
12.06.06	407.70	101032	877
13.06.06	407.75	102066	464
14.06.06	407.75	102066	NA
15.06.06	407.75	102066	NA
16.06.06	407.80	102530	564
17.06.06	407.81	102999	468
18.06.06	407.70	103457	464
19.06.06	407.00	103917	NA
20.06.06	407.95	105920	463
21.06.06	408.00	104383	464
22.06.06	408.10	105811	927
23.06.06	408.15	105775	464
24.06.06	408.20	106238	463
25.06.06	408.25	106702	464
26.06.06	408.30	107166	464
27.06.06	408.35	107630	463
28.06.06	408.45	108556	927
29.06.06	408.60	112265	3705
30.06.06	408.95	115992	377

Date	Reservoir Level (ft.)	Use Storage (Acre)	Inflow (Acre)
01.07.06	409.00	28056	954
02.07.06	409.10	25908	927
03.07.06	409.20	32085	927
04.07.06	409.30	32993	927
05.07.06	409.40	32993	927
06.07.06	409.45	33920	463
07.07.06	409.50	34847	464
08.07.06	409.55	35313	463
09.07.06	409.60	35779	464
10.07.06	409.50	35779	2781
11.07.06	411.30	36701	38388
12.07.06	412.80	37615	20145
13.07.06	414.30	38010	20145
14.07.06	415.35	40327	5473
15.07.06	417.70	44954	35562
16.07.06	421.35	47264	36122
17.07.06	423.90	51796	47938
18.07.06	425.20	55245	34797
19.07.06	426.05	56172	15896
20.07.06	426.40	57099	3541
21.07.06	427.40	58990	18690
22.07.06	428.20	60944	14954
23.07.06	428.90	62938	10993
24.07.06	429.25	63589	5542
25.07.06	429.40	64003	6293
26.07.06	429.20	64225	4708
27.07.06	429.00	62844	6012
28.07.06	429.00	62544	13140
29.07.06	429.40	62170	9880
30.07.06	429.85	64528	78330
31.07.06	431.65	64847.01	50011

Date	Reservoir Level (ft.)	Use Storage (Acre)	Inflow (Acre)
01.08.06	432.00	50809	35252
02.08.06	433.05	51814	22911
03.08.06	433.35	52881	20228
04.08.06	433.40	53707	15298
05.08.06	433.40	53707	16073
06.08.06	433.25	52992	9585
07.08.06	433.05	51814	9102
08.08.06	432.00	51486	19470
09.08.06	432.40	50262	1892
10.08.06	431.50	49068	1849
11.08.06	431.45	47944	3070
12.08.06	431.05	46948	4352
13.08.06	430.65	46090	4267
14.08.06	430.10	44870	528
15.08.06	430.55	45744	14295
16.08.06	430.95	46730	9745
17.08.06	431.15	47915	12104
18.08.06	432.20	48547	15813
19.08.06	433.00	519734	24999
20.08.06	434.05	54262	23159
21.08.06	434.95	56483	32914
22.08.06	435.00	56951	23223
23.08.06	435.20	57090	22763
24.08.06	435.40	58580	36322
25.08.06	435.50	57696	20886
26.08.06	435.55	57488	10441
27.08.06	435.20	56957	21989
28.08.06	435.05	56489	72775
29.08.06	435.35	56970	9697
30.08.06	434.40	55717	10130
31.08.06	435.50	57826	78879

Date	Reservoir Level (ft.)	Use Storage (Acre)	Inflow (Acre)
01.09.06	435.30	57776	24239
02.09.06	435.45	58143	12818
03.09.06	435.45	58418	6845
04.09.06	435.65	59143	13327
05.09.06	437.10	61780	20312
06.09.06	437.30	59776	20710
07.09.06	437.40	60021	14895
08.09.06	438.15	58894	11284
09.09.06	438.25	59657	21749
10.09.06	438.30	59776	15358
11.09.06	438.30	58726	14128
12.09.06	438.10	58418	10447
13.09.06	438.00	58090	10413
14.09.06	438.70	58344	6685
15.09.06	438.75	57468	1653
16.09.06	438.00	56972	5578
17.09.06	434.00	55817	4398
18.09.06	434.00	54692	4305
19.09.06	433.75	53587	3256
20.09.06	433.40	52705	3538
21.09.06	433.50	52490	14700
22.09.06	433.40	60021	78073
23.09.06	433.85	63578	71353
24.09.06	437.05	61607	42416
25.09.06	437.00	61438	30408
26.09.06	438.30	54772	23625
27.09.06	438.50	65431	15015
28.09.06	437.60	61484	4663
29.09.06	437.15	61806	8318
30.09.06	437.40	62469	6057

Date	Reservoir Level (ft.)	Use Storage (Acre)	Inflow (Acre)
01.10.06	437.90	58679	12194
02.10.06	438.20	54714	7917
03.10.06	438.45	65021	4097
04.10.06	438.90	65369	3658
05.10.06	438.60	65369	4464
06.10.06	438.55	65265	1854
07.10.06	438.50	65143	5891
08.10.06	438.15	64772	4156
09.10.06	438.10	64175	3027
10.10.06	437.85	63578	3044
11.10.06	437.90	62742	4010
12.10.06	437.00	61484	2188
13.10.06	436.50	60564	3079
14.10.06	436.00	59680	1125
15.10.06	435.90	57826	3120
16.10.06	435.00	56072	5055
17.10.06	434.85	55269	1997
18.10.06	435.85	53800	738
19.10.06	435.55	53079	1029
20.10.06	435.60	51726	218
21.10.06	432.40	50562	656
22.10.06	431.90	49048	1224
23.10.06	431.40	47824	1054
24.10.06	430.85	46481	713
25.10.06	430.25	45028	550
26.10.06	429.55	43731	766
27.10.06	429.10	42730	2537
28.10.06	428.70	41934	2649
29.10.06	428.55	41500	777
30.10.06	428.05	41500	NA
31.10.06	428.00	41860	NA

  
 Assistant Engineer  
 Sub-Division Officer  
 K.L.B. Sub-Division-II  
 Mukutmanipur, Bankura

  
 Executive Engineer  
 Kangsabati Canal Div-II  
 Raibara, Bankura

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Kangsabati Reservoir Data for the year 2007(June to October)

Date	Reservoir Level (ft.)	Live Storage (Acft)	Inflow (Acft)
01.06.07	395.40	2417	94
02.06.07	395.40	2417	94
03.06.07	395.40	2417	94
04.06.07	395.40	2417	94
05.06.07	395.40	2417	94
06.06.07	395.40	2417	94
07.06.07	395.40	2417	94
08.06.07	395.40	2417	94
09.06.07	395.40	2417	94
10.06.07	395.40	2417	94
11.06.07	395.40	2417	94
12.06.07	395.40	2417	94
13.06.07	395.40	2417	94
14.06.07	395.40	2417	94
15.06.07	395.40	2417	94
16.06.07	395.40	2417	43
17.06.07	395.40	2417	NIL
18.06.07	395.40	2417	NIL
19.06.07	395.40	2417	NIL
20.06.07	395.45	2719	302
21.06.07	395.45	2719	NIL
22.06.07	395.60	3625	906
23.06.07	395.80	4884	1209
24.06.07	396.00	6042	1208
25.06.07	396.05	6244	302
26.06.07	396.15	6948	604
27.06.07	396.20	7252	303
28.06.07	396.25	7553	302
29.06.07	396.35	8157	604
30.06.07	396.50	9064	907

Date	Reservoir Level (ft.)	Live Storage (Acft)	Inflow (Acft)
01.07.07	396.60	9668	604
02.07.07	396.65	9970	302
03.07.07	396.70	10272	302
04.07.07	396.75	10574	302
05.07.07	397.15	12991	2417
06.07.07	421.55	286204	273213
07.07.07	429.70	438524	152320
08.07.07	431.70	485591	47067
09.07.07	432.65	508759	23168
10.07.07	433.15	520953	12194
11.07.07	433.50	524612	3659
12.07.07	433.40	527053	2439
13.07.07	433.35	531148	6097
14.07.07	433.25	535587	2439
15.07.07	433.85	589026	2439
16.07.07	434.25	547781	9755
17.07.07	434.20	546562	31428
18.07.07	433.00	517295	11107
19.07.07	431.85	489249	312
20.07.07	432.40	502662	14813
21.07.07	433.00	517295	18589
22.07.07	433.20	522173	8937
23.07.07	433.40	527053	11537
24.07.07	433.70	534367	14474
25.07.07	434.70	558756	33003
26.07.07	455.30	570950	19051
27.07.07	455.20	570950	20096
28.07.07	434.20	546562	10146
29.07.07	433.45	528270	10813
30.07.07	433.55	530709	17501
31.07.07	433.70	534367	8780

Date	Reservoir Level (ft.)	Live Storage (Acft)	Inflow (Acft)
01.08.07	433.70	534367	7673
02.08.07	433.70	534367	7111
03.08.07	434.70	558756	32008
04.08.07	435.00	566072	18138
05.08.07	435.00	566072	11420
06.08.07	434.75	559875	5461
07.08.07	434.40	551439	5306
08.08.07	434.00	541684	5267
09.08.07	433.70	534367	7747
10.08.07	433.45	528270	7430
11.08.07	433.15	520953	7621
12.08.07	432.60	507540	1449
13.08.07	433.50	529490	36855
14.08.07	435.05	567291	51971
15.08.07	435.05	567291	30032
16.08.07	434.25	547781	14653
17.08.07	433.20	522173	8113
18.08.07	436.00	590460	77570
19.08.07	438.70	656308	304491
20.08.07	434.40	551439	111565
21.08.07	433.35	525831	33402
22.08.07	432.90	514856	16929
23.08.07	432.40	502662	6816
24.08.07	432.70	509979	9793
25.08.07	433.05	518514	8576
26.08.07	433.40	527053	8537
27.08.07	433.75	535587	8536
28.08.07	434.15	545342	9755
29.08.07	434.35	550220	9380
30.08.07	434.25	547781	7681
31.08.07	434.00	541684	7962

Date	Reservoir Level (ft.)	Live Storage (Acft)	Inflow (Acft)
01.09.07	433.65	533148	6185
02.09.07	433.10	519794	1641
03.09.07	432.70	509979	5335
04.09.07	432.10	495346	448
05.09.07	431.75	486810	6566
06.09.07	431.65	484371	12584
07.09.07	431.60	483152	13905
08.09.07	431.55	481932	13898
09.09.07	431.60	483152	16338
10.09.07	431.55	481932	13898
11.09.07	431.30	475835	8995
12.09.07	431.55	481932	21887
13.09.07	431.25	474616	7760
14.09.07	431.35	477055	17492
15.09.07	431.15	472177	10165
16.09.07	431.25	474616	14806
17.09.07	431.30	475835	5689
18.09.07	431.35	477055	5240
19.09.07	431.30	475835	2800
20.09.07	431.40	478274	2712
21.09.07	431.40	478274	
22.09.07	431.55	481932	3658
23.09.07	431.70	485591	3659
24.09.07	434.95	564853	79262
25.09.07	435.55	603875	89789
26.09.07	437.00	614848	95850
27.09.07	436.60	605095	81734
28.09.07	436.80	609970	41602
29.09.07	437.65	630700	25584
30.09.07	438.45	650211	19511

Date	Reservoir Level (ft.)	Live Storage (Acft)	Inflow (Acft)
01.10.07	438.80	658747	15119
02.10.07	438.95	662406	12443
03.10.07	439.00	663625	14101
04.10.07	439.00	663625	15074
05.10.07	438.85	658967	11567
06.10.07	438.40	648992	4284
07.10.07	438.20	644214	10407
08.10.07	437.60	634358	5453
09.10.07	437.40	624603	5484
10.10.07	437.00	614848	5397
11.10.07	436.50	602654	3242
12.10.07	436.00	590460	3195
13.10.07	435.45	577047	2043
14.10.07	434.90	562633	2046
15.10.07	434.45	552659	3751
16.10.07	434.00	540464	3077
17.10.07	434.00	540464	2766
18.10.07	434.00	540464	NIL
19.10.07	434.00	540464	NIL
20.10.07	434.00	540464	NIL
21.10.07	434.00	540464	NIL
22.10.07	434.00	540464	NIL
23.10.07	434.00	540464	NIL
24.10.07	434.00	540464	NIL
25.10.07	434.00	540464	NIL
26.10.07	434.00	540464	NIL
27.10.07	434.00	540464	NIL
28.10.07	434.00	540464	NIL
29.10.07	434.00	540464	NIL
30.10.07	434.00	540464	NIL
31.10.07	434.00	540464	NIL

13/02/17  
Assistant Engineer  
Sub-Division Officer  
K.L.B. Sub-Division-II  
Mukutmonipur, Bankura

14/2/17  
Executive Engineer  
Kangsabati Canal-Div-II  
Khatra Bankura

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Kangsabati Reservoir Data for the year 2008(June to October)


Date	Reservoir Level (ft.)	Live Storage (Acut)	Inflow (Acut)
01.06.08	402.90	57009	NIL
02.06.08	402.90	57009	NIL
03.06.08	402.90	57009	NIL
04.06.08	402.90	57009	NIL
05.06.08	402.90	57009	NIL
06.06.08	402.90	57009	NIL
07.06.13	402.90	57009	NIL
08.06.08	402.90	57009	NIL
09.06.08	402.90	57009	NIL
10.06.08	402.90	57009	NIL
11.06.08	402.90	57009	NIL
12.06.08	402.90	57009	NIL
13.06.08	402.90	57009	NIL
14.06.08	403.10	58953	1854
15.06.08	403.40	61735	2782
16.06.08	403.50	62662	927
17.06.08	404.30	69152	6490
18.06.08	410.00	122927	53775
19.06.08	419.65	252534	129607
20.06.08	421.40	283400	30866
21.06.08	422.20	298352	14952
22.06.08	422.90	311434	13082
23.06.08	423.30	318910	7476
24.06.08	423.50	322648	3738
25.06.08	423.70	326386	3738
26.06.08	423.85	329190	2804
27.06.08	424	331992	2803
28.06.08	424.05	332928	935
29.06.08	424.2	345076	12148
30.06.08	425.5	360028	14952

Date	Reservoir Level (ft.)	Live Storage (Acut)	Inflow (Acut)
01.07.08	425.95	368438	8471
02.07.08	426.25	374045	5607
03.07.08	426.50	378717	4672
04.07.08	426.70	382455	3738
05.07.08	427.05	388996	6541
06.07.08	427.55	398341	9345
07.07.08	429.05	426376	28035
08.07.08	430.05	449350	18974
09.07.08	430.70	461209	15863
10.07.08	434.50	553878	92675
11.07.08	435.00	566072	16199
12.07.08	434.45	552659	7416
13.07.08	433.75	535587	3133
14.07.08	433.25	523302	8076
15.07.08	432.70	509979	6688
16.07.08	433.10	519734	28935
17.07.08	432.70	509979	10325
18.07.08	432.50	505301	15078
19.07.08	432.80	512417	27294
20.07.08	431.85	538026	45815
21.07.08	433.90	539245	21394
22.07.08	434.50	529490	10571
23.07.08	432.90	514856	5545
24.07.08	433.00	517195	22649
25.07.08	434.10	544123	47128
26.07.08	434.10	544123	23451
27.07.08	433.7	536367	33790
28.07.08	433.25	523392	12418
29.07.08	432.7	509979	12797
30.07.08	432.80	512417	14822
31.07.08	433.00	517295	17008

Date	Reservoir Level (ft.)	Live Storage (Acut)	Inflow (Acut)
01.08.08	433.25	523392	18717
02.08.08	433.25	525831	15974
03.08.08	433.40	527051	13994
04.08.08	433.10	526612	10957
05.08.08	432.95	516076	5150
06.8.08	432.70	509979	8654
07.08.08	432.25	499004	2949
08.08.08	432.05	494126	8256
09.08.08	431.75	486810	6468
10.08.08	431.30	475835	3574
11.08.08	431.25	474616	12599
12.08.08	431.30	475835	13577
13.08.08	431.75	486810	20174
14.08.08	431.95	491688	15253
15.08.08	432.60	507540	28651
16.08.08	433.50	529489	32448
17.08.08	433.80	536806	17858
18.08.08	433.85	538026	11789
19.08.08	433.80	536806	11788
20.08.08	434.35	550220	17017
21.08.08	435.70	589144	42142
22.08.08	435.15	589731	14850
23.08.08	434.40	549000	8708
24.08.08	433.25	523392	3265
25.08.08	433.25	523392	4764
26.08.08	433.40	527051	3659
27.08.08	433.4	527051	NIL
28.08.08	433.3	524611	5724
29.08.08	433	517295	4891
30.08.08	432.75	511198	6915
31.08.08	432.50	505103	7050

Date	Reservoir Level (ft.)	Live Storage (Acut)	Inflow (Acut)
01.09.08	432.10	495346	3328
02.09.08	431.75	486810	4833
03.09.08	431.35	477055	3639
04.09.08	431.00	468519	4959
05.09.08	430.60	458764	3919
06.9.08	430.40	453886	8769
07.09.08	430.05	445350	6249
08.09.08	429.65	437590	4374
09.09.08	429.10	427310	3757
10.09.08	428.60	417965	5492
11.09.08	428.30	412958	9184
12.09.08	427.85	403848	2741
13.09.08	427.45	396472	3341
14.09.08	427.50	397407	5941
15.09.08	427.50	397407	4120
16.09.08	427.70	401344	7867
17.09.08	428.35	413293	15755
18.09.08	429.70	438524	25675
19.09.08	431.65	484371	45847
20.09.08	432.85	513637	29266
21.09.08	433.40	527051	13414
22.09.08	433.70	534367	7316
23.09.08	434.00	541684	7317
24.09.08	434.50	553879	12194
25.09.08	435.50	578298	24388
26.09.08	436.60	605093	33491
27.09.08	437.2	619726	24557
28.09.08	437.15	618506	12069
29.09.08	436.95	613629	8762
30.09.08	436.6	605093	5147

Date	Reservoir Level (ft.)	Live Storage (Acut)	Inflow (Acut)
01.10.08	436.25	596557	5130
02.10.08	435.80	585582	2933
03.10.08	435.35	574608	2976
04.10.08	434.95	564853	4235
05.10.08	434.45	552659	1742
06.10.08	434.45	552659	7436
07.10.08	434.45	552659	NIL
08.10.08	434.50	553878	1219
09.10.08	434.60	556317	2439
10.10.08	434.65	557536	1219
11.10.08	434.65	557536	NIL
12.10.08	434.65	557536	NIL
13.10.08	434.65	557536	NIL
14.10.08	434.60	556317	976
15.10.08	434.45	552659	1975
16.10.08	434.15	545342	4023
17.10.08	433.65	533348	2654
18.10.08	433.15	520953	102
19.10.08	432.75	511198	791
20.10.08	432.15	498565	NIL
21.10.08	431.55	484932	313
22.10.08	430.95	463700	348
23.10.08	430.35	452667	366
24.10.08	429.70	438524	798
25.10.08	428.95	424507	951
26.10.08	428.15	408555	NIL
27.10.08	428.00	406751	5829
28.10.08	427.95	405613	297
29.10.08	427.80	403013	358
30.10.08	427.65	400210	656
31.10.08	427.65	400210	247

  
 14/12/17  
 Asst. Engineer  
 Sub-Division Officer  
 K.L.B. Sub-Division-II  
 Mukutmonipur, Bankura

  
 14/12/17  
 Executive Engineer  
 Kangsabati Canals Dwn.-II  
 Khatra Bankura

Kangsabati Reservoir Data for the year 2009(June to October)


Date	Reservoir Level (ft.)	Live Storage (Acht)	Inflow (Acht)
01.06.09	398.10	18731	NIL
02.06.09	398.10	18731	NIL
03.06.09	398.10	18731	NIL
04.06.09	398.10	18731	NIL
05.06.09	398.10	18731	NIL
06.06.09	398.10	18731	NIL
07.06.09	398.10	18731	NIL
08.06.09	398.10	18731	NIL
09.06.09	398.10	18731	NIL
10.06.09	398.10	18731	NIL
11.06.09	398.10	18731	NIL
12.06.09	398.10	18731	NIL
13.06.09	398.10	18731	NIL
14.06.09	398.10	18731	NIL
15.06.09	398.10	18731	NIL
16.06.09	398.10	18731	NIL
17.06.09	398.10	18731	NIL
18.06.09	398.10	18731	NIL
19.06.09	398.10	18731	NIL
20.06.09	398.10	18731	NIL
21.06.09	398.10	18731	NIL
22.06.09	398.10	18731	NIL
23.06.09	398.10	18731	NIL
24.06.09	398.10	18731	NIL
25.06.09	398.10	18731	NIL
26.06.09	398.10	18731	NIL
27.06.09	398.10	18731	NIL
28.06.09	398.10	18731	NIL
29.06.09	398.10	18731	NIL
30.06.09	398.10	18731	NIL

Date	Reservoir Level (ft.)	Live Storage (Acht)	Inflow (Acht)
01.07.09	398.10	18731	NIL
02.07.09	398.10	18731	NIL
03.07.09	398.10	18731	NIL
04.07.09	398.10	18731	NIL
05.07.09	398.10	18731	NIL
06.07.09	398.10	18731	NIL
07.07.09	398.30	19940	1209
08.07.09	398.60	21759	1812
09.07.09	398.70	22356	603
10.07.09	398.85	23162	906
11.07.09	398.90	23564	302
12.07.09	399.35	26283	2719
13.07.09	400.00	30211	3928
14.07.09	400.40	31920	3709
15.07.09	400.55	35311	1391
16.07.09	400.70	36701	1390
17.07.09	400.85	38092	1391
18.07.09	401.00	39685	1391
19.07.09	401.50	39988	465
20.07.09	401.20	41337	1389
21.07.09	401.35	42728	1391
22.07.09	401.60	45046	2318
23.07.09	401.80	46903	1835
24.07.09	402.00	48755	1854
25.07.09	402.15	50146	1391
26.07.09	402.25	51073	927
27.07.09	402.60	54318	3295
28.07.09	403.10	58953	4635
29.07.09	403.70	64516	5563
30.07.09	404.05	67751	3245
31.07.09	404.25	69616	1855

Date	Reservoir Level (ft.)	Live Storage (Acht)	Inflow (Acht)
01.08.09	404.40	71006.00	1390.00
02.08.09	404.55	72397.00	1391.00
03.08.09	404.90	75642.00	3245.00
04.08.09	405.70	83059.00	7417.00
05.08.09	407.00	95112.00	12053.00
06.08.09	407.70	101602.00	6490.00
07.08.09	408.20	106238.00	4636.00
08.08.09	408.90	111801.00	5563.00
09.08.09	409.95	122463.00	10652.00
10.08.09	411.05	137030.00	14967.00
11.08.09	411.60	143745.00	6715.70
12.08.09	412.00	149789.00	6044.00
13.08.09	412.15	151804.00	2015.00
14.08.09	412.90	161875.00	10072.00
15.08.09	413.85	174635.00	17759.00
16.08.09	414.30	180679.00	6044.00
17.08.09	414.90	188738.00	8059.00
18.08.09	415.30	194110.00	5377.00
19.08.09	415.60	198139.00	4029.00
20.08.09	415.85	201997.00	3558.00
21.08.09	416.25	206869.00	5377.00
22.08.09	416.35	213885.00	6716.00
23.08.09	417.10	218285.00	4700.00
24.08.09	417.50	223658.00	5375.00
25.08.09	418.30	234402.00	10744.00
26.08.09	419.60	251865.00	17463.00
27.08.09	420.70	270917.00	18454.00
28.08.09	421.80	290876.00	20559.00
29.08.09	423.55	323583.00	32707.00
30.08.09	425.00	350683.00	27100.00
31.08.09	425.60	361895.00	11213.00

Date	Reservoir Level (ft.)	Live Storage (Acht)	Inflow (Acht)
01.09.09	425.90	367505	5607.00
02.09.09	426.10	371242	3738.00
03.09.09	426.20	373110	1869.00
04.09.09	426.30	374979	1869.00
05.09.09	426.45	377783	2804.00
06.09.09	427.15	390865	15082.00
07.09.09	426.15	594118	203253
08.09.09	426.35	598936	68050.00
09.09.09	423.90	539245	26311.00
10.09.09	422.70	509979	23008.00
11.09.09	423.30	524612	21017.00
12.09.09	423.70	534367	9755.00
13.09.09	424.00	541684	7317.00
14.09.09	424.20	546562	5533.00
15.09.09	424.35	550220	4707.00
16.09.09	424.25	547781	4080.00
17.09.09	424.30	544123	4899.00
18.09.09	423.90	539245	3624.00
19.09.09	423.75	535587	5410.00
20.09.09	423.70	534967	7895.00
21.09.09	423.55	533148	8032.00
22.09.09	423.35	525831	4039.00
23.09.09	423.10	519734	4692.00
24.09.09	422.75	511198	2717.00
25.09.09	421.35	501443	3298.00
26.09.09	422.00	492907	4564.00
27.09.09	421.60	482152	3304.00
28.09.09	421.05	469738	491.00
29.09.09	420.60	458764	3055.00
30.09.09	420.05	445350	551.00

Date	Reservoir Level (ft.)	Live Storage (Acht)	Inflow (Acht)
01.10.09	429.65	457590	6208
02.10.09	429.05	426376	2780
03.10.09	428.60	417965	5027
04.10.09	428.30	408620	3903
05.10.09	428.00	406751	1131
06.10.09	428.00	406751	9043
07.10.09	428.10	408620	6399
08.10.09	428.40	414227	13989
09.10.09	428.35	411299	7574
10.10.09	428.45	415361	5854
11.10.09	428.45	415361	4971
12.10.09	428.40	414217	4080
13.10.09	428.30	412158	3140
14.10.09	428.10	408620	1258
15.10.09	427.90	404882	1241
16.10.09	427.85	403948	2022
17.10.09	427.60	399275	606
18.10.09	427.15	390865	697
19.10.09	426.75	383390	2110
20.10.09	426.35	375914	2160
21.10.09	425.75	364700	1523
22.10.09	425.15	353486	2234
23.10.09	424.45	340404	450
24.10.09	423.75	327321	491
25.10.09	423.10	315172	1330
26.10.09	422.45	303024	1282
27.10.09	421.95	290680	884
28.10.09	421.25	280597	NIL
29.10.09	420.45	268645	NIL
30.10.09	419.70	253206	1585
31.10.09	418.80	241118	1813

  
 Assistant Engineer  
 Sub-Division Officer  
 K.L.B. Sub-Division-II  
 Mukutmanipur, Bankura

  
 Executive Engineer  
 Kangsabati Canal Divn-II  
 Kharsa, Bankura

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Kangsabati Reservoir Data for the year 2010(June to October)


Date	Reservoir Level (ft.)	Live Storage (Acft)	Inflow (Acft)
01.06.10	399.60	27794	NIL
02.06.10	399.60	27794	NIL
03.06.10	399.60	27794	NIL
04.06.10	399.60	27794	NIL
05.06.10	399.60	27794	NIL
06.06.10	399.60	27794	NIL
07.06.10	399.60	27794	NIL
08.06.10	399.60	27794	NIL
09.06.10	399.60	27794	NIL
10.06.10	399.60	27794	NIL
11.06.10	399.60	27794	NIL
12.06.10	399.60	27794	NIL
13.06.10	399.60	27794	NIL
14.06.10	399.60	27794	NIL
15.06.10	399.60	27794	NIL
16.06.10	399.60	27794	NIL
17.06.10	399.60	27794	NIL
18.06.10	399.60	27794	NIL
19.06.10	399.70	28398	604
20.06.10	399.70	28398	NIL
21.06.10	399.80	29008	609
22.06.10	399.80	29008	NIL
23.06.10	399.90	29609	606
24.06.10	399.90	29609	NIL
25.06.10	399.90	29609	NIL
26.06.10	399.90	29609	NIL
27.06.10	399.95	29909	302
28.06.10	399.95	29909	NIL
29.06.10	399.95	29909	NIL
30.06.10	400.00	30211	302

Date	Reservoir Level (ft.)	Live Storage (Acft)	Inflow (Acft)
01.07.10	400.00	30211.00	NIL
02.07.10	400.00	30211.00	NIL
03.07.10	400.00	30211.00	NIL
04.07.10	400.00	30211.00	NIL
05.07.10	400.00	30211.00	NIL
06.07.10	400.00	30211.00	NIL
07.07.10	400.00	30211.00	NIL
08.07.10	400.00	30211.00	NIL
09.07.10	400.00	30211.00	NIL
10.07.10	400.00	30211.00	NIL
11.07.10	400.00	30211.00	NIL
12.07.10	400.05	30679.00	464.00
13.07.10	400.10	31138.00	463.00
14.07.10	400.10	31138.00	NIL
15.07.10	400.10	31138.00	NIL
16.07.10	400.10	31138.00	NIL
17.07.10	400.10	31138.00	NIL
18.07.10	400.10	31138.00	NIL
19.07.10	400.10	31138.00	NIL
20.07.10	400.10	31138.00	NIL
21.07.10	400.10	31138.00	NIL
22.07.10	400.10	31138.00	NIL
23.07.10	400.10	31138.00	NIL
24.07.10	400.10	31138.00	NIL
25.07.10	400.10	31138.00	NIL
26.07.10	400.40	33920.00	2782.00
27.07.10	400.6	35774.00	1854.00
28.07.10	400.65	36234.00	464.00
29.07.10	400.65	36234.00	NIL
30.07.10	400.80	37629.00	1391.00
31.07.10	400.80	37629.00	1391.00

Date	Reservoir Level (ft.)	Live Storage (Acft)	Inflow (Acft)
01.08.10	400.90	38556	927
02.08.10	400.99	39020	464
03.08.10	401.20	41337	2317
04.08.10	401.35	42728	1391
05.08.10	401.50	44119	1391
06.8.10	401.70	45979	1854
07.08.10	401.96	48291	2318
08.08.10	402.15	50146	1854
09.08.10	402.30	51536	1390
10.08.10	402.60	52462	997
11.08.10	402.50	53390	927
12.08.10	402.50	53390	NIL
13.08.10	402.50	53390	NIL
14.08.10	402.55	53954	464
15.08.10	402.90	57098	3244
16.08.10	403.05	58489	1391
17.08.10	403.05	58489	NIL
18.08.10	403.20	59880	1391
19.08.10	403.40	61734	1854
20.08.10	403.40	61734	NIL
21.08.10	403.45	62198	464
22.08.10	403.55	63125	927
23.08.10	404.00	68225	5100
24.08.10	404.30	70079	1854
25.08.10	404.40	71006	927
26.08.10	404.98	76105	5099
27.08.10	405.4	80277	4172
28.08.10	405.65	82595	2318
29.08.10	405.8	83986	1391
30.08.10	405.95	85377	1391
31.08.10	406.10	86768	1391

Date	Reservoir Level (ft.)	Live Storage (Acft)	Inflow (Acft)
01.09.10	406.25	86159.00	1391
02.09.10	406.35	89086.00	927
03.09.10	406.50	90477.00	1391
04.09.10	406.60	91404.00	927
05.09.10	406.60	91404.00	NIL
06.9.10	406.60	91404.00	NIL
07.09.10	406.60	91404.00	NIL
08.09.10	406.85	93722.00	2318
09.09.10	407.00	95113.00	1391
10.09.10	407.20	96967.00	1854
11.09.10	407.30	97894.00	927
12.09.10	407.45	99285.00	1390
13.09.10	407.55	100212.00	927
14.09.10	407.60	100675.00	464
15.09.10	407.65	101139.00	464
16.09.10	407.95	102921.00	2782
17.09.10	408.15	105775.00	1854
18.09.10	408.35	107629.00	1854
19.09.10	408.70	110874.00	3245
20.09.10	409.00	113656.00	2782
21.09.10	409.35	116901.00	3245
22.09.10	409.90	122001.00	5100
23.09.10	410.20	125614.00	3613
24.09.10	410.45	128572.00	3358
25.09.10	410.75	133001.00	4029
26.09.10	411.00	136359.00	3358
27.09.10	411.2	139045.00	2685
28.09.10	411.3	140388.00	1343
29.09.10	411.35	141060.00	672
30.09.10	411.35	141060.00	NIL

Date	Reservoir Level (ft.)	Live Storage (Acft)	Inflow (Acft)
01.10.10	411.35	141060	NIL
02.10.10	411.55	141060	NIL
03.10.10	411.35	141060	NIL
04.10.10	411.40	141790	670
05.10.10	411.40	141790	NIL
06.10.10	411.60	144417	2687
07.10.10	411.80	147105	2687
08.10.10	412.95	149115	2024
09.10.10	412.00	149788	672
10.10.10	412.05	150460	672
11.10.10	412.10	151132	672
12.10.10	411.20	139044	NIL
13.09.10	410.35	127528	2302
14.10.10	409.55	117829	4260
15.10.10	408.25	106702	3238
16.10.10	406.90	94185	NIL
17.10.10	405.80	83887	211
18.10.10	406.40	89550	10293
19.10.10	406.50	90477	927
20.10.10	406.55	90941	464
21.10.10	406.60	90404	464
22.10.10	406.75	92795	1391
23.10.10	406.95	94649	1854
24.10.10	407.10	95398	1390
25.10.10	407.20	95966	927
26.10.10	407.25	97430	464
27.10.10	407.25	97430	NIL
28.10.10	407.25	97430	NIL
29.10.10	407.25	97430	NIL
30.10.10	407.25	97430	NIL
31.10.10	407.25	97430	NIL

  
 Assistant Engineer  
 Sub-Division Officer  
 K.L.B. Sub-Division-II  
 Mukutmonipur, Bankura

  
 Executive Engineer  
 Kangsabati Canal Divn-II  
 Khatra - Bankura

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Kangsabati Reservoir Data for the year 2011(June to October)

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.06.11	403.25	60422	NIL
02.06.11	403.25	60422	NIL
03.06.11	403.25	60422	NIL
04.06.11	403.25	60422	NIL
05.06.11	403.25	60422	NIL
06.06.11	403.25	60422	NIL
07.06.11	403.25	60422	NIL
08.06.11	403.25	60422	NIL
09.06.11	403.25	60422	NIL
10.06.11	403.25	60422	NIL
11.06.11	403.25	60422	NIL
12.06.11	403.25	60422	NIL
13.06.11	403.25	60422	NIL
14.06.11	403.25	60422	NIL
15.06.11	403.25	60422	NIL
16.06.11	403.25	60422	NIL
17.06.11	403.40	61735	1323
18.06.11	404.90	75642	13907
19.06.11	415.40	168591	92949
20.06.11	419.40	249176	80585
21.06.11	420.90	274071	24895
22.06.11	421.35	282466	8395
23.06.11	421.65	288073	5607
24.06.11	421.85	291811	3738
25.06.11	421.95	293679	1868
26.06.11	422.15	297417	3738
27.06.11	423.2	317041	19624
28.06.11	425.25	355395	38314
29.06.11	426.65	381521	26166
30.06.11	427.75	402079	20558

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.07.11	428.10	408620.00	6541.00
02.07.11	428.40	414227.00	5607.00
03.07.11	428.70	419834.00	5607.00
04.07.11	429.20	419179.00	9345.00
05.07.11	429.70	428524.00	9345.00
06.07.11	430.10	446570.00	8046.00
07.07.11	430.35	452867.00	6097.00
08.07.11	430.60	458764.00	5097.00
09.07.11	430.90	466090.00	7316.00
10.07.11	431.30	470958.00	4878.00
11.07.11	431.35	472177.00	1219.00
12.07.11	431.20	473397.00	1220.00
13.07.11	431.25	474616.00	1219.00
14.07.11	431.30	475836.00	1220.00
15.07.11	431.95	477055.00	1219.00
16.07.11	431.40	478175.00	1220.00
17.07.11	431.45	479499.00	1219.00
18.07.11	431.90	480713.00	1219.00
19.07.11	431.55	481932.00	1219.00
20.07.11	431.70	473397.00	895.00
21.07.11	430.75	463422.00	1763.00
22.07.11	431.50	480713.00	26352.00
23.07.11	434.15	545342.00	72781.00
24.07.11	434.55	555067.00	21492.00
25.07.11	434.45	552659.00	8468.00
26.07.11	434.10	544123.00	5399.00
27.07.11	433.7	534367.00	2800.00
28.07.11	433.35	525831.00	3189.00
29.07.11	432.85	513637.00	1133.00
30.07.11	432.30	500223.00	NIL
31.07.11	431.80	488029.00	375.00

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.08.11	431.30	475855	NIL
02.08.11	430.95	467300	4650
03.08.11	430.80	463641	10646
04.08.11	430.70	461203	12088
05.08.11	430.40	453886	7123
06.08.11	429.90	442262	2756
07.08.11	429.70	438524	10618
08.08.11	429.80	442262	18154
09.08.11	432.30	500223	58177
10.08.11	433.50	529490	36483
11.08.11	433.85	538026	18641
12.08.11	435.35	574608	49160
13.08.11	435.95	589241	58073
14.08.11	434.80	561194	44423
15.08.11	433.75	535587	23423
16.08.11	433.00	517295	8834
17.08.11	432.90	514856	14648
18.08.11	432.70	509979	25113
19.08.11	432.90	505101	24980
20.08.11	432.85	513637	42745
21.08.11	432.60	507540	20589
22.08.11	432.70	509979	13179
23.08.11	432.90	514856	6623
24.08.11	433.10	519734	6878
25.08.11	433.50	529490	9755
26.08.11	433.85	538026	8517
27.08.11	434.1	544123	8097
28.08.11	434.45	552659	8506
29.08.11	434.75	559975	7316
30.08.11	435.05	567291	7316
31.08.11	435.25	572169	4878

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.09.11	435.40	575827.00	3658
02.09.11	435.65	581924.00	11813
03.09.11	435.70	583144.00	13078
04.09.11	435.75	584363.00	13947
05.09.11	435.75	584363.00	12728
06.09.11	435.65	581924.00	10936
07.09.11	435.50	578266.00	9574
08.09.11	435.50	578266.00	13280
09.09.11	435.60	580795.00	15915
10.09.11	436.90	617409.00	35234
11.09.11	435.35	574608.00	45496
12.09.11	434.00	541694.00	158588
13.09.11	433.90	539245.00	14231
14.09.11	433.80	536806.00	9826
15.09.11	433.70	534367.00	9627
16.09.11	433.80	536806.00	13979
17.09.11	434.20	546562.00	21316
18.09.11	434.30	549000.00	21546
19.09.11	434.20	546562.00	26350
20.09.11	434.15	545342.00	48514
21.09.11	433.80	536806.00	21501
22.09.11	433.35	525831.00	15014
23.09.11	433.60	531928.00	40803
24.09.11	434.35	550220.00	66463
25.09.11	433.85	538026.00	31803
26.09.11	434.10	544123.00	19819
27.09.11	434.25	547781.00	11728
28.09.11	434.25	547781.00	8088
29.09.11	434.20	546562.00	6466
30.09.11	434.20	546562.00	5018

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.10.11	434.20	546562	4741
02.10.11	434.15	545542	3716
03.10.11	434.20	546562	2408
04.10.11	434.25	547781	1215
05.10.11	434.30	549000	1219
06.10.11	434.35	550219	1219
07.10.11	434.40	551438	1219
08.10.11	434.45	552657	1925
09.10.11	434.50	553876	1925
10.10.11	434.60	556317	3127
11.10.11	434.65	557536	4663
12.10.11	434.35	550219	2504
13.10.11	433.90	539245	1001
14.10.11	433.50	529490	3349
15.10.11	433.00	517295	1146
16.10.11	432.55	506320	2026
17.10.11	432.05	494126	802
18.10.11	431.45	479494	NIL
19.10.11	430.90	466080	NIL
20.10.11	430.35	452667	NIL
21.10.11	429.80	440289	1498
22.10.11	429.20	429179	2572
23.10.11	428.60	417965	2418
24.10.11	428.00	406751	2420
25.10.11	427.50	397406	4097
26.10.11	427.00	388062	3970
27.10.11	426.60	380586	4180
28.10.11	426.15	372176	4826
29.10.11	425.70	363765	5495
30.10.11	425.60	361896	1880
31.10.11	425.60	361896	1211

Assistant Engineer  
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Khatra Bankura

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Kangsabati Reservoir Data for the year 2012(June to October)


Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.06.12	402.40	52463	NIL
02.06.12	402.30	50609	NIL
03.06.12	402.00	48755	NIL
04.06.12	401.85	47364	85
05.06.12	401.70	45973	85
06.06.12	401.50	44119	NIL
07.06.12	401.40	43192	NIL
08.06.12	401.40	43192	NIL
09.06.12	401.40	43192	NIL
10.06.12	401.40	43192	NIL
11.06.12	401.35	42728	NIL
12.06.12	401.35	42728	NIL
13.06.12	401.35	42728	NIL
14.06.12	401.35	42728	NIL
15.06.12	401.35	42728	NIL
16.06.12	401.35	42728	NIL
17.06.12	401.35	42728	NIL
18.06.12	401.35	42728	NIL
19.06.12	401.40	43192	464
20.06.12	401.60	45046	1854
21.06.12	401.80	46900	1854
22.06.12	402.20	50609	3709
23.06.12	402.40	52463	1854
24.06.12	402.65	54781	2318
25.06.12	402.90	57099	2318
26.06.12	403.10	58953	1854
27.06.12	403.2	59880	927
28.06.12	403.2	59880	NIL
29.06.12	403.2	59880	NIL
30.06.12	403.20	59880	NIL

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.07.12	403.50	62662.00	2782.00
02.07.12	403.65	64053.00	1391.00
03.07.12	403.65	64053.00	NIL
04.07.12	403.70	64516.00	463.00
05.07.12	403.75	64980.00	464.00
06.07.12	403.90	66371.00	1391.00
07.07.12	404.20	69152.00	2781.00
08.07.12	404.40	71006.00	1054.00
09.07.12	404.60	72860.00	1854.00
10.07.12	404.90	75642.00	2782.00
11.07.12	405.20	78423.00	2781.00
12.07.12	405.30	79550.00	927.00
13.07.12	405.40	80776.00	928.00
14.07.12	405.50	82005.00	927.00
15.07.12	405.65	82946.00	1391.00
16.07.12	405.00	85841.00	3245.00
17.07.12	406.25	88195.00	2318.00
18.07.12	406.65	90940.00	2781.00
19.07.12	406.80	92256.00	2318.00
20.07.12	407.80	102530.00	9277.00
21.07.12	409.20	115510.00	12980.00
22.07.12	409.95	122463.00	8553.00
23.07.12	410.50	129644.00	7180.00
24.07.12	410.60	130985.00	1343.00
25.07.12	410.75	132000.00	2014.00
26.07.12	410.85	134343.00	1343.00
27.07.12	411.00	136958.00	2015.00
28.07.12	411.35	141059.00	4701.00
29.07.12	411.75	146431.00	5862.00
30.07.12	412.10	151132.00	4701.00
31.07.12	412.40	155161.00	4029.00

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.08.12	413.25	166077	13416
02.08.12	413.85	174635	8058
03.08.12	414.15	178665	4080
04.08.12	415.10	191424	12759
05.08.12	416.15	205527	14103
06.08.12	417.15	218957	13430
07.08.12	418.00	230373	11416
08.08.12	418.95	243152	12759
09.08.12	419.85	255220	12088
10.08.12	420.50	266579	11359
11.08.12	420.85	273120	6541
12.08.12	421.95	293078	20559
13.08.12	423.10	315172	22654
14.08.12	423.80	328055	13997
15.08.12	425.10	355552	32506
16.08.12	425.95	368438	27718
17.08.12	426.15	372176	35128
18.08.12	427.35	394809	33478
19.08.12	427.55	398941	16281
20.08.12	427.45	396472	11512
21.08.12	427.40	395538	11876
22.08.12	427.50	397407	14986
23.08.12	427.88	398541	14220
24.08.12	427.35	394606	9564
25.08.12	427.35	394600	13236
26.08.12	427.45	396472	15105
27.08.12	427.4	395538	12336
28.08.12	427.3	395669	11385
29.08.12	427.05	389696	7769
30.08.12	426.80	384324	6730
31.08.12	426.50	378717	5731

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.09.12	426.50	378717.00	3449
02.09.12	426.55	379653.00	934
03.09.12	426.65	381520.00	1869
04.09.12	426.85	385258.00	3739
05.09.12	427.35	394603.00	9345
06.09.12	428.85	422639.00	28035
07.09.12	431.55	481932.00	59294
08.09.12	433.50	529490.00	50388
09.09.12	434.20	540562.00	21058
10.09.12	434.50	553878.00	12305
11.09.12	435.35	553878.00	19988
12.09.12	433.90	539344.00	12274
13.09.12	433.25	528392.00	5648
14.09.12	432.70	509979.00	6447
15.09.12	432.05	494126.00	4493
16.09.12	432.35	501442.00	11913
17.09.12	433.05	518514.00	17071
18.09.12	434.40	551439.00	32925
19.09.12	434.30	549000.00	11677
20.09.12	433.55	530708.00	2740
21.09.12	432.90	514856.00	4884
22.09.12	433.30	524611.00	14438
23.09.12	433.80	536805.00	12194
24.09.12	434.40	551439.00	14634
25.09.12	434.50	553878.00	11056
26.09.12	434.40	551439.00	8065
27.09.12	434.15	545342.00	5245
28.09.12	433.7	534367.00	2388
29.09.12	433.2	522173.00	1384
30.09.12	432.8	512417.00	3714

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.10.12	432.25	495004	379
02.10.12	431.75	488810	1434
03.10.12	431.25	474616	1552
04.10.12	430.75	462422	1430
05.10.12	430.25	450228	1468
06.10.12	429.70	438034	2044
07.10.12	429.15	426045	3429
08.10.12	428.60	413956	3260
09.10.12	428.05	401866	3447
10.10.12	427.50	389777	3387
11.10.12	426.95	387127	3055
12.10.12	426.40	376848	2625
13.10.12	425.80	366568	1670
14.10.12	425.20	354421	1757
15.10.12	424.60	342277	1873
16.10.12	424.00	331993	2034
17.10.12	423.40	320779	19
18.10.12	423.00	313505	2268
19.10.12	422.50	303959	1215
20.10.12	422.05	295550	1345
21.10.12	421.75	289942	557
22.10.12	421.50	285269	NIL
23.10.12	421.30	281531	816
24.10.12	421.10	277793	804
25.10.12	420.85	273122	NIL
26.10.12	420.60	268449	NIL
27.10.12	420.40	264711	712
28.10.12	420.10	259104	NIL
29.10.12	419.80	254549	1013
30.10.12	419.50	250520	1561
31.10.12	419.20	246490	763

  
 Assistant Engineer  
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 Mukutmonipur, Bankura

  
 Executive Engineer  
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 Khatra, Bankura

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Kangsabati Reservoir Data for the year 2013(June to October)


Date	Reservoir Level (ft.)	Use Storage (Acf)	Inflow (Acf)
01.06.13	418.80	241118	67154
02.06.13	420.20	260973	19885
03.06.13	420.80	268445	7475
04.06.13	420.90	274055	5607
05.06.13	421.00	275924	1869
06.06.13	421.00	275924	NIL
07.06.13	421.00	275924	NIL
08.06.13	421.00	275924	NIL
09.06.13	421.00	275924	NIL
10.06.13	399.50	275924	NIL
11.06.13	421.20	279662	3738
12.06.13	421.30	281511	1869
13.06.13	421.35	282485	934
14.06.13	421.85	284334	1869
15.06.13	421.55	286203	1869
16.06.13	421.60	287138	935
17.06.13	421.65	288072	934
18.06.13	421.75	288941	1869
19.06.13	421.95	293679	3738
20.06.13	422.05	295568	1869
21.06.13	422.40	300900	6542
22.06.13	422.85	310500	8410
23.06.13	423.15	316106	5606
24.06.13	423.30	318010	2804
25.06.13	423.50	320648	3738
26.06.13	423.95	322059	8411
27.06.13	424.2	325791	4672
28.06.13	424.35	328584	2809
29.06.13	424.45	340409	1869
30.06.13	424.65	344140	3738


Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.07.13	425.30	356290.00	32149.00
02.07.13	425.75	364700.00	8410.00
03.07.13	426.00	368972.00	4672.00
04.07.13	426.15	372175.00	2809.00
05.07.13	426.35	375913.00	3738.00
06.07.13	426.40	376948.00	935.00
07.07.13	426.50	378717.00	1869.00
08.07.13	426.50	378717.00	NIL
09.07.13	426.50	378717.00	NIL
10.07.13	426.50	378717.00	NIL
11.07.13	426.50	378717.00	NIL
12.07.13	426.50	378717.00	NIL
13.07.13	426.55	379051.00	934.00
14.07.13	426.60	380586.00	935.00
15.07.13	426.65	381520.00	934.00
16.07.13	426.70	382455.00	935.00
17.07.13	426.70	382455.00	NIL
18.07.13	426.75	383389.00	934.00
19.07.13	426.80	384324.00	935.00
20.07.13	426.80	384324.00	NIL
21.07.13	426.85	385258.00	935.00
22.07.13	426.95	387127.00	1868.00
23.07.13	426.75	383390.00	1783.00
24.07.13	426.45	377783.00	4303.00
25.07.13	425.95	368437.00	2316.00
26.07.13	425.60	361836.00	6030.00
27.07.13	425.4	358159.00	7242.00
28.07.13	425.3	356002.00	12448.00
29.07.13	425.75	364700.00	16219.00
30.07.13	427.95	405818.00	47956.00
31.07.13	429.45	433852.00	32350.00

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.08.13	430.45	455106	25448
02.08.13	430.95	467300	18097
03.08.13	431.10	470958	10561
04.08.13	431.15	472177	3023
05.08.13	431.00	468519	4234
06.08.13	430.75	462422	3364
07.08.13	430.35	452867	1250
08.08.13	430.20	449009	5918
09.08.13	430.50	456325	17402
10.08.13	430.80	463641	15882
11.08.13	430.80	463641	6944
12.08.13	430.90	466080	6375
13.08.13	431.00	468519	5735
14.08.13	431.20	473397	7926
15.08.13	431.25	474616	4273
16.08.13	431.25	474616	3056
17.08.13	431.30	475835	4275
18.08.13	431.65	484971	11596
19.08.13	432.20	497785	16484
20.08.13	432.75	511198	18819
21.08.13	433.80	526806	42969
22.08.13	437.85	635578	155773
23.08.13	436.75	608751	74903
24.08.13	435.00	566072	22387
25.08.13	434.10	544123	10223
26.08.13	433.65	539148	5363
27.08.13	433.75	535587	6481
28.08.13	433.85	538026	8764
29.08.13	434.25	547781	17753
30.08.13	434.70	558756	18993
31.08.13	434.95	564861	15777

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.09.13	434.95	564861.00	9788
02.09.13	434.70	558756.00	4008
03.09.13	434.60	556317.00	7625
04.09.13	434.65	557536.00	11271
05.09.13	434.60	556317.00	8969
06.09.13	433.80	538806.00	3696
07.09.13	433.00	517295.00	2272
08.09.13	432.55	505320.00	1958
09.09.13	432.40	502662.00	4404
10.09.13	432.35	501443.00	5847
11.09.13	432.35	501443.00	2800
12.09.13	432.50	505101.00	3656
13.09.13	432.60	507540.00	2439
14.09.13	432.70	509879.00	2439
15.09.13	432.80	513417.00	2439
16.09.13	433.00	517295.00	4878
17.09.13	433.15	520953.00	3658
18.09.13	433.25	523392.00	2439
19.09.13	433.40	527051.00	3659
20.09.13	433.95	540464.00	13481
21.09.13	434.35	550220.00	9756
22.09.13	434.85	562414.00	17194
23.09.13	435.30	573388.00	10674
24.09.13	435.55	579485.00	6604
25.09.13	435.35	574608.00	4582
26.09.13	435.20	572950.00	6132
27.09.13	435.05	567291.00	8296
28.09.13	434.9	563633.00	8376
29.09.13	435.15	569730.00	18066
30.09.13	436.05	591679.00	33553

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.10.13	436.30	597776	25889
02.10.13	436.40	600215	26798
03.10.13	437.90	636792	63713
04.10.13	438.00	639236	42812
05.10.13	437.00	614848	12028
06.10.13	436.15	594118	3720
07.10.13	435.60	580705	7867
08.10.13	434.95	564863	5264
09.10.13	434.85	552659	2507
10.10.13	434.50	551878	10977
11.10.13	434.00	551499	8221
12.10.13	434.00	541684	928
13.10.13	433.75	535587	4455
14.10.13	433.40	523383	165248
15.10.13	433.30	520953	58469
16.10.13	437.65	620700	18200
17.10.13	437.45	625823	11706
18.10.13	437.30	622164	10615
19.10.13	437.15	618506	10586
20.10.13	436.75	608751	4459
21.10.13	436.30	597776	5149
22.10.13	436.40	600215	10958
23.10.13	436.15	594118	8080
24.10.13	435.60	580705	5443
25.10.13	435.10	568511	4484
26.10.13	435.15	569730	23058
27.10.13	434.30	644114	190240
28.10.13	437.95	638017	22995
29.10.13	437.25	620945	11201
30.10.13	437.40	624603	10955
31.10.13	437.60	629481	8864

  
 75/02/17  
 Assistant Engineer  
 Sub-Division Officer  
 K.L.B. Sub-Division-II  
 Mukutmonipur, Bankura

  
 14/2/17  
 Executive Engineer  
 Kangsabati Canal Divn-II  
 Khatra, Bankura

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Kangsabati Reservoir Data for the year 2014(June to October)

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.06.14	415.05	190751	192
02.06.14	415.05	190751	NIL
03.06.14	415.05	190751	NIL
04.06.14	415.05	190751	NIL
05.06.14	415.00	190081	NIL
06.06.14	415.00	190081	NIL
07.06.14	415.00	190081	NIL
08.06.14	415.00	190081	NIL
09.06.14	414.95	189409	NIL
10.06.14	414.95	189409	NIL
11.06.14	414.90	188736	NIL
12.06.14	414.90	188736	NIL
13.06.14	414.85	188066	NIL
14.06.14	414.85	188066	NIL
15.06.14	414.85	188066	NIL
16.06.14	414.85	188066	NIL
17.06.14	414.85	188066	NIL
18.06.14	414.85	188066	NIL
19.06.14	414.85	188066	NIL
20.06.14	414.85	188066	NIL
21.06.14	414.85	188066	NIL
22.06.14	414.85	188066	NIL
23.06.14	414.95	188409	1343
24.06.14	414.05	150752	1343
25.06.14	415.05	190751	NIL
26.06.14	415.05	190751	NIL
27.06.14	415.05	190751	NIL
28.06.14	415.05	190751	NIL
29.06.14	415.05	190751	NIL
30.06.14	415.05	190751	NIL

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.07.14	415.05	190752.00	NIL
02.07.14	415.05	190752.00	NIL
03.07.14	415.10	191423.00	671.00
04.07.14	415.25	198499.00	2016.00
05.07.14	415.35	194781.00	1343.00
06.07.14	415.65	198801.00	4023.00
07.07.14	415.70	199489.00	672.00
08.07.14	415.85	201497.00	2004.00
09.07.14	415.90	202109.00	672.00
10.07.14	415.95	202840.00	671.00
11.07.14	416.05	204183.00	1343.00
12.07.14	416.05	204183.00	NIL
13.07.14	416.20	206198.00	2015.00
14.07.14	416.25	206860.00	671.00
15.07.14	416.35	208212.00	1343.00
16.07.14	416.45	209865.00	1343.00
17.07.14	416.50	210227.00	672.00
18.07.14	416.55	210898.00	572.00
19.07.14	416.65	212242.00	1343.00
20.07.14	416.85	214928.00	2686.00
21.07.14	417.00	215942.00	2015.00
22.07.14	417.15	218957.00	2015.00
23.07.14	417.25	220300.00	1343.00
24.07.14	417.40	222314.00	703.40
25.07.14	417.55	224329.00	2015.00
26.07.14	417.65	225672.00	1343.00
27.07.14	417.75	227015.00	1343.00
28.07.14	417.85	228358.00	1343.00
29.07.14	417.95	229701.00	1343.00
30.07.14	418.15	234388.00	2687.00
31.07.14	418.35	239074.00	2686.00

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.08.14	418.45	239103	4029
02.08.14	418.95	243152	4029
03.08.14	419.20	246490	3,358
04.08.14	419.45	248948	3,358
05.08.14	419.60	251869	2,015
06.08.14	419.95	256563	4,700
07.08.14	420.20	260979	4,410
08.08.14	420.40	254711	3,738
09.08.14	420.85	273122	8,421
10.08.14	421.55	285208	12,082
11.08.14	422.40	302090	15,896
12.08.14	422.80	303605	7,475
13.08.14	422.65	306792	4,949
14.08.14	422.40	302090	5,961
15.08.14	422.50	303958	12,076
16.08.14	422.45	303024	9078
17.08.14	422.35	301155	8405
18.08.14	422.35	301155	10,396
19.08.14	422.15	297417	7556
20.08.14	421.85	291810	6025
21.08.14	421.35	282461	3090
22.08.14	420.90	274055	4583
23.08.14	420.50	266579	5464
24.08.14	420.00	257235	3635
25.08.14	419.45	249848	5463
26.08.14	418.90	242461	5425
27.08.14	418.4	235745	5884
28.08.14	417.9	229030	5655
29.08.14	417.55	221643	4787
30.08.14	416.75	213584	4253
31.08.14	416.15	205526	4234

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.09.14	415.55	197468.00	4000
02.09.14	415.75	200154.00	4343
03.09.14	416.25	208269.00	6715
04.09.14	416.70	212913.00	6044
05.09.14	416.90	215599.00	2686
06.09.14	417.10	218285.00	2686
07.09.14	417.20	219628.00	1343
08.09.14	417.35	221643.00	2685
09.09.14	417.60	225001.00	3358.00
10.09.14	417.75	227015.00	2014.00
11.09.14	417.88	228358.00	1343.00
12.09.14	417.90	229030.00	672.00
13.09.14	417.95	229701.00	671.00
14.09.14	418.10	231716.00	2015.00
15.09.14	418.30	234402.00	2686.00
16.09.14	418.50	237088.00	2686.00
17.09.14	418.75	240446.00	3358.00
18.09.14	418.95	243132.00	2686.00
19.09.14	419.10	245147.00	2015.00
20.09.14	419.10	244490.00	1343.00
21.09.14	419.25	247162.00	672.00
22.09.14	419.55	251191.00	4029.00
23.09.14	420.70	270317.00	19126.00
24.09.14	421.20	279662.00	9345.00
25.09.14	421.60	287138.00	7476.00
26.09.14	421.90	290875.00	3738.00
27.09.14	421.95	293679.00	2808.00
28.09.14	422.05	296548.00	1869.00
29.09.14	422.1	296481.00	935.00
30.09.14	422.15	297418.00	935.00
31.09.14	416.15	205526	4234

Date	Reservoir Level (ft.)	Live Storage (Acf)	Inflow (Acf)
01.10.14	422.05	295548	NIL
02.10.14	421.70	289207	900
03.10.14	421.20	279562	501
04.10.14	420.65	269323	725
05.10.14	420.10	259104	731
06.10.14	419.45	249848	1780
07.10.14	418.70	239775	1932
08.10.14	417.85	228358	1303
09.10.14	417.05	217513	1812
10.10.14	416.70	206198	1028
11.10.14	415.30	194110	550
12.10.14	414.50	183365	1763
13.09.14	414.65	171949	1051
14.10.14	412.90	161876	2845
15.10.14	412.00	149789	201
16.10.14	411.15	138173	715
17.10.14	410.65	131657	2711
18.10.14	410.45	128971	5090
19.10.14	410.20	125613	2878
20.10.14	410.00	122927	1864
21.10.14	409.80	120073	2686
22.10.14	409.30	116437	NIL
23.10.14	408.95	113192	1243
24.10.14	408.60	109947	1195
25.10.14	408.25	106702	1347
26.10.14	407.95	103457	1528
27.10.14	408.15	106775	2412
28.10.14	408.25	106702	927
29.10.14	408.35	107620	927
30.10.14	408.40	108085	464
31.10.14	408.40	108085	

13/12/17  
 Assistant Engineer  
 Sub-Division Officer  
 K.L.B. Sub-Division-II  
 Mukutmonipur, Bankura

14/12/17  
 Executive Engineer  
 Kangsabati Canal Div-II  
 Khajra, Bankura

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**Kangsabati Reservoir Data for the year 2015(June to October)**


Date	Reservoir Level (ft.)	Live Storage (Acht)	Inflow (Acht)
01.06.15	403.55	63126	
02.06.15	403.55	63126	
03.06.15	403.55	63126	
04.06.15	403.55	63126	
05.06.15	403.55	63126	NIL
06.06.15	403.55	63126	NIL
07.06.15	403.55	63126	NIL
08.06.15	403.55	63126	NIL
09.06.15	403.55	63126	NIL
10.06.15	403.55	63126	NIL
11.06.15	403.55	63126	NIL
12.06.15	403.55	63126	NIL
13.06.15	403.55	63126	NIL
14.06.15	403.55	63126	NIL
15.06.15	403.55	63126	NIL
16.06.15	403.55	63126	NIL
17.06.15	403.55	63126	NIL
18.06.15	403.55	63126	NIL
19.06.15	403.55	63126	NIL
20.06.15	403.55	63126	NIL
21.06.15	403.55	63126	NIL
22.06.15	403.55	63126	NIL
23.06.15	403.55	63126	NIL
24.06.15	403.55	63126	NIL
25.06.15	403.55	63126	NIL
26.06.15	403.55	63126	NIL
27.06.15	403.55	63126	NIL
28.06.15	403.55	64053	927
29.06.15	403.75	64980	927
30.06.15	403.85	65907	927


Date	Reservoir Level (ft.)	Live Storage (Acht)	Inflow (Acht)
01.07.15	403.95	66834.00	927.00
02.07.15	404.05	67761.00	927.00
03.07.15	404.25	69616.00	1854.00
04.07.15	404.40	71006.00	1391.00
05.07.15	404.55	72397.00	1391.00
06.07.15	404.85	75179.00	2781.00
07.07.15	405.40	80278.00	5099.00
08.07.15	407.35	97430.00	17152.00
09.07.15	409.30	116437.00	19007.00
10.07.15	410.35	127628.00	11191.00
11.07.15	414.00	176650.00	49022.00
12.07.15	413.30	196795.00	20146.00
13.07.15	416.00	208512.00	6715.00
14.07.15	416.40	208884.00	5192.00
15.07.15	418.70	212013.00	4029.00
16.07.15	416.95	216271.00	3358.00
17.07.15	417.25	220900.00	4029.00
18.07.15	417.75	227015.00	6715.00
19.07.15	419.15	245818.00	18803.00
20.07.15	419.88	255220.00	9402.00
21.07.15	420.85	269383.00	14163.00
22.07.15	421.65	28079.00	18690.00
23.07.15	423.20	298352.00	10778.00
24.07.15	422.55	304893.00	8621.00
25.07.15	423.05	314338.00	9345.00
26.07.15	423.10	315172.00	9487.00
27.07.15	423.25	317976.00	13095.00
28.07.15	425.00	350683.00	43320.00
29.07.15	432.7	509979.00	136405.00
30.07.15	431.50	480713.00	27027.00
31.07.15	430.05	445350.00	5319.00

Date	Reservoir Level (ft.)	Live Storage (Acht)	Inflow (Acht)
01.08.15	429.20	429173	9164
02.08.15	431.45	479493	71022
03.08.15	433.20	522173	54347
04.08.15	433.95	540454	33187
05.08.15	433.95	540464	10514
06.8.15	433.70	534357	4391
07.08.15	432.90	514856	251
08.08.15	432.00	492907	1001
09.08.15	431.05	469738	826
10.08.15	430.05	445350	1726
11.08.15	428.70	419834	2958
12.08.15	427.40	395538	569
13.08.15	426.45	377782	7514
14.08.15	422.50	360027	2999
15.08.15	424.70	345076	547
16.08.15	424.30	337650	3276
17.08.15	423.85	329189	4798
18.08.15	423.25	317976	2125
19.08.15	422.70	307696	3218
20.08.15	422.30	300221	6035
21.08.15	421.90	292745	5888
22.08.15	421.60	287138	7222
23.08.15	421.10	277793	3134
24.08.15	420.55	267514	2614
25.08.15	419.85	255220	581
26.08.15	419.20	246490	2884
27.08.15	418.8	241118	5517
28.08.15	418.65	239103	5037
29.08.15	418.55	237760	5403
30.08.15	418.40	235745	2152
31.08.15	418.85	237088	1615

Date	Reservoir Level (ft.)	Live Storage (Acht)	Inflow (Acht)
01.09.15	418.80	241118.00	4080.00
02.09.15	419.20	246490.00	5372.00
03.09.15	419.50	250519.00	4029.00
04.09.15	419.65	252534.00	2015.00
05.09.15	419.75	253877.00	1343.00
06.9.15	419.85	255220.00	1343.00
07.09.15	419.90	255891.00	671.00
08.09.15	420.00	257235.00	1343.00
09.09.15	420.05	258169.00	934.00
10.09.15	420.10	259003.00	934.00
11.09.15	421.10	259103.00	NIL
12.09.15	419.40	249176.00	1711.00
13.09.15	418.50	237088.00	757.00
14.09.15	417.70	226344.00	2216.00
15.09.15	415.90	215599.00	2440.00
16.09.15	416.00	203512.00	1286.00
17.09.15	415.30	192767.00	2727.00
18.09.15	414.70	180679.00	1292.00
19.09.15	413.45	167920.00	587.00
20.09.15	412.40	155161.00	419.00
21.09.15	411.45	142402.00	267.00
22.09.15	410.50	129643.00	295.00
23.09.15	409.65	119682.00	345.00
24.09.15	409.30	116437.00	4125.00
25.09.15	409.70	120146.00	3938.00
26.09.15	409.85	121537.00	1391.00
27.09.15	409.95	122464.00	927.00
28.09.15	410.00	122927.00	463.00
29.09.15	410.05	123599.00	672.00
30.09.15	410.05	123599.00	NIL

Date	Reservoir Level (ft.)	Live Storage (Acht)	Inflow (Acht)
01.10.15	410.05	123599	NIL
02.10.15	410.05	123599	NIL
03.10.15	410.05	123599	NIL
04.10.15	410.05	123599	NIL
05.10.15	410.05	123599	NIL
06.10.15	410.05	123599	NIL
07.10.15	410.05	123599	NIL
08.10.15	410.05	123599	NIL
09.10.15	410.05	123599	NIL
10.10.15	410.05	123599	NIL
11.10.15	410.05	123599	NIL
12.10.15	410.05	123599	NIL
13.09.15	410.05	123599	NIL
14.10.15	410.05	123599	NIL
15.10.15	410.05	123599	NIL
16.10.15	409.10	114583	1001
17.10.15	408.90	109020	1027
18.10.15	408.15	105775	561
19.10.15	407.90	99748	451
20.10.15	406.85	93722	694
21.10.15	406.30	89622	921
22.10.15	406.70	92341	8014
23.10.15	406.80	93258	527
24.10.15	406.85	93722	464
25.10.15	406.85	93722	NIL
26.10.15	406.85	93722	NIL
27.10.15	406.85	93722	NIL
28.10.15	406.85	93722	NIL
29.10.15	406.85	93722	NIL
30.10.15	406.85	93722	NIL
31.10.15	406.85	93722	NIL

  
 Assistant Engineer  
 Sub-Division Officer  
 K.L.B. Sub-Division-II  
 Mukutmonipur, Bankura

  
 Executive Engineer  
 Kangsabati Canal Division  
 Bansa Bankura