Draft
Environmental Assessment
of
Proposed Alternate Road for Villagers Adjoining
Kaliakoir Hi-Tech Park

Kaliakoir Hi-Tech Park Authority (KHTPA)

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Environmental Specialist
August, 2013
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AP</td>
<td>Affected Person</td>
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<tr>
<td>ARIPO</td>
<td>Acquisition/Requisition of Immovable Property Ordinance</td>
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<tr>
<td>BP</td>
<td>Bank Procedure</td>
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<td>DOE</td>
<td>Department of Environment</td>
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<td>EA</td>
<td>Environmental Assessment</td>
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<td>ECA</td>
<td>Environmental Conservation Act</td>
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<td>ECC</td>
<td>Environmental Clearance Certificates</td>
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<td>ECR</td>
<td>Environmental Conservation Rules</td>
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<td>EMP</td>
<td>Environmental Management Plan</td>
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<td>EMF</td>
<td>Environmental Management framework</td>
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<td>GoB</td>
<td>Government of Bangladesh</td>
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<td>IEE</td>
<td>Initial Environmental Examination</td>
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<td>KHTP</td>
<td>KaliakoirHi Tech Parks</td>
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<td>KHTPA</td>
<td>KaliakoirHi Tech Parks Authority</td>
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<tr>
<td>MOEF</td>
<td>Ministry of Environment and Forest</td>
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<tr>
<td>NEMAP</td>
<td>National Environment Management Action Plan</td>
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<tr>
<td>NOC</td>
<td>No-objection-certificate</td>
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<tr>
<td>NWMP</td>
<td>National Water Management Plan</td>
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<tr>
<td>OP</td>
<td>Operational Policy</td>
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<tr>
<td>PAP</td>
<td>Project Affected People</td>
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<td>PSDSP</td>
<td>Private Sector Development Support Project</td>
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<tr>
<td>RAP</td>
<td>Resettlement Action Plan</td>
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<td>WB</td>
<td>World Bank</td>
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1. **INTRODUCTION**

1.1 **Background**

1. Government of Bangladesh is implementing, the Private Sector Development Support Project (PSDSP) with the financial assistance from The World Bank. The objective of the Hi-Tech Park project is to increase the employment in the country through the facilitation of investment in selected emerging growth centers in the manufacturing and services sectors of the economy.

2. An important component of this project is development of Kaliakoir Hi Tech Park (KHTP) by Bangladesh Hi Tech Park Authority (BHTPA) that houses Information and Communications Technology (ICT) enterprises catering to Bangladesh’s economy. The proposed site is located at about 40 km north of Dhaka. It is also about 25-30 km from the important northern suburb Uttara and HazratShajalal International Airport of Dhaka and is directly connected by road and a railway line to Dhaka. Substantial preparatory activities such as allocation of land, construction of boundary wall, preliminary expenditure on roads and administrative buildings have been carried out for the development of KHTP and the same is ready for park development.

3. The KHTP covers a total land area of 232 acres, all of which has been allocated by government. Substantial progress has been made in the last few years - a boundary wall has been partially completed and an administrative building and basic internal roads have been developed. At present there are few access road which passes through the Hi-Tech Park starting from east and north-east side of the project. Once the boundary wall completed then these access road will be closed and would affect and block the easy movement of the nearby villagers.

4. In order to complete the boundary wall, the project will result in the loss of a 15-feet wide paved approach road owned by the Local Government Engineering Department (LGED). Changes the alignment of road would be affect access of families to their social relations, places of work, healthcare and educational institutions. A diversion road had originally been proposed outside the perimeter of the Park and it was expected that this would require the acquisition of private lands. Given the difficulties and the delays associated with the acquisition process and the social impacts resulting from the displacement and resettlement of people, the project team has now decided to redesign the proposal to rehabilitate the original road and to build parts of it within the Park land, on its outskirts, thus avoiding any land acquisition or displacement of people. An Environmental Assessment (EA) is required for the construction of the road as per World Bank and Government of Bangladesh requirements.

5. An access road connecting nearby villages however passes through the proposed park, which will be lost due to the development of KHTP. In order to ensure easy access to the villages and the main highway, BHTPA proposes to develop an alternate access road around the boundary of the KHTP. In order to assess the environmental impacts of the proposed road, BHTPA intends to carry out an Environmental Assessment (EA) of the alternate road in
compliance with the Environmental Management Framework (EMF) of PSDSP and the safeguard policies of the World Bank (WB).

1.2 Objectives of the EA

6. The objectives of the EA will be to

- Review the proposed alignment and identify potential environmental and social impacts to be considered in the planning and design of the road
- Recommend specific measures to avoid / mitigate the impacts
- Prepare implementable Environmental Management Plan (EMP) integrating the measures to avoid the identified impacts and an appropriate monitoring and supervision mechanism to ensure EMP implementation.
- Recommend suitable institutional mechanisms to monitor and supervise effective implementation of EMF and respective EMPs.

The specific EMP developed for road will be fully integrated into the respective contracts and BOQs for implementation and operation of the road to ensure its adequate implementation.

1.3 Categorization

7. The project is classified as category “Orange B” for Department of Environment (DOE). WB categorizes all projects according to the magnitude or scale of their anticipated environmental impact. Projects with limited potential adverse environmental impact require an IEE, and are classified as Category B in accordance with WB’s Safeguard requirement as no significant impacts are envisioned. An environmental assessment and review procedures, and an initial environmental examination for core subprojects, were prepared and included.

1.4 Methodology

8. Environmental assessment (EA) is an integral part of resource development planning. It is essential that environmental issues are properly evaluated in terms of impacts and relevance, and are integrated into each stage of the project cycle. The proposed actions under the KHTP involve interventions in the implementation of various infrastructure in the project area. In conforming to the requirements of preparing an EA report, a methodology was developed in accordance with the WB’s environmental assessment guidelines. The period of preparing the EA was from 18 July 2013 to 20 August 2013, and field visits for data collection were done in 20th July 2013. The task of preparing the EA report consisted of the following sequential components:

- Familiarization with and review of various project actions of the PSDSP projects;
- Identification and screening of the environmental parameters relevant to the proposed project actions in the KHTP area through a scoping process;
• Assessment of the magnitude of the potential negative impacts for relevant environmental parameters through the use of Rapid Rural Appraisal (RRA) techniques in sample sites;

• Formulation of avoidance/mitigation measures to address the potential negative impacts, and preparation of a monitoring program during the period of project implementation;

• Outlining a set of recommendations/suggestions for institutional strengthening of the KHTPA to develop its in-house capability in environmental assessment tasks, especially issues of climate change and disaster risks.
2. **DESCRIPTION OF THE PROJECT**

2.1 **Description of the Project**

9. The proposed Kaliakoir Hi-Tech Park alternate access road project site is located at a distance of half a km from the Dhaka-Tangail Highway. The main railway line from Dhaka to Sirajganj crossing through the proposed alternate road project at Bakterpur forest area. A major portion of the alternate road is an undulating land with grass and bushes with existing Poursahava’s road. A part of the proposed alternate road is also fall under pond, agricultural land. A few habitants and trees are visible along the existing road and in the proposed alignment. The land has already been acquired. A few designated water bodies are present in the site. A 33 kV overhead transmission line crosses the site at two locations. An approach road to various villages crosses the site on the northern side of the railway track. LT (low tension) lines are also present in the proposed site area. The proposed site is located about 1.5 km southwest of the river Bangshi, a tributary to the river Turag. There are many branch roads passing through the Hi-Tech Park. The local people are using the road to come to Kaliakoir bazar, Bus stand, Dhaka-Tangail high way and other places.

10. The total length of the alternate road is 4.125 km. Most of the portion of the road is maintained by Kaliakoir Pourashava. Kaliakoir Pourashava to Khokan’s rice mill 6 m wide 200 m long existing road is belong to Pourashava and maintains by Pourashava. Khokan’s rice mill to Mondal’s house is 525 m long, Mondal’s house to Royal green is 750 m and 7 m wide. Royal green to Jalil’s rice mill is 1000 m length and wide 7 m and Jalil’s rice mill to Dhaka Tangail road at Fire service station is 1850 m. The width of the approach road varies from 3 m to 5 m. This width may not be sufficient for the ultimate maximum traffic scenario and hence an alternative route should be identified as approach road, or additional land should be acquired to widen the existing road. Photograph 1-14 shows the proposed alignment of the road.
2.2 Location of the Project

11. The proposed access alternate road of KHTP is located at staring from Khokan’s rice mill to Sanerchala village at north the West side is Dhaka-Tangail via Kaliakoir highway, East side is Bakterpur, Kamampur villages, Jalil’s rice mill, South side is Bakterpur village, Forest area, Jahanaraalamin spinning mill.

12. The proposed location of alternate road of KHTP is on the 0.5 km away west side of Dhaka-Kaliakoir road and adjacent to the Talibabad satellite station and the distance of the
KHTP is about 40 km from the Zero point of Dhaka City. The location map of the industry is shown in the relative location map (Fig. 1).

13. The surrounding area of the proposed road is of mix rural industrial in nature consisting of low and high agricultural land. A national high way from the Dhaka-Tangail road is passed through touching at the west side of the KHTP. On the eastern site of the project is passing through the social forest and the south side a garment industry and forest is situated. The river Bangshia tributary to the river Turag is 1.5 km away from the project side at the north.

Fig. 1 Location of the Project in District Map
2.3 Cross section of the Road

The pavement design of the road is shown in Fig. 4. The width of carriage way is 18 ft and the shoulder is 5 ft each side and slope is 2:1. The total width of the road is 28 ft and the total earth filling width and right of way is 56 ft.

![Fig. 3 Cross-sectional design of Alternate Road alignment](image-url)
Fig. 4 Earth Work Design Type-1
3. **RELEVANT POLICY AND REGULATIONS**


15. The importance of environmental consideration, occupational health & safety and land acquisition related to road construction projects has been recognized in a number of national documents. The major relevant policies, acts, rules and plans are:

*Environment*
- National Environment Management Plan, 1995
- Environmental Conservation Act (ECA), 1995
- Environmental Conservation Rules (ECR), 1997
- Environmental Courts Act, 2000

*Water Resources*
- National Water Policy, 2000

*Industry, Occupational Health & Safety and Construction*
- Industrial Policy, 2005
- The Bangladesh Labor Act, 2006

*Land Acquisition/Requisition*
- Acquisition/ Requisition of Immovable Property Ordinance (ARIPO, 1982)

3.1.1 **Environmental Policy, 1992 and Environment Action Plan, 1992**

16. The concept of environmental protection through national efforts was first recognized and declared with the adoption of the Environmental Policy, 1992 and the Environment Action Plan, 1992. The importance of policies in beefing up the environmental regime is recognized in a number of international instruments including the World Conservation Strategy in 1980 and the Brundtland Commission Report, 1987. Paragraph 14 of Chapter 8 of Agenda 21 underscored the necessity of formulation of national policies as well as laws for environmental protection and sustainable development. The major objectives of Environmental policy are to i) maintain ecological balance and overall development through protection and improvement of the environment; ii) protect the country against natural disaster; iii) identify and regulate activities, which pollute and degrade the environment; iv) ensure environmentally sound development in all sectors; v) ensure a sustainable, long term and environmentally sound base of natural resources; and vi) actively remain associate with all international environmental initiatives to the maximum possible extent.

3.1.2 **National Environment Management Plan, 1995**
17. The National Environment Management Action Plan (NEMAP, 1995), based on a
nationwide consultation program identified the main national environmental issues, including
those related to the water sector which EA practitioners should note. The main related national
conterns included flood damage, riverbank erosion, environmental degradation of water bodies,
increased water pollution, shortage of irrigation water and drainage congestion; various specific
regional concerns were also identified.

3.1.3 Bangladesh Environmental Conservation Act (ECA), 1995

18. The Environmental Conservation Act (ECA) of 1995 is the main legislative framework
document relating to environmental protection in Bangladesh. This umbrella Act includes laws
for conservation of the environment, improvement of environmental standards, and control and
mitigation of environmental pollution. This Act established the Department of Environment
(DOE), and empowers its Director General to take measures as he considers necessary which
includes conducting inquiries, preventing probable accidents, advising the Government,
coordinating with other authorities or agencies, and collecting & publishing information about
environmental pollution.

19. According to this act (Section 12), no industrial unit or project shall be established or
undertaken without obtaining, in a manner prescribed by the accompanying Rules, an
Environmental Clearance Certificate (ECC) from the Director General of DOE.

20. In addition, through a gazette notification date September 1, 2009, the High Court
declared the 4 rivers surrounding Dhaka, namely Buriganga, Turag, Balu and Shitolakhkhya, as
Ecologically Critical Areas, citing the ECA 1995, Section 5. Subsequently pollution creating
activities that are detrimental to the water and aquatic life in those rivers has been declared
forbidden.

3.1.4 Bangladesh Environmental Conservation Rules (ECR), 1997

21. The Environment Conservation Rules, 1997 were issued by the Government of
Bangladesh in exercise of the power conferred under the Environment Conservation Act (Section
20), 1995. Under these Rules, the following aspects, among others, are covered:

(i) Declaration of ecologically critical areas
(ii) Classification of industries and projects into 4 categories
(iii) Procedures for issuing the Environmental Clearance Certificate
(iv) Determination of environmental standards

22. These Rules were amended three times (17 February 2002, 26 August 2002 and 01 April
2003) to specify different sections like inclusion of Certificate of Fitness, Pollution Under
Control Certificate, Fees for Environmental Clearance Certificate and other services etc.
23. ECR’97 (Rule 7) classifies industrial units and projects into four categories depending on environmental impact and location for the purpose of issuance of ECC. These categories are:

- Green
- Orange A
- Orange B, and
- Red

24. All existing industrial units and projects and proposed industrial units and projects, that are considered to be low polluting are categorized under “Green” and shall be granted Environmental Clearance. For proposed industrial units and projects falling in the Orange- A, Orange- B and Red Categories, firstly a site clearance certificate and thereafter an environmental clearance certificate will be issued. A detailed description of those four categories of industries has been given in Schedule-1 of ECR’97. Apart from the general requirements, for every OrangeB and Red category proposed industrial unit or project, the application must be accompanied with feasibility report on Initial Environmental Examination (IEE), Environmental Impact Assessment (EIA) based on approved TOR by DOE, Environmental Management Plan (EMP) etc.

25. The ECR’97 also contains the procedures for obtaining Environmental Clearance Certificates (ECC) from the Department of Environment for different types of proposed units or projects. Any person or organization wishing to establish an industrial unit or project must obtain ECC from the Director General. The application for such certificate must be in the prescribed form together with the prescribed fees laid down in Schedule 13, through the deposit of a Treasury Chalan (Pay Order) in favor of the Director General. Rule 8 prescribes the duration of validity of such certificate (3 years for green category and 1 year for other categories) and compulsory requirement renewal of certificate at least 30 days before expiry of its validity.

26. The ECR’97 also establishes the National Environmental Quality (EQS) for ambient air, various water sources/ bodies, industrial effluents, etc. Table -1 shows Industrial Project Effluent standard for Bangladesh.

### Table 1 Bangladesh Standards for Industrial Project Effluent according to EQSB of DOE

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Unit</th>
<th>Discharge To</th>
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<td></td>
<td>Inland Surface Water Public Sewer from Secondary Treatment Plant Irrigable Land</td>
</tr>
<tr>
<td>1</td>
<td>Ammonia cal nitrogen (aselementaryN)</td>
<td>mg/l</td>
<td>50 75 75</td>
</tr>
<tr>
<td>2</td>
<td>Ammonia (as free ammonia)</td>
<td>mg/l</td>
<td>5 5 15</td>
</tr>
<tr>
<td>3</td>
<td>Arsenic (as As)</td>
<td>mg/l</td>
<td>0.2 0.05 0.2</td>
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<td>4</td>
<td>BOD₅ at 20°C</td>
<td>mg/l</td>
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<td>5</td>
<td>Boron</td>
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<td>6</td>
<td>Cadmium (as Cd)</td>
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<td>7</td>
<td>Chloride</td>
<td>mg/l</td>
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<td>Chromium (as total Cr)</td>
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<td>22</td>
<td>Nickel (as Ni)</td>
<td>23</td>
<td>Nitrate (as elementary N)</td>
</tr>
<tr>
<td>24</td>
<td>Oil and grease</td>
<td>25</td>
<td>Phenolic compounds (as C₆H₅OH)</td>
</tr>
<tr>
<td>26</td>
<td>Dissolved phosphorus (as P)</td>
<td>27</td>
<td>Radioactive substance</td>
</tr>
<tr>
<td>28</td>
<td>pH</td>
<td>29</td>
<td>Selenium (as Se)</td>
</tr>
<tr>
<td>30</td>
<td>Zinc (as Zn)</td>
<td>31</td>
<td>Total dissolved solids</td>
</tr>
<tr>
<td>32</td>
<td>Temperature</td>
<td>°C (summer)</td>
<td>40</td>
</tr>
<tr>
<td>33</td>
<td>Suspended solids</td>
<td>°C (winter)</td>
<td>40</td>
</tr>
<tr>
<td>34</td>
<td>Cyanide (As Cn)</td>
<td>Mg/l</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**Source:** Schedule –10, Rule-13, Environment Conservation Rules, 1997 (Page 3132 - 3134 of the Bangladesh Gazette of 28 August 1997) (Own authentic translation from original Bengali).

**Note:**
- These standards will be applicable for all industries other than those which are specified under ‘industrial sector specific standards’.
- These standards will have to be complied with from the moment of trial production in the case of industries and from the very beginning in the case of projects.
- These standards will have to be met at any point of time and at any sampling. In case of need for ambient environment condition, these standards may be made more stringent.
- Inland surface water will include drains, ponds, tanks, water bodies, ditches, canals, rivers, streams and estuaries.
- Public sewer means leading to fullfledged joint treatment facility comprising primary and secondary treatment.
- Land for irrigation means organized irrigation of selected crops on adequate land determined on the basis of quantum and characteristics of waste water.
- If any discharge is made into public sewer or on land which does not meet the respective definitions in notes 5 and 6 above, then the inland surface water standards will apply.

3.1.5 Environmental Courts Act, 2000

27. The Environment Court Act, 2000 has been enacted in order to establish environmental courts in each administrative division of Bangladesh. Under this Act, the court has concurrent jurisdiction i.e. to try both civil and criminal cases. The basis for instituting a case is a violation of the “environmental law”, meaning the Bangladesh Environment Conservation Act, 1995 (ECA) and Rules made thereunder. In particular the environment court is empowered to:

- Impose penalties for violating court orders;
- Confiscate any article, equipment and transport used for the commission of the offence;
- Pass any order or decree for compensation; iv) Issue directions to the offender or any person (a) not to repeat or continue the offence; (b) to take preventive or remedial measures with relation to any injury, specifying the time limit and reporting to the DOE regarding the implementation of the directions.

Under this Act the Director General of the DOE has the power to impose heavy penalties to industrial polluters who are dumping untreated wastewater into the environment or not operating their legally mandated ETPs.

3.1.6 Implications of Policies and Environmental Clearance Procedure

28. Legislative bases for EIA in Bangladesh are the Environmental Conservation Act 1995 (ECA’95) and the Environmental Conservation Rules 1997 (ECR’97). Department of Environment (DOE), under the Ministry of Environment and Forest (MOEF), is the regulatory body responsible for enforcing the ECA’95 and ECR’97. According to the ECR”97, construction/reconstruction/expansion of alternative road is classified as a “Orange B” category project. This will require initial environmental examination with EMP and DOE clearance.

29. It is the responsibility of the proponent to conduct an IEE and EIA of the development proposal. The responsibility to review EIAs for the purpose of issuing Environmental Clearance Certificate (ECC) rests on DOE. The procedures for “Orange B” Category include submission of:

   a. An Initial Environmental Examination (IEE)
   b. An Environmental Management Plan (EMP)
30. Environment clearance has to be obtained by the respective implementing agency or project proponent (private sector) from Department of Environment (DOE). The environmental clearance procedure for “Orange B” Category projects can be summarized as follows:

Application to DOE → Obtaining Site Clearance → Applying for Environmental Clearance → Obtaining Environmental Clearance → Clearance Subject to annual renewal

**Detailed steps for getting an Environmental Clearance Certificate:**

31. The following are the steps need to be followed in getting an environmental clearance certificate from the Department of Environment (DOE).

   (a) Feasibility Study Report of the Project (applicable only for proposed industries or projects);
   (b) Initial Environmental Examination (IEE) Report, layout plan (indicating the site), design and time-schedule to construct the road and the process-flow diagram;
   (c) Environment Management Plan (EMP)
   (d) No-objection-certificate (NOC) from the local authority;
   (e) Mitigation measure with respect of adverse environmental impacts together with a plan to reduce pollution load;
   (f) Outlines of relocation, rehabilitation plan (where applicable); and
   (g) Other relevant information.

3.1.7 National Water Policy, 1999

32. The National Water Policy was promulgated in 1999 with the intention of guiding both future public and private actions to ensure the optimal development and management of water that benefits both individuals and the society at large. The policy aims to ensure progress towards fulfilling the national goals of economic development, poverty alleviation, food security, public health and safety, decent standard of living for the people and protection of natural environment. According to the policy, all agencies and departments entrusted with water resource management responsibilities (regulation, planning, construction, operation, and maintenance) will have to enhance environmental amenities and ensure that environmental resources are protected and restored in executing their tasks. Environmental needs and objectives will be treated equally with the resources management needs.

The policy has several clauses related to the protection of the natural environment. Some of the relevant clauses are:

**Clause 4.5b:** Planning and feasibility studies of all projects will follow the Guidelines for Project Assessment, the Guidelines for People's Participation (GPP), the Guidelines for Environmental Impact Assessment, and all other instructions that may be issued from time to time by the Government.

**Clause 4.9b:** Measures will be taken to minimize disruption to the natural aquatic environment in streams and water channels.
Clause 4.12a: Give full consideration to environmental protection, restoration and enhancement measures consistent with National Environmental Management Action Plan (NEMAP) and the National Water Management Plan (NWMP).

Clause 4.12b: Adhere to a formal environmental impact assessment (EIA) process, as set out in EIA guidelines and manuals for water sector projects, in each water resources development project or rehabilitation program of size and scope specified by the Government from time to time.

3.1.8 Industrial Policy, 2005

33. Several sections of the policy highlight the importance of environmental issues in industrial development.

Section 2.11: Provide all necessary assistance for producing environment-friendly product with the objective for creating a pollution-free environment in the industrial sector.

Section 3.24: Arrange for incentives to be given for research and development, acceptance and transfer of environmentally friendly appropriate technology. At the same time, develop market-oriented institutional structure in overall technological development.

Section 17.1: One of the foremost objectives of the Industrial Policy 2005 is to help attain competitive efficiency by developing technology, reducing consumers’ costs by using cost-effective technology, and assisting in the development of an environmentally friendly industrial production system.

Section 18.6: Environmental pollution control: The Environmental Protection Act 1995 and other relevant legislations are gradually implemented to control environmental pollution. Those industries that pollute the environment and endanger public health must ensure safety measures in respect of environmental pollution control. Industrial enterprises will be encouraged to obtain ISO-14000 certificates.

3.1.9 Bangladesh Labor Act, 2006

34. The Bangladesh Labor Act, 2006 provides the guidance of employers’ extent of responsibility and workmen extent of right to get compensation in case of injury by accident while working. Some of the relevant Sections are:

Section 150. Employer’s Liability for Compensation: (1) If personal injury is caused to a workman by accident arising out of and in the course of his employment, his employer shall be liable to pay compensation in accordance with the provisions of this Act; and (2) Provided that the employer shall not be so liable - (a) in respect of any injury which does not result in the total or partial disablement of the workman for a period exceeding three days; (b) in respect of any injury, not resulting in death or permanent total disablement, caused by an accident which is directly attributable to - (i) the workman having been at the time thereof under the influence of drink or drugs, or (ii) the willful disobedience of the workman to an order expressly given, or to a rule expressly framed, for the purpose of securing the safety of workmen, or (iii) the willful
removal or disregard by the workman of any safety guard or other device which he knew to have been provided for the purpose of securing the safety of workmen.

**Section 151.** (1) **Amount of Compensation:** Subject to the provisions of this Act, the amount of compensation shall be as follows, namely :- (a) where death results an amount equal to fifty from the injury cent of the monthly wages of the deceased workman multiplied by the relevant factor; or an amount of fifty thousand rupees, whichever is more; (b) where permanent total an amount equal to disablement results from sixty the injury per cent of the monthly wages of the injured workman multiplied by the relevant factor, or an amount of sixty thousand rupees, whichever is more; and (2) On the ceasing of the disablement before the date on which any half-monthly payment falls due, there shall be payable in respect of that half-month a sum proportionate to the duration of the disablement in that half-month.

### 3.1.10 Acquisition and Requisition of Immovable Property Ordinance, 1982

35. Currently the only legal framework that governs land acquisition in Bangladesh is the **Acquisition and Requisition of Immovable Property Ordinance, 1982.** The Acquisition of Immovable Property Rules, 1982 (No. S. R. O. 172-U82) are made for the exercise of the powers conferred upon by Section 46 of the Acquisition and Requisition of Immovable Property Ordinance, 1982 (Ordinance. No. II of 1982). The rules spell out the procedural details required for the acquisition of immovable properties in the following sub-heads:

- Proceedings for acquisition
- Notices under sections 3, 6, and 7
- Declaration of acquisition and possession
- Declaration of abatement and revocation of proceedings
- Transfer of acquired land
- Assessment of compensation, and
- Unutilized acquired property

In other words, when the pre-requisites are fulfilled, the step-wise activity of land acquisition process that has to be followed is given below:

- Submission of land acquisition proposal by the requiring body to the Deputy Commissioner.
- Holding District Land Acquisition meeting and providing land allocation.
- Serving Notice under Section 3 to the affected persons.
- Joint verification of the acquired property
- Final approval of land to be acquired by the Deputy Commissioner (for area of land 50 big has or less) or the Land Ministry (for area of land over 50 big has) on the basis of land area requirement.
- Serving notice under Section 6 to settle any dispute
- Estimation of jointly verified property for cost compensation and informing requiring body.
- Acceptance of estimate of cost compensation and placement of fund to the Deputy Commissioner by the requiring body.
- Serving Notice under Section 7 by the Deputy Commissioner to the affected land owners for disbursement of compensation.
- Disbursement of compensation as per estimate to the affected persons.
- Giving possession of land to the requiring body.
- CCL payment by the Deputy Commissioner.

3.1.12 Gaps in Acquisition and Requisition of Immovable Property Ordinance, 1982

36. The provisions in acquisition and requisition of Immovable Property Ordinance are not adequate to address adverse impacts associated with land acquisition and involuntary displacement and do not fully satisfy the requirements of the Bank’s Operational Policy (OP 4.12) on Involuntary Resettlement or that of the international practices. In essence, the law is largely indifferent to the landowners’ present socio-economic conditions, or the long-term adverse impacts on incomes and livelihood that the acquisition and displacement may cause on the affected people. Also, there are no other policies that complement the acquisition ordinance in ways to assess, mitigate and monitor adverse impacts that the affected people may suffer. Some of the salient gaps in the existing legal framework are summarized below:

- **Avoiding/Minimizing Land Acquisition**: The law only implicitly discourages unnecessary acquisition, as lands acquired for one purpose cannot be used for a different purpose, and lands that remain unused be returned to the original owners. However, there are no mechanisms to monitor if these conditions are actually adhered to.

- **Eligibility for Compensation**: The law stipulates compensation only for the persons who appear in the land administration records as the owners. It does not recognize the rights of those, such as squatters, who do not possess a legal title to the lands they live in or make a living from. There is thus no provision to mitigate the adverse impacts they suffer.

- **People who are impacted through loss of income are not recognized**: The Land Acquisition Act provides for compensation for lands and other fixed assets built and grown on them (structures, trees and orchards, crops and any other developments like ponds, built amenities, etc.). However there is no provision to assess the impacts on peoples” incomes, livelihood, loss of employment and businesses for mitigation measures to restore loss of incomes and livelihood.

- **Compensation Standards**: Although the law stipulates payment of compensation at market prices' for acquired lands as the just compensation, the legal assessment procedures used almost always results in prices that are far below the actual market prices.

- **Relocation of Displaced Persons**: There is no provision in the existing laws for relocation of displaced families who are affected by the loss of their assets: land and/or structures.

- **Ensuring Payment/Receipt of Compensation**: The legal process to determine entitlements are too cumbersome and time consuming and do not ensure payment of compensation prior to their displacement. Lands are legally acquired and handed over to the project execution agency as soon as the authority identifies the owners (or 'awardees'), by examining the records, and sends a legal notice advising them to claim
the compensation (or 'awards'). The onus is left on the affected land owners to prove, by producing an array of documents, that the acquired lands legally belong to them. As gathering these documents is a long, expensive and cumbersome process, many landowners may be unable to claim their awards. The project has meanwhile started to use the lands.

- **Socio-economic Rehabilitation**: The existing legal framework does not have any provisions to mitigate long-term impacts on peoples’ livelihoods caused by their displacement. Except for the compensation at the ‘market price’ for the loss of land, there are no other provisions, in the acquisition or other laws that require the government to mitigate the resultant adverse impacts caused by the acquisition. Socioeconomic rehabilitation of the involuntarily displaced persons is totally absent in the legal regime of the country.

### 3.2 World Bank Policies on Environment and Social Safeguard

37. The World Bank's environmental and social safeguard policies are a cornerstone of its support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. Safeguard policies have often provided a platform for the participation of stakeholders in project design, and have been an important instrument for building ownership among local populations.

38. The effectiveness and development impact of projects and programs supported by the Bank has substantially increased as a result of attention to these policies. The World Bank has ten environmental, social, and legal safeguard policies. The World Bank's environmental assessment policy and recommended processing are described in Operational Policy (OP)/Bank Procedure (BP) 4.01: Environmental Assessment. This policy is considered to be the umbrella policy for the Bank's environmental "safeguard policies" which among others include: Natural Habitats (OP 4.04), Forests (OP 4.36), Pest Management (OP 4.09), Physical Cultural Resources (OP 4.11), and Safety of Dams (OP 4.37). Operational Policies (OP) are the statement of policy objectives and operational principles including the roles and obligations of the Borrower and the Bank, where as Bank Procedures (BP) are the mandatory procedures to be followed by the Borrower and the Bank. The Complete list of safeguard policies is given below and relevant policies are discussed.

**Environmental Policies**
- OP/BP 4.01 Environmental Assessment
- OP/BP 4.04 Natural Habitats
- OP/BP 4.09 Pest Management
- OP/BP 4.36 Forests
- OP/BP 4.37 Safety of Dams

**Social Policies**
- OP/BP 4.10 Indigenous Peoples
- OP/BP 4.11 Physical Cultural Resources
- OP/BP 4.12 Involuntary Resettlement
Legal Policies
OP/BP 7.50 International Waterways
OP/BP 7.60 Disputed Areas

39. In addition to the 10 safeguard policies, BP 17.5 exists as the Bank Disclosure Policy, which also relates to safeguards. Bank disclosure Policy supports decision making by the Borrower and Bank by allowing the public access to information on environmental and social aspects of projects. The policy requires disclosure in both English and Local language before project appraisal and must meet the World Bank standards.

3.2.1 OP/BP 4.01 Environmental Assessment

40. Environmental Assessment is one of the 10 environmental, social, and legal Safeguard Policies of the World Bank. Environmental Assessment is used in the World Bank to identify, avoid, and mitigate the potential negative environmental impacts associated with Bank lending operations. In World Bank operations, the purpose of Environmental Assessment is to improve decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted.

41. The Bank requires environmental assessment (EA) of projects proposed for Bank support to ensure that they are environmentally sound and sustainable, and thus to improve decision making. EA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed project. EA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. EA takes into account the natural environment (air, water and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples and physical cultural resources); and transboundary and global environmental aspects. The borrower is responsible for carrying out the EA and the Bank advises the borrower on the Bank’s EA requirements.

42. The Bank classifies the proposed project into three major categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

Category A: The proposed project is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.
Category B: The proposed project’s potential adverse environmental impacts on human population or environmentally important areas—including wetlands, forests, grasslands, or other natural habitats—are less adverse than those of Category A projects. These impacts are site specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than Category A projects.

Category C: The proposed project is likely to have minimal or no adverse environmental impacts.

3.2.2 OP/BP 4.04 Natural Habitats

43. The conservation of natural habitats, like other measures that protect and enhance the environment, is essential for long-term sustainable development. The Bank therefore supports the protection, maintenance, and rehabilitation of natural habitats and their functions in its economic and sector work, project financing, and policy dialogue. The Bank supports, and expects borrowers to apply, a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. The Bank promotes and supports natural habitat conservation and improved land use by financing projects designed to integrate into national and regional development the conservation of natural habitats and the maintenance of ecological functions. Furthermore, the Bank promotes the rehabilitation of degraded natural habitats. The Bank does not support projects that involve the significant conversion or degradation of critical natural habitats.

3.2.3 OP/BP 4.11 Physical Cultural Resources

44. Physical cultural resources are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Their cultural interest may be at the local, provincial or national level, or within the international community. Physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic and social development, and as integral parts of a people's cultural identity and practices. The Bank assists countries to avoid or mitigate adverse impacts on physical cultural resources from development projects that it finances. The impacts on physical cultural resources resulting from project activities, including mitigating measures, may not contravene either the borrower's national legislation, or its obligations under relevant international environmental treaties and agreements. The borrower addresses impacts on physical cultural resources in projects proposed for Bank financing, as an integral part of the environmental assessment (EA) process. The following projects are classified during the environmental screening process as Category A or B, and are subject to the provisions of this policy: (a) any project involving significant excavations, demolition, movement of earth, flooding, or other environmental changes; and (b) any project located in, or in the vicinity of, a physical cultural resources site recognized by the borrower. Projects specifically designed to support the management or conservation of physical cultural resources are individually reviewed, and are normally classified as Category A or B. When the project is likely to have adverse impacts on physical cultural resources, the borrower identifies appropriate measures for avoiding or mitigating these impacts as part of the EA process. These measures may range from full site
protection to selective mitigation, including salvage and documentation, in cases where a portion or all of the physical cultural resources may be lost.
4. ENVIRONMENTAL BASELINE

4.1 General

45. Gazipur district (coordinate 22°11’N90°20’E) with an area of 1,741.53 aq. km, is bounded by Mymensingh and Kishoreganj districts on the north, Dhaka Narayanganj and Narsingdi on the south, Narsingdi on the east, Dhaka and Tangail district on the west. The main rivers are Brahmaputra, Shitalakshya, Turag, Bangshi, Balu and Banar. The Figure -3 shows the map of Gazipur district. This chapter provides the detailed baseline and analysis for the proposed project area.

4.2 Physical Environment

4.2.1 Topography

46. Topography of the project area is undulating, with pond, social forest and high land. The project lies on the Madhupur Clay with its average thickness of about 10 meters consists of over-consolidated clayey slit and is underlain by the Pleistocene DupiTila formation. Most depression, pond and river are tectonically controlled.

47. The proposed Kaliakoir Hi-Tech Park is situated alongside Dhaka-Tangail highway and is about 40 km away from the capital city of Dhaka. The total extent of the KHTP site area is about 275.68 acres. The topographical land survey was carried out using a high-precision total electronic surveying station with computerized traversing and contouring. Spot levels were taken on a grid of 10x10 m. The grids were suitably reduced for locating the prominent physical features of the terrain. The spot levels were also taken at grade changes, so as to capture the details of the grade changes / slopes. The entire station was checked periodically for horizontal and vertical collimation. The site slopes towards the water bodies within the boundary. The level of the land varies from +3.960 to +14.54 M with considerable undulations. The site is irregular in shape. A 33kV transmission line crosses the site at two locations. The master planning has been carried out to achieve the maximum leasable area within these constraints.

4.2.2 Surrounding land use

48. The site is located at Bakterpur, JanerChala, Panchlakhi, PirerTek and Latifpur village under 4 No. word of KaliakoirPourashava of Gazipur District. The total area of land for the proposed road project is about 2.89 hectare. The site is located 40 km from zero point of Dhaka in the north-west. A part of the proposed road is consists of existing bituminous road, some parts is narrow earthen road, some portion is herring bone and some portion is need to be newly construct and link with the proposed road. The existing level of land is almost 1.0-3 meter below of the national highway level. The proposed location enjoys the adjacent national high way at the west side. Talibabad satellite station is adjacent with the main Hi-tech par project area. Like other parts of Bangladesh agricultural crops is not dominate within the area. The main crops are paddy, wheat, potatoes, garlic and other vegetables. There are few industries located along the existing road network. Some lands are used for seasonal cultivations. The Dhaka-Tangailhigway is the main access road to the proposed Kaliakoir Hi-Tech Park. The region has a railway station
called Mirzapur on the west and Mouchak on the east, which are about 14 Km and 6 Km away from the proposed park respectively. Even though a railway line passes through the site, the nearest railway stations are located at a distance of about 14 km and 6km from the site. Therefore, a new railway station can be constructed near the Kaliakoir Hi-Tech Park for bettering the connectivity.

4.2.3 Climate

49. Gazipur has a humid sub-tropical climate with large variations between summer and winter temperatures. The cluster has a tropical monsoon climate. It has three main seasons.

<table>
<thead>
<tr>
<th>Season</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer/Pre-monsoon</td>
<td>March to May</td>
</tr>
<tr>
<td>Rainy Season/monsoon</td>
<td>June to October</td>
</tr>
<tr>
<td>Winter season</td>
<td>November to February</td>
</tr>
</tbody>
</table>

The rainy season is hot and humid having about 90 percent of the annual rainfall. The winter is predominately cool and dry. The summer is hot and dry interrupted by occasional heavy rainfall. The annual average temperature maximum 36°C and minimum temperature is about 12.7°C. Annual rainfall is about 2,376 mm.

4.2.4 Meteorological information of the project area (Temp., Rainfall, Humidity, Wind, Evaporation)

50. The region has tropical monsoon climate with alternating dry/wet seasons. Including the pre-rainy season, there are three marked seasons:

November to February: The dry (winter) season is the coolest and driest period. Monthly average temperatures are below 29°C with a minimum at 13°C. Rainfall is very rare during this period (below 30 mm/month). Winds are predominantly blowing from the Northwest but with a high frequency of calm wind situations.

March and April: In the pre-rainy season (summer) and the early months of the west seasons, the highest temperatures are reached. The monthly average temperature can raise up to 34°C. During this period, air becomes more humid, rainfall increases, and heavy rains with thunderstorm occur. This period is locally called as “Kalbaaishakhi”. Sometimes the rain falls with hail.

May to October: In the west season (“monsoon period”) more than 85% of the total annual rainfall occurs. Monthly average temperatures remain high with a maximum of 33°C. The period of periodic heavy thunderstorms lasts until June. June to mid-September to early November is the transitional period with decreasing rainfall, often thunder. During the wet season, the winds are predominantly blowing from the South.
During the pre-monsoon period, squally winds of up to 130 km/h or occasionally more, often accompanied by thunderstorms may damage assets and crops. Cyclonic storms occurring in the Bay of Bengal in April-May and October-November rarely penetrate as far as Gazipur district, but may cause serious damage to crops, livestock, assets, and people when they do so. Monsoon rains are generally not stormy, but downpours of 50-75 mm per day are not uncommon and rainfall with more than 250mm per day is occasionally experienced. The relative humidity rises to above 90% during the wet season. The mean annual evaporation is high, with the highest daily figures occurring during March to May which are the months when the mean daily temperatures are at their highest.

The mean monthly maximum temperature for Dhaka varies from 25.3°C in January, to 34.4°C in April. A maximum daily of 42.2 and a minimum of 5 Degrees Celsius have been recorded. The mean daily maximum temperatures rise during March (33.3°C) and April as a prelude to the oncoming rains. As is to be expected, the mean daily maximum temperature drops when the rainy season starts. Fig. 5 shows the maximum Average Temperature (2001-2011) and Fig. 6 Minimum Average Temperature (2001-2011). Fig. 7 shows the maximum Average Rainfall (2001-2011) and Fig. 8 Minimum Average Humidity (2001-2011).
Fig. 6 Minimum Average Temperature (2001-2011)

Fig. 7 Shows the maximum Average Rainfall (2001-2011)
Fig. 8 Minimum Average Humidity (2001-2011).

4.2.5 Geology and Geomorphology

51. The project area lies on the southern corner of Madhupur Tract along the Old Brahmaputra, Turag, Bangshi and Sitolakkhya Rivers. This tract is made of sediments of Pleistocene age which is underlain by the Plio-Pleistocene DupiTila Formation. The study area lies in the deep geosynclinals part. It is characterized by a huge sedimentary sequence of mostly tertiary age testified high tectonic instability or mobility. The stratigraphy of the deep basin including fore deep and fold belt to the southeast is characterized by an enormous thickness of tertiary sedimentary succession. The rocks encountered here are much younger in geologic age and ranges between Oligocene and Recent time. The basin has got the record of rapid subsidence and sedimentation. Geological structure in Gazipur is delineated mainly based on geophysical survey named as Titas structure. This is an anticlinal fold, which has no surface geomorphic expression and is covered by Titas-Meghna River floodplain deposits. Titas anticline is a north-south elongated semi-domal structure influenced by tectonically positive element from the deep subsurface. Titas anticlinal closure is one of the largest (168 km) in Bangladesh. The structure is asymmetric in nature with steeper dip in the eastern flank and gentler slope in the western flank. There has been indication of faulting in the deeper level in the eastern flank, as shown by seismic reflection discontinuities.

4.2.6 Surface Water Resources

52. As other parts of the country, this area also receives sufficient amount of rainfall (average annual rainfall is 2376 mm). Turag River is the major surface water body in the project area under the Gazipur district. This river is used for local navigation and multipurpose uses during monsoon, carrying wastewater from the adjoining industries and to carry runoff water from
adjoining agricultural lands, which might contain pesticides and residual fertilizers. These are also used for seasonal fishing purposes. Regarding pollution load concern, Turag River receives discharges from all the industries situated along the Joydebpur-Tangail road and Konabari-Kashimpur Industrial Zone, which include textiles, footwear, food, chemical, pharmaceutical, detergent, etc. Some of the industries have got their own effluent treatment plant (ETP) and many of them have got no ETP, as a result the surround surface water bodies are polluted, which is a major concern of environmental degradation of the surface water. There are many brick manufacturing industries around the bank of Turag River and the burnt brick are carried through boats along the Turag River. Many people use boats along the Turag River for their local transportation.

53. There is a discharge gauge station in Bangshi River (Station No. SW301) located at Kaliakair about 1 kilometer downstream of the proposed project site. Discharge of this station is available from January 1980 to December 2010. In normal years the peak varies from 700-800 cubic metres on an average. In the year of extreme flood, the discharge drastically reached the peak at a value of 2,200 cubic metres. The average annual minimum discharge of the Bangshi River in the period 1980 to 2010 was around 25 m$^3$/sec. In some years, lean flow below 5-10 m$^3$/sec occurred during the month of March to June.

4.2.7 Surface water quality

54. The Bangshi river water is polluted by different industrial treated, and partially and untreated effluent discharge directly to the river. A surface water sample from pond was taken near the proposed site on 2$^{nd}$ August 2013 and analyzed in the laboratory. Physically we found that the pond water is turbid and brown in color. The Detailed of surface water quality test results of parameter like pH, TDS, EC, DO, TSS, BOD and COD is shown in Table 2. During discussion with local people inform us that there is no arsenic and the quality of ground water is good.

![Photo 15: Pond water sample collection on 2$^{nd}$ August 2013](image-url)
### Table 2: Surface water chemical parameters

<table>
<thead>
<tr>
<th>SN</th>
<th>Parameter</th>
<th>Unit</th>
<th>Concentration of Pond Water</th>
<th>Bangladesh (DoE) Standard for Surface water</th>
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<tbody>
<tr>
<td>01</td>
<td>pH</td>
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<td>6.5 - 8.5</td>
</tr>
<tr>
<td>02</td>
<td>EC</td>
<td>µS/cm</td>
<td>43</td>
<td>2250</td>
</tr>
<tr>
<td>03</td>
<td>Total Suspended Solid (TSS)</td>
<td>mg/l</td>
<td>55</td>
<td>NYS</td>
</tr>
<tr>
<td>04</td>
<td>Total Dissolved Solid (TDS)</td>
<td>mg/l</td>
<td>29</td>
<td>NYS</td>
</tr>
<tr>
<td>05</td>
<td>DO</td>
<td>mg/l</td>
<td>7.2</td>
<td>≥5</td>
</tr>
<tr>
<td>06</td>
<td>BOD</td>
<td>mg/l</td>
<td>9</td>
<td>≤10</td>
</tr>
<tr>
<td>07</td>
<td>COD</td>
<td>mg/l</td>
<td>16</td>
<td>NYS</td>
</tr>
</tbody>
</table>

Source: Enviro Quality Lab

### 4.2.8 Ground Water Resources

55. There is a good availability of ground water that is being used by hand pumps for drinking and domestic purposes. Groundwater is currently the chief source of water in and around Kaliakoir. Manually operated pumps and power driven tube wells are employed to extract groundwater from a depth of 150 to 200 feet. The arsenic concentration in shallow aquifers within Gazipur district is reported to be within the allowable limit of 0.05 mg/l\(^1\). Some industries are using deep tube wells within their premises to meet the requirement of quality water for various purposes. The scattered homesteads are using hand tube well (HTW) to meet their domestic demand.

### 4.2.9 Hand tube well

56. According to DPHE the total number of hand tubewells in Kaliakair are 2929. But there are many private hand tube wells. The Kaliakair population is 4,00,000 (DPHE). Every 50 people of that area use 1 hand tubewell. Most tube wells are manually operated and only few wells are operated by electric powered centrifugal pump. The ground water consumption of Kaliakoir for domestic purpose around 20000 m\(^3\)/day. The industrial use of ground water is huge. The actual amount of industrial use is not known.

### 4.2.10 Ground water quality

57. Detail of hydrological investigation will be performed during the detail feasibility study. However a few of the chemical parameters of tested in order to get the primary idea regarding the quality of ground water. Iron concentration is found higher than standard. Table 3 Shows the groundwater chemical parameters.

---

Table 3  Groundwater chemical parameters

<table>
<thead>
<tr>
<th>SN</th>
<th>Parameter</th>
<th>Unit</th>
<th>Concentration of Ground Water</th>
<th>Bangladesh (DoE) Standard for Ground Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>pH</td>
<td></td>
<td>8.2</td>
<td>6.5 – 8.5</td>
</tr>
<tr>
<td>02</td>
<td>EC</td>
<td>µS/cm</td>
<td>690</td>
<td>2250</td>
</tr>
<tr>
<td>03</td>
<td>Total Dissolved Solid (TDS)</td>
<td>mg/l</td>
<td>360</td>
<td>1000</td>
</tr>
<tr>
<td>04</td>
<td>DO</td>
<td>mg/l</td>
<td>4.4</td>
<td>4.5-8</td>
</tr>
<tr>
<td>05</td>
<td>Iron</td>
<td>mg/l</td>
<td>1.6172</td>
<td>0.3-1.0</td>
</tr>
<tr>
<td>06</td>
<td>As</td>
<td>mg/l</td>
<td>Nil</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Source: Enviro Quality Lab

4.2.11 Air Quality

58. The air shed of the project area beyond 5 km during dry season is dominated by high emissions from the brick fields, the majority of those operating with simple technology (FCK) and produces high emissions of soot, \( \text{SO}_2 \) and \( \text{NO}_x \) from burning of Coal/Firewood. Industrial operation emit also huge volume of SPM, \( \text{SO}_2 \) and \( \text{NO}_x \) during fuel burning. Around the project site there is no brick field and polluting industries hence the project area is found quite clean and rural in nature.

4.2.12 Noise Level

59. The noise level was measured at day time in front of main gate and main office building of KHTP at 5 sec interval and shown in Table 4. The alignment of the road is passes through the rural and forest area and hence there is no noise source and hence noise was not measured.

![Photo 16 & 17: Noise level data collection in front of the main building and main gate](image)
Table 4 Noise level data

<table>
<thead>
<tr>
<th>SN</th>
<th>Location</th>
<th>Time</th>
<th>Results in dB Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Main Office Building</td>
<td>12:26:05 PM</td>
<td>53.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:26:11 PM</td>
<td>52.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:26:15 PM</td>
<td>50.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:26:19 PM</td>
<td>52.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:26:23 PM</td>
<td>50.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:26:27 PM</td>
<td>50.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:26:31 PM</td>
<td>51.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:26:35 PM</td>
<td>50.6</td>
</tr>
<tr>
<td>02</td>
<td>Main Gate of the Project</td>
<td>12:37:23 PM</td>
<td>53.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:37:27 PM</td>
<td>59.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:37:31 PM</td>
<td>56.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:37:35 PM</td>
<td>54.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:37:41 PM</td>
<td>53.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:37:45 PM</td>
<td>52.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:37:49 PM</td>
<td>57.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:37:51 PM</td>
<td>56.8</td>
</tr>
<tr>
<td></td>
<td>DoE (Bangladesh) Noise Standard for Residential area</td>
<td>50Day Time(6 am-9 pm)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Methods/Instruments</td>
<td>Sound Level Meter (SL-4033SD) Calibration at 94dB</td>
<td></td>
</tr>
</tbody>
</table>

Source: Enviro Quality Lab

4.3 Ecological Resources

60. The ecological settings of the cluster are mostly with wetland, homestead and roadside vegetation etc. The homestead vegetation has a positive effect on improvement of soil moisture through shading and mulching process. The trees growing at homesteads also ensure for easy access to the fuel wood, fodder and other products. A large number of multipurpose trees (fruit, timber, fodder, medicine) are grown in the cluster. The most common among them are jackfruit, mango, lemon, banana etc. Two major types of fauna viz., terrestrial and aquatic fauna have been identified in and around the cluster.

4.3.1 Flora

61. Wetland flora plays a vital role for biodiversity conservation. The wetland habitat is characterized by anaerobic conditions, which inhibits normal plant growth. The cluster supports two types of wetland e.g., (a) Permanent wetland and (b) Seasonal wetland. The permanent wetland includes rivers and perennial water bodies. This wetland provides refuge and shelter for the most of the aquatic flora. The seasonal wetland serves as the cultivated land. Aquatic flora in
the cluster can be divided into communities based on a set of environmental conditions. The communities are as follows:

- Free-floating plants
- Submerged floating plants
- Rooted floating plants
- Sedges and meadows
- Marginal vegetation

### 4.3.2 Forest and Protected Areas

62. Bhawal National Forest and Bhawal National Park is the biggest forest and protected area with the Gazipur district. These are far away from the proposed road sites and no negative environmental impacts are anticipated due to construction of road. Social forestation was done in the project area.

### 4.3.3 Birds, Wildlife and Wetland Habitats

63. Leaving aside the common birds like crows, sparrows, shaliks, cuckoos etc. and some domestic cattle, no other wild animals inhabit the area. The wildlife that fully depends on the terrestrial land throughout their whole life, their existence, shelter, food, nesting, breeding and also producing own offspring is called terrestrial fauna. Core components of the terrestrial fauna are amphibian, reptile, birds and mammals.

### 4.3.4 Fisheries

64. Fresh water fish habitat such as river, pond and ditches exist in and around the project site, which provide shelter, feeding, and spawning ground for different types of fresh water fish species. Large-scale human intervention for catching fresh water fishes from their natural habitat/Turag River has been observed. The reproduction, breeding and multiplication of aquatic fishes are very finely tuned and adjusted to the rhythm and amplitude of monsoon flooding in and around the proposed project. There are many fishermen within the area whose income source is mainly fishing from the Turag River as well as natural canals.

### 4.4 Social and Cultural Profile

65. Social & cultural profile of this project area is similar to other parts of Bangladesh. Muslims represent about 90% of the local population, Hindus & other religion represent about 10%. Muslims observe big festivals of End-all Azha&Eid-ul-Fitr and Hindus observe Durga Puja, Kali Puja etc.

#### 4.4.1 Population and Community Characteristics

66. The population of the district as per 2001 Census is 2,026,244 with male 51.77%, female 48.23%; Muslim (91.9%) is the dominant religion and other are Hindu (7.5%), Christian (0.4%) and Others (0.2%). Ethnic nationals are Rajbangshi (Koch), Garo and Mandi.
4.4.2 Socio-Economic Conditions

67. The Average literacy is 36.25% (male 43.2% and female 29.3%). The major sources of income within the population of this area are agriculture, agricultural labour, wage labour, industrial labour, commerce, small shops, small shops in the markets, service, transport, construction, fisheries, hawker, house renting out, land renting out for the Brick field and others.

4.4.3 Physical Cultural Resources

68. There are many physical cultural resources within Gazipur District, e.g. Bhawal National Park, Bhawal National Forest, Social forest, BhawalRajbari, Natural beauty of Pirojali, Turag River, Old Brahmaputra, Bangshi, Balu&Banar Rivers.

4.4.5 Heritage and Archaeology

69. There are no sites of significant archaeological value or sites of tourist interest within the project area or vicinities. There is a single graveyard and a graveyard situated at the east side of the proposed project. There is a Sarerpukura believe where two Sur (Ox) were disappeared in 100 year ago. People from the surrounding area and frequently visit the area for relief of mental satisfaction of any. Sunday and Thursday area are huge crowded here due many people are visit to come here for relief mental distress or any kind of sacrifice for greater benefits.

4.4.5 Communication facilities in the project

70. The proposed site for IBPL having all the infrastructures facilities like electricity, gas, telephone, national highway, river transport and railway etc. The proposed project site is a good communication network with other parts of the country. The Bangshi River passes through adjacent to the site. The Bangshiriver is connecting with the Turag River. The river has good navigation facility in the rainy season but limited navigation facility the dry season.

4.4.6 Soil types and distribution

71. The Soil types and distribution is shown in Fig 9 of the project area.
4.4.7 Geology

72. The proposed project area is situated in a non floodplain area. The soil is non acidic and sandy silt (Fig. 10) and neutral to moderately alkaline.
3.15 Natural Disasters

4.4.8 Flooding

As Kaliakoir lies in the Middle region of Bangladesh and adjacent to Bangshi River, the project area has less risk of natural disasters like cyclone, flood and earthquake due to the location in a geographically elevated area. The area is low flood risk zone record of 1988 & 1998 flood level. The communication never disrupted or stop during the high flood. The national highway is above the high flood level. The Bangshiriver is use for natural and industrial wastewater drainage catchment.

The area faces no river flooding (Fig. 11).
4.4.9 Detail of last 20 years of flooding

74. The Fig 12 shows the detail of last 30 year monthly average variation (1980-2010) of flood situation in Bangladesh. From the fig it is found that 1988 and 2008 July to October surface water level increases and maximum water level found in August to September.

4.4.10 Cyclones

75. Cyclones occur in the Bay of Bengal mainly in two seasons – April to May and October to November. Due to the funnel shaped coast of the Bay of Bengal, Bangladesh very often becomes the landing ground of cyclones formed in the Bay of Bengal. Approximately 46 damaging cyclones were reported in the coastal area of Bangladesh from 1793 through May 2010. Thus cyclone frequency during this period averaged about once in every 4.5 years. These cyclones cause enormous damage to the nation’s lands, crops, infrastructure and lives of coastal
people. The alignment of cyclonic events is given in Fig. 13. The proposed project site is less cyclone prone.

![Fig. 13  Alignment of cyclonic events](image)

### 4.4.11 Seismicity

76. On the basis of distribution of earthquake epicentres and morphotectonic behaviour of different tectonic blocks Bangladesh has been divided into three generalised seismic zones. The centre Bangladesh is seismically intermediate zone and represented by zone II with Bask coefficient 0.05. Ground condition (firm or soft) has not been taken into consideration during the seismic zonation of Bangladesh. So, considering the seismic zoning of Bangladesh the project area is less medium vulnerable for earthquake. Characteristic features of seismic zonation of Bangladesh are presented in the Table 5.

77. As the project area is far away from river Padma and far from coastal region, so there is less risk of cyclone. The project area remains in the seismic zone II which is less vulnerable for earthquake (Fig. 14).

#### Table 5  Seismic Zones of Bangladesh

<table>
<thead>
<tr>
<th>Zoning</th>
<th>Area Mercalli Scale</th>
<th>Modified</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>North and eastern regions of Bangladesh (Seismically most active)</td>
<td>IX</td>
</tr>
<tr>
<td>II</td>
<td>Lalmai, Barind, Madhupur Tracts, Dhaka, Comilla, Noakhali and</td>
<td>VIII</td>
</tr>
</tbody>
</table>
According to the map Bangladesh has been classified into three seismic zones, with Zone-I the most severe and Zone-III the least. The project area falls in Zone-II, which is the medium severe zone.

**Fig. 14 Seismic map of Bangladesh**
5 IDENTIFICATION AND EVALUATION OF POTENTIAL IMPACTS

5.1 General Overview of Environmental Impacts

Identification of potential impacts and mitigation measures both are very important criteria of the EIA study for any project. Important Environmental and Social Components (IESCs) likely to be affected by the proposed road construction project are considered carefully to avoid, reduce and compensate any damages.

Identification of Impacts

In reviewing impacts, this section addresses the following issues:
- Land Utilization
- Crop Damage
- Noise and Vibration
- Air Quality
- Surface Water Quality
- Groundwater Quality
- Soil Resources
- Land Erosion
- Seismology
- Biodiversity
- Transportation / Traffic and
- Other Social Aspects

5.2 Pre-Construction Phase

5.2.1 Impact on Physical Environment

5.2.1.1 Land Use

In the preconstruction phase, the potential impacts are considered that either occur during project planning (such as social inequities due to insensitive land acquisition or negative effects due to project siting), or which occur during subsequent phases but are the direct consequence of activities which are carried out during the pre-construction phase.

5.2.1.2 Land Acquisition and Requisition
81. An almost --- hectares of land would be needed for acquisition and ---hectares would be needed for requisition. Some landowners would lose their land permanently due to acquisition while some others would have to temporarily give up their land on requisition.

5.2.2 Impact on Biological Environment

5.2.2.1 Biodiversity

82. Vegetation and shrub will be destroyed for clearing the proposed project area. Soil covering plants will be destroyed during pre-construction activities. These types of activities will create soil erosion in the project area.

5.2.2.2 Terrestrial ecosystem

83. A small amount of vegetation and shrub along the proposed alignment would be lost due to preparation of road. It would be necessary to cut few trees in the newly acquired land. Such activities would not hamper wildlife habitats. Though there are a few big trees along the alignment, a number of herbs and shrubs would be uprooted and some crop lands will be changed. However, the urban and sub-urban areas would be relatively less impacted due to their already degraded condition.

5.2.2.3 Aquatic ecosystem

84. The proposed road will not cross any river or canal. Only a part of the pond will be filled up for construction of road. Corrugated sheet will be used for preventing earth with pond water which can pollute pond water quality.

5.2.3 Impact on Socioeconomic Environment

5.2.3.1 Socioeconomic condition

85. In view of the fact that permanent acquisition and temporary requisition of land and ensuring a minimum safe distance is essentially required for construction of road It is unavoidable that the project execution has to cause socio economic impact on the people.

86. The basic and primary socio-economic impact of execution of the project, as such, is the one to be felt by the PAPs, where land, homestead, trees, structures and/or job/ business is either temporarily or permanently affected and therefore should provide due compensation/ resettlement as a measure for mitigation. Similarly, it’s socio-economic impact will also be felt
at the local and national level. Successful construction of road in designated area will contribute significantly to the economic growth at the national level.

87. The potential positive impact on the socio-economic condition at the local level which will generate employment of labour during construction activities. The road construction companies will engage a number of local people, thus creating employment opportunities as well as business opportunities for their goods and services.

88. On the other hand, the influx of outsiders may also cause some disruption to the social structure of the local people. KHTPA will seek to minimize this impact by introducing a Code of Behavior (to be agreed with the local communities). Potential impact will be temporary and minor.

89. In depth discussion of these issues and mitigation measure/compensation measure as per GoB regulations has been recorded by District Commissioner (DC), KHTPA will pay fair compensation through DC to the project affected persons.

5.2.3.2 Planning and Design

90. In the pre-construction phase potential impacts are considered that either occur during project planning and design (such as social inequalities due to insensitive land acquisition and requisition or negative effects due to project siting), or which occur during subsequent phases but are the direct consequences of activities which are carried out during the pre-construction phase.

5.3 Construction Phase

5.3.1 Impact on Physical Environment

5.3.2.1 Loss of vegetation

91. The project area is located in a undulated area and there remains few household. Most of the land of the proposed alternative road area is vacant, existing pacca, katcha, and herring bone bond road. The area is mainly vacant land and covered with green vegetations along the road and fallow land. The loss of vegetation is minor. Erosion during construction of road, leading to instability in soils and landslides, resulting in runoff and sedimentation in adjacent pond during construction

92. The soils of areas falling under the road construction would be disturbed during the construction period. A part of the existing walking road need to be filled up with 18 ft wide road
for construction at the pond area. The soil will be collected from nearby land available which ultimately made another pond. During heavy rainfall, the loosened topsoils would be eroded from the higher ridge and shoulder to the borrow pit side if the loosened and altered soils along the road are not compacted properly and sequentially deposited.

5.3.2.2 Disruption of Traffic

93. The proposed alternate road construction would be done on the existing road. This existing road will face temporary communication disruption. Smooth transportation of passengers and goods using this road will be impacted negatively in this regard.

5.3.2.3 Sanitation and drinking water facilities

94. The health of the project personnel, construction workers and laborers living at the base camp would be impacted if arrangement of sanitation and drinking water would not be ensured adequately and properly.

5.3.2.4 Housing facilities for workers

95. Inadequate housing facilities will be affected of the health of the workers. If the temporary shed will not constructed for construction workers and laborers for living at the base camp this will impact surrounding area as well as hamper construction activity. If the construction workers and laborers are engage from locally then housing and sanitation problem will be solved.

5.3.2.5 Air Quality

96. The impact of the project is related with generation of dust during transportation and filling up the low land by earth for newly constructed road. The construction equipment, diesel generator and soil will be transported to the road site and hence the surrounding area will busy with traffic and may impact on the air pollution and congestion of traffic movement.

5.3.2.6 Noise and Vibration

97. The noise and vibration produced during construction phase from the movement of vehicles, lorries and construction equipment will impact on public health both workers and local people. This impact will be minor and of short duration at any particular location along the road.

5.3.2.7 Blockage of waterways
98. No blockage of waterways will occur due to road construction, since there is no crossing of river or canal along the road alignment. Hence there will be no impact on canal water quality.

5.3.2.8 Soil and Water contamination

99. The accidental mixing of dust and earth in nearby pond water bodies may have an impact on the mother fish stock and other fishes. As a result, successive recruitment in the next fishing season would be lost which would reduce fish production.

5.3.2.9 Workers and public safety during construction

100. During construction period lack of any safety, protective equipment, emergency medical attention, elements by proper administrative control, engineering control, Emergency Response team may cause loss of property, life and disaster.

5.3.2.10 Surface and Ground Water

101. There will be no scope of groundwater and surface waters contamination due to no chemical, hazardous materials, fuel and solvent will be used during road construction.

5.3.2.11 Drainage System

102. During rainy season monsoon showers and pre-monsoon showers could lead to surface run-offs. Liquid waste will generate from cutting the earth during construction of road. Drainage congestion may occur if not properly manage drainage system.

5.3.3 Impact on Biological Environment

5.3.3.1 Biodiversity (Floral and Faunal)

103. Road side vegetation will be destroyed for clearing the proposed project area. Soil covering plants will be destroyed after such type of activities. These types of activities will create soil erosion in the project area. This will be short term and vegetation will recover within a season.

5.3.4 Impact on Socioeconomic Environment

5.3.4.1 Social Impacts due to Displacement of people

104. Since in this project there will be no displacement of people hence there is no social impact due to the project.
5.3.4.2 Workers and public safety issues

105. All workers recruited should be experience and trained in road construction activities specially in safety issues. All precaution and safety measure like first aid box, protective equipment for personnel, emergency medical attention, elements by proper administrative controls, engineering control and emergency response team should be ready to ensure workers and public safety issues. Adverse impacts upon income or living standards, due to land acquisition or other activities associated with construction. Due to land acquisition and requisition the owner of the land and dependent on the land may affect the income, livelihood and living standards of the area.

5.3.4.3 Employment Opportunity

106. Local manpower may qualify as drivers, and unskilled labour, and more rarely as equipment operators. Local manpower can 100% of the total labour force employed in construction. This should more than offset any temporary loss of agricultural and fishing employment, and there will be a resulting positive impact on the local economy.

5.4 Operation Phase

5.4.1 Impact on Physical Environment

5.4.1.1 Loss of use of Land

107. Potential environmental impacts from the operation of the road are limited to the loss of utility of land along the road alignment due to the requirement for a right of way. There is no physical negative impact during operation phase of the project instead there are positive impact.

5.4.1.2 Invasion of exotic plants due to creation of ROW’s

108. After establishment of original land surface there may invasion of exotic plants plantation due to creation of ROW which may affect the environment like drawing more water from the ground.

5.4.1.3 Loss of land use and impacts on agriculture and forests

109. No forest exists in the road alignment. But loss of land use for crop production will be hampered for one season.
5.4.2 Impact on Biological Environment

5.4.2.1 Biodiversity

110. Re-vegetation of the expose part will recover the biodiversity destroyed during the construction work. The road will be as it is after one season of construction.

5.4.3 Impact on Socioeconomic Environment

5.4.3.1 Impacts on the local market in change in demand for local services

111. The whole road will be constructed under the soil of agricultural land hence there will be no changes of local services.

5.4.3.2 Impacts due to creation of barriers for human and migratory life

112. Due to construction of road there will be no barrier for human and migratory bird. During operation period road will not be seen from the ground and no social impact will cause on human and migratory life

5.4.3.3 Impacts on archaeological sites, historical buildings/heritage

113. There is no archaeological, historical buildings/heritage site along the alignment of the road and hence no social impact will occur.

5.4.3.4 Impacts caused by inducting secondary development, such as squatters,

114. The RoW along the alignment of road is low land agricultural field and compensation to be given to the land owners hence there is no scope of squatters and also the land will be return after completion of road construction to the original land owner for agricultural use.

5.4.3.5 Fire and explosion related emergencies

115. Panic will be created during the fire and explosion related emergencies or an accident happened.

5.4.3.6 Threat to public safety
116. High standards of project operation, environmental impact mitigation measures and safety procedures must be maintained at all times for reducing the threat to public safety. The socio-economic impact of the project will be felt at local and national level. That is to say the successful implementation of this project in the respective areas will contribute significantly to the socio-economic growth both at the local and the national level. The potential impact on the socio-economic condition at the local level will be generated primarily from the employment of labour during the project activities. Contractor and subcontractors working for the project will engage several local people, thus creating employment opportunities as well as business opportunities for their goods and services.

117. On the other hand the influx of outsiders may also cause some disruption to the social structure of the local people. KHTPA will seek to minimize this impact by introducing a code of Behavior (to be agreed with the local communities). Potential impacts will be temporary and minor in nature.
6. ENVIRONMENTAL MANAGEMENT AND MITIGATION PLAN

6.1 Mitigation Measures of Project Impacts on land use, Noise and vibration, surface and ground water, air quality, bio diversity, socio economic aspects.

118. The potential impacts of such of the proposed access road construction are considered in turn, by phase of implementation. The potential environmental impact of project is assessed by phase of development activity, namely: preconstruction, construction and operation phase.

6.1.1 Preconstruction Phase

119. The construction of the 4.55 km access road starting from Khokan’s rice mill to Dhaka-Tangail highway near Fire service station will require 43.00 acre of land for acquisition and ---- acre for temporary requisition of land for two purposes: (a) 18-28 ft access road and (b) for construction of road.

120. In the pre-construction phase, potential impacts are considered that either occur during project planning such as social inequalities due to insensitive land acquisition or negative effect due to project sitting, excavation of land, or which occur during subsequent phases but are the direct consequence activities which are carried out during the pre-construction phase. Identified potential impact mentioned in the previous chapter and the suggested mitigation measure of preconstruction phase is described below.

Mitigation Measure

121. Land Use: A soil and land use survey should be carried out, at an appropriate level of detail, along the proposed road during the project planning phase, and an appropriate soil conservation plan developed. The survey should be aim to identify wildlife passageway which cross the proposed road alignment. Specific measure to be addressed in the soil conservation (erosion and fertility) plan will include identification of the depth of top soil to be carefully removed and stockpiled adjacent to the line of the trench at the start of excavation, for replacement during re-instatement and recommended soil improvement measure such as fertilizer application.

122. Land Acquisition and Requisition: Land acquisition would be done by maintaining proper GOB and WB land acquisition and resettlement guideline. All affected people will be given compensation properly as per Land Acquisition and Requisition of Immovable Properties Ordinance 1982 (ARIPO).
Bio-diversity:

- Vegetation clearance will be minimized
- Damage to habitat in non-work areas will be encouraged to grow to as near as possible its original condition

123. Socioeconomic Condition: Procedure for liaison with local people has to be established before commencement of the construction work. KHTPA must clearly explain to local people about the need for the project for both the country and regional contexts;

KHTPA must reassure the public about compliance with environmental impact mitigation measures and safety measures prepared for local communities;

Local communities must be consulted before commencing any future development projects in or near their community;

Large concentration of housing for construction labourers should be avoided

Staff to be recruited locally where feasible. KHTPA shall encourage contractor to employ local people during construction work;

Public relations programs with local communities should be continually maintained to advise on risks and safety;

High standards of project operation, environmental impact mitigation measures and safety procedures must be maintained all the times; Establish good relationships with local communities and help support their community activities;

To ensure proper compensation to the project affected people as the law of the country;

Representatives from local communities should be allowed to join the committee to ensure justice and transparency;

124. Planning and Design: Access road should be designed to cause minimum possible (economically and practically) dislocation of services and loss of productive land area. Careful road selection should aim to avoid sensitive location and to cross services without causing a loss of utility. Where the survey identified a wildlife passageway which crosses the proposed route, the restoration plan should include the re-instatement of the ground and the surface vegetation at such locations as far as possible to restore the pre-project conditions.
6.1.2 Construction Phase

125. In the construction phase potential impacts are those which results directly from the construction activity like soil erosion, soil contamination, loss of vegetation, noise, dust and gaseous emission, river crossing, sanitation, drinking water supply, drainage problem, oil spillage, solid waste disposal, bio-diversity, The mitigation measures are described below in detail of the above potential impact.

Mitigation Measure

126. Soil Erosion and Fertility Control Plan: The impact of access road construction on existing road and soil will be minimized in the long-term if construction and reclamation procedures are carried out according to strict soil protection guideline.

- Grading shall be limited as much as possible to minimize disturbing vegetated areas and subject them to potential erosion
- Develop an appropriate and comprehensive reinstatement and site clearance plan
- Strict supervision shall be maintained to ensure that a minimum area require for construction activities are cleared
- The contractor shall install erosion controls on all disturbed critical avoid earth work during rainy season, as appropriate
- Spoil piles shall not be placed on slopes greater than 5% or adjacent to water bodies where they may be washed away by high water or run off. The upper 30 cm fertile soil level should be conserved by segregating fertile spoil piles from common fill spoil piles.
- The soil is highly erodible in areas where vegetation has been disturbed. Disturbed slopes greater than 30 % shall be stabilized with sand bags, slopes between 5 and 30 % seeded and stabilized with jute mats anchored with stakes.
- The discharge flow shall be controlled to prevent washout of the vegetation and subsequent erosion.

6.1.2.1 Loss of Vegetation

127. Erosion can be minimized if the duration of construction is kept to a minimum, and if the reinstated road corridor is properly vegetated to the original position of the land. The soil conservation plan should be address the issue of erosion, and set out measure to be followed. Re-vegetation will recover the original position of the land.

6.1.2.2 Soil Contamination
hort term soil contamination can result from oil leaking from equipment and material and waste from construction activities and from contractor’ camp should be minimized or avoided it possible.

6.1.2.3 Supervise Contractors

Mitigation of such contamination is in the hands of the contractor, who should be required to produce and comply with site management plans. A spill prevention and clean up plan should form part of the site management plan. The contractors operations should be supervised by inspectors who are trained in identification and mitigation of environmental impacts.

6.1.2.4 Railway Line Crossing

The proposed project will cross one Rail line near at Bakterpur of -- km long alternate road project. For crossing the rail the authority will use level crossing or overpass on the rail truck.

6.1.2.5 Noise and Vibration

- Selecting ‘quiet’ working methods and use low noise equipment must be specified in construction contract tender documents.
- Construction activities should not take place at nighttime. If this is absolutely unavoidable, the contractor shall advise/consult with local community leaders.
- Local community should be consulted beforehand and reach an agreement over appropriate timing for noisy activities.
- Equipment will be maintained in good working order and, where appropriate, acoustic hood will be provided.
- Taking maximum advantage of shielding provided by onsite structures and off site natural features (tree, etc) to minimize noise levels at offsite receptor location.
- Try to avoid using heavy noise producing equipment.

6.1.2.6 Surface and Ground Water

Surface drainage shall be controlled to divert surface runoff away from the construction area;
- Side slope should be vegetated as soon as practicable;
- Strict supervision should be maintained to avoid blockage of natural pond during the construction period, and
- Container of sanitary waste should be adequately disposed off to avoid surface and ground water contamination.
6.1.2.7 Sanitation and Drinking Water

132. Arrangement of adequate sanitation and drinking water should be ensured and the workers should be aware to practice those facilities. Sanitary latrines shall be provided at each construction camp and waste dispose of through designing and constructing and appropriate septic system.

6.1.2.8 Drainage System

133. To avoid drainage congestion, completion of construction should be ensured within the dry season, so surface run-offs from the site are not expected. However near the end of dry period, pre-monsoon showers could lead to run-offs. Provision of dewatering should be made for ensuring proper drainage.

6.1.2.9 Oil Spill Plan

134. Equipment maintenance areas shall have proper house cleaning procedures. Oil, grease and chemical spill shall be cleaned up as they occur. An area specified for oil, lubricants and chemicals shall be set aside.

6.1.2.10 Waste Disposal Plan

135. Used oil and spilled oil shall be collected and recycled. Contaminated soils, paints, solvent or other chemicals etc. shall be collected and disposed of in an approved waste disposal site. Solid waste shall be collected and dispose of in an approved solid waste facility.

6.1.2.11 Air Quality

136. Machinery & equipment like generator engines and other heavy duty engines should be routinely inspected, good repair and maintained in good running condition to reduce exhaust emissions.

- Selecting short and direct routes for all the traffic
- Vegetation clearance during dry weather periods
- Excavated material and haul roads will be dampened with water during dry ambient Conditions;
- Vehicle speed restrictions shall be imposed to reduce dust generation and dispersion;
- Transport vehicles shall not be overloaded, and
- Visual inspection of equipment and vehicles shall be conducted on a regular basis to ensure no excessive emissions of black smoke.
- Good housekeeping (Strict fuel inventory and minimization of spillages, to reduce fugitive vapor emission

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6.1.2.12 Bio-diversity

137. Re-vegetation of the expose part will recover the biodiversity destroyed during the construction work.

- Should clear the RoW as minimum as possible
- Vegetation clearance will be minimized
- Damage to habitat in non-work areas will be encouraged to grow to as near as possible its original condition
- Tree cutting should be kept at a minimum stage, and
- Re-vegetation the expose part as early as possible just after completion of the project
- Natural fish production will be protected to the extent possible, by controlling water pollution caused by sanitary and solid waste, oil, grease and other chemicals and scheduling work when fish are not breeding.

6.1.2.13 Historical and Archaeological Resources

138. Mosques, temples, graves and graveyards will be protected by acquiring temporarily working space on the opposite side of the RoW. Equipment operators will be instructed to be especially careful not to damage the mosques, temple, grave and graveyards.

6.1.2.14 Workers and public safety during construction

139. During construction period first aid box, protective equipment for personnel, emergency medical attention, elements by proper administrative controls, engineering control, Emergency Response team should be ready for mitigate any accident.

6.1.2.15 Socio Economic Aspects

140. Procedures for liaison with local people to be established before commencement of the works. KHTPA should clearly explain to local people about the need for the project in both the county and regional contexts.

- KHTPA should also reassure the public about compliance with environmental impact mitigation measures and safety measures prepared for local communities;
- Local communities must be consulted before commencing any future development projects in or near their community;
- Large concentrations of housing for construction laborers should be avoided;
- Staffs are to be recruited locally where feasible. KHTPA shall encourage employing local people during construction work.
• Public relations programs with local communities should be continually maintained to advice on risks and safety. It is particularly important to appraise them about the preparations taken to meet any eventualities in course of construction and testing & commissioning stages.
• High standards of project operation, environmental impact mitigation measures and safety procedures must be maintained at all times;
• Establish good relationships with local communities and help support their community activities;
• To ensure adequate compensation to the project affected people as per the law of the country and WB; and
• The mitigation measure includes training in skills and necessary market assistance to start alternative income generating activities.

141. **Adverse impacts upon income or living standards, due to land acquisition or other activities associated with construction.**

142. Adequate and proper compensation should be provided to the affected person. Due to land acquisition and requisition the owner of the land and dependent on the land should be compensation properly. Training may be provided in order to build the affected people capacity for earning.

6.1.3 **Operation Phase**

143. In the operation phase, potential impacts are those which arise as a consequence of activities involved in project operation. These are mainly air emission and noise pollution.

6.2 **Environmental Management Measure Proposed**

144. Environmental baseline condition survey, socio-economic survey, biological resource survey and land use survey have identified the potential positive and negative impacts and in enabling development of the environmental management plan. An Environmental Management Plan (EMP) is an array of activities suggested for minimizing the effect of the negative impacts (mitigation) and increasing the benefits of the positive impacts (enhancement). The EMP also includes a monitoring plan to check if the intended benefits are accruing and for taking corrective measures before it is too late. All the measures are said to be successful when they comply with the Environmental Quality Standards (EQS) of Bangladesh.

145. The Environmental Management Plan (EMP) is the end-product of the EA study and should be integrated into the project design for sustainable development of the project. Integration of the EMP into the project design would minimize the effect of the negative impacts and increase the benefits of the positive impacts in addition to creating an opportunity to monitor the changes taking place in the environmental and social components at the pre-
construction, construction and post-construction phases. EMP for the three phases of road construction is presented in the following section. The benefit of the EA study would not be derived and would remain a theoretical exercise if the EMP is not integrated into the project design.

The Environmental Management Plan (EMP) includes the following:

i) Mitigation plan containing suggestion on measures aimed at minimizing the effect of the negative impacts;

ii) Enhancement plan containing suggestion on measures aimed at increasing the benefits of the positive impacts;

iii) Compensation plan suggesting measures required for paying compensation for negative impacts which cannot be mitigated;

iv) Contingency plan suggesting measures required for taking care of accidental events;

v) Environmental monitoring plan for detecting changes taking place due to the proposed interventions. The environmental monitoring plan includes suggestion of indicators on which data are to be collected, location and frequency of data collection and the institutional arrangements for the data collection.

vi) Costs of the EMP measures are estimated so that the same may be included in the project cost for economic and financial analysis.

146. In the context of a project, environmental management is concerned with the implementation of the measures necessary to minimize or offset adverse impacts and to enhance beneficial impacts, unless the mitigation and benefit enhancement measures as identified in the study are fully implemented.

6.3 Implementation of the Environmental Management and Mitigation Plan

Environmental Impacts of Road Construction and Recommended Mitigation Measures

147. Environmental Management Plan (EMP) includes a set of mitigation measures for minimizing or removing negative impacts, enhancement measures for further improvement of positive impacts, environmental monitoring arrangements for observing the changes induced by the project interventions and institutional arrangements for smooth implementation of environmental management plan. EMP for the road construction is presented in the following matrix Table 6.

**Table 6 EMP for the access road construction**
<table>
<thead>
<tr>
<th>Impact</th>
<th>Mitigation measure</th>
<th>Enhancement measure</th>
<th>Monitoring arrangements</th>
<th>Institutional Arrangements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Pre-construction Phase</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removal of all existing vegetation</td>
<td>Plantation of local trees to mitigate the loss and enhance the available breeding and roosting space for avi-fauna</td>
<td></td>
<td></td>
<td>KHTPA &amp; Contractors</td>
</tr>
<tr>
<td>Land acquisition and requisition</td>
<td>Appropriate compensation according to GoB land acquisition and requisition law in case of private land. For T.E. the transfer deeds have to be registered between KHTPA and DC office</td>
<td>Records in T.E., KHTPA and DC’s office</td>
<td>KHTPA</td>
<td></td>
</tr>
<tr>
<td>Encroachment of public/private properties at site</td>
<td>Compensation for crop loss and damage to properties during mobilization</td>
<td>Physical enumeration of loss by type and owner</td>
<td>KHTPA</td>
<td></td>
</tr>
<tr>
<td>Loss of vegetation and wildlife in the adjoining homestead area</td>
<td>Avoid disturbance as much as possible and minimize the vegetation removal</td>
<td></td>
<td>KHTPA</td>
<td></td>
</tr>
<tr>
<td><strong>B. Construction Phase</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air pollution</td>
<td>Cover the soil during transportation</td>
<td>Water should be sprayed during construction</td>
<td>KHTPA</td>
<td></td>
</tr>
<tr>
<td>Dust emission</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise and vibration pollution</td>
<td>From generator, compressor may be covered with sound and noise absorbing materials to absorb sound, noise and vibration</td>
<td>Conduct noise quality test to check with the specification. This test will be conducted during construction</td>
<td>KHTPA</td>
<td></td>
</tr>
<tr>
<td>Loss of land</td>
<td>Change of land use, Soil erosion and fertility</td>
<td>Restoration of disturbed soil to its original use or to an approved use</td>
<td>KHTPA</td>
<td></td>
</tr>
<tr>
<td>Soil pollution</td>
<td>Solid and liquid waste should not be spread over the project site. These are to be kept in container for safe disposal outside. Detail waste management plan</td>
<td>Surveillance team should periodically visit the project site for checking soil pollution, if a surveillance team formed by the implementing agency</td>
<td>KHTPA</td>
<td></td>
</tr>
<tr>
<td>Impact</td>
<td>Mitigation measure</td>
<td>Enhancement measure</td>
<td>Monitoring arrangements</td>
<td>Institutional Arrangements</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>Loss of species diversity</td>
<td>Vegetation clearance will be minimized. Damage to habitat in non-work areas will be encouraged to re-grow to as near as possible its original condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>any</td>
<td></td>
<td>KHTPA&amp; Contractor</td>
</tr>
<tr>
<td>Temporary loss of wildlife habitat due to construction activities</td>
<td>Avoid too much noise</td>
<td></td>
<td></td>
<td>Contractors</td>
</tr>
<tr>
<td>Change of local flood regime</td>
<td>Avoid blocking the stream flow and dumping sediment into the flow.</td>
<td></td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td>Labor employment</td>
<td></td>
<td>To prioritize employment of local skilled and unskilled labor</td>
<td>Daily labor logbook checking</td>
<td>KHTPA, and Contractor</td>
</tr>
<tr>
<td>Traffic congestion</td>
<td>Set up all traffic signals and warnings for children, women, disabled and other pedestrians. Make provision of an overpass so that people can move safely from residential area</td>
<td></td>
<td>Project construction plan and schedule</td>
<td>KHTPA and Contractor</td>
</tr>
<tr>
<td>Encroachment/ Obstruction to existing public passage to highway</td>
<td>Provide alternative access road to the highway for the nearby inhabitants Need to be shiftone grave yard SarerPukur need to be separate by constructing boundary wall</td>
<td></td>
<td>Alternative road construction plans and implementation thereof</td>
<td>Contractor and KHTPA</td>
</tr>
<tr>
<td>One graveyard and SarerPukur</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encroachment/ Obstruction to existing public and private land and properties at site</td>
<td>To compensate for the loss of crops or properties to the owners of land and structures to prepare the right of way from point to the site</td>
<td></td>
<td>Checking compensation payment register</td>
<td>Contractor</td>
</tr>
<tr>
<td>Health and Safety of workers and surrounding people</td>
<td>Necessary protective equipment and firefighting equipment should be kept in the project site. The workers should be trained in health and safety measures. Awareness of surrounding</td>
<td></td>
<td>Regular health check-up of workers. Monitoring of awareness raising activities such poster, bill</td>
<td>KHTPA&amp; Contractor</td>
</tr>
<tr>
<td>Impact</td>
<td>Mitigation measure</td>
<td>Enhancement measure</td>
<td>Monitoring arrangements</td>
<td>Institutional Arrangement</td>
</tr>
<tr>
<td>--------</td>
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<td>---------------------</td>
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<td>--------------------------</td>
</tr>
<tr>
<td>-</td>
<td>people should be made about the project activities and probable hazards.</td>
<td>-</td>
<td>board/ signboards.</td>
<td>-</td>
</tr>
</tbody>
</table>

**C. Post construction Phase**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Mitigation measure</th>
<th>Enhancement measure</th>
<th>Monitoring arrangements</th>
<th>Institutional Arrangement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drainage of surrounding areas</td>
<td>Pipe /culvert under access road and surface drain pipes are to be constructed.</td>
<td>Water level monitoring at peripheral pond and canals and low lying ditches.</td>
<td>Contractor and KHTPA.</td>
<td>-</td>
</tr>
<tr>
<td>Surface water quality may deteriorate due to sewage/ liquid waste disposal to near by river or ditches</td>
<td>Sewage from residential area should be kept in septic tank and domestic waste water may kept in lagoon. No sewage should be dumped in the pond or ditches or flood plain lands. Liquid waste and engine oils should be kept in tanks/drum to avoid contamination with water and soil. The liquid wastes may be incinerated and engine oil may be refined and used as fuel in small industries.</td>
<td>Conduct chemical water quality test for DO, BOD etc</td>
<td>KHTPA and Contractor</td>
<td>-</td>
</tr>
<tr>
<td>Soil pollution</td>
<td>Solid and liquid waste should not be spread over the project site. These are to be kept in container for safe disposal outside.</td>
<td>Surveillance team to periodically visit the project site for enquiring soil pollution</td>
<td>Contractors. A surveillance team formed by implementin g agency</td>
<td>-</td>
</tr>
<tr>
<td>Reduced habitat quality for vegetation and wildlife communities for the nearby homesteads</td>
<td>Reduce noise pollution by installing barriers both physically as well as biologically by developing green belt of local trees along the road</td>
<td>Monitor noise pollution and wildlife population periodically.</td>
<td>Contractor. A surveillance team formed by implementin g agency</td>
<td>-</td>
</tr>
</tbody>
</table>

**6.3.1 Organizational Management Aspects**

148. Executive responsibility for project management commonly involves a number of organizations, each with specific responsibilities for particular aspects during the preparatory works for site clearing, earth cutting and filling on site execution and post-construction operation & maintenance phases.
An important aspect of environmental management is the accumulation of a database of environmental measurements. The management measures shall have to be taken with regard to controlling the potential impacts that could, in broader terms, occur during the pre-construction, construction and operation and maintenance phases of the project and indicates responsibilities for the various actions concerned. The environmental management team should, at an early stage of project planning, prepare a detail schedule of management actions required along with fixation of specific individual responsibilities for these actions.

- Policy and Leadership
- Continuous Improvement
- Safety and Health
- Risk management
- Incident reporting and investigation
- Emergency preparedness and response
- Environmental protection
- Training and orientation
- Community relation
- Regulatory requirement

6.4 Emergency Response Plan and Disaster Management Plan

The initial response to an incident is a critical step in the overall emergency response. The responders often have minimal information and must make rapid decisions to ensure safety of the public and the response teams themselves. As a general rule the initial response is guided by three priorities, Ranked in importance these priorities are:
  - People
  - Property
  - Environment

Keeping these priorities in mind, the six steps describes below constitute most of the emergency response phase. It is important to realize that although the six discrete steps have been identified, several of the steps may be activated simultaneously.

152. The emergency procedures identify ‘who doeswhat and when’ in the event of an emergency. Responsibility for who is in charge and their coordination of emergency action shall be identified. The following are important events that require emergency procedures at any given time or may be occurring all at once.
It is also important to remember that emergency response must be adapted to individual circumstances and may require inventive adaptive or creative solutions to difficult problems with very little time or planning or debate. Further, to improve the response capabilities, cooperative arrangements and organizations must be established for providing the appropriate equipment and expertise.

Nature of emergency and hazardous situations may be of any or all of the following categories:

1. **Emergency**
   - Fire
   - Explosion
   - Medical emergency
   - Leaks and other releases of hazardous substance
   - Spillages of toxic chemical, and electrocution.

2. **Natural Disasters**
   - Flood
   - Earthquake cyclone
   - Strom/typhoon/tornados
   - And cloud burst lightning

3. **External Factors**
   - Flood poisoning/water poisoning and
   - Sabotage.

6.5 **Responsibility of the Contractor**

Potential impacts could originate from contractor’s activities. Therefore, KHTPA shall ensure that contractors take due responsibility to mitigate those negative impacts. Particularly KHTPA will ensure that the Contractor:

- Takes reasonable steps to protect the environment and avoid damage and nuisance arising from their activities
- Complies with statutes and regulations relating to environmental protection that is relevant to their activities.
- Refers to national environmental quality guidelines.
- Be responsible for the costs of cleaning up any environmental pollution resulting from their activities, if methods for doing so are available and effective.
- Maintains sites under their control in a clean and tidy condition and shall provide appropriate and adequate facilities for the temporary storage of wastes before disposal.
- Shall not allow used oil or other petroleum wastes to be used as dust suppressant and reasonable precautions shall be taken to control and prevent accidental blow off of gas or discharge into atmosphere or water course.

- Be responsible for the provision of adequate sanitary facilities for the construction workforce (including those employed under sub-contracts) at construction and camp sites. Vehicles operated by the Contractor (including sub-contractors) shall be maintained according to the original manufacturer’s specifications and manuals with particular regard to the control of noise and or smoke emissions.

- Takes responsible measures to minimize dust-blow arising from sites under their control by regular watering of soil stockpiles, bare oil, haul roads, non-surfaced traffic areas and sources of fugitive dust, when conditions require dust suppression.

- Be responsible to pay compensation upon the appropriate monetary evaluation applicable to the local market if any damage is incurred to agricultural land or surrounding homesteads outside of the requisitioned land.

- Precautionary signboards /danger signals/ propitiatory billboards shall be placed in appropriate places to notify people about the possible dangers.

- Remove equipment, surplus material, rubbish and temporary works and leave the site in a clean condition to the satisfaction of the company’s representatives after completion of construction activities.
7. ENVIRONMENTAL MONITORING PROGRAM FOR PERFORMANCE EVALUATION

7.1 Requirements for Management and Monitoring

Environmental monitoring is an essential tool in relation to environmental management as it provides the basic information for rational management decisions. The prime objectives of monitoring are-

- To check on whether mitigation and benefit enhancement measures are actually being adopted and are proving effective in practice
- To provide a means whereby impacts which were subjects to uncertainty at the time of preparation of EA, or which were unforeseen, can be identified, and steps to be taken to adopt appropriate control measures.
- To provide information on the actual nature and extent of key impacts and the effectiveness of the mitigation measures which, through a feedback mechanism, can be taken into account in the planning and execution of similar projects in future.
- There are two basic forms of monitoring:
  - Visual observation or checking, coupled with inquiries
  - Physical measurement of selected parameters

In the case of road construction projects in general, monitoring is done by physical measurement of some selected parameters like air, drinking water, wastewater, noise, solid waste etc. It should be mentioned here that the monitoring program should be such so that it can ensure compliance with national environmental standards. The importance of this monitoring program is also for ensuring that the project does not create adverse environmental changes in the area and providing a database of operations and maintenance, which can be utilized if unwarranted complaints are made.

7.2 Monitoring Requirement

Monitoring of the performance of road is very important and sometimes vital. Dust is generated from the road and need to be monitor the environmental quality. For surveillance of the performance of the road and the quality of the environment, monitoring of the environment of the work-zone, not affected village and the general environment should not require on a regular basis.

It should be mentioned here that the monitoring program should be such so that it can ensure compliance with national environmental standards. The importance of this monitoring program is also for ensuring that the road does not create adverse environmental changes in the
area and providing a database of operations and maintenance that can be utilized if unwarranted complaints are made.

7.3 Monitoring Parameters and Schedule

7.3.1 Monitoring Indicators

159. Environmental monitoring requires a set of indicators that could be conveniently measured, assessed and evaluated periodically to establish trends of change in base line environment quality. A list of parameters to be tested, sample number and sampling frequency are given in Table 7.1 These indicators may be independent or may be functionally related. The physico-chemical, ecological, human interest and socio-economic indicators should be well defined and a mutual relationship among the indicators should be well understood. The monitoring program, in view of the possible impacts as assessed earlier, should consider the indicators for the impact assessment related to the following issues:

7.3.2 Noise Monitoring

160. Generator and vehicle movement there are no high noise making equipment are used. Power generator units should be place in the soundproof rooms and regulating the use of hydraulic horns should be monitored for compliance

7.3.3 Socio-economic Monitoring

161. Checking of the land and property acquisition and requisition process and disbursement of compensation money are being carried out in accordance with the Land Acquisition and Requisition Plan and that no unforeseen problems have arisen.

162. A list of monitoring parameters to be tested, sample number and sampling frequency of sampling are given in Table–7. Here it may be mentioned that parameters are selected according to the requirement of DoE as indicated in the Environmental Quality Standard (EQS).
### Table 7 Types, Parameters and Location and Frequency of Monitoring

<table>
<thead>
<tr>
<th>Environmental component/Types of monitoring</th>
<th>Parameters</th>
<th>Location</th>
<th>Frequency of Monitoring or Sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking Water</td>
<td>pH, DO, TDS, Salinity, As, Fe and total coliform</td>
<td>Nearby ground water</td>
<td>During construction period</td>
</tr>
<tr>
<td>Wastewater</td>
<td>pH, DO, BOD, COD, TDS and SS.</td>
<td>Pond water</td>
<td>During construction period</td>
</tr>
<tr>
<td>Noise</td>
<td>dBA</td>
<td>Along the road construction</td>
<td>During construction period</td>
</tr>
<tr>
<td>Dust</td>
<td>SPM, PM$<em>{2.5}$ and PM$</em>{10}$, SOx and NO$_2$</td>
<td>Along the road and near town/ busy area</td>
<td>During construction period</td>
</tr>
</tbody>
</table>

### 7.3 Effluent and Emissions Monitoring

#### 7.3.1 Water Quality Monitoring

163. Ground water quality monitoring shall be done during road construction period to check the change the parameters. Surface water quality at Pond/ Khalar around the project site shall be performed. Besides the above specific monitoring aspects for operations, a tentative list of parameters is presented bellow in **Table 8**. Routine monitoring on Environmental Performance of the project will be reported by the Project Division of KHTPA and copy of the report will be made available to DoE.

#### 7.3.2 Air Quality Monitoring

164. It was identified earlier that the negative impact on air quality mainly dust and gaseous emissions generated from by the movement of heavy vehicles during construction, operations and maintenance of the road. Dust load on the nearby homesteads and plants is an indicator of dust pollution in the air. Mitigation measure suggested earlier will successfully offset these negative impacts. Monitoring of suspended particles load in the atmosphere of the construction sites should be measured frequently to comply with the air quality standard.

### 7.4 Direct Construction Impacts Monitoring

165. Monitoring need to be done during direct construction work mainly on dust emission, noise generation.

Three basic monitoring systems during construction stage will be followed and these are:
- Monitoring of air quality at selected point during construction at quarterly intervals
- Monitoring of noise close to working location at quarterly intervals
- Monitoring of restriction or obstruction to traffic movement at work places during construction period

The significant physical impact will be on air quality due to generation of dust during road construction period. One point in the site will be monitored monthly during construction period for SPM. As the other issues related to air quality is of no concern.

The work camps are to be monitored regularly on the monthly basis if work camps are mainly proper method of protecting soil from spill of oil.

Water quality and the adjacent pond may be monitored if there is any scope of dumping of debris into the pond. Thus water quality monitoring will be specific on identification of any scope of turbid water flowing from work sites.

Water supply and sanitation in the labour camps will be monitored to ensure that the contractor engaged actually follows the guidelines under contractual obligation.

Solid wastes are to be disposed at designated at places in bins. The grey waters are to be processed through septic tanks. Hazardous waste should be properly collected and dispose through registered DoE vendor and make an inventory.

### 7.5 Environmental Management and Monitoring Program

166. The environmental management of the KHTP project should be based on the framework of concerned project cell of KHTPA and the project cell should be fully involved in the development and implementation of the project Environmental Management Plan (EMP). Detail baseline monitoring, pre-construction, construction and post construction should also be co-ordinated by concern project cell. The monitoring programs are as follows in Table 8.

#### Table-8: Environmental Monitoring, Types of Monitoring, Parameters, Frequency of Monitoring to be Measured and Responsible agency

<table>
<thead>
<tr>
<th>Environmental Component</th>
<th>Parameter(s)</th>
<th>Sampling Number/Year</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-economic disruption</td>
<td>Living standard</td>
<td>During the entire period of the project</td>
<td>Project /Contractor Director</td>
</tr>
<tr>
<td>Drainage congestion/ water logging</td>
<td>Visual Inspection</td>
<td>During monsoon period</td>
<td>Project /Contractor Director</td>
</tr>
<tr>
<td>Surface water quality</td>
<td>TDS, COD, BOD, pH, DO, TDS</td>
<td>2 (During dry and monsoon)</td>
<td>Project /Contractor Director</td>
</tr>
<tr>
<td>Ground water quality</td>
<td>pH, Fe, Mn, As</td>
<td>1 (During dry season)</td>
<td>Project /Contractor Director</td>
</tr>
<tr>
<td>Drinking water</td>
<td>Fe, Mn, As</td>
<td>2 (During dry and monsoon)</td>
<td>Project Director</td>
</tr>
</tbody>
</table>
### Environmental Management Budget

167. At this stage of the project there are a number of matters which have not yet been resolved which have a bearing on environmental management cost include:

- The precise nature and extent of works involved.
- The precise scope of the land acquisition and requisition process
- Details of their nature and scope any institutional strengthening and environmental training which is required.

168. These uncertainties will also be resolved, either at the end of the feasibility study (after this EA has been completed) or during the detailed design stage, when further environmental management planning will be carried out, and detailed cost estimates will be prepared. At this stage, in view of the considerable uncertainties, which exist, meaningful environmental management cost estimates can be prepared.

169. Costs associated with environmental management duties carried out by the KHTPA and contractor’s supervision staffs are expected to be marginal, since these will be incidental to their main duties and no incremental costs are anticipated.

170. Estimates of the administrative costs which will be incurred by KHTPA in connection with management duties related to the land acquisition process, and the payment of compensation, will be included in overall project cost estimates, and will not be treated as environmental management costs.

171. Environmental management and monitoring cost will be around Tk. 2 Lac for monitoring and testing of various environmental parameters.

<table>
<thead>
<tr>
<th>Solid waste</th>
<th>Quantity</th>
<th>Continuous</th>
<th>Project /Contractor</th>
<th>Director</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>SPM, NOx, SOx</td>
<td>2 nos during construction</td>
<td>Project /Contractor</td>
<td>Director</td>
</tr>
<tr>
<td>Noise</td>
<td>Noise level in dB (a)</td>
<td>2 nos during construction</td>
<td>Project /Contractor</td>
<td>Director</td>
</tr>
<tr>
<td>Health and safety</td>
<td>Inspection of health and safety of labourer and others in the construction field.</td>
<td>Continuous for safety and routine for health.</td>
<td>Project /Contractor</td>
<td>Director</td>
</tr>
</tbody>
</table>

Table 9 Estimated outsourcing cost for monthly environmental monitoring during construction and operation phases.
<table>
<thead>
<tr>
<th>Items</th>
<th>Number</th>
<th>Per unit sample Cost in Tk.</th>
<th>Total cost in Tk.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ambient air</td>
<td>6</td>
<td>14000</td>
<td>84000</td>
</tr>
<tr>
<td>2. Drinking water</td>
<td>5</td>
<td>2500</td>
<td>12500</td>
</tr>
<tr>
<td>3. Noise level</td>
<td>10</td>
<td>1000</td>
<td>10000</td>
</tr>
<tr>
<td><strong>Total cost for one time sample during construction phase</strong></td>
<td></td>
<td></td>
<td><strong>106500</strong></td>
</tr>
</tbody>
</table>

**Operation Phase**

<table>
<thead>
<tr>
<th>Items</th>
<th>Number</th>
<th>Per unit sample Cost in Tk.</th>
<th>Total cost in Tk.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ambient air</td>
<td>5</td>
<td>14000</td>
<td>70000</td>
</tr>
<tr>
<td>2. Drinking water</td>
<td>5</td>
<td>2500</td>
<td>12500</td>
</tr>
<tr>
<td>3. Noise level</td>
<td>5</td>
<td>1000</td>
<td>5000</td>
</tr>
<tr>
<td>4. Training</td>
<td></td>
<td></td>
<td>62500</td>
</tr>
<tr>
<td><strong>Total cost for one time sample during operation phase</strong></td>
<td></td>
<td><strong>1435000</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Grand Total in Tk. Two lac fifty thousand only</strong></td>
<td></td>
<td><strong>250,000</strong></td>
<td></td>
</tr>
</tbody>
</table>
8. INSTITUTIONAL CAPACITY

8.1 Key Aspects of the Study Including the no. of Competency Staff

172. The key aspect of the study is to assess environmental impacts for implementation of the project and is identified in section 5.2-5.4 of Chapter 5. The mitigation measure of identified impacts is described in section 6.3 of Chapter 6 and will be implemented during road construction period. The respective implementing or responsible agencies are also identified in Table 8.1 of Chapter 8. The manpower require for successful implementation of the project is 3 officers and 5 staffs. The staff will be deputation from KHTPA as estimated for twenty four months full time assignment in implementing the project activities. The positions are Project Director-1, Deputy Project Director-1, Manager-1, Assistant Engr.- 1 and Assistant Manager-1. The other 3 skilled and 5 unskilled staff will be engaged during the implementation of the project.

8.2 Availability of Appropriate Technology and Equipment

173. A monitoring program will be implemented for construction of access road in the project. Scientific environmental monitoring is required for implementation of the proposed project and environmental management plan. Specific monitoring parameters will help to achieve the monitoring objective and ensure environmental quality. Crop damage compensation process, waste management, drinking water quality around the project sites will be regularly checked, tree plantation, irrigation networks, quality of ambient air, noise, river water and health & safety of officers & laborers involved in the project and employment of laborer etc. should be monitored periodically to ensure pollution free environment in the project site. Environmental parameters to be monitored along with sampling site, frequency of data collection, method and the responsible agencies are indicated in the following matrix Table 10

Table 10 Monitoring Parameters, Data Collection Method and the Responsible Agencies

<table>
<thead>
<tr>
<th>Parameter/Issues</th>
<th>Sampling site/ study area</th>
<th>Frequency</th>
<th>Laboratory/ Method</th>
<th>Responsible agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness training on safety, risk, emergency response when accident will occur</td>
<td>Among the affected people</td>
<td>Twice a year</td>
<td></td>
<td>KHTPA, Contractor</td>
</tr>
<tr>
<td>Provide fire extinguisher equipment</td>
<td>Project area during construction</td>
<td>Once a year</td>
<td></td>
<td>KHTPA</td>
</tr>
<tr>
<td>Provide safety</td>
<td>Among the affected</td>
<td>Once a year</td>
<td></td>
<td>KHTPA</td>
</tr>
<tr>
<td>Equipment/People</td>
<td>Project Area</td>
<td>Frequency</td>
<td>Inspection of Health and Safety of Inhabitant, Labour and Others People Involved in the Road Construction Work</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>--------------</td>
<td>-----------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Health and Safety</td>
<td>Project Area</td>
<td>Once a month</td>
<td>KHTPA, Contractor and DC Office, Upazila Administration, Union Parishad</td>
<td></td>
</tr>
<tr>
<td>Compensation of Crop Damage</td>
<td>Along the Road Alignment</td>
<td>As required</td>
<td>KHTPA, Contractor and DC Office, Upazila Administration, Union Parishad</td>
<td></td>
</tr>
<tr>
<td>Ambient Air Quality</td>
<td>Near the Road Junction</td>
<td>Quarterly</td>
<td>DoE CO₂, SOₓ, NOₓ, SPM, pH, As, Fe, Mn, Ba, NO₃</td>
<td></td>
</tr>
<tr>
<td>Noise Quality</td>
<td>Near the Road Junction</td>
<td>Day and Night Time, Quarterly</td>
<td>DoE Noise Level in dB(A), Monitor Parameters — pH, DO, BOD, TSS, TDS, pH, As, Fe, Mn</td>
<td></td>
</tr>
<tr>
<td>Surface Water Quality of Fish Habitat</td>
<td>Pond</td>
<td>Quarterly</td>
<td>KHTPA, Contractor</td>
<td></td>
</tr>
<tr>
<td>Ground Water</td>
<td>Tube Well</td>
<td>Quarterly</td>
<td>pH, As, Fe, Mn, Ba, NO₃, pH, As, Fe, Mn</td>
<td></td>
</tr>
<tr>
<td>Drinking Water</td>
<td>Tube Well</td>
<td>Quarterly</td>
<td>KHTPA, Contractor</td>
<td></td>
</tr>
<tr>
<td>Labor Employment</td>
<td>For Entire Area</td>
<td>During Road Construction</td>
<td>Checking Daily Logbook of Workers, KHTPA, Contractor</td>
<td></td>
</tr>
<tr>
<td>Health and Safety of Workers and Surrounding People (Emergency Facilities and Workers Health)</td>
<td>Entire Area</td>
<td>Health Check-up of Workers</td>
<td>KHTPA, Contractor</td>
<td></td>
</tr>
</tbody>
</table>

Besides the physical testing of environmental quality, rigorous scientific monitoring of the project implementation should be conducted by special institutional setup.

8.3 Monitoring Requirement

174. Monitoring of the performance of a project is important and sometimes vital. For surveillance of the performance of the road and the quality of the environment, monitoring of
the environment of the work-zone, affected village and the general environment should be performed on a regular basis.

175. It should be mentioned here that the monitoring program should be such that it can ensure compliance with national environmental standards. The importance of this monitoring program is also for ensuring that the plant does not create adverse environmental changes in the area and providing a database of operations and maintenance that can be utilized if unwarranted complaints are made.

8.3.1 Air Quality Monitoring

176. Air emission was identified which mostly generated from vehicle movement during construction of road. Monitoring of suspended particles load in the atmosphere of the road construction sites will be measured frequently to comply with the air quality standard.

8.3.2 Water Quality Monitoring

177. Ground water quality monitoring shall be done at regular basis to check the change of parameters. Surface water quality test of the river around the project site should be performed. Routine monitoring on Environmental Performance of the project will be reported by the Project Division of KHTPA and copy of the report will be made available to DoE.

8.3.3 Noise Monitoring

Except generator and vehicle movement there is no high noise making equipment are used. Power generator units should be place in the soundproof rooms and regulating the use of hydraulic horns should be monitored for compliance.
To be an environmentally acceptable access road, the present project should have its own environment monitoring unit with trained manpower with necessary equipment and other logistics along with require budget.

### 8.4 Size of Operational Budget

178. The EMP cost of the proposed project is estimated tentatively. Based on the market price this assessment may be changed at the time when it will be implemented. The tentative EMP cost is presented below; **Table 11** may be seen for details of measures.

#### Table 11Size of Operational Budget (EMP Cost Matrix)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>During Selection of Alternate Access Road</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Loss of land</td>
<td>Land Acquisition 43 acres</td>
<td>ARIPO 1982 will be followed and DC will provide compensation to the PAPs</td>
<td>--- Lakh</td>
</tr>
<tr>
<td></td>
<td>Cost of Acquisition</td>
<td>Tk. -- Lac/acre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>Loss of crops and eroded land</td>
<td>Land requisition for crop compensation ---- Acres (00.00 hectare)</td>
<td>ARIPO 1982 will be followed and DC will provide compensation to the PAPs</td>
<td>--- Lakh</td>
</tr>
<tr>
<td></td>
<td>Loss of crops, trees and structure</td>
<td>Cost of Requisition Tk. ----La/acre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>Scientific environmental monitoring And training</td>
<td></td>
<td></td>
<td>--Lakh</td>
</tr>
<tr>
<td>Total in Tk.</td>
<td></td>
<td></td>
<td></td>
<td>--- Lakh</td>
</tr>
</tbody>
</table>

To be an environmentally acceptable access road, the present project should have its own environment monitoring unit with trained manpower with necessary equipment and other logistics along with require budget.
9. PUBLIC CONSULTATION

9.1 Introduction

179. KHTPA recognized the importance of social and environmental factors for successful implementation of the proposed project. Consultant plans to undertake a comprehensive process of public consultation and environmental investigation. Feedback from the consultation process will play an integral role in development of the social and environmental programs.

180. The purpose of consultation is to inform local inhabitants/primary stakeholders to make them aware of the project and to gather their opinion/suggestions about the proposed development program as well as to incorporate their suggestions during project planning and implementation stage.

9.2 Methodology

181. As part of the EA process, group discussion as well as individual stakeholder’s consultation were organized and conducted to record views and opinions of the stakeholders. Participants in these consultation meetings included elected representatives, local leaders, affected people, representatives of professional groups like service man, businessmen, etc. Table-12 indicates the date and place of the group discussion meetings including the number of participants present at each.

Table-12 Public consultation regarding the proposed project

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Date</th>
<th>Consulted with Whom</th>
<th>Place</th>
<th>No. of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20\textsuperscript{th} July, 2013</td>
<td>Mr. Siful Islam (Word no. 4) KaliakoirPourashava and other elites Over 50 people</td>
<td>KHTP conference room, Kaliakoir, Gazipur</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>2\textsuperscript{nd} August, 2013</td>
<td>Pourashava Mayor Mr. Majibur Rahman (KaliakoirPourashava), Mr. Siful Islam (Word no. 4) KaliakoirPourashava and other elites</td>
<td>KaliakoirPourashava and 4 no word</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>2\textsuperscript{nd} August, 2013</td>
<td>Md. Abdul Baten, Abdur Rahim worker</td>
<td>4 no word</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>2\textsuperscript{nd} August, 2013</td>
<td>Samia, garment worker</td>
<td>4 no word</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Date</td>
<td>Interviewees</td>
<td>Notes</td>
<td>Page</td>
</tr>
<tr>
<td>---</td>
<td>-----------------</td>
<td>--------------------------------------------------</td>
<td>-------------</td>
<td>------</td>
</tr>
<tr>
<td>5</td>
<td>2nd August, 2013</td>
<td>Momtaz begum, Mariam begum, Mazeda, Julekha</td>
<td>4 no word</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>2nd August, 2013</td>
<td>Shahidul Islam, Shop owner</td>
<td>4 no word</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>2nd August, 2013</td>
<td>Osman Gani, Jashim Uddin, Graveyard affected</td>
<td>4 no word</td>
<td>2</td>
</tr>
</tbody>
</table>

**Photo18** Consultation with Mayor of Kaliakoir Pourashava and other elites

**Photo19** Consultation with stakeholder at Bakterpur village

**Photo20** Consultation with stakeholders at Tea Shop

**Photo21** Mrs. Samia affected household a Garment worker
9.3 Findings from Public Consultations

The participants in general welcomed the project and expected that the project will contribute to the national economy in many ways. As reported, the following major issues among others were raised in the public consultation meetings.

- The construction of access road will create satisfaction over the people living in the area
- The safety of the Hi-Tech Park will increase
- The access road will confirm the boundary of the Hi-Tech Park
- After implementation of the access road the land value will increase
- The lifestyle, education facilities, increase man hour and income of the people of the area will increase
- Crime will reduce
- Assembly of people during project activities may need to cut trees.
- Noise pollution from vehicles and equipment at the project sites may cause disturbance to human being.
- Compensation for land as per government rate would not be a fair compensation to the affected person as it is far below prevailing market rate.
- Movement of vehicles and pedestrian may affect especially women, children and disabled persons from one place to another.
- Air pollution due to dust and gaseous emission should be controlled.
- Environmental pollution through sanitation and waste materials as well as other social nuisance should be controlled.
9.4 Expectations of the People

183. The following expectations of the local people were raised during the consultations:

- There are 13 household and one shop which need to be shifted. Rehabilitation of shifting cost of the house owners asked for fair compensation.
- Local worker should be employed in different activities of the project on a priority basis.
- Compensation payment in any form, if any, should be properly and promptly distributed so that the actual affected person gets his full share and in right time.
- Local Pourashava Mayor Mr. Majibur Rahman (KaliakoirPourashava) and Commissioner Mr. Siful Islam (Word no. 4) expressed in the meeting avoid or acquire less quantity of land, to provide fair compensation and complete the access road as early as possible.
- Arrange to shift the one single graveyard to the near graveyard.
- Provide easy access to general people and visitors to pray in the Sarerpukur
- They asked for construct over pass at the rail line crossing point
- People asked for construction of school, college and madrasa in the area

9.5 Public Consultation Results

184. The findings as recorded from public consultations have been presented in the Table 13 indicating the critical issues.

Table 13 Public Consultation

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Issue Discussed</th>
<th>Issue Raised</th>
<th>Suggestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Assessment of Alternate Access Road for Villagers Adjoining Kaliakoir Hi-Tech Park</td>
<td>Impact of constructing alternate road</td>
<td>Land acquisition and requisition</td>
<td>Try to avoid acquire land and requisite required amount of land</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Employment</td>
<td>Labour should be taken from respective locality.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Social &amp; Economic developments</td>
<td>Living status will be improve.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Land &amp; property, house &amp; shop damage</td>
<td>Due fair compensation to be paid according to the up to date price list.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crop damage</td>
<td>Due fair compensation to be paid on the spot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fruit trees damage</td>
<td>Due fair compensation to be paid for tress</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compensation</td>
<td>Compensation assessment by DC and</td>
</tr>
<tr>
<td>Assessment</td>
<td>Local Leader</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-----------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect to private forest</td>
<td>Avoided private forest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affected Homestead</td>
<td>Due Compensation to be given</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pollution of air and surface water</td>
<td>Monitoring should be adopted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sanitary problem</td>
<td>Sanitary system should be developed during project execution.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One graveyard</td>
<td>Arrange to shift the one single graveyard to the near graveyard.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rail line crossing</td>
<td>Over pass or provide level crossing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10. CONCLUSION

185. An EA has been carried out for the project according to the requirement of WB safeguard policy and DOE for necessary environmental clearances as it is made mandatory in ECA ’95, for any new project set up and the subsequent ECA ’97. An EA report has been prepared through identifying the potential impacts, assessing them and recommending possible mitigating and enhancing measure for negative and positive impacts, respectively. An outline of EMP has been given in the present report to mitigate/enhance the impacts, which are expected to occur during construction and operation phase of the project.

186. The findings of this EA suggest that the project involves potential socio-economic benefit, connecting with the Dhaka-Tangail main road and Kaliakoir Upazilla head quarter. The social-economic development of the area will increase and reduce wastage of valuable time. To protect the completed slope of the new fill works of road adjacent to the pond area from rain wash, it should be covered with hard material and with thick grass turffing over the slope. One graveyard need to be shift to nearby graveyard. A boundary wall need to be constructed to separate the SarerPukur a public visit site. A level crossing should be constructed at the rail road crossing point.

187. Issues related to involuntary resettlement were assessed by a parallel process of resettlement planning and should be compensated by measures set out in detail in the Resettlement Framework for the program.

188. The limited environmental impacts to which further careful attention should be given during the construction and in the operation and maintenance of the project in order to minimize and offset the adverse effects. The possible negative impacts are not severe, and the adverse impacts if duly addressed could be minimized without much effort, though they would require attention and positive commitment from the Project Management.

189. The overall finding of the EA is that the proposed project will not cause any significant adverse environmental impacts, provided that adequate mitigation measures are implemented. The proposed mitigation measures are prescribed conceptually in the EA, as an outline EMP. This will be developed by the contractor in the construction phase.

190. There are no uncertainties in the analysis, and no additional work is required to comply with National Law. There is thus no need for further study or Environmental Assessment.