3.0 DESCRIPTION OF ENVIRONMENT

3.1 INTRODUCTION

The baseline environmental studies help in assessing the existing environmental conditions of the study area and identifying the critical environmental attributes. This would facilitate the comparison of the resultant environmental conditions in the post project scenario with the present day conditions and would help in preserving the environment without any deterioration and safeguarding the interests of the area. An area of 5.0 Km radius from the proposed site was considered as the study area. This chapter comprises the description of the existing environmental status of the study area with reference to the prominent environmental components. The existing environmental setting is considered to judge the baseline conditions which are described with respect to climate, hydro-geological aspects, atmospheric conditions, water quality, soil quality, ecology, socio-economic profile, land-use pattern etc.

This report presents the primary data generated during the period from March 2014 to May 2014 and the secondary data collected from various Government and semi-Government organisations. Secondary data, from various scientific studies conducted in the study area by various organizations, has also been collected, compiled and interpreted.

3.2 LAND ENVIRONMENT

The baseline status of the land environment has been established with respect to the soil quality and land use pattern of the study area.

3.2.1 Land Use Pattern of proposed Site

The proposed site is located in Moinarband village. The proposed site is barren land.

3.2.2 Land Use Pattern (5.0-Kms) As per Satellite Imagery

The land-use/land-cover map of the study area is usually generated through the digital image processing. The data with respect to land use / land cover of the study area has been presented in Table - 3.1.
**Description of Environment**

Table 3.1

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>Land Use/Land Cover Categories</th>
<th>Area (in Km²)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mixed Rural Built up</td>
<td>22.44</td>
<td>23.47</td>
</tr>
<tr>
<td>2</td>
<td>Agricultural Kharif Crop</td>
<td>43.53</td>
<td>45.53</td>
</tr>
<tr>
<td>3</td>
<td>Agricultural Rabi Crop</td>
<td>1.83</td>
<td>1.92</td>
</tr>
<tr>
<td>4</td>
<td>Agricultural land plantation</td>
<td>15.57</td>
<td>16.28</td>
</tr>
<tr>
<td></td>
<td><strong>Total Agriculture Land</strong></td>
<td><strong>60.93</strong></td>
<td><strong>63.73</strong></td>
</tr>
<tr>
<td>5</td>
<td>Forest –semi Evergreen -open</td>
<td>4.61</td>
<td>4.82</td>
</tr>
<tr>
<td>6</td>
<td>Tree Clad</td>
<td>0.12</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td><strong>Total forest Land</strong></td>
<td><strong>4.73</strong></td>
<td><strong>4.94</strong></td>
</tr>
<tr>
<td>7</td>
<td>Scrub land open</td>
<td>5.15</td>
<td>5.39</td>
</tr>
<tr>
<td>8</td>
<td>Baren /Rocky Area</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td>9</td>
<td>Sand Bar</td>
<td>0.05</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td><strong>Total Wasteland</strong></td>
<td><strong>5.24</strong></td>
<td><strong>5.5</strong></td>
</tr>
<tr>
<td>10</td>
<td>Lake/Pond/River</td>
<td>0.64</td>
<td>0.67</td>
</tr>
<tr>
<td>11</td>
<td>Wetland-Inland Natural</td>
<td>0.84</td>
<td>0.88</td>
</tr>
<tr>
<td>12</td>
<td>Water bodies-River-Perennial</td>
<td>0.78</td>
<td>0.81</td>
</tr>
<tr>
<td></td>
<td><strong>Total Water body</strong></td>
<td><strong>2.26</strong></td>
<td><strong>2.36</strong></td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>95.6</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

### 3.2.3 Land Use / Land cover

The land use / land cover classification standardized by the Department of Space, for mapping different agro-climatic zones has been presented in Table-3.2. The present classification system has following six major classes:

(1) **Built-Up Land**: This comprises land covered by structures.

(2) **Agricultural Land**: This comprises areas primarily used for raising agricultural crops, vegetables and plant material of medicinal and commercial values.

(3) **Forest**: Forest is defined as all land bearing vegetative association dominated by trees of any size, exploited or not, capable of producing wood or other forest products and exerting an influence on climatic or water regimes, or providing shelter for wildlife and live stock.

(4) **Wasteland**: Land having potential for development of vegetation cover but not being used due to constraints which include salt affected land, eroded land and water logged area.

(5) **Water bodies**: This comprises area persistently covered by water such as...
rivers/ streams/ reservoirs/ tanks, lakes/ ponds and canals.

(6) Others: This class includes shifting cultivation, grass land / grazing land and snow covered / glacial land.

**Table - 3.2**

**LAND USE/ LANDCOVER CLASSIFICATION SYSTEM**

<table>
<thead>
<tr>
<th>1.</th>
<th>Built-up Land</th>
<th>1.1 Built-Up Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Agricultural Land</td>
<td>2.1 Crop Land</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I. Kharif</td>
</tr>
<tr>
<td></td>
<td></td>
<td>II. Rabi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>III. Kharif + Rabi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.2 Fallow Land</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.3 Plantation</td>
</tr>
<tr>
<td>3.</td>
<td>Forest</td>
<td>3.1 Evergreen / Semi-green Forest</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.2 Deciduous Forest</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.3 Degraded or Scrub Forest</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.4 Forest Blank</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.5 Forest Plantation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.6 Mangroves</td>
</tr>
<tr>
<td>4.</td>
<td>Waste Land</td>
<td>4.1 Salt Affected Land</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.2 Waterlogged Land</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.3 Marshy / Swampy Land</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.4 Gullied / Ravinous Land</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.5 Land without scrub</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.6 Sandy Area (Coastal &amp; Desertic)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.7 Barren Rocky/Stony waste/Sheet rock Area</td>
</tr>
<tr>
<td>5.</td>
<td>Water Bodies</td>
<td>5.1 River Stream</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.2 Lake / Reservoir/ Tank/ Canal</td>
</tr>
<tr>
<td>6.</td>
<td>Others</td>
<td>6.1 Shifting Cultivation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.2 Grass Land/ Grazing Land</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.3 Snow covered/ Glacial Land</td>
</tr>
</tbody>
</table>

The land use/ land cover classification as per satellite imagery indicates that the total area covered by agricultural land is about 60.93 Sq.Km which is about 63.73% of total 5.-km area, built-up area is about 22.44 Sq. Km. equivalent to about 23.47% of total area, forest area is about 4.73 Sq.Km. equivalent to 4.94 % of total area, area covered by water bodies is about 2.26 Sq.Km. which is equivalent to about 2.36 % of total area and area covered by total waste land is about 5.24 which is equivalent to about 5.5 % of the total area. The LU/LC map obtained from North Eastern Space Application Centre (NESAC), Govt. of India, Dept. of Space, Umaiam has been presented in Plate-3.1.
PLATE 3.1
LU/LC MAP
3.2.4 Topography & Drainage Pattern

Study area having the geographical features of plain, undulating and hilly. The north and south part of the study area is divided by Barak River. Northern part of the study area is plain to undulating, whereas southern part of the study area is hilly and undulating. Elevation of the study area ranges between 20 m and 140 m AMSL. Barak River is the perennial source of surface water in the study area.

3.2.5 Geological Succession

Geologically, the district can be divided into two major groups, i.e. unconsolidated deposits comprising alluvial deposits of Sub-Recent to Recent age and semi-consolidated Tertiary deposits of Bhaban, Bokabil, Girujan/Tipam, Dupitila and Dihing formations of Miocene to Pliocene age. The alluvial deposits containing in the central parts mainly comprises of sand, silt and clay with gravel and occasional coal bands. The semi-consolidated rocks are exposed in the form of hillocks comprising shale, sandstone, ferruginous sandstone, mottle clay, pebble bed and boulder beds etc.

Ground water occurs in phreatic condition in shallow aquifer and in semi-confined condition in deeper aquifer. Flow of ground water is from the North to South in northern parts and from South to North in southern parts of the district.

3.2.6 Geomorphology and Soil Type

The area consists of resistant structural hills in the borders with an elongated valley in the central part. The general trend of the hills is NE-SW. Structural features like hog’s back and steep escarpments are commonly present. The valley area comprises of low land with swamps and alluvial flat land. The southern part has number of field depressions and these are permanent water bodies commonly known as ‘beel’. The soil of the district varies from alluvial to lateritic in nature. Texture is generally clayey loam.
DESCRIPTION OF ENVIRONMENT

IRS - P6 LISS-IV MX (5.8 m RESOLUTION) DATA WITH BASE FEATURES AROUND 5.2 KM RADIUS OF MOINARBAND POL DEPOT, CACHAR DISTRICT, ASSAM.

Plate 3.1 A
Satellite Imagery
3.3 SOIL OF CACHAR DISTRICT

The soils are Clay Loam. The pH of the soil is acidic. The water soluble salts content is usually normal for crop growth.

3.3.1 Soil Characteristics in the Study Area

In order to evaluate the physico-chemical characteristics of soils, three sampling locations were selected to represent various land use conditions in the study area. Out of Six locations, one was selected within project site and four locations were identified from the agricultural land located around the Proposed project and one location were identified from reserved forest located in 05 km radius from the project. A map showing soil sampling locations has been presented in Plate - 3.2 and a brief description of the same is presented in Table - 3.3.

**TABLE – 3.3**

**Sampling Location for Soil Quality Assessment**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Sampling Locations</th>
<th>Frequency</th>
<th>Total No. of Samples</th>
<th>Location Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Near Proposed Area</td>
<td>Once in a season</td>
<td>Three 0-30, 30-60 &amp; 60-90cm depth</td>
<td>SS1</td>
</tr>
<tr>
<td>02.</td>
<td>Agricultural Land – Moinarband</td>
<td>Once in a season</td>
<td>Three 0-30, 30-60 &amp; 60-90cm depth</td>
<td>SS2</td>
</tr>
<tr>
<td>03.</td>
<td>Agricultural Land – Gosaipur village</td>
<td>Once in a season</td>
<td>Three 0-30, 30-60 &amp; 60-90cm depth</td>
<td>SS3</td>
</tr>
<tr>
<td>04.</td>
<td>Agricultural Land – Shajagaon village</td>
<td>Once in a season</td>
<td>Three 0-30, 30-60 &amp; 60-90cm depth</td>
<td>SS4</td>
</tr>
<tr>
<td>05.</td>
<td>Agricultural Land – Doyapur village</td>
<td>Once in a season</td>
<td>Three 0-30, 30-60 &amp; 60-90cm depth</td>
<td>SS5</td>
</tr>
<tr>
<td>06.</td>
<td>Agricultural Land – Rangpur village</td>
<td>Once in a season</td>
<td>Three 0-30, 30-60 &amp; 60-90cm depth</td>
<td>SS6</td>
</tr>
</tbody>
</table>

Total no. of samples 18
PLATE - 3.2
MAP SHOWING SOIL SAMPLING LOCATIONS
Rationale behind Sampling
The main aim of the soil characterisation is to assess the soil quality of the area in order to select proper species of plants and trees for green belt and afforestation as an anti-pollution measure. Keeping the above objective in view, three sampling locations were selected so as to represent the entire study area.

Sampling & Analytical Methods
The soil samples were collected by ramming a core-cutter into the soil up to a depth of 90 cm. At each location, soil samples were collected from three depths, viz. 0-30 cm, 30-60 cm, and 60-90 cm below the surface and mixed together. The mixed samples were analysed for their physico-chemical characteristics. From each location, samples were collected with a frequency of once per season during the study period. The samples were brought to the laboratory and air dried for a few days. The air-dried samples were then grounded in agate mortar with the help of a wooden hammer and passed through 2-mm (10 mesh) sieve. The coarser materials were rejected and the sieved material was sampled by the standard 'conning and quartering' method and the processed samples were analyzed for the different parameters according to the standard methods and procedures. For analysis of metals, atomic absorption spectroscope was used. The processed samples were analyzed for the following parameters according to the standard methods briefly described below:

**pH:** The pH of the soil suspension (1:2, Soil : Water ratio) was determined with the help of glass calomel electrode pH Meter.

**Electrical Conductivity:** The conductivity of the soil suspension (as above) was determined with the help of a Conductivity Meter and the results expressed in milli mho/cm.

**Phosphorous:** Following methods were followed for extraction of available Phosphorous in soil, namely (a) Bray & Kurtz's (for acid soils) in which dilute acid fluoride solution was used, and (b) Olsen’s (for alkaline soils) in which sodium bicarbonate solution was used. After extraction, the Phosphorous concentration was determined colorimetrically by Chloro-stannous Reduced Molybdo-Phosphoric Blue Colour method.

**Potassium:** Potassium as K was extracted by neutral, normal ammonium
acetate solution and determined by flame photometric method.

**Nitrogen:** Nitrogen as N was determined following alkaline potassium permanganate distillation method.

**Organic Carbon:** Organic carbon in soil was determined titrimetrically by the Chromic acid - wet oxidation method of Walkley & Black and the results expressed as percent of C in the soil.

**Grain Size:** Grain size distribution was performed by sieving method and the results have been expressed as percent of sand, silt and clay in the soil.

**Bulk Density:** 100 mm diameter undisturbed soil sample has been collected during boring operation in 45 mm long specially designed tube sampler attached with a cutting shoe at its lower end with desired ratio. After sampling, the ends of sample have been trimmed off. From the above obtained undisturbed sample, the volume and the weight was found. The ratio between the weight and volume gives bulk density.

**Water Holding Capacity of Soil:** 10 grams of soil sample was weighed and put in a funnel already filled with filter papers. Funnel was kept on a conical flask. 50-ml of water was poured on the sample. It was kept for one hour to complete the filtration. The amount of water filtered in conical flask was measured. The greater, the quantity of water collected, the lesser the water holding capacity or greater porosity of the soil sample.

The results of characterization have been presented in Tables 3.4 to 3.9. The highlights of the observations are as follows:

- The texture of soil was Clay Loam.
- The percentage of sand content ranged between 41.63 to 45.27%.
- The percentage of silt content ranged between 21.56 to 25.74%.
- The percentage of clay content ranged between 30.55 to 35.12%.
- The pH of the soil ranged between 6.1 and 6.6.
- The bulk density of the soil ranged between 1.27 to 1.32 g/cm³.
- The infiltration rate ranged between 7.94 to 9.45 cm/hr.
- The electrical conductivity ranged between 0.24 to 0.31 dS/cm.
- Organic carbon was found in the range of 1.21 to 1.37%.
- Level of Nitrogen as N ranged between 115.6 and 132.5 Kg/ha.
- Level of Phosphorous as P₂O₅ ranged between 5.26 & 6.89 Kg/ha.
Level of Potash as $K_2O$ ranged between 31.24 & 40.35 Kg/ha.

**TABLE - 3.4**

**CHARACTERISTICS OF SOIL**

**Period:** March 2014 to May 201

**Location:** Near Proposed Area SS1

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>SS1</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(0-30cm)</td>
<td>(30-60cm)</td>
<td>(60-90cm)</td>
</tr>
<tr>
<td>1</td>
<td>Soil Texture</td>
<td>Clay Loam</td>
<td>Clay Loam</td>
<td>Clay Loam</td>
</tr>
<tr>
<td>2</td>
<td><strong>Grain Size, %</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Sand</td>
<td>44.56</td>
<td>45.24</td>
<td>43.78</td>
</tr>
<tr>
<td></td>
<td>b) Silt content</td>
<td>22.28</td>
<td>21.56</td>
<td>21.95</td>
</tr>
<tr>
<td></td>
<td>c) Clay content</td>
<td>33.16</td>
<td>33.20</td>
<td>34.27</td>
</tr>
<tr>
<td>3</td>
<td>Porosity, %</td>
<td>41.7</td>
<td>41.3</td>
<td>40.6</td>
</tr>
<tr>
<td>4</td>
<td>Bulk Density, g/cm³</td>
<td>1.28</td>
<td>1.29</td>
<td>1.31</td>
</tr>
<tr>
<td>5</td>
<td>pH</td>
<td>6.2</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>6</td>
<td>Elect. Conductivity (dS/cm at 20°C)</td>
<td>0.28</td>
<td>0.29</td>
<td>0.28</td>
</tr>
<tr>
<td>7</td>
<td>Water holding capacity %</td>
<td>43.8</td>
<td>43.4</td>
<td>42.6</td>
</tr>
<tr>
<td>8</td>
<td>Infiltration Rate (cm/hr.)</td>
<td>8.20</td>
<td>7.94</td>
<td>8.08</td>
</tr>
<tr>
<td>9</td>
<td>Available Magnesium, as MgO mg/kg</td>
<td>29.63</td>
<td>30.24</td>
<td>31.58</td>
</tr>
<tr>
<td>10</td>
<td>Organic Carbon %</td>
<td>1.32</td>
<td>1.35</td>
<td>1.34</td>
</tr>
<tr>
<td>11</td>
<td>Sodium Adsorption Ratio</td>
<td>0.43</td>
<td>0.45</td>
<td>0.46</td>
</tr>
<tr>
<td>12</td>
<td>Cation Exchange</td>
<td>43.11</td>
<td>43.16</td>
<td>44.55</td>
</tr>
<tr>
<td></td>
<td>Capacity,Cmol(+)/kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Nitrogen as N, mg/kg</td>
<td>115.6</td>
<td>118.3</td>
<td>119.5</td>
</tr>
<tr>
<td>14</td>
<td>Phosphorus as $P_2O_5$ mg/kg</td>
<td>5.26</td>
<td>6.32</td>
<td>6.34</td>
</tr>
<tr>
<td>15</td>
<td>Potash as $K_2O$, mg/kg</td>
<td>32.24</td>
<td>34.62</td>
<td>34.83</td>
</tr>
</tbody>
</table>

**Soil Fertility Quality Standard w.r.t C:N:P:K**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>PARAMETERS</th>
<th>QUALITY STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organic Carbon %</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td>2</td>
<td>Nitrogen as N, kg/ha</td>
<td>&lt;280</td>
</tr>
<tr>
<td>3</td>
<td>Phosphorus as $P_2O_5$, kg/ha</td>
<td>&lt;23</td>
</tr>
<tr>
<td>4</td>
<td>Potash as $K_2O$, kg/ha</td>
<td>&lt;133</td>
</tr>
</tbody>
</table>
### TABLE - 3.5
CHARACTERISTICS OF SOIL

**Period:** March 2014 to May 2014  
**Location:** Agricultural Land- Moinarband SS₂

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Observed Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SS₂</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0-30cm)</td>
</tr>
<tr>
<td>1</td>
<td>Soil Texture</td>
<td>Clay Loam</td>
</tr>
<tr>
<td>2</td>
<td><strong>Grain Size, %</strong></td>
<td></td>
</tr>
<tr>
<td>a) Sand</td>
<td>42.64</td>
<td>42.32</td>
</tr>
<tr>
<td>b) Silt</td>
<td>25.22</td>
<td>24.67</td>
</tr>
<tr>
<td>c) Clay</td>
<td>32.14</td>
<td>33.01</td>
</tr>
<tr>
<td>3</td>
<td>Porosity, %</td>
<td>41.3</td>
</tr>
<tr>
<td>4</td>
<td>Bulk Density, g/cm³</td>
<td>1.29</td>
</tr>
<tr>
<td>5</td>
<td>pH</td>
<td>6.3</td>
</tr>
<tr>
<td>6</td>
<td>Elect. Conductivity(dS/cm at 20°C)</td>
<td>0.26</td>
</tr>
<tr>
<td>7</td>
<td>Water holding capacity %</td>
<td>43.4</td>
</tr>
<tr>
<td>8</td>
<td>Infiltration Rate (cm/hr.)</td>
<td>9.26</td>
</tr>
<tr>
<td>9</td>
<td>Available Magnesium, as MgO mg/kg</td>
<td>26.54</td>
</tr>
<tr>
<td>10</td>
<td>Organic Carbon %</td>
<td>1.24</td>
</tr>
<tr>
<td>11</td>
<td>Sodium Adsorption Ratio</td>
<td>0.52</td>
</tr>
<tr>
<td>12</td>
<td>Cation Exchange Capacity,Cmol(+)/kg</td>
<td>41.78</td>
</tr>
<tr>
<td>13</td>
<td>Nitrogen as N, mg/kg</td>
<td>117.5</td>
</tr>
<tr>
<td>14</td>
<td>Phosphorous as P₂O₅ mg/kg</td>
<td>6.24</td>
</tr>
<tr>
<td>15</td>
<td>Potash as K₂O, mg/kg</td>
<td>37.58</td>
</tr>
</tbody>
</table>

**Soil Fertility Quality Standard w.r.t C:N:P:K**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>PARAMETERS</th>
<th>QUALITY STATUS</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Poor</td>
</tr>
<tr>
<td>1</td>
<td>Organic Carbon %</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td>2</td>
<td>Nitrogen as N, kg/ha</td>
<td>&lt;280</td>
</tr>
<tr>
<td>3</td>
<td>Phosphorous as P₂O₅ kg/ha</td>
<td>&lt;23</td>
</tr>
<tr>
<td>4</td>
<td>Potash as K₂O, kg/ha</td>
<td>&lt;133</td>
</tr>
</tbody>
</table>
TABLE - 3.6
CHARACTERISTICS OF SOIL

Period: March 2014 to May 2014
Location: Agricultural Land - Gosaipur SS\textsubscript{3}

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Observed Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SS\textsubscript{3}</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0-30cm)</td>
</tr>
<tr>
<td>1</td>
<td>Soil Texture</td>
<td>Clay Loam</td>
</tr>
<tr>
<td>2</td>
<td>Grain Size, %</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Sand</td>
<td>45.24</td>
</tr>
<tr>
<td></td>
<td>b) Silt content</td>
<td>24.21</td>
</tr>
<tr>
<td></td>
<td>c) Clay content</td>
<td>30.55</td>
</tr>
<tr>
<td>3</td>
<td>Porosity, %</td>
<td>41.7</td>
</tr>
<tr>
<td>4</td>
<td>Bulk Density, g/cm\textsuperscript{3}</td>
<td>1.28</td>
</tr>
<tr>
<td>5</td>
<td>pH</td>
<td>6.2</td>
</tr>
<tr>
<td>6</td>
<td>Elect. Conductivity (dS/cm at 20°C)</td>
<td>0.28</td>
</tr>
<tr>
<td>7</td>
<td>Water holding capacity %</td>
<td>43.8</td>
</tr>
<tr>
<td>8</td>
<td>Infiltration Rate (cm/hr)</td>
<td>8.90</td>
</tr>
<tr>
<td>9</td>
<td>Available Magnesium, as MgO mg/kg</td>
<td>25.34</td>
</tr>
<tr>
<td>10</td>
<td>Organic Carbon %</td>
<td>1.34</td>
</tr>
<tr>
<td>11</td>
<td>Sodium Adsorption Ratio</td>
<td>0.49</td>
</tr>
<tr>
<td>12</td>
<td>Cation Exchange Capacity, Cmol(+) /kg</td>
<td>39.72</td>
</tr>
<tr>
<td>13</td>
<td>Nitrogen as N, mg/kg</td>
<td>117.6</td>
</tr>
<tr>
<td>14</td>
<td>Phosphorus as P\textsubscript{2}O\textsubscript{5} mg/kg</td>
<td>6.54</td>
</tr>
<tr>
<td>15</td>
<td>Potash as K\textsubscript{2}O, mg/kg</td>
<td>34.69</td>
</tr>
</tbody>
</table>

Soil Fertility Quality Standard w.r.t C:N:P:K

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>PARAMETERS</th>
<th>QUALITY STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Poor</td>
</tr>
<tr>
<td>1</td>
<td>Organic Carbon %</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td>2</td>
<td>Nitrogen as N, kg/ha</td>
<td>&lt;280</td>
</tr>
<tr>
<td>3</td>
<td>Phosphorus as P\textsubscript{2}O\textsubscript{5}, kg/ha</td>
<td>&lt;23</td>
</tr>
<tr>
<td>4</td>
<td>Potash as K\textsubscript{2}O, kg/ha</td>
<td>&lt;133</td>
</tr>
</tbody>
</table>
## TABLE - 3.7
### CHARACTERISTICS OF SOIL

**Period:** March 2014 to May 2014  
**Location:** Agricultural Land - Shajagaon SS₄

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Observed Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SS₄</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0-30cm)</td>
</tr>
<tr>
<td>1</td>
<td>Soil Texture</td>
<td>Clay Loam</td>
</tr>
<tr>
<td>2</td>
<td>Grain Size,%</td>
<td>Clay Loam</td>
</tr>
<tr>
<td></td>
<td>a) Sand</td>
<td>43.26</td>
</tr>
<tr>
<td></td>
<td>b) Silt content</td>
<td>23.64</td>
</tr>
<tr>
<td></td>
<td>c) Clay content</td>
<td>33.10</td>
</tr>
<tr>
<td>3</td>
<td>Porosity, %</td>
<td>41.15</td>
</tr>
<tr>
<td>4</td>
<td>Bulk Density, g/cm³</td>
<td>1.27</td>
</tr>
<tr>
<td>5</td>
<td>pH</td>
<td>6.5</td>
</tr>
<tr>
<td>6</td>
<td>Elect. Conductivity(dS/cm at 20°C)</td>
<td>0.25</td>
</tr>
<tr>
<td>7</td>
<td>Water holding capacity %</td>
<td>43.2</td>
</tr>
<tr>
<td>8</td>
<td>Infiltration Rate (cm/hr)</td>
<td>8.69</td>
</tr>
<tr>
<td>9</td>
<td>Available Magnesium, as MgO mg/kg</td>
<td>30.62</td>
</tr>
<tr>
<td>10</td>
<td>Organic Carbon %</td>
<td>1.29</td>
</tr>
<tr>
<td>11</td>
<td>Sodium Adsorption Ratio</td>
<td>0.52</td>
</tr>
<tr>
<td>12</td>
<td>Cation Exchange Capacity,Cmol(+)kg</td>
<td>43.03</td>
</tr>
<tr>
<td>13</td>
<td>Nitrogen as N, mg/kg</td>
<td>127.27</td>
</tr>
<tr>
<td>14</td>
<td>Phosphorus as P₂O₅ mg/kg</td>
<td>6.32</td>
</tr>
<tr>
<td>15</td>
<td>Potash as K₂O, mg/kg</td>
<td>36.24</td>
</tr>
</tbody>
</table>

### Soil Fertility Quality Standard w.r.t C:N:P:K

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>PARAMETERS</th>
<th>QUALITY STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organic Carbon %</td>
<td>Poor: &lt;0.5, Medium: 0.5 to 0.75, Fertile: &gt;0.75</td>
</tr>
<tr>
<td>2</td>
<td>Nitrogen as N, kg/ha</td>
<td>Poor: &lt;280, Medium: 280 to 560, Fertile: &gt;560</td>
</tr>
<tr>
<td>3</td>
<td>Phosphorus as P₂O₅ kg/ha</td>
<td>Poor: &lt;23, Medium: 23 to 57, Fertile: &gt;57</td>
</tr>
<tr>
<td>4</td>
<td>Potash as K₂O, kg/ha</td>
<td>Poor: &lt;133, Medium: 133 to 337, Fertile: &gt;337</td>
</tr>
</tbody>
</table>
## TABLE - 3.8
### CHARACTERISTICS OF SOIL

**Period:** March 2014 to May 2014  
**Location:** Agricultural Land - Doyapur SS₅

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Observed Value</th>
<th>SS₅ (0-30cm)</th>
<th>(30-60cm)</th>
<th>(60-90cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Soil Texture</td>
<td>Clay Loam</td>
<td>Clay Loam</td>
<td>Clay Loam</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Grain Size, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Sand</td>
<td>41.63</td>
<td>42.24</td>
<td>42.64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Silt content</td>
<td>25.74</td>
<td>24.56</td>
<td>23.14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Clay content</td>
<td>32.63</td>
<td>33.20</td>
<td>34.22</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Porosity, %</td>
<td>40.77</td>
<td>40.63</td>
<td>39.23</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Bulk Density, g/cm³</td>
<td>1.28</td>
<td>1.28</td>
<td>1.32</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>pH</td>
<td>6.4</td>
<td>6.3</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Elect. Conductivity(dS/cm at 20°C)</td>
<td>0.24</td>
<td>0.27</td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Water holding capacity %</td>
<td>42.8</td>
<td>42.6</td>
<td>41.2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Infiltration Rate (cm/hr)</td>
<td>9.45</td>
<td>9.02</td>
<td>8.51</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Available Magnesium, as MgO mg/kg</td>
<td>26.57</td>
<td>27.38</td>
<td>29.83</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Organic Carbon %</td>
<td>1.24</td>
<td>1.27</td>
<td>1.28</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Sodium Adsorption Ratio</td>
<td>0.53</td>
<td>0.55</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Cation Exchange Capacity,Cmol(+)/kg</td>
<td>42.42</td>
<td>43.16</td>
<td>44.49</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Nitrogen as N, mg/kg</td>
<td>117.7</td>
<td>119.5</td>
<td>121.9</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Phosphorus as P₂O₅ mg/kg</td>
<td>5.9</td>
<td>6.0</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Potash as K₂O, mg/kg</td>
<td>31.24</td>
<td>33.27</td>
<td>35.62</td>
<td></td>
</tr>
</tbody>
</table>
### DESCRIPTION OF ENVIRONMENT

**EIA STUDY FOR GRASSROOT BG RAILFED POL STORAGE DEPOT AT MOINARBAND, SILCHAR, CACHAR, ASSAM**

**TABLE - 3.9**

**CHARACTERISTICS OF SOIL**

**Period:** March 2014 to May 2014  
**Location:** Agricultural Land - Rangpur SS6

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Observed Value</th>
<th>0-30cm</th>
<th>30-60cm</th>
<th>60-90cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Soil Texture</td>
<td>Clay Loam</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Grain Size, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Sand</td>
<td>43.26</td>
<td>42.74</td>
<td>43.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Silt content</td>
<td>23.48</td>
<td>22.14</td>
<td>23.17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Clay content</td>
<td>33.26</td>
<td>35.12</td>
<td>33.83</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Porosity, %</td>
<td>40.00</td>
<td>40.38</td>
<td>39.62</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Bulk Density, g/cm³</td>
<td>1.30</td>
<td>1.29</td>
<td>1.31</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>pH</td>
<td>6.3</td>
<td>6.4</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Elect. Conductivity (dS/cm at 20°C)</td>
<td>0.31</td>
<td>0.28</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Water holding capacity %</td>
<td>42.0</td>
<td>42.4</td>
<td>41.6</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Infiltration Rate (cm/hr)</td>
<td>8.63</td>
<td>8.15</td>
<td>8.52</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Available Magnesium, as MgO mg/kg</td>
<td>27.59</td>
<td>29.36</td>
<td>31.28</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Organic Carbon %</td>
<td>1.21</td>
<td>1.23</td>
<td>1.23</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Sodium Adsorption Ratio</td>
<td>0.49</td>
<td>0.52</td>
<td>0.54</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Cation Exchange Capacity, Cmol(+) /kg</td>
<td>43.24</td>
<td>45.66</td>
<td>43.98</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Nitrogen as N, mg/kg</td>
<td>131.2</td>
<td>129.5</td>
<td>132.5</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Phosphorus as P₂O₅ mg/kg</td>
<td>6.3</td>
<td>6.5</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Potash as K₂O, mg/kg</td>
<td>35.62</td>
<td>35.95</td>
<td>36.28</td>
<td></td>
</tr>
</tbody>
</table>

**Soil Fertility Quality Standard w.r.t C:N:P:K**

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>PARAMETERS</th>
<th>QUALITY STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organic Carbon %</td>
<td>Poor: &lt;0.5</td>
</tr>
<tr>
<td>2</td>
<td>Nitrogen as N, kg/ha</td>
<td>Medium: 0.5 to 0.75</td>
</tr>
<tr>
<td>3</td>
<td>Phosphorus as P₂O₅ kg/ha</td>
<td>Poor: &lt;280</td>
</tr>
<tr>
<td>4</td>
<td>Potash as K₂O, kg/ha</td>
<td>Medium: 280 to 560</td>
</tr>
<tr>
<td>5</td>
<td>Water holding capacity %</td>
<td>Poor: &lt;23</td>
</tr>
<tr>
<td>6</td>
<td>Infiltration Rate (cm/hr)</td>
<td>Medium: 23 to 57</td>
</tr>
<tr>
<td>7</td>
<td>Elect. Conductivity (dS/cm at 20°C)</td>
<td>Poor: &lt;133</td>
</tr>
<tr>
<td>8</td>
<td>Cation Exchange Capacity, Cmol(+) /kg</td>
<td>Medium: 133 to 337</td>
</tr>
</tbody>
</table>

PDIL: Projects & Development India Limited, Sindri  
33 of 200
SOIL TEXTURE DIAGRAM

PLATE - 3.3
DESCRIPTION OF ENVIRONMENT

3.4 CLIMATE & METEOROLOGY

3.4.1 Climate

The study area has tropical climate influenced by the atmospheric conditions in Bay of Bengal. During monsoon period from May to September and occasionally during rest period of the year in the wake of western disturbances humidity, cloudiness and rainfall activities increase. The year is broadly divided into four seasons namely the winter season starts from mid November to mid March, summer or hot weather season from April, monsoon season spread from end of May to mid September, and October and November are known as transit period or post monsoon period. The summer in Silchar is not very hot while winters are extremely cold. The maximum temperatures hover at 39.4 °C to 30.6 °C in April. Heat wave prevails for a few days in the season, when day temperature rises to 4-10°C above normal. The winter minimum temperatures remain about 5.0 to 19.3 °C and fall below zero degree or so when chilly wind (northerly) blow from Himalayan region. Mist and fog occur in the morning hours after passage of western disturbances. The minimum temperature as low as 05 °C was recorded on 10th Feb.1905. The maximum temperature’s upward surge starts from April and reaches at peak in the month of April. The down ward trend in minimum temperatures commences in September and continues up to January. January is the coldest month. Rainfall increases from the month of June when thundery activities start and July and August are the rainiest months. Monsoon withdraws in the middle of September. Rainfall decreases sharply in October and November.

Climatological normal data of Silchar IMD observatory are available for comparatively longer period of time. Climatological normal data for this observatory have been presented through Tables - 3.10 to 3.15.

3.4.2 Rainfall and Humidity

The lowest total normal rainfall is observed in the month of December and the highest in the month of June. June and July are the main rainiest months. From October onward the rainfall decreases drastically which continues up to the month of April. From May onward the rainfall slightly picks up and reaches at its peak in the month of July. June to September are the main rainy months and this period is referred as the “Monsoon Season”. Dry and hot weather is prevails from
March to May months which is called the “Summer season”. A temperature are very low during the period of December to February, and is called “Winter season”. October and November months are the transit months between Monsoon and Winter season. This period is referred as “Post Monsoon Season.” Climatological Normal Data on rainfall and humidity and cloudiness for Silchar Meteorological Station for the period 1951-1980 are presented in Table - 3.10. The annual average rainfall is 267.7 mm and 76% of this is received during south-west monsoon period from June to September. Maximum rainfall in a single day is reported to be 290.3 mm on 30th May, 1893. Heavy rainfall generally does not occur in this season. Rainfall of 1cm or less is not uncommon. The humidity is maximum during morning hours and lowest during evening hours. The lowest humidity is observed in the month of March. May onward humidity picks up and increases gradually to have its highest values in the month of September. After this, it decreases slowly up to the month of November. But again shows an increasing tendency for two months namely December and January. From next month onward the humidity again shows a decreasing trend and attains its lowest value during the month of April. The morning hour’s humidity remains between 74-54% and the evening period between 87-81% during a year.

3.4.3 Temperature
Climatological normal data on monthly mean values of daily maximum and minimum temperatures, highest and lowest values in the different months, and extremes of temperature for the period 1951-1980 for Silchar Meteorological Station have been presented in Table - 3.11. Amongst the extremes of temperatures recorded during the 30 years period, the highest temperature of 39.4°C was recorded on Apr, 1937 and the lowest temperature of 5.0°C was recorded on February, 1905.

3.4.4 Wind Flow Pattern
Climatological normal data on wind flow pattern for Silchar Observatory have been presented in Table - 3.12. Generally, the average monthly wind speed varies in between 0.7 to 2.5 km/h during the year. But in summer, there are dust strom, dust-raising winds prevailing and wind speed reached up to 2.5 km/hr. During the winter season, generally wind blows from East to North Sector with
speed 1 to 5 m/s. The maximum (15%) days it blows from Easterly direction. Summer Season is windy season for Silchar. The average wind speed is 6-5 km/hr. In the month of March and April the wind direction is East to South-Easterly during morning hours and North-Westerly (NW) in all the three months of season during evening hours.

The surface wind speed decreased in monsoon season as compared to summer season. The average wind speed is 7-8 km/hr during most part of the season North-Westerly to West-North-Westerly component of wind direction remain prominent while Easterly component remains about 5% in all the months of the seasons. The frequency of calm wind is lowest in June and highest at the end of the September.

Post-monsoon season is not windy like summer and monsoon season. The average wind speed ranges between 2-4 km/hr. The light winds blow during day time and become calm during night time. During morning hours wind direction remains Easterly while in evening become Northerly to North-Westerly. The percentage number of calm conditions is also high in this season. Percentage frequency distribution of dominant wind during the study period has been presented in Tables-3.17 to 3.20.

3.4.5 Special Weather Phenomenon

Climatological normal data on special weather phenomenon at Silchar Observatory have been presented in Table - 3.13. It is very interesting to note that data with respect to hail, dust storm, squall and fog has been reported to be nil whereas during the entire period of a year, the annual mean data for thunder, Hail and Fog is 46.6 days, 0.4 days and 1.7 days respectively.
### TABLE - 3.10
CLIMATOLOGICAL NORMAL DATA - RAINFALL & HUMIDITY

<table>
<thead>
<tr>
<th>Month</th>
<th>Rainfall Monthly Total, mm</th>
<th>Rainfall No. of rainy days</th>
<th>Relative Humidity, %</th>
<th>Cloud Amount (Octas of Sky)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>All Clouds</td>
</tr>
<tr>
<td>January</td>
<td>16.3</td>
<td>1.3</td>
<td>82</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>63</td>
<td></td>
<td></td>
<td>1.5</td>
</tr>
<tr>
<td>February</td>
<td>44.8</td>
<td>2.6</td>
<td>74</td>
<td>2.0</td>
</tr>
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Source: Climatological Normal Table for Silchar (IMD Publication).
### TABLE - 3.11

**CLIMATOLOGICAL NORMAL DATA – TEMPERATURE**

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**Source:** IMD Observatory at Silchar (IMD Publication).

* Highest Temperature 39.4°C on 16th April 1937 and 28th July 1896

** Lowest Temperature 5.0°C on 10th February 1905.
TABLE - 3.12
METEOROLOGICAL NORMAL DATA - WIND FLOW PATTERN

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Source: IMD Observatory at Silchar (IMD Publication).
**TABLE - 3.13**
**CLIMATOLOGICAL NORMAL DATA - SPECIAL WEATHER PHENOMENA**

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**Source:** IMD Observatory at Silchar (IMD Publication).
### TABLE - 3.14
PERCENTAGE FREQUENCIES OF GROUND BASED INVERSIONS AT SILEHAR WITH VARIOUS TOP HEIGHTS

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Source: Indian Meteorological Department Publication.
TABLE – 3.15
PERCENTAGE FREQUENCIES OF ELEVATED INVERSIONS AT
SILCHAR WITH VARIOUS BASE HEIGHTS

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Source: Indian Meteorological Department Publication
3.4.6  MICROMETEOROLOGY

The micrometeorological data generated during the study period are very useful for proper interpretation of the baseline information and provides an input for prediction models for air pollutant dispersion. The transport and diffusion of the pollutants in the atmosphere are governed by meteorological factors. Factors like wind velocity, wind direction and atmospheric stability are known as primary/basic meteorological parameters since the dispersion and diffusion of pollutants depend mainly on these factors. Factors like ambient temperature, humidity, rainfall, atmospheric pressure, etc. are known as secondary meteorological parameters as these factors control the dispersion of the pollutants indirectly by affecting the primary factors. Thus, to assess the air pollution impact it becomes imperative to collect the above mentioned micrometeorological parameters of the project area.

3.4.7  On Site Meteorological conditions

Wind speed and direction at the project site was monitored with a mechanical wind monitor installed on the roof of Project Office. Monitoring was carried out during the month of March 2014 to May 2014. The wind rose for the study period has been shown in Plate - 3.4 to 3.7. The predominant wind direction was East, followed by North-West.

3.4.8  DATA COLLECTION AND ANALYSIS

Generally, moderate to high winds prevailed throughout the season. Winds were light particularly during the morning hours. The analysis of wind pattern during the season showed that the wind was predominant blowing from East with frequency of 10.30%. It was followed by North-East with 08.70 % frequency. The other observed directions were South-East (6.80%), South-West (4.20%) etc. The calm conditions prevailed 40.30%. The wind speeds of 0.6-2.6 m/sec, 2.6-4.5 m/sec and above 4.5 m/sec were recorded for 25.10%, 23.20% and 11.40% of the total time respectively.

During the month of March, 2014, calm conditions prevailed about 36.80%. The
predominant wind direction was East with frequency of 10.60%. The wind speeds of 0.6-2.6 m/sec, 2.6-4.5 m/sec and above 4.5 m/sec were recorded for 31.60%, 21.70% and 9.90% of the total time respectively.

During the month of April, 2014, calm conditions prevailed about 40.50%. The predominant wind direction was East with frequency of 12.30%. The wind speeds of 0.6-2.6 m/sec, 2.6-4.5 m/sec and above 4.5 m/sec were recorded for 24.40%, 23.80% and 11.30% of the total time respectively.

During the month of May, 2014 calm conditions prevailed about 43.70%. The dominant wind direction was North-East with frequency of 10.30%. The wind speeds of 0.6-2.6 m/sec, 2.6-4.5 m/sec and above 4.5 m/sec were recorded for 19.30%, 24.20% and 12.80% of the total time respectively.

The ambient temperature, relative humidity and rainfall recorded during the study period around the project site have been summarized in Table-3.21 to 3.23.

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The minimum temperature during the study period was recorded as 17.2°C and the maximum ambient temperature was recorded as 33.6°C. The minimum value of relative humidity was recorded as 48% whereas the maximum value has been recorded as 85%. The maximum rainfall recorded during the study period was 8.0 mm in the month of March and April, 2014.
### TABLE - 3.17

SEASONAL WIND DISTRIBUTION

Period: March’ 2014 - May’ 2014

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MONTHLY WIND DISTRIBUTION

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MONTHLY WIND DISTRIBUTION

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MICRO METEOROLOGICAL DATA DURING STUDY PERIOD

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MICRO METEOROLOGICAL DATA DURING STUDY PERIOD

Period: April, 2014

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**Period:** May, 2014

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<td>33.2</td>
<td>71</td>
</tr>
</tbody>
</table>

**SUMMARY**

<table>
<thead>
<tr>
<th>Values</th>
<th>Temperature (°C)</th>
<th>Relative Humidity (%)</th>
<th>Total Rainfall (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
<td>Min.</td>
</tr>
<tr>
<td>Minimum</td>
<td>21.3</td>
<td>-</td>
<td>69</td>
</tr>
<tr>
<td>Maximum</td>
<td>-</td>
<td>33.2</td>
<td>-</td>
</tr>
</tbody>
</table>
PLATE-3.4

SEASONAL WINDROSE PATTERN (March, 2014- May, 14)
PLATE - 3.5
MONTHLY WINDROSE PATTERN (March, 2014)
PLATE – 3.6
MONTHLY WINDROSE PATTERN (April, 2014)
Plate - 3.7
MONTHLY WINDROSE PATTERN (May, 2014)
3.5 AMBIENT AIR QUALITY

The ambient air quality with respect to the study area forms the baseline information. The prime objective of the baseline air quality study was to establish the existing ambient air quality of the area.

3.5.1 Methodology Adopted for the study

The baseline status of the ambient air quality has been established through a scientifically designed ambient air quality monitoring network which is based on the following considerations:

- Meteorological conditions of the area;
- Topography of the study area;
- Representatives of back-ground air quality for obtaining baseline status; and
- Representatives of likely impact areas.

Baseline data on air quality was monitored at six sampling locations as discussed above during the period from March 2014 – May 2014. The ambient air quality monitoring stations were set-up at four locations with due consideration of the above mentioned points and as per MoEF guidelines for ambient air quality monitoring. The detail sampling locations has been shown in Plate No - 3.8.

3.5.2 Sampling Period & Parameters

The following air pollutants were monitored on 24-hourly basis for consecutive two days in a week for a period of twelve weeks:

- Particulate matter (PM_{10})
- Particulate matter (PM_{2.5})
- Sulphur dioxide (SO_{2}).
- Oxides of nitrogen (NO_{x})
- Carbon monoxide (CO)
- HC (Methane, Non- Methane)
- VOC (Volatile Organic Compounds)
3.5.3 **Sampling & Analytical Procedure**

A brief description of the sampling and analytical procedures followed during the ambient air quality monitoring is as follows:

**Particulate Matter (PM\(_{10}\))**:  
The sampling of ambient air for evaluating PM\(_{10}\) levels were performed with a RDS Sampler fitted with a cyclone separator for separation of particles larger than 10 microns diameter. Air exiting the separator is drawn at a measured rate through pre-weighed glass fiber filter sheets of 20 cm x 25 cm sizes. The PM\(_{10}\) concentrations were computed from the average air flow rate, sampling period and the mass of particulate matter collected over the filter surface.

**Particulate Matter (PM\(_{2.5}\))**:  
PM\(_{2.5}\) is determined as per USEPA (United State Environment Protection Agency) guidelines with the help of Fine Dust Sampler. Ambient air is allowed to pass through Louvered inlet and wins impactor as well as particulate matter of size <2.5 microns is deposited on 46.2mm PTFE filter paper. The difference of final weight of filter and initial weight gives the weight of particulate matter of size <2.5 microns. The concentration of PM\(_{2.5}\) is computed with the help of dust deposited on the filter, volume of air sampled monitoring temperature and barometric pressure.

**SO\(_2\)**:  
The sampling of ambient air for evaluating the gaseous pollutants were performed with a Multigas Sampler, using the vacuum created by the RDS Sampler for drawing the air samples through the impingers. For SO\(_2\), air was drawn at a measured and controlled rate of 400 to 500 ml/min through a solution of potassium tetrachloromercurate. After completion of the sampling, the used absorbing reagent was treated with dilute solutions of sulfamic acid, formaldehyde and para-roasaniline hydrochloride. The absorbance of the intensely coloured para-roasaniline methyl sulphonic acid was measured at 560 nm wavelength of light on spectrophotometer and the amount of SO\(_2\) in the sample was computed. The ambient SO\(_2\) concentrations were computed from the total SO\(_2\) absorbed in the impingers, overall efficiency of the impinger and the volume of air sampled.
**NO₂:**
Air was drawn at a measured and controlled rate of about 200 ml/minute through an orifice-tipped impinger containing solutions of sodium hydroxide and sodium arsenite. After completion of the sampling, suitable aliquot of the used absorbing solution was treated with solutions of \( \text{H}_2\text{O}_2 \), sulphanilamide and NEDA. The nitrite ion present in the impinger was calculated by measuring the absorbance of the resulting solution at 540 nm wavelength of light on spectrophotometer. The ambient NOx concentrations were computed from the total nitrite ion present in the impingers, overall efficiency of the impinger and the volume of air sampled.

**Carbon Monoxide:** Mylar bags and pulse pumps have been used to collect the three 8 hourly samples for carbon monoxide. The CO levels were analyzed by Gas Chromatograph.

**VOC:** VOC concentration was measured by Gas Chromatography technique.

**Hydrocarbons:** Mylar bags and pulse pumps have been used to collect the three 8 hourly samples for hydrocarbon. The HC levels were analyzed by Gas Chromatograph.

### 3.5.4 Brief description of the sampling locations

**Near Proposed Project Area (SA-1)**
This sampling station has been selected to assess the concentration of pollutants in upwind direction and is located towards East (1st pre-dominant) of the POL Depot. The FDS was installed on the roof of a private house. This location is selected to assess the background concentration of pollutants in rural and residential area.

**Moinarband Village (SA-2)**
This sampling station has been selected to assess the concentration of pollutants in upwind direction and is located at a distance of about 0.63 Km towards North-Western direction of the POL Depot. This location is selected to assess the background concentration of pollutants in rural and residential area.
Gosainpur Village (SA - 3)

This sampling station is located at a distance of about 4.19 Km in South -West direction of the POL Depot. This station lies in downwind direction with respect to the POL Depot.

Debpara Village (SA - 4)

This location is situated at distance of approx. 4.67 km from the POL depot towards West - South direction. The sampler was placed on the roof of a single storied building and this location is selected to assess the concentration of the pollutants in the downwind direction.

Shajagaon Village (SA - 5)

This location is situated at distance of approx. 3.03 km from the POL depot towards North direction. The sampler was placed on the roof of a single storied building and this location is selected to assess the concentration of the pollutants in the downwind direction.

Rangpur Village (SA - 6)

This location is situated at distance of approx. 4.61 km from the POL depot towards South –South- West direction. The sampler was placed on the roof of a single storied building and this location is selected to assess the concentration of the pollutants in the downwind direction.

**TABLE - 3.24**

**DESCRIPTION OF MONITORING STATIONS**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Location Code</th>
<th>Location Name</th>
<th>Direction</th>
<th>Location w.r.t predominant wind direction</th>
<th>Distance w.r.t Project Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>SA₁</td>
<td>Near Proposed Project Area</td>
<td></td>
<td>Up-Wind</td>
<td>-</td>
</tr>
<tr>
<td>02.</td>
<td>SA₂</td>
<td>Moinarband village</td>
<td>NW</td>
<td>Up-Wind</td>
<td>0.63</td>
</tr>
<tr>
<td>03.</td>
<td>SA₃</td>
<td>Gosainpur village</td>
<td>SW</td>
<td>Dn-Wind</td>
<td>4.19</td>
</tr>
<tr>
<td>04.</td>
<td>SA₄</td>
<td>Debpara village</td>
<td>WS</td>
<td>Dn-Wind</td>
<td>4.67</td>
</tr>
<tr>
<td>05.</td>
<td>SA₅</td>
<td>Shajagaon village</td>
<td>N</td>
<td>Cross-Wind</td>
<td>3.03</td>
</tr>
<tr>
<td>06.</td>
<td>SA₆</td>
<td>Rangpur village</td>
<td>SSW</td>
<td>Cross-Wind</td>
<td>4.61</td>
</tr>
</tbody>
</table>
PLATE - 3.8
MAP SHOWING AIR QUALITY MONITORING STATIONS
3.5.5 Techniques for Measurement

The techniques used for measurement of pollutants may be summarized as under:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Code of Practice</th>
<th>Sampler</th>
<th>Instruments used for Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>PM(_{10})</td>
<td>IS: 5182 (Part-IV)</td>
<td>RDS Sampler with Cyclone Separator</td>
<td>Balance, Desiccator</td>
</tr>
<tr>
<td>2.</td>
<td>PM(_{2.5})</td>
<td>USEPA</td>
<td>Fine Dust Sampler</td>
<td>Balance, Desiccator</td>
</tr>
<tr>
<td>3.</td>
<td>SO(_2)</td>
<td>IS: 5182 (Part-V)</td>
<td>RDS Sampler</td>
<td>Spectrophotometer</td>
</tr>
<tr>
<td>4.</td>
<td>NO(_x)</td>
<td>IS: 5182 (Part-V)</td>
<td>RDS Sampler</td>
<td>Spectrophotometer</td>
</tr>
<tr>
<td>5.</td>
<td>CO</td>
<td>IS: 5182 (Part-X)</td>
<td>Bladder &amp; Aspirator</td>
<td>Gas Chromatograph with Methanizer</td>
</tr>
</tbody>
</table>

3.5.6 Summary

The summary of the observations made during the monitoring has been presented through Table 3.26 to 3.33 wherein minimum and maximum values, 24 hourly averages and 98\(^{th}\) percentile values of PM\(_{10}\), PM\(_{2.5}\), SO\(_2\), NO\(_x\), HC, VOC and CO concentration have been computed.

3.5.7 Observation

The detailed observation made for ambient air quality during the study period has been presented in Table 3.35 to Table - 3.40.

**PM\(_{10}\)**

Salient features of the observations made with respect to PM\(_{10}\) during the study period are summarized in Table - 3.26 as under:

<table>
<thead>
<tr>
<th>Sampling Location</th>
<th>Min.</th>
<th>Max.</th>
<th>Average</th>
<th>98(^{th}) Percentile</th>
<th>Permissible Limits (24-Hrs Average) as per NAAQS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near Proposed Project Area</td>
<td>47</td>
<td>67</td>
<td>54.6</td>
<td>66.1</td>
<td>Industrial, Res. &amp; Rural Area</td>
</tr>
<tr>
<td>Moinarband village</td>
<td>44</td>
<td>58</td>
<td>52.2</td>
<td>57.5</td>
<td>-do-</td>
</tr>
<tr>
<td>Gosaipur village</td>
<td>47</td>
<td>56</td>
<td>51.2</td>
<td>56.0</td>
<td>-do-</td>
</tr>
<tr>
<td>Debpara village</td>
<td>45</td>
<td>60</td>
<td>50.6</td>
<td>59.1</td>
<td>-do-</td>
</tr>
<tr>
<td>Shajagaon village</td>
<td>43</td>
<td>57</td>
<td>49.3</td>
<td>56.5</td>
<td>-do-</td>
</tr>
<tr>
<td>Rangpur village</td>
<td>48</td>
<td>63</td>
<td>55.8</td>
<td>62.5</td>
<td>-do-</td>
</tr>
</tbody>
</table>

The concentrations of PM\(_{10}\) at all the six sampling locations were observed in the
range of 43 to 67 µg/m$^3$, while the average values ranged between 49.3 to 55.8 µg/m$^3$. It has been observed that the minimum value of 43 µg/m$^3$ have been observed at Shajagaon village (SA-5), whereas the maximum value of 67 µg/m$^3$ was observed Near Proposed Project Area (SA-1). The 98th percentile values ranged between 56.0 to 66.1 µg/m$^3$. The average concentration of PM$_{10}$ was observed well below 100 µg/m$^3$, which is the ambient air quality standard for industrial, residential and rural area. All the 98th percentile values were also well below the limit and it is much less than the Exceedence Factor$^1$ <0.5 (considered as low risk). None of the results has exceeded the value of 100 ug/m$^3$.

(1=Comprehensive Environmental Assessment of Industrial Clusters by CPCB, MoEF, December 2009).

In view of the observations made above, it may, therefore, be concluded that the existing air quality has adequate receptive capacity with respect to PM$_{10}$.

**PM$_{2.5}$**

Salient features of the observations made with respect to PM$_{2.5}$ during the study period are summarized in Table - 3.27 as under:

<table>
<thead>
<tr>
<th>Sampling Location</th>
<th>Min.</th>
<th>Max.</th>
<th>Average</th>
<th>98th Percentile</th>
<th>Permissible Limits (24-Hrs Average) as per NAAQS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near Proposed Project Area</td>
<td>25</td>
<td>36</td>
<td>28.1</td>
<td>34.1</td>
<td>Industrial, Res. &amp; Rural Area 60</td>
</tr>
<tr>
<td>Moinarband village</td>
<td>23</td>
<td>30</td>
<td>25.8</td>
<td>29.5</td>
<td>-do-</td>
</tr>
<tr>
<td>Gosaipur village</td>
<td>24</td>
<td>30</td>
<td>26.0</td>
<td>29.9</td>
<td>-do-</td>
</tr>
<tr>
<td>Debpara village</td>
<td>21</td>
<td>31</td>
<td>25.6</td>
<td>30.1</td>
<td>-do-</td>
</tr>
<tr>
<td>Shajagaon village</td>
<td>21</td>
<td>30</td>
<td>25.1</td>
<td>29.6</td>
<td>-do-</td>
</tr>
<tr>
<td>Rangpur village</td>
<td>23</td>
<td>34</td>
<td>28.3</td>
<td>33.6</td>
<td>-do-</td>
</tr>
</tbody>
</table>

The concentrations of PM 2.5 at all the six sampling locations were observed in the range of 21 to 36 µg/m$^3$, while the average values ranged between 25.1 to 28.3 µg/m$^3$. It has been observed that the minimum value of 21 µg/m$^3$ have been observed at Debpara village (SA-4) & Shajagaon village(SA-5), whereas the maximum value of 36 µg/m$^3$ was observed, Near Proposed Project Area (SA-1). The 98th percentile values ranged between 29.5 to 34.1 µg/m$^3$. The average concentration of PM 2.5 was observed well below 60 µg/m$^3$, which is the ambient
air quality standard for industrial, residential and rural area.

**Sulphur Dioxide**

Salient features of the observations made during the study period have been presented in Table - 3.28 as under.

**TABLE - 3.28**

<table>
<thead>
<tr>
<th>Sampling Location</th>
<th>Min.</th>
<th>Max.</th>
<th>Average</th>
<th>98th Percentile</th>
<th>Permissible Limits (24-Hrs Average) as per NAAQS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near Proposed Project Area</td>
<td>5.4</td>
<td>7.2</td>
<td>6.1</td>
<td>7.0</td>
<td>Industrial, Res. &amp; Rural Area 80</td>
</tr>
<tr>
<td>Moinarband village</td>
<td>5.3</td>
<td>6.9</td>
<td>6.1</td>
<td>6.8</td>
<td>Industrial, Res. &amp; Rural Area 80</td>
</tr>
<tr>
<td>Gosaipur village</td>
<td>5.6</td>
<td>7.2</td>
<td>6.4</td>
<td>7.2</td>
<td>Industrial, Res. &amp; Rural Area 80</td>
</tr>
<tr>
<td>Debpara village</td>
<td>5.2</td>
<td>7.3</td>
<td>6.3</td>
<td>7.3</td>
<td>Industrial, Res. &amp; Rural Area 80</td>
</tr>
<tr>
<td>Shajagaon village</td>
<td>5.4</td>
<td>7.6</td>
<td>6.6</td>
<td>7.6</td>
<td>Industrial, Res. &amp; Rural Area 80</td>
</tr>
<tr>
<td>Rangpur village</td>
<td>5.9</td>
<td>7.7</td>
<td>7.0</td>
<td>7.6</td>
<td>Industrial, Res. &amp; Rural Area 80</td>
</tr>
</tbody>
</table>

SO$_2$ concentrations at all the Six sampling locations have been observed in the range of 5.2 to 7.7 μg/m$^3$, while the average values were observed in the range of 6.1 to 7.0 μg/m$^3$. The minimum concentration of SO$_2$ was recorded at Debpara Village (SA-4) while the maximum concentration was observed at Rangpur Village (SA-6). The 98$^{th}$ percentile values ranged between 6.8 to 7.6 μg/m$^3$. The observed average SO$_2$ concentrations were well below 80 μg/m$^3$, which is the ambient air quality standard for industrial, residential & rural areas. It is, therefore, concluded that plant operations have insignificant impact on existing air quality with respect to the Sulphur dioxide.

**Nitrogen Dioxide (NO$_x$)**

Salient features of the observations made during the study period have been presented in Table - 3.29 as under:
Table - 3.29
SUMMARY OF NO\textsubscript{x} CONCENTRATIONS (µg/m\textsuperscript{3})

<table>
<thead>
<tr>
<th>Sampling Location</th>
<th>Min.</th>
<th>Max.</th>
<th>Average</th>
<th>98th Percentile</th>
<th>Permissible Limits (24-Hrs Average) as per NAAQS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near Proposed Project Area</td>
<td>10.1</td>
<td>12.4</td>
<td>11.1</td>
<td>12.4</td>
<td>Industrial, Res. &amp; Rural Area 80</td>
</tr>
<tr>
<td>Moinarband village</td>
<td>10.4</td>
<td>12.3</td>
<td>11.2</td>
<td>12.2</td>
<td>-do- 80</td>
</tr>
<tr>
<td>Gosaipur village</td>
<td>10.6</td>
<td>12.2</td>
<td>11.4</td>
<td>12.5</td>
<td>-do- 80</td>
</tr>
<tr>
<td>Debpara village</td>
<td>10.4</td>
<td>12.5</td>
<td>11.3</td>
<td>12.5</td>
<td>-do- 80</td>
</tr>
<tr>
<td>Shajagaon village</td>
<td>9.8</td>
<td>12.3</td>
<td>11.2</td>
<td>12.3</td>
<td>-do- 80</td>
</tr>
<tr>
<td>Rangpur vilage</td>
<td>10.5</td>
<td>12.5</td>
<td>11.6</td>
<td>12.5</td>
<td>-do- 80</td>
</tr>
</tbody>
</table>

The concentrations of NO\textsubscript{x} at all the six sampling locations have been observed in the range of 9.8 to 12.5 µg/m\textsuperscript{3}, while the average values ranged between 11.1 to 11.6 µg/m\textsuperscript{3}. The minimum concentration of NO\textsubscript{x} was observed at Shajagaon village (SA-5), while the maximum concentration was observed at Debpara village (SA-4) & Rangpur village (SA-6). The 98\textsuperscript{th} percentile values ranged between 12.2 to 12.5 µg/m\textsuperscript{3}. The observed average NO\textsubscript{x} concentrations were well below 80 µg/m\textsuperscript{3}, which is the ambient air quality standard for industrial, residential & rural areas. It is, therefore, concluded that plant operations have insignificant impact on existing air quality with respect to the oxides of Nitrogen.

**Hydrocarbons (Methane) (HC)**

Salient features of the observations made during the study period have been presented in Table - 3.30 as under:

Table - 3.30
SUMMARY OF HC (Methane) CONCENTRATIONS (ppm)

<table>
<thead>
<tr>
<th>Sampling Location</th>
<th>Min.</th>
<th>Max.</th>
<th>Average</th>
<th>98th Percentile</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near Proposed Project Area</td>
<td>1.47</td>
<td>1.63</td>
<td>1.55</td>
<td>1.62</td>
<td>Industrial, Res. &amp; Rural Area</td>
</tr>
<tr>
<td>Moinarband village</td>
<td>1.42</td>
<td>1.63</td>
<td>1.54</td>
<td>1.62</td>
<td>-do-</td>
</tr>
<tr>
<td>Gosaipur village</td>
<td>1.48</td>
<td>1.65</td>
<td>1.55</td>
<td>1.64</td>
<td>-do-</td>
</tr>
<tr>
<td>Debpara village</td>
<td>1.46</td>
<td>1.60</td>
<td>1.53</td>
<td>1.6</td>
<td>-do-</td>
</tr>
<tr>
<td>Shajagaon village</td>
<td>1.46</td>
<td>1.63</td>
<td>1.55</td>
<td>1.63</td>
<td>-do-</td>
</tr>
<tr>
<td>Rangpur vilage</td>
<td>1.54</td>
<td>1.67</td>
<td>1.61</td>
<td>1.67</td>
<td>-do-</td>
</tr>
</tbody>
</table>

The concentrations of HC (Methane) were observed in the range of 1.42 to 1.67 ppm, with the average values ranged between 1.53 to 1.61 ppm. The minimum
concentration of HC was observed at Moinarband village (SA-2), while the maximum concentration was observed at Rangpur village (SA-6). The 98th percentile values ranged between 1.60 to 1.67 ppm.

**Table - 3.31**

**SUMMARY OF HC (Non-Methane) CONCENTRATIONS (ppm)**

<table>
<thead>
<tr>
<th>Sampling Location</th>
<th>Min.</th>
<th>Max.</th>
<th>Average</th>
<th>98th Percentile</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near Proposed Project Area</td>
<td>0.55</td>
<td>0.77</td>
<td>0.65</td>
<td>0.76</td>
<td>Industrial, Res. &amp; Rural Area</td>
</tr>
<tr>
<td>Moinarband village</td>
<td>0.49</td>
<td>0.83</td>
<td>0.66</td>
<td>0.8</td>
<td>-do-</td>
</tr>
<tr>
<td>Gosaipur village</td>
<td>0.52</td>
<td>0.84</td>
<td>0.67</td>
<td>0.82</td>
<td>-do-</td>
</tr>
<tr>
<td>Debpara village</td>
<td>0.48</td>
<td>0.77</td>
<td>0.62</td>
<td>0.77</td>
<td>-do-</td>
</tr>
<tr>
<td>Shajagaon village</td>
<td>0.49</td>
<td>0.83</td>
<td>0.61</td>
<td>0.82</td>
<td>-do-</td>
</tr>
<tr>
<td>Rangpur village</td>
<td>0.44</td>
<td>0.77</td>
<td>0.6</td>
<td>0.76</td>
<td>-do-</td>
</tr>
</tbody>
</table>

The concentrations of HC (Non-Methane) were observed in the range of 0.44 to 0.84 ppm, with the average values ranged between 0.60 to 0.67 ppm. The minimum concentration of HC was observed at Rangpur Village (SA-6), while the maximum concentration was observed at Gosainpur Village (SA-3). The 98th percentile values ranged between 0.76 to 0.82 ppm.

**Volatile Organic Compounds (VOC)**

Salient features of the observations made during the study period have been presented in Table - 3.32 as under:

**Table - 3.32**

**SUMMARY OF VOC CONCENTRATIONS (mg/m³)**

<table>
<thead>
<tr>
<th>Sampling Location</th>
<th>Min.</th>
<th>Max.</th>
<th>Average</th>
<th>98th Percentile</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near Proposed Project Area</td>
<td>2.06</td>
<td>2.34</td>
<td>2.20</td>
<td>2.33</td>
<td>Industrial, Res. &amp; Rural Area</td>
</tr>
<tr>
<td>Moinarband village</td>
<td>2.04</td>
<td>2.34</td>
<td>2.20</td>
<td>2.33</td>
<td>-do-</td>
</tr>
<tr>
<td>Gosaipur village</td>
<td>2.09</td>
<td>2.32</td>
<td>2.22</td>
<td>2.32</td>
<td>-do-</td>
</tr>
<tr>
<td>Debpara village</td>
<td>2.04</td>
<td>2.28</td>
<td>2.15</td>
<td>2.28</td>
<td>-do-</td>
</tr>
<tr>
<td>Shajagaon village</td>
<td>2.08</td>
<td>2.31</td>
<td>2.16</td>
<td>2.30</td>
<td>-do-</td>
</tr>
<tr>
<td>Rangpur village</td>
<td>2.11</td>
<td>2.35</td>
<td>2.20</td>
<td>2.35</td>
<td>-do-</td>
</tr>
</tbody>
</table>

The concentrations of VOC were observed in the range of 2.04 to 2.35 mg/m³, with the average values ranged between 2.15 to 2.22 mg/m³. The minimum concentration of VOC was observed at Moinarband village (SA-2), while the maximum concentration was observed at Rangpur village (SA-6). The 98th percentile values ranged between 2.28 to 2.35 mg/m³.
Carbon Monoxide (CO)

Salient features of the observations made during the study period have been presented in Table - 3.33 as under:

<table>
<thead>
<tr>
<th>Sampling Location</th>
<th>Min.</th>
<th>Max.</th>
<th>Average</th>
<th>98th Percentile</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near Proposed Project Area</td>
<td>0.2</td>
<td>0.7</td>
<td>0.4</td>
<td>0.7</td>
<td>Industrial, Res. &amp; Rural Area</td>
</tr>
<tr>
<td>Moinarband village</td>
<td>0.2</td>
<td>0.8</td>
<td>0.5</td>
<td>0.8</td>
<td>-do-</td>
</tr>
<tr>
<td>Gosaipur village</td>
<td>0.2</td>
<td>0.6</td>
<td>0.4</td>
<td>0.6</td>
<td>-do-</td>
</tr>
<tr>
<td>Debpara village</td>
<td>0.1</td>
<td>0.6</td>
<td>0.4</td>
<td>0.6</td>
<td>-do-</td>
</tr>
<tr>
<td>Shajagaon village</td>
<td>0.2</td>
<td>0.6</td>
<td>0.4</td>
<td>0.6</td>
<td>-do-</td>
</tr>
<tr>
<td>Rangpur village</td>
<td>0.3</td>
<td>0.6</td>
<td>0.5</td>
<td>0.6</td>
<td>-do-</td>
</tr>
</tbody>
</table>

The concentrations of CO were observed in the range of 0.1 to 0.8 mg/m$^3$, with the average values is ranged between 0.4 to 0.5 mg/m$^3$. The minimum concentration of CO was observed at Debpara village, while the maximum concentration was observed at Moinarband village (SA-2). The 98$^{th}$ percentile values ranged between 0.6 to 0.8 mg/m$^3$.

**Conclusion**

On the basis of observations made on baseline ambient air quality data, it may safely be concluded that the ambient air quality in the area around the proposed project is in compliance with the National Ambient Air Quality Standards and has adequate assimilative capacity to facilitate industrial development in the area at sustainable exploitation of resources.
3.5.8 **AIR QUALITY STANDARDS**

The Ambient Air Quality Standards notified by Ministry of Environment & Forest [the Gazette of India, Extraordinary, Part-II - Section 3 sub-section (i) dated November 16, 2009], in exercise of its powers conferred by section 6 and section 25 of the Environment (Protection) Act, 1986 (29 of 1981), Seventh Amendment Rules, 2009 have been presented in Table - 3.34.

While formulating the standards, it has been presumed that the State Pollution Control Boards would, on the basis of land use and other factors, classify the various areas of the state into two categories:

A) Industrial, Residential, rural and other areas, and

B) Sensitive areas.

Category (A) will become self-evident from the intensity of industrial and anthropogenic activity in the area and is bound to have somewhat inferior quality of air compared to category (C). Category (C) will cover hill stations, tourist resorts, sanctuaries, national parks, national monuments, health-resorts, and other such areas where the nation would wish to conserve its clean environment even if that implies some curbs on economic activity.
**TABLE - 3.34**

**ENVIRONMENT (PROTECTION) SEVENTH AMENDMENT RULES, 2009**

**NATIONAL AMBIENT AIR QUALITY STANDARDS**

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Time weighted average</th>
<th>Concentration in ambient air</th>
<th>Method of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Industrial, Residential, rural &amp; other areas</td>
<td>Ecologically Sensitive areas (Notified by Central Government)</td>
</tr>
<tr>
<td>Sulphur dioxide, ((\text{SO}_2)\mu\text{g/m}^3)</td>
<td>Annual*</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>24-hours**</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Nitrogen dioxides ((\text{NO}_2)\mu\text{g/m}^3)</td>
<td>Annual*</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>24-hours**</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Particulate Matter (Size less than 10(\mu\text{m})) or PM(10) (\mu\text{g/m}^3)</td>
<td>Annual*</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>24-hours**</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Particulate Matter (Size less than 2.5(\mu\text{m})) or PM(2.5) (\mu\text{g/m}^3)</td>
<td>Annual*</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>24-hours**</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ozone ((\text{O}_3)\mu\text{g/m}^3)</td>
<td>8 hours**</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>1 hour**</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead ((\text{Pb})\mu\text{g/m}^3)</td>
<td>Annual*</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>24-hours**</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Carbon Monoxide ((\text{CO})\text{ng/m}^3)</td>
<td>8 hours**</td>
<td>02</td>
<td>02</td>
</tr>
<tr>
<td></td>
<td>1 hour*</td>
<td>04</td>
<td>04</td>
</tr>
<tr>
<td>Ammonia ((\text{NH}_3)\mu\text{g/m}^3)</td>
<td>Annual*</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>24-hours**</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Benzene ((\text{C}_6\text{H}_6)\mu\text{g/m}^3)</td>
<td>Annual*</td>
<td>05</td>
<td>05</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benzo (α) Pyrene ((\text{BaP})\text{- Particulate phase only, ng/m3})</td>
<td>Annual*</td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>Arsenic ((\text{As})\text{ng/m}3)</td>
<td>Annual*</td>
<td>06</td>
<td>06</td>
</tr>
<tr>
<td>Nickel ((\text{Ni})\text{ng/m}3)</td>
<td>Annual*</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year, 2% of the time; they may exceed the limits but not on two consecutive days of monitoring.
### Table - 3.35

#### AIR QUALITY DATA

**Period:** March, 2014 - May, 2014  
**Location:** Near Proposed Project Area (SA1)

<table>
<thead>
<tr>
<th>WEEK</th>
<th>DATE</th>
<th>PM$_{10}$ (µg/m$^3$)</th>
<th>PM$_{2.5}$ (µg/m$^3$)</th>
<th>SO$_2$ (µg/m$^3$)</th>
<th>NOx (µg/m$^3$)</th>
<th>HC (ppm) Methane (ppm)</th>
<th>HC (ppm) Non-Methane (ppm)</th>
<th>VOC (mg/m$^3$)</th>
<th>CO (mg/m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>03/04/03.14</td>
<td>52</td>
<td>25</td>
<td>6.4</td>
<td>10.3</td>
<td>1.49</td>
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<td>2.14</td>
<td>0.5</td>
</tr>
<tr>
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<td>1.47</td>
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<td>2.08</td>
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<tr>
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<td>12/13/03.14</td>
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<td>24</td>
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<td>11.3</td>
<td>1.52</td>
<td>0.61</td>
<td>2.13</td>
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</tr>
<tr>
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<td>2.14</td>
<td>0.2</td>
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<tr>
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<td>02/03/04.14</td>
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<td>25</td>
<td>5.9</td>
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<td>0.77</td>
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<td>23/24/04.14</td>
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<td>26</td>
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<td>11.2</td>
<td>1.59</td>
<td>0.59</td>
<td>2.18</td>
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<td>0.4</td>
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<td>0.63</td>
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<td>2.13</td>
<td>0.5</td>
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<td>1.57</td>
<td>0.74</td>
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<td>0.4</td>
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<td>1.59</td>
<td>0.58</td>
<td>2.17</td>
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</table>

### STATISTICAL ANALYSIS

<table>
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<tr>
<th>Evaluation</th>
<th>PM$_{10}$ (µg/m$^3$)</th>
<th>PM$_{2.5}$ (µg/m$^3$)</th>
<th>SO$_2$ (µg/m$^3$)</th>
<th>NOx (µg/m$^3$)</th>
<th>HC (ppm) Methane (ppm)</th>
<th>HC (ppm) Non-Methane (ppm)</th>
<th>VOC (mg/m$^3$)</th>
<th>CO (mg/m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.of observation</td>
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<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
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<td>Minimum Conc.</td>
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<td>1.47</td>
<td>0.55</td>
<td>2.06</td>
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<td>Maximum Conc.</td>
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<td>0.77</td>
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<td>0.7</td>
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<td>Average</td>
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<td>28.1</td>
<td>6.1</td>
<td>11.1</td>
<td>1.55</td>
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<tr>
<td>98th percentile</td>
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<td>0.4</td>
<td>0.6</td>
<td>0.05</td>
<td>0.06</td>
<td>0.08</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**NOTE:** VOC= Volatile Organic Compound, CO= Carbon Mono-oxide
### Table - 3.36

**AIR QUALITY DATA**

**Period:** March, 2014 - May, 2014

**Location:** Moinarband village (SA2)

<table>
<thead>
<tr>
<th>WEEK</th>
<th>DATE</th>
<th><strong>CONCENTRATION OF AIR POLLUTANTS</strong></th>
<th><strong>STATISTICAL ANALYSIS</strong></th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td><strong>PM$_{10}$</strong> (µg/m$^3$)</td>
<td><strong>PM$_{2.5}$</strong> (µg/m$^3$)</td>
</tr>
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<td>03/04/03.14</td>
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<tr>
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<td>04/05/03.14</td>
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<td>25</td>
</tr>
<tr>
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<td>11/12/03.14</td>
<td>53</td>
<td>28</td>
</tr>
<tr>
<td></td>
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<td>25</td>
</tr>
<tr>
<td>IV</td>
<td>25/26/03.14</td>
<td>53</td>
<td>27</td>
</tr>
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<td>26/27/03.14</td>
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<td>23</td>
</tr>
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<td>26</td>
</tr>
<tr>
<td></td>
<td>03/04/04.14</td>
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<td>07/08/04.14</td>
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<td>27</td>
</tr>
<tr>
<td></td>
<td>08/09/04.14</td>
<td>57</td>
<td>25</td>
</tr>
<tr>
<td>VII</td>
<td>15/16/04.14</td>
<td>56</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>16/17/04.14</td>
<td>54</td>
<td>25</td>
</tr>
<tr>
<td>VIII</td>
<td>23/24/04.14</td>
<td>58</td>
<td>23</td>
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<tr>
<td></td>
<td>24/25/04.14</td>
<td>54</td>
<td>28</td>
</tr>
<tr>
<td>IX</td>
<td>02/03/05.14</td>
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<td>30</td>
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<td>03/04/05.14</td>
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<tr>
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<td>05/06/05.14</td>
<td>48</td>
<td>23</td>
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**STATISTICAL ANALYSIS**

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**NOTE:** VOC= Volatile Organic Compound, CO= Carbon Mono-oxide
### Table - 3.37
**AIR QUALITY DATA**

**Period:** March, 2014 - May, 2014  
**Location:** Gosainpur Village (SA3)

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### STATISTICAL ANALYSIS

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**NOTE:** VOC= Volatile Organic Compound, CO= Carbon Mono-oxide
### Table - 3.38
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Period: March, 2014 - May, 2014  
Location: Debpara village (SA4)

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**NOTE:** VOC= Volatile Organic Compound, CO= Carbon Mono-oxide
### Table - 3.39
AIR QUALITY DATA

**Period:** March, 2014 - May, 2014  
**Location:** Shajagaon village (SA5)

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### STATISTICAL ANALYSIS

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**NOTE:** VOC= Volatile Organic Compound, CO= Carbon Mono-oxide
Table - 3.40
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Period: March, 2014 - May, 2014  Location: Rangpur vilage (SA6)

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STATISTICAL ANALYSIS

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NOTE: VOC= Volatile Organic Compound, CO= Carbon Mono-oxide
3.6 WATER ENVIRONMENT

General

The water resources of the project site can be broadly classified as follows:

(a) Ground water
(b) Surface Water

Water quality of ground water and surface water resources within the study area has been studied for assessing the water quality and to evaluate anticipated impact due to the plant activities. Physico-chemical characterisation of water is essential in preparation of environmental management Plan and to identify critical issues with a view to suggest appropriate mitigation measures and to safeguard the ecosystem. The purpose of this study is devoted to:

- Assessment of water quality with reference to relevant parameters;
- Evaluation of the present status of water on agricultural productivity, habitat conditions, creational resources and aesthetics in the vicinity; and
- Prediction of impact on water quality due to the project activities by assessing the receptive and assimilative power of the local water bodies.

The information required has been collected through Primary survey and Secondary sources of information.

3.6.1 Methodology

Reconnaissance survey was undertaken and monitoring locations were finalized based on:

- Drainage Pattern;
- Location of residential areas representing different activities/likely impact areas; and
- Likely areas, which can represent baseline conditions.

Water sources in the study area were characterised with respect to physico-chemical parameters, heavy metals and biological contaminants in order to assess the impact of industrial and other activities on water resources. The samples were collected and analyzed as per the procedures specified in ‘Standard Methods for the Examination of Water and Waste Water’ published by

Water samples were collected in polyethylene containers. Samples collected for determination of metal content were acidified with 1 ml. HNO₃. Samples for biological analysis were collected in sterilized glass bottles. Selected physico-chemical and biological parameters have been analyzed for projecting the existing water quality status in the study area. Parameters like temperature, Dissolved oxygen and pH were analyzed at the time of sample collection.

### 3.6.2 Water Sampling Locations & sampling frequency

To evaluate the characteristics of water system, four numbers of ground water and two numbers of surface water sampling locations were fixed. Baseline data’s with respect to water quality were generated for a period of three months with a frequency of once in a season. The analytical results of the ground water samples are presented through Table 3.44 to 3.45. The water sampling locations have been shown Plate - 3.9. The sampling locations and reference codes are presented below:

### 3.6.3 Sampling Locations for Ground Water

To assess the quality of drinking water in and around the project area, the samples were collected from the following locations:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Sampling Locations</th>
<th>Frequency</th>
<th>Location Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Hand Pump – Moinarband Village</td>
<td>Once in a season</td>
<td>GW₁</td>
</tr>
<tr>
<td>02.</td>
<td>Hand Pump – Gosainpur Village</td>
<td>Once in a season</td>
<td>GW₂</td>
</tr>
<tr>
<td>03.</td>
<td>Hand Pump – Udarban Village</td>
<td>Once in a season</td>
<td>GW₃</td>
</tr>
<tr>
<td>04.</td>
<td>Hand Pump – Hansutila Village</td>
<td>Once in a season</td>
<td>GW₄</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Sampling Locations</th>
<th>Frequency</th>
<th>Location Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Surface Water- Madura River</td>
<td>Once in a season</td>
<td>SW₁</td>
</tr>
<tr>
<td>02.</td>
<td>Surface Water- Barak River</td>
<td>Once in a season</td>
<td>SW₂</td>
</tr>
</tbody>
</table>
DESCRIPTION OF ENVIRONMENT

Plate - 3.9
MAP SHOWING WATER QUALITY SAMPLING LOCATIONS
3.6.4 STANDARD FOR DRINKING WATER

The test characteristics for Drinking water as specified under IS: 10500 is appended below:

**TABLE - 3.43**

**TEST CHARACTERISTICS FOR DRINKING WATER (IS: 10500)**

(Wherever not specified, characteristics are mg/l)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Characteristics</th>
<th>Method of Test or Ref. of IS:3025</th>
<th>Requirement (Desirable / permissible Limit)</th>
<th>Undesirable effects</th>
<th>Desirable or Essential</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Colour, H Unit, max.</td>
<td>4</td>
<td>5 / 25</td>
<td>Note-1</td>
<td>Essential</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>Odour</td>
<td>5 (Note-1)</td>
<td>Unobjectionsble.</td>
<td>-</td>
<td>Essential</td>
<td>B</td>
</tr>
<tr>
<td>3</td>
<td>Taste</td>
<td>7</td>
<td>Agreeable</td>
<td>-</td>
<td>Essential</td>
<td>C</td>
</tr>
<tr>
<td>4</td>
<td>Turbidity, NTU, max.</td>
<td>10</td>
<td>5 / 10</td>
<td>Note-1</td>
<td>Essential</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>pH value</td>
<td>11</td>
<td>6.5-8.5</td>
<td>Note-2</td>
<td>Essential</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Total Hardness (as CaCO₃), mg/l, max.</td>
<td>21</td>
<td>300 / 600</td>
<td>Note-4</td>
<td>Essential</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Iron (as Fe), mg/l, max.</td>
<td>32</td>
<td>0.3 / 1.0</td>
<td>Note-6</td>
<td>Essential</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Chloride (as Cl), mg/l, max.</td>
<td>32</td>
<td>250 / 1000</td>
<td>Note-8</td>
<td>Essential</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Residual, free Chlorine, mg/l, min.</td>
<td>26</td>
<td>0.2</td>
<td>-</td>
<td>Essential</td>
<td>G</td>
</tr>
<tr>
<td>10</td>
<td>Dissolved Solids, mg/l, max.</td>
<td>16</td>
<td>500 / 2000</td>
<td>Note-3</td>
<td>Desirable</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>Calcium (as Ca), mg/l, max.</td>
<td>40</td>
<td>75 / 200</td>
<td>Note-4</td>
<td>Desirable</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>Magnesium (as Mg), mg/l, max.</td>
<td>36</td>
<td>30</td>
<td>-</td>
<td>Desirable</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>Copper (as Cu), mg/l, max.</td>
<td>36</td>
<td>0.05 / 1.5</td>
<td>Note-5</td>
<td>Desirable</td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td>Manganese (as Mn), mg/l, max.</td>
<td>35</td>
<td>0.1 / 0.3</td>
<td>Note-7</td>
<td>Desirable</td>
<td>-</td>
</tr>
<tr>
<td>15</td>
<td>Sulphate (as SO₄), mg/l, max.</td>
<td>24</td>
<td>200 / 400</td>
<td>Note-9</td>
<td>Desirable</td>
<td>D</td>
</tr>
<tr>
<td>16</td>
<td>Nitrate (as NO₃), mg/l, max.</td>
<td>34</td>
<td>45 / 100</td>
<td>Note-10</td>
<td>Desirable</td>
<td>-</td>
</tr>
<tr>
<td>17</td>
<td>Fluoride (as F), mg/l, max.</td>
<td>23</td>
<td>1.0 / 1.5</td>
<td>Note-11</td>
<td>Desirable</td>
<td>-</td>
</tr>
<tr>
<td>18</td>
<td>Phenolic Compounds (as C₆H₅OH), mg/l, max.</td>
<td>54</td>
<td>0.001 / 0.002</td>
<td>Note-12</td>
<td>Desirable</td>
<td>-</td>
</tr>
<tr>
<td>19</td>
<td>Mercury (as Hg), mg/l, max.</td>
<td>Note-2</td>
<td>0.001</td>
<td>Note-13</td>
<td>Desirable</td>
<td>E</td>
</tr>
<tr>
<td>20</td>
<td>Cadmium (as Cd), mg/l, max.</td>
<td>Note-2</td>
<td>0.01</td>
<td>Note-13</td>
<td>Desirable</td>
<td>E</td>
</tr>
<tr>
<td>21</td>
<td>Selenium (as Se), mg/l, max.</td>
<td>28</td>
<td>0.01</td>
<td>Note-13</td>
<td>Desirable</td>
<td>E</td>
</tr>
<tr>
<td>22</td>
<td>Arsenic (as As), mg/l, max.</td>
<td>37</td>
<td>0.05</td>
<td>Note-13</td>
<td>Desirable</td>
<td>E</td>
</tr>
<tr>
<td>23</td>
<td>Cyanide (as CN), mg/l, max.</td>
<td>27</td>
<td>0.05</td>
<td>Note-13</td>
<td>Desirable</td>
<td>E</td>
</tr>
<tr>
<td>24</td>
<td>Lead (as Pb), mg/l, max.</td>
<td>Note-2</td>
<td>0.05</td>
<td>Note-13</td>
<td>Desirable</td>
<td>F</td>
</tr>
<tr>
<td>25</td>
<td>Zinc (as Zn), mg/l, max.</td>
<td>39</td>
<td>5.0 / 15.0</td>
<td>Note-14</td>
<td>Desirable</td>
<td>E</td>
</tr>
<tr>
<td>26</td>
<td>Anionic detergents (as MBAS), mg/l, max.</td>
<td>Note-3</td>
<td>0.2 / 1.0</td>
<td>Note-15</td>
<td>Desirable</td>
<td>E</td>
</tr>
<tr>
<td>27</td>
<td>Chromium (as Cr⁶⁺), mg/l, max.</td>
<td>38</td>
<td>0.05</td>
<td>Note-16</td>
<td>Desirable</td>
<td>E</td>
</tr>
<tr>
<td>28</td>
<td>Polynuclear aromatic hydrocarbons (as PAH), g/l, max.</td>
<td>-</td>
<td>-</td>
<td>Note-16</td>
<td>Desirable</td>
<td>-</td>
</tr>
<tr>
<td>29</td>
<td>Mineral oil, mg/l, max.</td>
<td>Note-4</td>
<td>0.01 / 0.03</td>
<td>Note-17</td>
<td>Desirable</td>
<td>E</td>
</tr>
<tr>
<td>30</td>
<td>Pesticides, mg/l, max.</td>
<td>-</td>
<td>Absent / 0.001</td>
<td>Toxic</td>
<td>Desirable</td>
<td>-</td>
</tr>
<tr>
<td>31</td>
<td>Radioactive materials:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(a) Alpha emitters, Bq/l, max.</td>
<td>58</td>
<td>- / 0.1</td>
<td>-</td>
<td>Desirable</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>(b) Beta emitters, pCi/l, max.</td>
<td>-</td>
<td>- / 1.0</td>
<td>-</td>
<td>Desirable</td>
<td>-</td>
</tr>
<tr>
<td>32</td>
<td>Alkalinity, mg/l, max.</td>
<td>13</td>
<td>200 / 600</td>
<td>Note-18</td>
<td>Desirable</td>
<td>-</td>
</tr>
<tr>
<td>33</td>
<td>Aluminium (as Al), mg/l, max.</td>
<td>31</td>
<td>0.03 / 0.2</td>
<td>Note-19</td>
<td>Desirable</td>
<td>-</td>
</tr>
<tr>
<td>34</td>
<td>Boron, mg/l, max.</td>
<td>29</td>
<td>1.0 / 5.0</td>
<td>-</td>
<td>Desirable</td>
<td>-</td>
</tr>
</tbody>
</table>

**Notes, Methods of Test**

1. (a) Test cold and when heated (b) Test at several dilutions.
2. Automatic absorption spectrophotometric method may be used.
3. Methylene Blue Extraction method (Limits and methods of test are under study).
4. Gas chromatographic method.
Notes. Undesirable effects outside desirable limits

1. Above 5, consumer acceptance decreases.
2. Beyond specified range, the water will affect the mucus membrane and/or water supply system.
3. Beyond specified limit, palatability decreases and may cause gastro-intestinal irritation.
4. Encrustation in water supply structure and adverse effects on domestic use.
5. Astringent taste, discoloration and corrosion of pipes, fittings and utensils will be caused beyond specified limit.
6. Beyond specified limit, taste/appearance is affected, has adverse effect on domestic uses and water supply structures, and promotes iron bacteria.
7. Beyond specified limit, taste/appearance are affected, has adverse effect on domestic uses and water supply structures.
8. Beyond specified limit, taste, corrosion and palatability are affected.
9. Beyond specified limit, it causes gastro-intestinal irritation when magnesium or sodium is present.
10. Beyond specified limit, methaemoglobinemia takes place.
11. Fluoride may be kept as low as possible. High fluoride may cause fluorosis.
12. Beyond specified limit, it may cause objectionable taste and odour.
13. Beyond specified limit, the water becomes toxic.
14. Beyond specified limit, it can cause astringent taste and opalescence in water.
15. Beyond specified limit, it can cause a light froth in water.
16. May be carcinogenic above specified limit.
17. Beyond specified limit, undesirable taste and odour after chlorination takes place.
18. Beyond specified limit, taste becomes unpleasant.
19. Cumulative effect is reported to cause dementia.

Remarks
(a) May be extended to 25 only if toxic substances are not suspected, in absence of alternate sources.
(b) (i) Test cold and when heated (ii) Test at several dilutions.
(c) Test to be conducted only after safety has been established.
(d) May be extended up to 400, provided magnesium (as Mg) does not exceed 30.
(e) To be tested when pollution is suspected.
(f) To be tested when pollution/plumbo-solvency is suspected.
(g) To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be minimum 0.5 mg/l.

3.6.5 CHARACTERIZATION OF GROUND WATER SAMPLES

The physico-chemical characteristics of four nos. of ground water samples collected from four different locations have been presented hereunder:
### Table – 3.44
**PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES**

**Date of Sample Collection: 29-03-2014**

(Results are expressed in mg/l, unless otherwise stated)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Analysis Results</th>
<th>Desirable/Permissible Limits (IS:10500)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hand Pump Moinarband Village (GW1)</td>
<td>Hand Pump Gosainpur Village (GW2)</td>
</tr>
<tr>
<td>1</td>
<td>pH</td>
<td>7.2</td>
<td>7.3</td>
</tr>
<tr>
<td>2</td>
<td>Temperature (°C)</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>Colour, HU</td>
<td>&lt;2.0</td>
<td>&lt;2.0</td>
</tr>
<tr>
<td>5</td>
<td>Taste</td>
<td>Agreeable</td>
<td>Agreeable</td>
</tr>
<tr>
<td>6</td>
<td>Turbidity (NTU)</td>
<td>&lt;5</td>
<td>&lt;5</td>
</tr>
<tr>
<td>7</td>
<td>Total Suspended Solid</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>Total Dissolved Solids</td>
<td>110</td>
<td>120</td>
</tr>
</tbody>
</table>

**CHEMICAL**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Analysis Results</th>
<th>Desirable/Permissible Limits (IS:10500)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P- Alkalinity as CaCO₃</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>2</td>
<td>Total Alkalinity as CaCO₃</td>
<td>54</td>
<td>62</td>
</tr>
<tr>
<td>3</td>
<td>Chloride as Cl</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>Sulphate as SO₄</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>5</td>
<td>Nitrate as NO₃</td>
<td>1.22</td>
<td>1.25</td>
</tr>
<tr>
<td>6</td>
<td>Fluoride as F</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
</tr>
<tr>
<td>7</td>
<td>Total Hardness as CaCO₃</td>
<td>44</td>
<td>48</td>
</tr>
<tr>
<td>8</td>
<td>Calcium Hardness as CaCO₃</td>
<td>26</td>
<td>30</td>
</tr>
<tr>
<td>9</td>
<td>Magnesium Hardness as CaCO₃</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>10</td>
<td>Sodium as Na</td>
<td>16.7</td>
<td>18.1</td>
</tr>
<tr>
<td>11</td>
<td>Potassium as K</td>
<td>3.2</td>
<td>3.4</td>
</tr>
<tr>
<td>12</td>
<td>Silica as SiO₂</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>13</td>
<td>Iron as Fe</td>
<td>0.18</td>
<td>0.22</td>
</tr>
</tbody>
</table>

**HEAVY METALS**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Analysis Results</th>
<th>Desirable/Permissible Limits (IS:10500)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manganese as Mn</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>2</td>
<td>Total Chromium as Cr</td>
<td>BDL</td>
<td>BDL</td>
</tr>
<tr>
<td>3</td>
<td>Lead as Pb</td>
<td>BDL</td>
<td>BDL</td>
</tr>
<tr>
<td>4</td>
<td>Zinc as Zn</td>
<td>0.28</td>
<td>0.26</td>
</tr>
<tr>
<td>5</td>
<td>Cadmium as Cd</td>
<td>BDL</td>
<td>BDL</td>
</tr>
<tr>
<td>6</td>
<td>Copper as Cu</td>
<td>BDL</td>
<td>BDL</td>
</tr>
<tr>
<td>7</td>
<td>Nickel as Ni</td>
<td>BDL</td>
<td>BDL</td>
</tr>
<tr>
<td>8</td>
<td>Arsenic as As</td>
<td>BDL</td>
<td>BDL</td>
</tr>
<tr>
<td>9</td>
<td>Selenium as Se</td>
<td>BDL</td>
<td>BDL</td>
</tr>
</tbody>
</table>

**OTHERS**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Analysis Results</th>
<th>Desirable/Permissible Limits (IS:10500)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Oil &amp; Grease</td>
<td>NT</td>
<td>NT</td>
</tr>
<tr>
<td>2</td>
<td>Phenolic Compound as C₆H₅OH</td>
<td>NT</td>
<td>NT</td>
</tr>
<tr>
<td>3</td>
<td>Coliform Organisms (MPN/100ml)</td>
<td>60</td>
<td>80</td>
</tr>
</tbody>
</table>

Note: 1) BDL – Below Detection Limit
2) NT- Not Traceable

*Calcium as Ca & **Magnesium as Mg*
### PHYSICO-CHEMICAL CHARACTERISTICS OF GROUND WATER SAMPLES

**Date of Sample Collection:** 29-03-2014  
*(Results are expressed in mg/l, unless otherwise stated)*

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Analysis Results</th>
<th>Desirable/Permissible Limits (IS:10500)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hand Pump Udarban Village (GW3)</td>
<td>Hand Pump Hansutila Village (GW4)</td>
</tr>
<tr>
<td><strong>PHYSICAL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>pH</td>
<td>7.4</td>
<td>7.3</td>
</tr>
<tr>
<td>2</td>
<td>Temperature (°C)</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>Colour, HU</td>
<td>&lt;2.0</td>
<td>&lt;2.0</td>
</tr>
<tr>
<td>5</td>
<td>Taste</td>
<td>Agreeable</td>
<td>Agreeable</td>
</tr>
<tr>
<td>6</td>
<td>Turbidity (NTU)</td>
<td>&lt;5</td>
<td>&lt;5</td>
</tr>
<tr>
<td>7</td>
<td>Total Suspended Solid</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>8</td>
<td>Total Dissolved Solids</td>
<td>100</td>
<td>136</td>
</tr>
<tr>
<td><strong>CHEMICAL</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>P- Alkalinity as CaCO₃</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>2</td>
<td>Total Alkalinity as CaCO₃</td>
<td>46</td>
<td>64</td>
</tr>
<tr>
<td>3</td>
<td>Chloride as Cl</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>Sulphate as SO₄</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>Nitrate as NO₃</td>
<td>1.14</td>
<td>1.22</td>
</tr>
<tr>
<td>6</td>
<td>Fluoride as F</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
</tr>
<tr>
<td>7</td>
<td>Total Hardness as CaCO₃</td>
<td>32</td>
<td>42</td>
</tr>
<tr>
<td>8</td>
<td>Calcium Hardness as CaCO₃</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>9</td>
<td>Magnesium Hardness as CaCO₃</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>10</td>
<td>Sodium as Na</td>
<td>16.6</td>
<td>21.4</td>
</tr>
<tr>
<td>11</td>
<td>Potassium as K</td>
<td>3.1</td>
<td>4.0</td>
</tr>
<tr>
<td>12</td>
<td>Silica as SiO₂</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>13</td>
<td>Iron as Fe</td>
<td>0.24</td>
<td>0.16</td>
</tr>
<tr>
<td><strong>HEAVY METALS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Manganese as Mn</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>2</td>
<td>Total Chromium as Cr</td>
<td>BDL</td>
<td>BDL</td>
</tr>
<tr>
<td>3</td>
<td>Lead as Pb</td>
<td>BDL</td>
<td>BDL</td>
</tr>
<tr>
<td>4</td>
<td>Zinc as Zn</td>
<td>0.30</td>
<td>0.28</td>
</tr>
<tr>
<td>5</td>
<td>Cadmium as Cd</td>
<td>BDL</td>
<td>BDL</td>
</tr>
<tr>
<td>6</td>
<td>Copper as Cu</td>
<td>BDL</td>
<td>BDL</td>
</tr>
<tr>
<td>7</td>
<td>Nickel as Ni</td>
<td>BDL</td>
<td>BDL</td>
</tr>
<tr>
<td>8</td>
<td>Arsenic as As</td>
<td>BDL</td>
<td>BDL</td>
</tr>
<tr>
<td>9</td>
<td>Selenium as Se</td>
<td>BDL</td>
<td>BDL</td>
</tr>
<tr>
<td><strong>OTHERS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Oil &amp; Grease</td>
<td>NT</td>
<td>NT</td>
</tr>
<tr>
<td>2</td>
<td>Phenolic Compound as C₆H₅OH</td>
<td>NT</td>
<td>NT</td>
</tr>
<tr>
<td>3</td>
<td>Coliform Organisms (MPN/100ml)</td>
<td>60</td>
<td>70</td>
</tr>
</tbody>
</table>

*Note: 1) BDL – Below Detection Limit  2) NT- Not Traceable  *Calcium as Ca & **Magnesium as Mg
3.6.6 **Results & Discussion**

The range of concentrations of drinking water parameters were observed as follows:

### TABLE - 3.46

**Ground Water Quality at a Glance in Comparison to IS: 10500**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Range of recorded Concentration (Results expressed in mg/l except pH)</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Desirable/Permissible Limits as per IS: 10500</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td></td>
<td>7.2</td>
<td>7.4</td>
<td>6.5-8.5</td>
</tr>
<tr>
<td>Total Suspended Solid</td>
<td></td>
<td>12</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>Total Dissolved Solids</td>
<td></td>
<td>100</td>
<td>136</td>
<td>500 / 2000</td>
</tr>
<tr>
<td>Total Alkalinity as CaCO₃</td>
<td></td>
<td>46</td>
<td>64</td>
<td>200 / 600</td>
</tr>
<tr>
<td>Total Hardness, as CaCO₃</td>
<td></td>
<td>32</td>
<td>48</td>
<td>300 / 600</td>
</tr>
<tr>
<td>Magnesium as CaCO₃</td>
<td></td>
<td>12</td>
<td>18</td>
<td>30**</td>
</tr>
<tr>
<td>Chloride as Cl</td>
<td></td>
<td>10</td>
<td>14</td>
<td>250 / 1000</td>
</tr>
<tr>
<td>Sulphate as SO₄</td>
<td></td>
<td>08</td>
<td>16</td>
<td>200 / 400</td>
</tr>
<tr>
<td>Nitrate as NO₃</td>
<td></td>
<td>1.14</td>
<td>1.25</td>
<td>45 / 100</td>
</tr>
<tr>
<td>Iron as Fe</td>
<td></td>
<td>0.14</td>
<td>0.26</td>
<td>0.3 / 1.0</td>
</tr>
<tr>
<td>Zinc as Zn</td>
<td></td>
<td>0.26</td>
<td>0.30</td>
<td>5.0 / 15.0</td>
</tr>
</tbody>
</table>

The physico-chemical characteristics of the ground water samples were in good agreement with IS: 10500. All the parameters are within the limits specified under Drinking Water Standard (IS: 10500). As regards heavy metals, only Fe and Zn have been recorded with lower concentration & rest of the heavy metals were not traceable. The ground water after proper filtration and disinfection can be safely used for potable and drinking purposes.

3.6.7 **SURFACE WATER**

3.6.7.1 **Characteristics of Surface Water Samples**

The physico-chemical characteristics of surface water samples collected from Barak & Madura River are presented hereunder:
**Table – 3.47**  
**PHYSICO-CHEMICAL CHARACTERISTICS OF SURFACE WATER SAMPLE**

Date of Sample Collection: 30-03-2014

*(Result are expressed in mg/l, unless otherwise stated)*

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parameters</th>
<th>Madura River SW1</th>
<th>Barak River SW2</th>
<th>Desirable / Permissible Limit IS: 10500</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PHYSICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Temperature (°C)</td>
<td>24</td>
<td>24</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Colour,HU</td>
<td>3.0</td>
<td>2.0</td>
<td>5/25</td>
</tr>
<tr>
<td>3</td>
<td>Turbidity (NTU)</td>
<td>18</td>
<td>12</td>
<td>5/10</td>
</tr>
<tr>
<td>4</td>
<td>pH</td>
<td>7.3</td>
<td>7.2</td>
<td>6.5-8.5</td>
</tr>
<tr>
<td>5</td>
<td>Total Dissolved solids</td>
<td>96</td>
<td>122</td>
<td>500/2000</td>
</tr>
<tr>
<td>6</td>
<td>Suspended Solids</td>
<td>26</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td><strong>CHEMICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Total Alkalinity as CaCO₃</td>
<td>40</td>
<td>66</td>
<td>200/600</td>
</tr>
<tr>
<td>2</td>
<td>Chloride as Cl</td>
<td>14</td>
<td>10</td>
<td>250/1000</td>
</tr>
<tr>
<td>3</td>
<td>Sulphate as SO₄</td>
<td>12</td>
<td>14</td>
<td>200/400</td>
</tr>
<tr>
<td>4</td>
<td>Nitrate as NO₃</td>
<td>1.56</td>
<td>1.64</td>
<td>45/100</td>
</tr>
<tr>
<td>5</td>
<td>Fluoride as F</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>1.0/1.5</td>
</tr>
<tr>
<td>6</td>
<td>Total Hardness as CaCO₃</td>
<td>56</td>
<td>60</td>
<td>300/600</td>
</tr>
<tr>
<td>7</td>
<td>Calcium Hardness as CaCO₃</td>
<td>30</td>
<td>36</td>
<td>75/200*</td>
</tr>
<tr>
<td>8</td>
<td>Magnesium Hardness as CaCO₃</td>
<td>26</td>
<td>24</td>
<td>30**</td>
</tr>
<tr>
<td>9</td>
<td>Dissolve Oxygen</td>
<td>6.6</td>
<td>6.6</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>COD</td>
<td>10</td>
<td>08</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>BOD (3 days at 27°C)</td>
<td>3.2</td>
<td>2.6</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>Sodium as Na</td>
<td>7.2</td>
<td>14.9</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>Potassium as K</td>
<td>1.4</td>
<td>2.8</td>
<td>-</td>
</tr>
<tr>
<td><strong>HEAVY METALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Iron as Fe</td>
<td>0.10</td>
<td>0.08</td>
<td>0.3/1.0</td>
</tr>
<tr>
<td>2</td>
<td>Manganese as Mn</td>
<td>BDL</td>
<td>BDL</td>
<td>0.1/0.3</td>
</tr>
<tr>
<td>3</td>
<td>Chromium as Cr⁺⁺</td>
<td>BDL</td>
<td>BDL</td>
<td>0.05</td>
</tr>
<tr>
<td>4</td>
<td>Lead as Pb</td>
<td>BDL</td>
<td>BDL</td>
<td>0.05</td>
</tr>
<tr>
<td>5</td>
<td>Zinc as Zn</td>
<td>0.14</td>
<td>0.18</td>
<td>5.0/15.0</td>
</tr>
<tr>
<td>6</td>
<td>Cadmium as</td>
<td>BDL</td>
<td>BDL</td>
<td>0.01</td>
</tr>
<tr>
<td>7</td>
<td>Copper as</td>
<td>BDL</td>
<td>BDL</td>
<td>0.05/1.5</td>
</tr>
<tr>
<td>8</td>
<td>Nickel as</td>
<td>BDL</td>
<td>BDL</td>
<td>-</td>
</tr>
<tr>
<td><strong>OTHERS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Oil &amp; grease</td>
<td>BDL</td>
<td>BDL</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Phenolic Compound</td>
<td>NT</td>
<td>NT</td>
<td>0.001/0.002</td>
</tr>
<tr>
<td>3</td>
<td>Coliform Organisms (MPN/100ml)</td>
<td>880</td>
<td>640</td>
<td>-</td>
</tr>
</tbody>
</table>

* (as Ca)  ** (as Mg)  BDL = Below Detection Level
3.6.7.2 Results & Discussion

The physico-chemical characteristics of the surface water samples showed great resemblance with respect to the characteristics like temperature, turbidity, pH, colour, odour, chloride, sulphate, total alkalinity, total hardness, TDS and heavy metals, etc. The range of concentrations of the parameters of surface water characteristics were observed as follows:

### TABLE – 3.48
Surface Water Quality at a Glance in Comparison to Drinking Water Standard

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Range of recorded Concentration (Results expressed in mg/l except pH)</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Desirable/Permissible Limits as per IS: 10500</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td>7.2</td>
<td>7.3</td>
<td>6.5-8.5</td>
</tr>
<tr>
<td>Total Suspended Solid</td>
<td></td>
<td>18</td>
<td>26</td>
<td>-</td>
</tr>
<tr>
<td>Total Dissolved Solids</td>
<td></td>
<td>96</td>
<td>122</td>
<td>500 / 2000</td>
</tr>
<tr>
<td>Total Alkalinity as CaCO₃</td>
<td></td>
<td>40</td>
<td>66</td>
<td>200 / 600</td>
</tr>
<tr>
<td>Total Hardness, as CaCO₃</td>
<td></td>
<td>56</td>
<td>60</td>
<td>300 / 600</td>
</tr>
<tr>
<td>Chloride as Cl</td>
<td></td>
<td>10</td>
<td>14</td>
<td>250 / 1000</td>
</tr>
<tr>
<td>Sulphate as SO₄</td>
<td></td>
<td>12</td>
<td>14</td>
<td>200 / 400</td>
</tr>
<tr>
<td>Nitrate as NO₃</td>
<td></td>
<td>1.56</td>
<td>1.64</td>
<td>45 / 100</td>
</tr>
<tr>
<td>Iron as Fe</td>
<td></td>
<td>0.08</td>
<td>0.10</td>
<td>0.3 / 1.0</td>
</tr>
</tbody>
</table>

**Conclusion:**
The physico-chemical characteristics of the surface water sample are in good agreement with IS: 10500 and it is good irrigational water.
3.7 NOISE ENVIRONMENT

3.7.1 General

The physical description of sound concerns its loudness as a function of frequency. Noise in general is unwanted/un-desired sound, which is composed of many frequency components of various loudness distributed over the audible frequency range. Various noise scales have been introduced to describe, in a single number, the response of an average human to a complex sound made up of various frequencies at different loudness levels. The most common and universally accepted scale is the A weighted scale which is measured as dB(A). This is more suitable for audible range of 20 to 20,000 Hz. The scale has been designed to weigh various components of noise according to the response of a human ear. The impact of noise sources on surrounding community depends on:

- Characteristics of noise sources (instantaneous, intermittent or continuous in nature). It can be observed that steady noise is not as annoying as one, which is continuously varying in loudness;
- The time of day at which noise occurs, for example high noise levels at night in residential areas, are not acceptable because of sleep disturbance; and
- The location of the noise source, with respect to sensitive land use, which determines the loudness.

The environmental impact of noise can have several effects varying from Noise Induced hearing Loss (NIHL) to annoyance depending on loudness of noise. The impact of noise generating from the Terminal can be undertaken by considering various factors like potential damage to hearing, physiological responses, annoyance and general community responses. In environmental noise, one is usually concerned with sound propagation through air. Noise has an adverse impact on human beings and their environment, including land, structures and domestic animals. It can also disturb natural wild life and ecological system. The increase in noise level to which urban and industrial population is exposed has lead to increasing awareness amongst the public, welfare organisations and the Government/ Statutory agencies. Many standards have been prescribed for the noise level to which the different communities should be exposed and steps are being taken by the industries and the manufacturers of noise generating
machines and equipment to keep the level of noise generation as low as possible.

3.7.2 **Existing Ambient Noise Level**

To evaluate the existing noise level, measurements were made at six locations. An Integrated Sound Level Meter, Type-2225, make B&K Denmark, was used in all the measurements. The instrument was calibrated with Pistaphone/sound Level Calibrator (Make-B&K, Denmark) before using in the field. The measurements were carried out to obtain noise level at different locations continuously for 24 Hours. The noise monitoring locations have been shown in Plate-3.10 and the observed values of noise levels, measured during day and night have been presented in the Table – 3.50 (A) & 3.50 (B). The detailed descriptions of the monitoring locations are presented below in Table-3.49.

**Table - 3.49**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Location Code</th>
<th>Name of Monitoring location</th>
<th>Direction</th>
<th>Distance (Km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SN₁</td>
<td>Proposed Project Site</td>
<td>UP-Wind</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>SN₂</td>
<td>Moinarband village</td>
<td>UP-Wind</td>
<td>0.63</td>
</tr>
<tr>
<td>3</td>
<td>SN₃</td>
<td>Gosaipur village</td>
<td>DN-Wind</td>
<td>4.19</td>
</tr>
<tr>
<td>4</td>
<td>SN₄</td>
<td>Debpara village</td>
<td>DN-Wind</td>
<td>4.67</td>
</tr>
<tr>
<td>5</td>
<td>SN₅</td>
<td>Shajagaon village</td>
<td>CR-Wind</td>
<td>3.03</td>
</tr>
<tr>
<td>6</td>
<td>SN₆</td>
<td>Rangpur village</td>
<td>CR-Wind</td>
<td>4.61</td>
</tr>
</tbody>
</table>
DESCRIPTION OF ENVIRONMENT

PLATE-3.10

MAP SHOWING NOISE MONITORING LOCATIONS
3.7.3 Results

The day and night noise levels at all the locations are observed to be well below the prescribed limits specified for different categories. The results of measurements made during the study period have been presented in Table – 3.50 (A) & 3.50 (B). Summary of observations made during the study at six locations within the study area has been summarized in Table- 3.52 and for four locations around boundary walls in Table- 3.51 as under:

Table - 3.50 (A)
AMBIENT NOISE LEVEL DATA DURING DAY TIME (HOURLY)

<table>
<thead>
<tr>
<th>Time (Hrs)</th>
<th>Noise Level, Leq (Hourly)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SN₁</td>
</tr>
<tr>
<td>6.00 - 7.00</td>
<td>46.2</td>
</tr>
<tr>
<td>7.00 - 8.00</td>
<td>46.8</td>
</tr>
<tr>
<td>8.00 - 9.00</td>
<td>47.5</td>
</tr>
<tr>
<td>9.00 - 10.00</td>
<td>48.6</td>
</tr>
<tr>
<td>10.00 - 11.00</td>
<td>51.3</td>
</tr>
<tr>
<td>11.00 - 12.00</td>
<td>50.8</td>
</tr>
<tr>
<td>12.00 - 13.00</td>
<td>53.4</td>
</tr>
<tr>
<td>13.00 - 14.00</td>
<td>55.3</td>
</tr>
<tr>
<td>14.00 - 15.00</td>
<td>54.2</td>
</tr>
<tr>
<td>15.00 - 16.00</td>
<td>53.1</td>
</tr>
<tr>
<td>16.00 - 17.00</td>
<td>52.7</td>
</tr>
<tr>
<td>17.00 - 18.00</td>
<td>51.8</td>
</tr>
<tr>
<td>18.00 - 19.00</td>
<td>49.7</td>
</tr>
<tr>
<td>19.00 - 20.00</td>
<td>48.6</td>
</tr>
<tr>
<td>20.00 - 21.00</td>
<td>47.3</td>
</tr>
<tr>
<td>21.00 - 22.00</td>
<td>46.2</td>
</tr>
<tr>
<td>Minimum</td>
<td>46.2</td>
</tr>
<tr>
<td>Maximum</td>
<td>55.3</td>
</tr>
<tr>
<td>Average</td>
<td>50.2</td>
</tr>
<tr>
<td>Leq (Day)</td>
<td>51.2</td>
</tr>
</tbody>
</table>
## Table - 3.50(B)
AMBIENT NOISE LEVEL DATA DURING NIGHT TIME

<table>
<thead>
<tr>
<th>Time (Hrs)</th>
<th>Noise Level, Leq (Hourly)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SN₁</td>
</tr>
<tr>
<td>22.00-23.00</td>
<td>45.1</td>
</tr>
<tr>
<td>23.00-24.00</td>
<td>44.3</td>
</tr>
<tr>
<td>24.00-1.00</td>
<td>42.1</td>
</tr>
<tr>
<td>1.00-2.00</td>
<td>40.3</td>
</tr>
<tr>
<td>2.00-3.00</td>
<td>39.5</td>
</tr>
<tr>
<td>3.00-4.00</td>
<td>38.2</td>
</tr>
<tr>
<td>4.00-5.00</td>
<td>38.5</td>
</tr>
<tr>
<td>5.00-6.00</td>
<td>40.7</td>
</tr>
<tr>
<td>Minimum</td>
<td>38.2</td>
</tr>
<tr>
<td>Maximum</td>
<td>45.1</td>
</tr>
<tr>
<td>Average</td>
<td>41.1</td>
</tr>
<tr>
<td>Leq (Day)</td>
<td>41.8</td>
</tr>
</tbody>
</table>

## TABLE - 3.51
AMBIENT NOISE LEVEL DATA - AROUND BOUNDARY WALLS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Location</th>
<th>Noise Level, dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Day</td>
</tr>
<tr>
<td>1.</td>
<td>Eastern Boundary</td>
<td>47.5</td>
</tr>
<tr>
<td>2.</td>
<td>Western Boundary</td>
<td>45.6</td>
</tr>
<tr>
<td>3.</td>
<td>Northern Boundary</td>
<td>52.3</td>
</tr>
<tr>
<td>4.</td>
<td>Southern Boundary</td>
<td>55.6</td>
</tr>
</tbody>
</table>

## Table – 3.52
AMBIENT NOISE LEVEL

<table>
<thead>
<tr>
<th>Sampling Locations</th>
<th>24-hrs Avg Leq. Value dB(A)</th>
<th>Day time Leq. Value dB(A)</th>
<th>Night time Leq. Value dB(A)</th>
<th>Prescribed Limits in dB(A) as per NAAQS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Category of Area</td>
</tr>
<tr>
<td>Proposed Project Site</td>
<td>49.7</td>
<td>51.2</td>
<td>41.8</td>
<td>Residential Area</td>
</tr>
<tr>
<td>Moinarband village</td>
<td>48.3</td>
<td>49.8</td>
<td>39.8</td>
<td>Residential Area</td>
</tr>
<tr>
<td>Gosaipur village</td>
<td>49.3</td>
<td>50.8</td>
<td>41.0</td>
<td>Residential Area</td>
</tr>
<tr>
<td>Debpara village</td>
<td>49.4</td>
<td>51.0</td>
<td>41.0</td>
<td>Residential Area</td>
</tr>
<tr>
<td>Shajagaon village</td>
<td>48.2</td>
<td>49.7</td>
<td>41.1</td>
<td>Residential Area</td>
</tr>
<tr>
<td>Rangpur village</td>
<td>48.4</td>
<td>49.9</td>
<td>40.3</td>
<td>Residential Area</td>
</tr>
</tbody>
</table>
3.7.4 STANDARD FOR NOISE

The Government of India, in exercise of its power under section 16(2)(h) of the Air (Prevention and Control of Pollution) Act 1981, notified the ambient air quality standards in respect of noise (which has been included as an air pollutant under section 20 of the Amended Air Act of 1987) as follows.

<table>
<thead>
<tr>
<th>Area</th>
<th>Category of Area</th>
<th>Limits in Decibels, dB (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Day Time</td>
</tr>
<tr>
<td>A</td>
<td>Industrial Area</td>
<td>75</td>
</tr>
<tr>
<td>B</td>
<td>Commercial Area</td>
<td>65</td>
</tr>
<tr>
<td>C</td>
<td>Residential Area</td>
<td>55</td>
</tr>
<tr>
<td>D</td>
<td>Silence Zone</td>
<td>50</td>
</tr>
</tbody>
</table>

**NOTE:**

1. Day Time is reckoned between 6 AM and 10 PM.
2. Night Time is reckoned between 10 PM and 6 AM.
3. Silence Zone is defined as area up to 100 meters around such premises as hospitals, educational institutions and courts. The silence zones are to be declared by the competent authority. Use of vehicular horns, loudspeakers and bursting of crackers shall be banned in these zones.
4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

- dB (A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is related to human hearing.
- “A”, in dB (A), denotes the frequency weighing in the measurement of noise and corresponds to frequency response characteristics of the human ear.

**Receptor Oriented Standards**

The Central Pollution Control Board, in exercise of its power under section 16(2)(h) of the Air (Prevention and Control of Pollution) Act, 1981, notified the ambient air quality standards in respect of noise (Which has been included as an air pollutant under section 20 of the Amended Air Act of 1987) as hereunder:
<table>
<thead>
<tr>
<th>Exposure Time, hr/day</th>
<th>Limit dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>93</td>
</tr>
<tr>
<td>2</td>
<td>96</td>
</tr>
<tr>
<td>1</td>
<td>99</td>
</tr>
<tr>
<td>0.5</td>
<td>102</td>
</tr>
<tr>
<td>0.25</td>
<td>105</td>
</tr>
<tr>
<td>0.125</td>
<td>108</td>
</tr>
<tr>
<td>0.063</td>
<td>111</td>
</tr>
<tr>
<td>0.031 or less</td>
<td>114</td>
</tr>
</tbody>
</table>
3.8 BIOLOGICAL ENVIRONMENT

3.8.1 Introduction

Study of biological environment is one of the most important aspects for Environmental Impact Assessment, in view of the need for conservation of environmental quality and biodiversity. Ecological systems show complex inter-relationships between biotic and abiotic components including dependence, competition and mutualism. Biotic components comprises of both plant and animal communities which interact not only within and between themselves but also with the abiotic components viz. Physical and chemical components of the environment.

Generally, biological communities are the good indicators of climatic and edaphic factors. Studies on biological aspects of ecosystems are important in Environmental Impact Assessment for safety of natural flora and fauna. Information on the impact of environmental stress on the community structure serves as an inexpensive and efficient early warning system to check the damage to a particular ecosystem. The biological environment includes mainly terrestrial ecosystem and aquatic ecosystem.

Biological communities are dependent on the environmental conditions and resources of its location. It may change if there is any change in the environment. A number of variables like temperature, humidity, rainfall, soils characteristic, topography, etc. are responsible for maintaining the homeostasis of the environment. A change in any one of these variables may lead to stress on the ecosystem. The animal and plant communities exist in their natural habitats in well-organized manner. Their natural settings can be disturbed by any externally induced anthropological activities or by naturally induced calamities or disaster. So, once this setting is disturbed, it becomes practically impossible or takes a longer time to come to its original state. Plants and animals are more susceptible to environmental stress. A change in the composition of biotic communities is reflected by a change in the distribution pattern, density, diversity, frequency, dominance and abundance of natural species of flora and fauna existing in the ecosystem. These changes over a span of time can be quantified and related to the existing environmental factors. The field observations on vegetation
characteristics were made by using random observation method. The sensitivity of animal and plant species to the changes occurring in their existing ecosystem can therefore, be used for monitoring Environmental Impact Assessment studies of any project.

3.8.2 Objectives
Following are the objectives of the study:
- To generate baseline data from field observations;
- To compare the data so generated with authentic past records to understand changes;
- To characterize the environmental components like land, water, flora and fauna;
- To understand the present biodiversity;
- To identify susceptible sensitive and critical areas (environmental hotspots);
- To understand impact of industrial activities on the flora and fauna;
- To predict changes as a result of impact in the composition and functioning of components of the ecosystem;

3.8.3 Different Methods Adopted for the Study
The study area for the ecological studies covers the area within 5 Km radius from the POL Depot. To accomplish above objectives, a general ecological survey covering the study area was carried out in the study area.

The study includes:
- Reconnaissance survey for the selection of sampling site;
- Compilation of secondary data;
- Generation of data from local villagers about importance and status of plants and animals; and
- Observation of symptoms and assessment of impacts.

3.8.4 Vegetation Pattern
Tropical evergreen Forests are generally found on the lower slopes of the northern and eastern region of the district. Tropical semi-evergreen forests occur in hill tops, ridges and the upper slopes. The forest cover of evergreen species have mostly been cleared and altered by repeated felling, burning and Jhum cultivation. These are now considerable areas of open grasslands with
scattered trees. In some patches, pine and oak are also found.

The trees are grown in three different storeys, though they look monolithic from distant. The top consists of species like *Artocarpus Chaplasa* (Cham) *Michelia Champaca* (Titashopa), *Mansonia depikae* (Badam), *Schima wallichii* (Makrisal), *Phoebe goalparensist* (Bonsum), *Adina cordifloa* (Galdu), *Gmelina arborea* (Gamari), *Duabanga species* (Khokan) Bhelu (*Tetrameles nudiflora*), *Albezzia prodera* (Koroi), *Terminalia* (Bohera etc.), Middle storey consists of trees like *Eugenia species* (Jam) *Callicarpa species* (Kum), *Emblica officinalis* (Amla) *Albezzia species* (moj), *Holarhena antidysentrica* (Dudhuri) etc.

The district has favourable agro climatic conditions for the development of various horticulture corps. The district is basically agrarian in nature. Paddy is the major crop. Other important crops include oil seeds, pulses, cash crop like jute, vegetables etc. The district has high potential for growth of citrus fruits, pineapple, areca nut, lemon, banana and coconut besides rubber, bamboo plantation and tea gardens.

### 3.8.5 METHODOLOGY OF FLORA-FAUNA STUDY

A natural eco system is a structural and functional unit of nature. It has components, which exists in harmony and survives by inter dependents. Eco systems have self sustaining ability and control the numbers of organisms at any level by cybernetic rule. The effects of these are – that an eco system does not become imbalance. Primary survey was conducted to:

- Walk through the areas to assess the biological resources which include plants & animals.
- Study of fauna, and
- Collection of ethno botanical data

### 3.8.6 SAMPLING SIZE AND FREQUENCY OF STUDY

Study on existing flora has been carried out in 5 km radius using quadrate method. The sample unit, quadrate, has been planned during survey once in a season. The standard quadrate size has been selected as follows:

- For wood bearing trees, depending up on girth class and height (15cm, 10m), 100mx100m square type quadrate are randomly selected in the field study.
DESCRIPTION OF ENVIRONMENT

- For small plants and bushes, 10m x 10m square type quadrates are randomly selected in the same quadrate as above in the field.
- For grass species, 1m x 1m square type quadrates are randomly selected in the same quadrate as above in the field.

The representative samples cover entire study area and the field study has been carried out for two weeks.

3.8.7 Fauna Assessment

3.8.7.1 Study Methodology

Actual counts of birds were made at different sampling stations following the standard survey technique. Observations were made during a walk through in the chosen transect for sighting birds and animals. The number of animals and birds observed in one-kilometer stretch of the site were directly counted and listing was made. The kilometer of the car/jeep was used to measure the stretch of the study transect. Birds were noted, counted and identified with the help of binocular and standard field identification guides. Other animals which were directly observed from amongst the vegetation, bushes and the roadside fields were also recorded and it is supplemented by the information obtained from discussion with Forest Department Silchar.
3.8.8 Baseline Status

Flora

The list of flora identified during the survey is presented in Table - 3.54

Table - 3.54
LIST OF FLORA IN THE STUDY AREA

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>COMMON NAME</th>
<th>BOTANICAL NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Arjun</td>
<td>Terminalia arjuna, Beda</td>
</tr>
<tr>
<td>02.</td>
<td>Amboke</td>
<td>Eugenia Farmosa, wall</td>
</tr>
<tr>
<td>03.</td>
<td>Ajhar</td>
<td>Lagerstromia flosreginac</td>
</tr>
<tr>
<td>04.</td>
<td>Aman</td>
<td>Amora Wallichil.</td>
</tr>
<tr>
<td>05.</td>
<td>Aam</td>
<td>Magnifera indica</td>
</tr>
<tr>
<td>06.</td>
<td>Amlokhi</td>
<td>Embica officinalis</td>
</tr>
<tr>
<td>07.</td>
<td>Amra amra</td>
<td>Spondias pinnata</td>
</tr>
<tr>
<td>08.</td>
<td>Atha-bor</td>
<td>Ficus elastica</td>
</tr>
<tr>
<td>09.</td>
<td>Autha-dimar</td>
<td>Ficus roxburghii</td>
</tr>
<tr>
<td>10.</td>
<td>Amaltash</td>
<td>Crassia fistula</td>
</tr>
<tr>
<td>11.</td>
<td>Banbagari</td>
<td>Zizyphus rugosus</td>
</tr>
<tr>
<td>12.</td>
<td>Barehar, simply Banyan</td>
<td>Ficus bengalensis, Linn</td>
</tr>
<tr>
<td>13.</td>
<td>Burhar, monkey jack or “lakuchi”</td>
<td>Artocarpus Lukoocha, Roxb</td>
</tr>
<tr>
<td>14.</td>
<td>Bandardima</td>
<td>Dysoxylum binectariferum</td>
</tr>
<tr>
<td>15.</td>
<td>Bar</td>
<td>Ficus bengalensis</td>
</tr>
<tr>
<td>16.</td>
<td>Bettle Nut</td>
<td>Areca catechu</td>
</tr>
<tr>
<td>17.</td>
<td>Barun</td>
<td>Creataeva nurvala</td>
</tr>
<tr>
<td>18.</td>
<td>Bhagilla</td>
<td>Oroxylum indicum</td>
</tr>
<tr>
<td>19.</td>
<td>Bhela</td>
<td>Semicarpus anacardium</td>
</tr>
<tr>
<td>20.</td>
<td>Bhomra, Bahera</td>
<td>Terminalia belerica</td>
</tr>
<tr>
<td>21.</td>
<td>Bola</td>
<td>Morus laevigala</td>
</tr>
<tr>
<td>22.</td>
<td>Dhopabar</td>
<td>Ficus mysoronsis</td>
</tr>
<tr>
<td>23.</td>
<td>Dimaru</td>
<td>Ficus hispida</td>
</tr>
<tr>
<td>24.</td>
<td>Dukoha</td>
<td>Drypetes assamica</td>
</tr>
<tr>
<td>25.</td>
<td>Gaborhitha, Samsuku</td>
<td>Pavetta indica</td>
</tr>
<tr>
<td>26.</td>
<td>Gamari</td>
<td>Gmelina arborea</td>
</tr>
<tr>
<td>27.</td>
<td>Gohora</td>
<td>Premna bengalensis</td>
</tr>
<tr>
<td>28.</td>
<td>Gular</td>
<td>Ficus glomerata</td>
</tr>
<tr>
<td>29.</td>
<td>Haldu, taraksopa</td>
<td>Adina cordifolia</td>
</tr>
<tr>
<td>30.</td>
<td>Harumoin</td>
<td>Randia fasciculate</td>
</tr>
<tr>
<td>31.</td>
<td>Helok, Poreng</td>
<td>Elaeocarpus robustus</td>
</tr>
<tr>
<td>32.</td>
<td>Hilikha</td>
<td>Terminalia chebula</td>
</tr>
<tr>
<td>33.</td>
<td>Juglo</td>
<td>Macaranga indica</td>
</tr>
<tr>
<td>35.</td>
<td>Jam</td>
<td>Syzygium cumini</td>
</tr>
<tr>
<td>36.</td>
<td>Jari- Udal</td>
<td>Fermiana colorata</td>
</tr>
<tr>
<td>37.</td>
<td>Jarbar</td>
<td>Ficus gobbosa</td>
</tr>
<tr>
<td>38.</td>
<td>Jobha, Lewa</td>
<td>Engelhardtia spicata</td>
</tr>
<tr>
<td>39.</td>
<td>Jamun</td>
<td>Eugenia jambolana</td>
</tr>
<tr>
<td>40.</td>
<td>Kadam</td>
<td>Anthocepalus cadamba</td>
</tr>
<tr>
<td>41.</td>
<td>Kanchan</td>
<td>Bauhinia sp.</td>
</tr>
<tr>
<td>42.</td>
<td>Kathal</td>
<td>Artocarpus heterophyllus</td>
</tr>
<tr>
<td>43.</td>
<td>Khonkon</td>
<td>Duabanga grandiflora</td>
</tr>
<tr>
<td>44.</td>
<td>Koroi</td>
<td>Albizzia procera</td>
</tr>
</tbody>
</table>
### DESCRIPTION OF ENVIRONMENT

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>COMMON NAME</th>
<th>BOTANICAL NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TREES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45.</td>
<td>Kum</td>
<td>Careya arborea</td>
</tr>
<tr>
<td>46.</td>
<td>Kurial</td>
<td>Bauhinia purpurea</td>
</tr>
<tr>
<td>47.</td>
<td>Kurila</td>
<td>Brassiopsis speciosa</td>
</tr>
<tr>
<td>48.</td>
<td>Maina</td>
<td>Tetrameles nudiflora R. Br</td>
</tr>
<tr>
<td>49.</td>
<td>Makri sal</td>
<td>Scima wallichii</td>
</tr>
<tr>
<td>50.</td>
<td>Moj</td>
<td>Albizzia lucida</td>
</tr>
<tr>
<td>51.</td>
<td>Nagini</td>
<td>Elaeocarpus aristatus</td>
</tr>
<tr>
<td>52.</td>
<td>Nahaor</td>
<td>Mesua ferrea</td>
</tr>
<tr>
<td>53.</td>
<td>Pipal</td>
<td>Ficus religiosa. Linn</td>
</tr>
<tr>
<td>54.</td>
<td>Panchphal</td>
<td>Dillenia indica ,Linn</td>
</tr>
<tr>
<td>55.</td>
<td>Palas</td>
<td>Butea monosperma</td>
</tr>
<tr>
<td>56.</td>
<td>Phulgamari</td>
<td>Endospernum chinense</td>
</tr>
<tr>
<td>57.</td>
<td>Raman-bih</td>
<td>Aesculus panduana</td>
</tr>
<tr>
<td>58.</td>
<td>Sal</td>
<td>Shorea robusta</td>
</tr>
<tr>
<td>59.</td>
<td>Satiana</td>
<td>Alstonia scholaris</td>
</tr>
<tr>
<td>60.</td>
<td>Sagun, Teak</td>
<td>Tectona grandis</td>
</tr>
<tr>
<td>61.</td>
<td>Silubar</td>
<td>Ficus retusa</td>
</tr>
<tr>
<td>62.</td>
<td>Simul</td>
<td>Salmalia malabarica</td>
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<tr>
<td>63.</td>
<td>Sirish</td>
<td>Albizia lebbeck</td>
</tr>
<tr>
<td>64.</td>
<td>Sonaru</td>
<td>Cassia fistula</td>
</tr>
<tr>
<td>65.</td>
<td>Sissu</td>
<td>Dalbergia sissoo.Roxb</td>
</tr>
<tr>
<td><strong>SHRUBS &amp; HERBS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>01.</td>
<td>Arere kata</td>
<td>mimosa himalayan, Gamble</td>
</tr>
<tr>
<td>02.</td>
<td>Akalbih</td>
<td>Clerodendron indicum</td>
</tr>
<tr>
<td>03.</td>
<td>Assamlota</td>
<td>Eupatorium Odoratum, Linn.</td>
</tr>
<tr>
<td>04.</td>
<td>Bhang</td>
<td>Cannabis sativa</td>
</tr>
<tr>
<td>05.</td>
<td>Bhokuri</td>
<td>Solanum indicum</td>
</tr>
<tr>
<td>06.</td>
<td>Bhit-tita</td>
<td>Solanum torvum</td>
</tr>
<tr>
<td>07.</td>
<td>Biyonihaputa</td>
<td>Desmodium laburnifolium</td>
</tr>
<tr>
<td>08.</td>
<td>Bogitora</td>
<td>Alpinia allughas</td>
</tr>
<tr>
<td>09.</td>
<td>Boriala</td>
<td>Suda caroubufolia</td>
</tr>
<tr>
<td>10.</td>
<td>Daridiga, Bonmedelua</td>
<td>Cassia toa</td>
</tr>
<tr>
<td>11.</td>
<td>Debre lahare</td>
<td>Butea parviflora Roxb, syn</td>
</tr>
<tr>
<td>12.</td>
<td>Gurjo</td>
<td>Tinospora cordiflora, Miers</td>
</tr>
<tr>
<td>13.</td>
<td>Kali lahara</td>
<td>Combreutum decandrum, Roxb</td>
</tr>
<tr>
<td>14.</td>
<td>Pani lahara</td>
<td>Cissus repanda,vahi</td>
</tr>
<tr>
<td>15.</td>
<td>Sarpagandha</td>
<td>Rauwalfia serpentine, Benth</td>
</tr>
<tr>
<td><strong>CLIMBERS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>01.</td>
<td>Bakal–bih</td>
<td>Derris elliptica</td>
</tr>
<tr>
<td>02.</td>
<td>Bokul-lata</td>
<td>Embelia ribes</td>
</tr>
<tr>
<td>03.</td>
<td>Bon-marich</td>
<td>Clematis cadmia</td>
</tr>
<tr>
<td>04.</td>
<td>Chagallata, Gorapohal</td>
<td>Narnvolla zoylanica</td>
</tr>
<tr>
<td>05.</td>
<td>Ghahelewa</td>
<td>Croton caudatus</td>
</tr>
<tr>
<td>06.</td>
<td>Helolokha</td>
<td>Milletia auriculata</td>
</tr>
<tr>
<td>07.</td>
<td>Kharika-lata</td>
<td>Jasminum coarctatum</td>
</tr>
</tbody>
</table>
### EIA STUDY FOR GRASSROOT BG RAILFED POL STORAGE DEPOT AT MOINARBAND, SILCHAR, CACHAR, ASSAM

#### DESCRIPTION OF ENVIRONMENT

<table>
<thead>
<tr>
<th>DESCRIPTION OF ENVIRONMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>08.</strong> Kolilata</td>
</tr>
<tr>
<td><strong>09.</strong> Kuchal, kuchalata</td>
</tr>
<tr>
<td><strong>10.</strong> Kukualata</td>
</tr>
</tbody>
</table>

#### BAMBOOS

| 01. | Bans | *Dendrocalamus strictus (Roxb) Nees.ex Munro* |
| 02. | Muli bamboo | *Mealoocanna* |
| 03. | Gati bamboo | *Bambusa tulda* |
| 04. | Bhaluka bamboo | *Bambusa balcooa* |

#### GRASSES

| 01. | Kansh | *Saceharum spontaneum, Linn* |
| 02. | Khash | *Vetivaria Zizaniodes, Nash* |
| 03. | Dubh | *Cynodon dactylon, Pers* |
| 04. | Phooli (Phulhara) | *Apuda mutica, Linn* |

#### MEDICINAL PLANT

| 01. | Neem | *Azadirachta indica* |
| 02. | Amla | *Emblica Officinalis* |
| 03. | Hilika | *Terminalia chebula* |
| 04. | Bohera | *T. belerica* |
| 05. | Arjun | *T. arjuna* |
| 06. | Bel | *Aegle marmilos* |
| 07. | Tejpata | *Cinnamomum tamala* |
| 08. | Agar | *Aquilaria,Agallocha* |

### 3.8.9 Fauna

Assam state supports rich faunal biodiversity ranging from Indo-Chinese species to peninsular Indian species. Diverse types of fauna ranging from mammals, avian species to reptiles were recorded/ reported. The existing aquatic ecology supports rich diversity due to existence of lotic and lentic water bodies.

#### Mammals

An area of 5 km radius around the site is taken for the study. The land is mostly dominated by rural setting. Consequently, among fauna species especially avifauna is rich and diversified. Common animals observed are mainly House rat, Bat, Jungle Cat, and Leopard Cats, squirrels, monkey, Python and other variety of snakes. The domestic fauna found in the area are Cow, Bullock, Buffalo, Sheep, Goat, Horse, Ponies and Pig among the live stock and Duck, Drake, Hen, Fowl. It has been observed that a wide variety of birds of 40 species were common in the area.

#### Avifauna

The avi-fauna is richer than other animals. The birds come across are tree-pie, bulbul, magpie robin, black drongo, hill maina, munia, house sparrow, humming bird, wood pecker, hoopoe, cuckoo, parakeet, kingfisher, owl, vulture, green...
pigeon, dove, jungle fowl, cormorant, cattle ergot, pond horn etc.

**Mammals and other species**

Among the other animals, about 34 species have been listed by the Forest Department. Many types of butterflies, dragonflies, honeybees, observed during the study period.

**Fisheries**

It is very important to assess the fishing potential of the fresh water ecosystem of the region to ascertain the likely impacts that may arise due to proposed development. Fishing is considered as one of the key small scale industries in the district and number of people depends on fishing for their livelihood. Fisheries in the district are of two types i.e. beel fisheries and river fisheries.

The fauna observed/reported during the study period are described below in the Table 3.55.

**Table 3.55**

LIST OF FAUNA SURROUNDING THE STUDY AREA

<table>
<thead>
<tr>
<th>SL.NO.</th>
<th>COMMON NAME</th>
<th>ZOOLOGICAL NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAMMALS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>01.</td>
<td>Common Langur</td>
<td><em>Presbytis entellus</em></td>
</tr>
<tr>
<td>02.</td>
<td>Indian Ratel</td>
<td><em>Mellivora capenis</em></td>
</tr>
<tr>
<td>03.</td>
<td>Field Rat</td>
<td><em>Bendicota bengalensis</em></td>
</tr>
<tr>
<td>04.</td>
<td>Three striped squirrel</td>
<td><em>Funambulus pennati</em></td>
</tr>
<tr>
<td>05.</td>
<td>Flying Squirrel</td>
<td><em>Manis Crassicaudata</em></td>
</tr>
<tr>
<td>06.</td>
<td>Jungle Cat</td>
<td><em>Felis chaus</em></td>
</tr>
<tr>
<td>07.</td>
<td>Indian Hare</td>
<td><em>Lepus nigricollis</em></td>
</tr>
<tr>
<td>08.</td>
<td>Jackal</td>
<td><em>Canis aureus</em></td>
</tr>
<tr>
<td>09.</td>
<td>Barking Deer</td>
<td><em>Muntiacus muntjak</em></td>
</tr>
<tr>
<td>10.</td>
<td>Blue Bull</td>
<td><em>Boselaphus tragocamelus</em></td>
</tr>
<tr>
<td>11.</td>
<td>Spotted deer</td>
<td><em>Axis axis</em></td>
</tr>
<tr>
<td>12.</td>
<td>Swamp deer</td>
<td><em>Rucervus duvaucelii</em></td>
</tr>
<tr>
<td>13.</td>
<td>Clouded leopard</td>
<td><em>Neofelis nebulosa</em></td>
</tr>
<tr>
<td>14.</td>
<td>Golden langur</td>
<td><em>Trachypithecus geei</em></td>
</tr>
<tr>
<td>15.</td>
<td>Indian mongoose</td>
<td><em>Herpestes javanicus</em></td>
</tr>
<tr>
<td>16.</td>
<td>Bay bamboo rat</td>
<td><em>Cannomys badius</em></td>
</tr>
<tr>
<td>17.</td>
<td>Hog badger</td>
<td><em>Arctonyx collaris</em></td>
</tr>
<tr>
<td>18.</td>
<td>Rhesus macaque</td>
<td><em>Macaca mulatta</em></td>
</tr>
<tr>
<td>19.</td>
<td>Hoary bamboo rat</td>
<td><em>Rhizomys prinosus</em></td>
</tr>
<tr>
<td>20.</td>
<td>Otter</td>
<td><em>Lutra perspicillata</em></td>
</tr>
<tr>
<td>21.</td>
<td>Ganges river dolphin</td>
<td><em>Platanista gangetica</em></td>
</tr>
<tr>
<td>22.</td>
<td>Wild dog</td>
<td><em>Cuon alimus</em></td>
</tr>
<tr>
<td>23.</td>
<td>Goat</td>
<td><em>Capra sp.</em></td>
</tr>
<tr>
<td>24.</td>
<td>Horse</td>
<td><em>Equus Caballus</em></td>
</tr>
<tr>
<td>25.</td>
<td>House Mouse</td>
<td><em>Mus musculus</em></td>
</tr>
</tbody>
</table>
### AVI-FAUNA

<table>
<thead>
<tr>
<th>No.</th>
<th>Animal</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Common myna</td>
<td>Acridotheres tristis</td>
</tr>
<tr>
<td>02</td>
<td>Blue rock pigeon</td>
<td>Columba livia</td>
</tr>
<tr>
<td>03</td>
<td>House crow</td>
<td>Corvus splendens</td>
</tr>
<tr>
<td>04</td>
<td>Black drango</td>
<td>Dicrurus adsimilis</td>
</tr>
<tr>
<td>05</td>
<td>White breasted kingfisher</td>
<td>Halyon smyrensis</td>
</tr>
<tr>
<td>06</td>
<td>Pariah kite</td>
<td>Milvus migrans</td>
</tr>
<tr>
<td>07</td>
<td>House sparrow</td>
<td>Passer domesticus</td>
</tr>
<tr>
<td>08</td>
<td>Spotted dove</td>
<td>Streptopelia chinensis</td>
</tr>
<tr>
<td>09</td>
<td>House swift</td>
<td>Apus affinis</td>
</tr>
<tr>
<td>10</td>
<td>Common sandpiper</td>
<td>Tringa hypoleucos</td>
</tr>
<tr>
<td>11</td>
<td>Lark</td>
<td>Mirafra assamica</td>
</tr>
<tr>
<td>12</td>
<td>Jungle Crow</td>
<td>Corvus macrorhynchos</td>
</tr>
<tr>
<td>13</td>
<td>Indian Grey hornbill</td>
<td>Ocyceros birostris</td>
</tr>
<tr>
<td>14</td>
<td>Hair-crested Drongo</td>
<td>Dicrurus hottentottus</td>
</tr>
<tr>
<td>15</td>
<td>Paddy field pipit</td>
<td>Anthus rufulus</td>
</tr>
<tr>
<td>16</td>
<td>Indian Chat</td>
<td>Cercomela fusca</td>
</tr>
<tr>
<td>17</td>
<td>Indian Roller</td>
<td>Coracias enghalensis</td>
</tr>
<tr>
<td>18</td>
<td>Green Bee Eater</td>
<td>Merops orientalis</td>
</tr>
<tr>
<td>19</td>
<td>Pond heron</td>
<td>Ardeola gravii</td>
</tr>
<tr>
<td>20</td>
<td>Red vented bulbul</td>
<td>Turdoides striata</td>
</tr>
<tr>
<td>21</td>
<td>Red wattled lapwing</td>
<td>Vanellus indicus</td>
</tr>
<tr>
<td>22</td>
<td>Little egret</td>
<td>Egretta garzetta</td>
</tr>
<tr>
<td>23</td>
<td>Indian pond heron</td>
<td>Ardeola grayigrayi</td>
</tr>
<tr>
<td>24</td>
<td>Cattle egret</td>
<td>Bubulcus ibis</td>
</tr>
<tr>
<td>25</td>
<td>Jungle babbler</td>
<td>Turdoides striata</td>
</tr>
<tr>
<td>26</td>
<td>Bank myna</td>
<td>Acridotheres ginginianus</td>
</tr>
<tr>
<td>27</td>
<td>Pied myna</td>
<td>Gracupica contra</td>
</tr>
<tr>
<td>28</td>
<td>Rose ring parakeet</td>
<td>Psittacula kramen</td>
</tr>
<tr>
<td>29</td>
<td>Hoopoe</td>
<td>Upupa epops</td>
</tr>
</tbody>
</table>

### REPTILES

<table>
<thead>
<tr>
<th>No.</th>
<th>Animal</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Cobra</td>
<td>Naja naja</td>
</tr>
<tr>
<td>02</td>
<td>Python</td>
<td>Python molurus</td>
</tr>
<tr>
<td>03</td>
<td>Rat Snake</td>
<td>Ptyas mucosus</td>
</tr>
<tr>
<td>04</td>
<td>Russel’s Viper</td>
<td>Viper russeli</td>
</tr>
<tr>
<td>05</td>
<td>The common Krait</td>
<td>Bungarus Caeruleus</td>
</tr>
<tr>
<td>06</td>
<td>Common house gecko</td>
<td>Hemidactylus gleadowiimaculatus</td>
</tr>
<tr>
<td>07</td>
<td>Agama</td>
<td>Agama tuberculata</td>
</tr>
<tr>
<td>08</td>
<td>Green tree Snake</td>
<td>Dryophis species</td>
</tr>
<tr>
<td>09</td>
<td>Wall lizard</td>
<td>Memicactylus species</td>
</tr>
<tr>
<td>10</td>
<td>Garden lizard</td>
<td>Calotesversicolor</td>
</tr>
<tr>
<td>11</td>
<td>Chemelion</td>
<td>Calotes versicolor</td>
</tr>
</tbody>
</table>

### FISHES (Aquatic Fauna)

<table>
<thead>
<tr>
<th>No.</th>
<th>Fish</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Bata</td>
<td>Labeo bata</td>
</tr>
<tr>
<td>02</td>
<td>Lata</td>
<td>Channa punctatus</td>
</tr>
<tr>
<td>03</td>
<td>Sole</td>
<td>Channa striatus</td>
</tr>
<tr>
<td>04</td>
<td>Chang</td>
<td>Channa gachua</td>
</tr>
<tr>
<td>05</td>
<td>Rohu</td>
<td>Labeo rohita</td>
</tr>
</tbody>
</table>
3.8.10 Biodiversity

The Assam region bears rich diversity of flora and fauna. The study area also comprises floral richness of varieties of shrubs, herbs and grasses bearing attractive coloured flowers laden with scented nectar to attract and support butterflies. The floral biodiversity itself indicates the species of butterflies that can be predicated in that area. All the species were common and none of them are listed as ‘endangered’ (IWPA, 1972). Table: 3.56 given below shows the list of Butterfly species.

Table - 3.56
BUTTERFLIES RECORDED DURING THE STUDY PERIOD

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Glassy bluebottle</td>
<td>Graphium cloanthus</td>
</tr>
<tr>
<td>2</td>
<td>Lime</td>
<td>Papilio demoleus</td>
</tr>
<tr>
<td>3</td>
<td>Common Mormon</td>
<td>Papilio polytes</td>
</tr>
<tr>
<td>4</td>
<td>Indian Cabbage White</td>
<td>Pieris canidia</td>
</tr>
<tr>
<td>5</td>
<td>Common Albatross</td>
<td>Appias albina</td>
</tr>
<tr>
<td>6</td>
<td>Small Grass Yellow</td>
<td>Eurema libythea</td>
</tr>
<tr>
<td>7</td>
<td>Common Brimstone</td>
<td>Goneoteryx rhamni</td>
</tr>
<tr>
<td>8</td>
<td>Sorrel Sapphire</td>
<td>Heliophorus sena</td>
</tr>
<tr>
<td>9</td>
<td>Pale Grass Blue</td>
<td>Pseudozizeeria maha</td>
</tr>
<tr>
<td>10</td>
<td>Common Wall</td>
<td>Pararge schakra</td>
</tr>
<tr>
<td>11</td>
<td>Common Leopard</td>
<td>Phalanta phalantha</td>
</tr>
<tr>
<td>12</td>
<td>Blue Pansy</td>
<td>Junonia orithya</td>
</tr>
<tr>
<td>13</td>
<td>Lemon pansy</td>
<td>Junonia lemonias</td>
</tr>
<tr>
<td>14</td>
<td>Chocolate Pansy</td>
<td>Junonia iphita</td>
</tr>
<tr>
<td>15</td>
<td>Indian Red Admiral</td>
<td>Vanessa indica</td>
</tr>
<tr>
<td>16</td>
<td>Painted Lady</td>
<td>Cynthia cardui</td>
</tr>
<tr>
<td>17</td>
<td>Yellow Coster</td>
<td>Pareba vesta</td>
</tr>
<tr>
<td>18</td>
<td>Plain Tiger</td>
<td>Danaus chrysippus</td>
</tr>
<tr>
<td>19</td>
<td>Common Sergeant</td>
<td>Pantoporia perius</td>
</tr>
</tbody>
</table>
3.8.11 **Conclusion**

The floristic component of the study area does not include any rare or endangered species. Thus, impact on rare and endangered species of flora is not envisaged. From the descriptions mentioned above, it may be concluded that the vegetations grown around the POL Depot contains common form of woody and herbaceous flora species.
SOCIO-ECONOMIC ENVIRONMENT

3.9.1 Introduction
For the purpose of preparation of EIA Report, areas located within 5-kms radius around the proposed site have been considered for secondary data collection.

3.9.2 Cultural profile
Cachar district occupies an area of 3,786 square kilometres (1,462 sq mi), comparatively equivalent to South Georgia. The Barak is the main river of the district and apart from that there are numerous small rivers which flow from Dima Hasao district, Manipur or Mizoram. The district is mostly made up of plains, but there are a number of hills spread across the district. Cachar receives an average annual rainfall of more than 3,000 mm. The climate is Tropical wet with hot and wet summers and cool winters.

The district headquarters, Silchar, is one of the most important business centres of Assam. In 2006 the Indian government named Cachar one of the country's 250 most backward districts out of a total of 640. It is one of the eleven districts in Assam currently receiving funds from the Backward Regions Grant Fund Programme (BRGF).

Silchar is one of the 6 cities of Assam to have an airport which is located at Kumbhirgram. The district is served by regular flights from Alliance Air, a subsidiary of Air India, Jet Airways and North East Shuttles. The district is also connected by meter gauge railroads to Lumding in Assam and by road to the rest of the country. Regular bus and train services are also there with other cities of North-East India.

According to the 2011 census Cachar district has a population of 1,736,319, roughly equal to the nation of The Gambia[13] or the US state of Nebraska. This gives it a ranking of 278th in India out of a total of 640. The district has a population density of 459 inhabitants per square kilometre (1,190 /sq mi). Its population growth rate over the decade 2001-2011 was 20.17%. Cachar has asex ratio of 958 females for every 1000 males,[ and a literacy rate of 80.36%

The district of Cachar has a number of well-known educational institutes in North East India. Silchar, the district headquarters, is a major learning hub of Assam. The district has a central university, the Assam University, which is situated at Durgakona, 18 km from Silchar. It also has NIT Silchar, one of the 30 NITs in
Description of Environment

India. The Silchar Medical College and Hospital is the only medical college of southern Assam

3.9.3 Demographic Profile

In view of the size and operations within the Project, the study of demographic profile has been limited to the area within a distance of 5 km from the site. The study area covers 18 villages, under Cachar district in Assam. The total population of the entire villages under study area was 1,56116 (District Census handbook – 2011). Under the category of sex ratio, the number of females per 1000 males is 939. The social compositions in the study area are such that nearly 8% of total population is Scheduled Caste population and 0.67% of total population is Scheduled Tribe population. The literacy rate in the study area was 61%, out of which the literacy rate in male category is higher (67%) whereas the literacy rate is only 55% in female category. The Salient features of the demography profile of the study area presented below in Table- 3.57 and details of population profile and literacy data has been presented in Table-3.59 & 3.60.

Table-3.57
Silent features of Demographic profile

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Features within 5-Km distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of households</td>
<td>33961</td>
</tr>
<tr>
<td>Population, Total</td>
<td>1,56116</td>
</tr>
<tr>
<td>Population - Male</td>
<td>80,507</td>
</tr>
<tr>
<td>Population - Female</td>
<td>75,609</td>
</tr>
<tr>
<td>Females per 1000 males</td>
<td>939</td>
</tr>
<tr>
<td>Scheduled Castes (SC), Total</td>
<td>12344</td>
</tr>
<tr>
<td>S/C - Males</td>
<td>6269</td>
</tr>
<tr>
<td>S/C - Females</td>
<td>6065</td>
</tr>
<tr>
<td>SC as % of total population</td>
<td>8</td>
</tr>
<tr>
<td>SC females/1000 males</td>
<td>967</td>
</tr>
<tr>
<td>Scheduled Tribe (S/T), Total</td>
<td>1,052</td>
</tr>
<tr>
<td>S/T - Males</td>
<td>543</td>
</tr>
<tr>
<td>S/T - Females</td>
<td>509</td>
</tr>
<tr>
<td>ST as % of total population</td>
<td>0.67</td>
</tr>
</tbody>
</table>
DESCRIPTION OF ENVIRONMENT

<table>
<thead>
<tr>
<th>ST females/1000 ST males</th>
<th>937</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (0-6 years), Total</td>
<td>23,057</td>
</tr>
<tr>
<td>Literates, Total</td>
<td>95,167</td>
</tr>
<tr>
<td>Literates - Males</td>
<td>53,895</td>
</tr>
<tr>
<td>Literates - Females</td>
<td>41,272</td>
</tr>
<tr>
<td>Total Literates as % of Total Population</td>
<td>61</td>
</tr>
<tr>
<td>Male Literates as % of Total Males</td>
<td>67</td>
</tr>
<tr>
<td>Female Literates as % of Total Females</td>
<td>55</td>
</tr>
</tbody>
</table>

3.9.4 ECONOMIC PROFILE

The economy of the study area is mainly dependent on agriculture. Next to agriculture activity, the economy is dependent on industrial activity. This is evident from the fact that 31% of total population fall in the category of main workers. Under the study area of 5 kms, the cultivation activity is impressive as the total number of main cultivators is only 5,115 and the main cultivators are 8.0% of total workers. Main agricultural labourers are only 3,553 and they are only 6% of total workers. The number of workers engaged in household workers is only 933 and they form 1.5% of total workers. The occupational pattern in the area within a distance of 5km from the site is presented below in Table-3.58.

Table-3.58
Summary of Occupational Pattern

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Features within 5-Km distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population, Total</td>
<td>1,56116</td>
</tr>
<tr>
<td>Population - Male</td>
<td>80,507</td>
</tr>
<tr>
<td>Population - Female</td>
<td>75,609</td>
</tr>
<tr>
<td>Main Workers, Total</td>
<td>48,557</td>
</tr>
<tr>
<td>Main Workers - Males</td>
<td>36,810</td>
</tr>
<tr>
<td>Main Workers - Females</td>
<td>11,747</td>
</tr>
<tr>
<td>Main Workers as % of Total population</td>
<td>31</td>
</tr>
<tr>
<td>Main male workers as % of total Males</td>
<td>46</td>
</tr>
<tr>
<td>Main female workers as % of Total Female</td>
<td>15</td>
</tr>
<tr>
<td>Marginal Workers, Total</td>
<td>13,821</td>
</tr>
<tr>
<td>Marginal Workers - Males</td>
<td>7094</td>
</tr>
</tbody>
</table>
3.9.5 **Amenities**

A significant infrastructural development work has been carried out in the study area during the past decade. The numbers of schools have increased considerably and more buses and cycles are plying on the roads. Education has tended to change the social outlook. The number of medical institutions is also fast increasing. As a result of the increased transport facilities, people have begun to travel more frequently. There is a perceptible change from the traditional pattern to the adoption of modern style of living. Aspirations of the people are high. The community development program has created an urge for better living among the people.

Within the study area, most of the settlements are electrified and connected with metalled roads. Facilities for primary education and medical treatment available in all the settlements are adequate. Further, Silchar town is located at a distance of 6 km from proposed terminal, where all the infrastructural facilities are available.

3.9.6 **Health Status**

Medical facilities in the region were mainly provided by the State Government. It is the basic social input for healthy and efficient human resources. The Health and Family Welfare Department is providing services such as public health, control of communicable diseases, health education, family welfare, maternal and child health care through a network. As regards health facilities, primary
health centre is available in Silchar town. Major medical facilities are available in Cachar district which is at a distance about 22 km from Moinarband POL depot.

3.9.7 Agriculture

Economic resources of the area include agriculture, irrigation, live stock and animal husbandry. Land has been classified according to the different uses of rural areas. The land has been classified into irrigated, un-irrigated, culturable waste, area not available for cultivation and forestland type.

The predominant crops grown in the area are Rice. Ground water drawn from bore wells is used for irrigation.

3.9.8 Conclusion

It is concluded that the proposed Moinarband POL depot shall not impart any adverse impact on demographic profile, amenities, social structure, transport system, occupational pattern etc. The project will produce tangible beneficial impacts on the life quality and socio-economic status of the area.
### TABLE - 3.59

**VILLAGE WISE POPULATION DATA WITHIN STUDY AREA**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Village</th>
<th>Total No. of House hold</th>
<th>Population</th>
<th>Scheduled Castes</th>
<th>Scheduled Tribes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>Male Female</td>
<td>Male Female</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male Female</td>
</tr>
<tr>
<td>01</td>
<td>Larsingpar Grant</td>
<td>819</td>
<td>3726</td>
<td>1879 1847</td>
<td>23 26</td>
</tr>
<tr>
<td>02</td>
<td>Latigram (Lathigram)</td>
<td>488</td>
<td>2513</td>
<td>1316 1197</td>
<td>1 0</td>
</tr>
<tr>
<td>03</td>
<td>Doyapore Grant</td>
<td>932</td>
<td>4202</td>
<td>2324 1878</td>
<td>86 96</td>
</tr>
<tr>
<td>04</td>
<td>Doyapore Grant</td>
<td>932</td>
<td>4202</td>
<td>2324 1878</td>
<td>86 96</td>
</tr>
<tr>
<td>05</td>
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*Source: Cachar District Census Handbook 2011*
**TABLE - 3.60**

**VILLAGE WISE LITERACY STUDY AREA**

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<tr>
<th>Sl. No.</th>
<th>Name of Village</th>
<th>Population</th>
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<th>Literates</th>
<th>Illiterates</th>
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<td>Male</td>
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<td>613</td>
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Source: Cachar District Census Hand Book 2011
### TABLE -3.61
**VILLAGE WISE ECONOMIC PROFILE IN STUDY AREA**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Village</th>
<th>Total Population</th>
<th>Total Worker</th>
<th>Total Main Workers</th>
<th>Marginal Workers</th>
<th>Non Workers</th>
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<td>Male</td>
<td>Female</td>
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*Source: Cachar District Census Hand Book 2011*
## TABLE - 3.62
### VILLAGE WISE WORKFORCE PATTERN IN STUDY AREA

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of village</th>
<th>Total Workers</th>
<th>Main Cultivators</th>
<th>Main Agricultural Labourers</th>
<th>Household Industry</th>
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Source: Cachar District Census Hand Book 2011