

Kohinoor Pulp & Paper Pvt. Ltd.	Environmental Impact Assessment for Proposed Greenfield Project of 250 TPD Pulp Plant, 250 TPD Paper Plant along with co-generation Power Plant at Industrial Growth Center, Matia, District Goalpara, Assam	C3 - 1
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## CHAPTER 3.0

### BASELINE ENVIRONMENTAL SCENARIO

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#### 3.0 GENERAL

The proposed unit of M/s Kohinoor Pulp & Paper Private Limited shall be located at Industrial Growth Centre (IGC), Plot Block C, Village Mornoi, Matia, District Goalpara, of Assam. The geographical coordinates are 26°05'45.61"N and 90°43'51.28"E. The proposed site area is well developed and has necessary infrastructure facilities such as motorable road upto the plant site, nearness to rail head, telephone telefax facilities etc. The nearest town Goalpara, district Head Quarters is situated around 16 kms in NW direction from the project site. Goalpara district is situated in the south bank of river Brahmaputra and in western part of Assam. Guwahati city is around 115 kms in east direction from the project site. River Brahmaputra is flowing towards north direction w.r.t the proposed project site.

The EIA is aimed at determining the environmental impacts on the "Study Area", which encompasses all areas falling within a radius of 10 km around the proposed plant site of Kohinoor Pulp & Paper Pvt. Limited due to the proposed project.

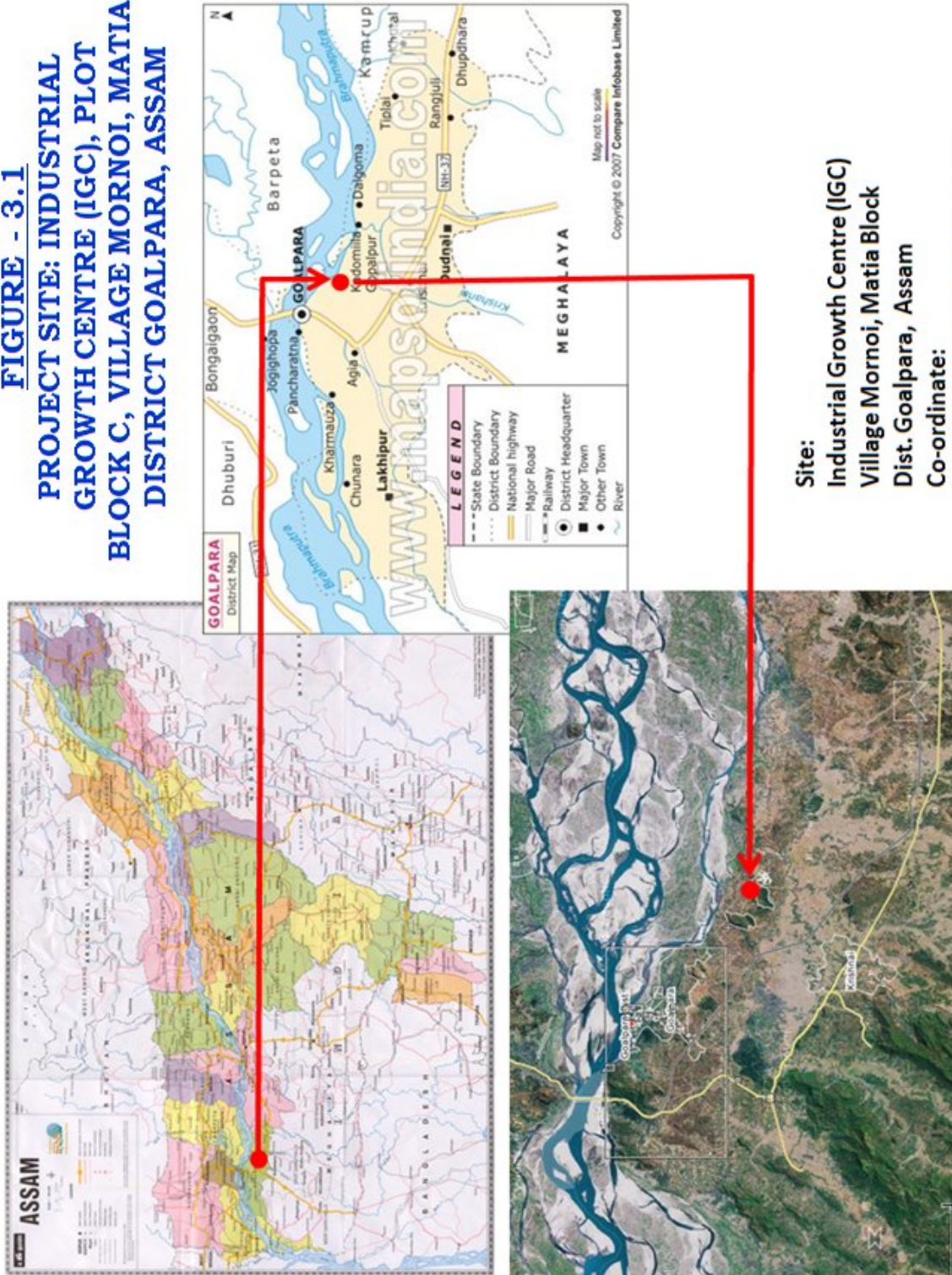
There is no national park, wildlife sanctuary/ tiger reserves exist within 10 km radius of proposed plant. However, reserve forests are located on the southern side of the project site.

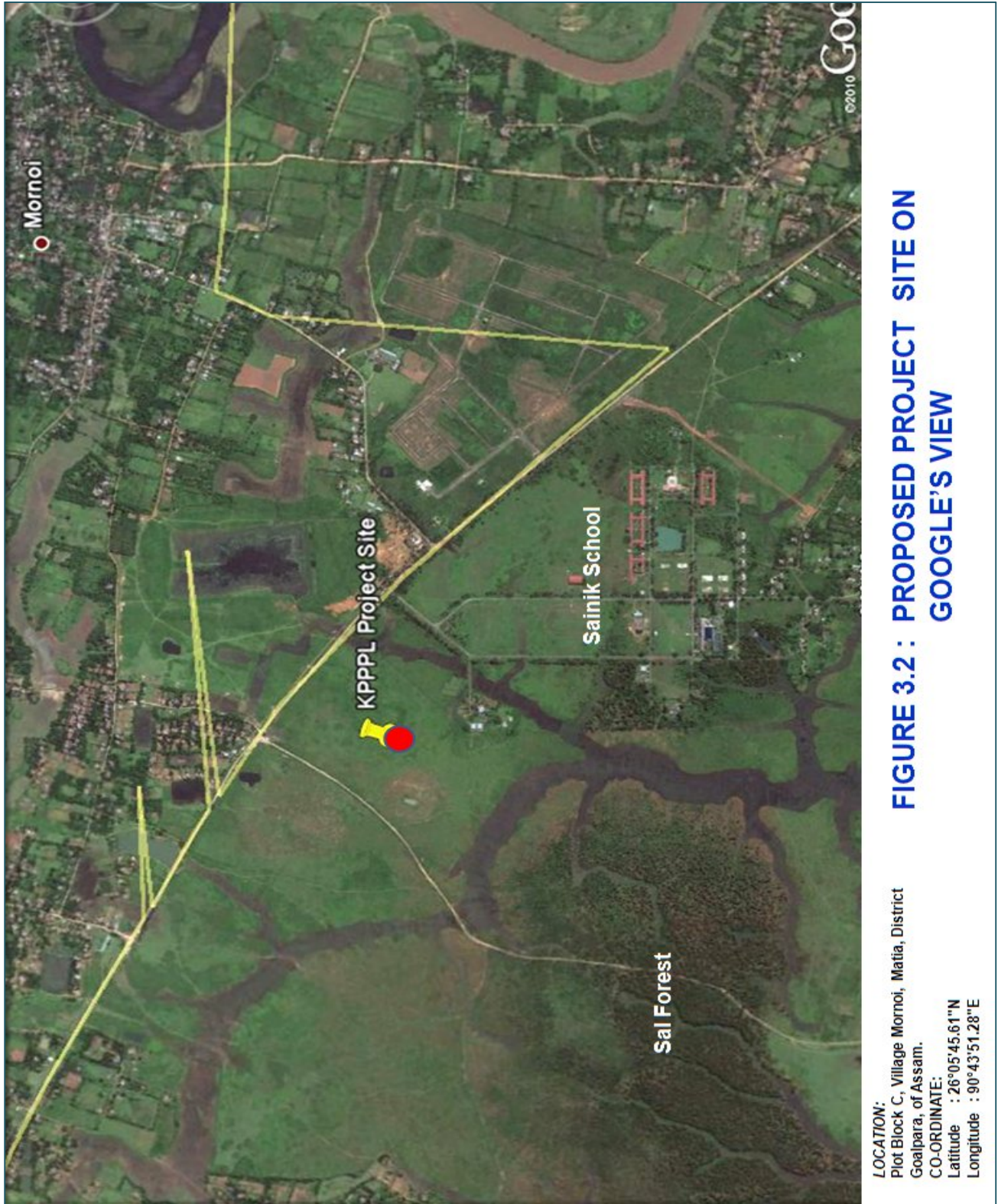
The major environmental disciplines studied in this EIA report include soil, land use, meteorology, surface and ground water quality, air quality, noise, ecology and demography and socio-economics.

The following chapters present the detailed discussion on the field data, generated for soil, meteorology, water quality, air quality, noise, ecology and socio-economics during three months' period (1<sup>st</sup> Oct, 2010 - 31<sup>st</sup> Dec, 2010) along with the relevant secondary data, collected from various agencies on the relevant disciplines.

The map showing the location of the project site is in Figure - 3.1. The project site on Google's view is presented in Figure 3.2.

**FIGURE - 3.1**  
**PROJECT SITE: INDUSTRIAL GROWTH CENTRE (IGC), PLOT BLOCK C, VILLAGE MORNOI, MATIA, DISTRICT GOALPARA, ASSAM**





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### 3.1 GEOLOGY & GEO-HYDROLOGY OF THE STUDY AREA

#### GEOLOGY OF THE STUDY AREA

Goalpara district is situated in the south bank of river Brahmaputra. The district covers an area of 1,842 square kilometers and is bounded by West and East Garo Hills districts of Meghalaya in the South and Kamrup district in the East, Dhubri district in the West and river Brahmaputra is all along in the North. Goalpara is located in western part of Assam. The geographical location of the district is between latitude 25° 53' and 26°30' N and longitude 90°07' and 91°05' E.

Physiographically, the study area is occupied both by hills and plains. The alluvial land is flat with a gentle regional slope towards Brahmaputra River. The hills mostly occur as isolated inselberg with heights ranging between 60 to 300 m above MSL. The hills are veneered by lateritic mantle and are deeply forested with evergreen mixed open jungles. Tongue like projections of the main Shillong Plateau is also seen in the study area.

Geologically, the study area may be divided into two broad groups, viz (i) Pre-Cambrian Crystallines occupying the hills and the inselbergs and (ii) Quaternary Sediments constituting the river valleys and the plain areas in between the inselbergs. The main hills are Pancharatna, Sri Surjya, Tukreswari, Nalanga & Paglartek with elevations ranging from 100 to 500 m. A significance of Goalpara is the existence of a large number of Char (Riverine tracts and sandy river island). The mighty river Brahmaputra flows east to west on the northern boundary of district and the main tributaries are river Dudhnoi, Krishnai, Jinjiram and Jinary.

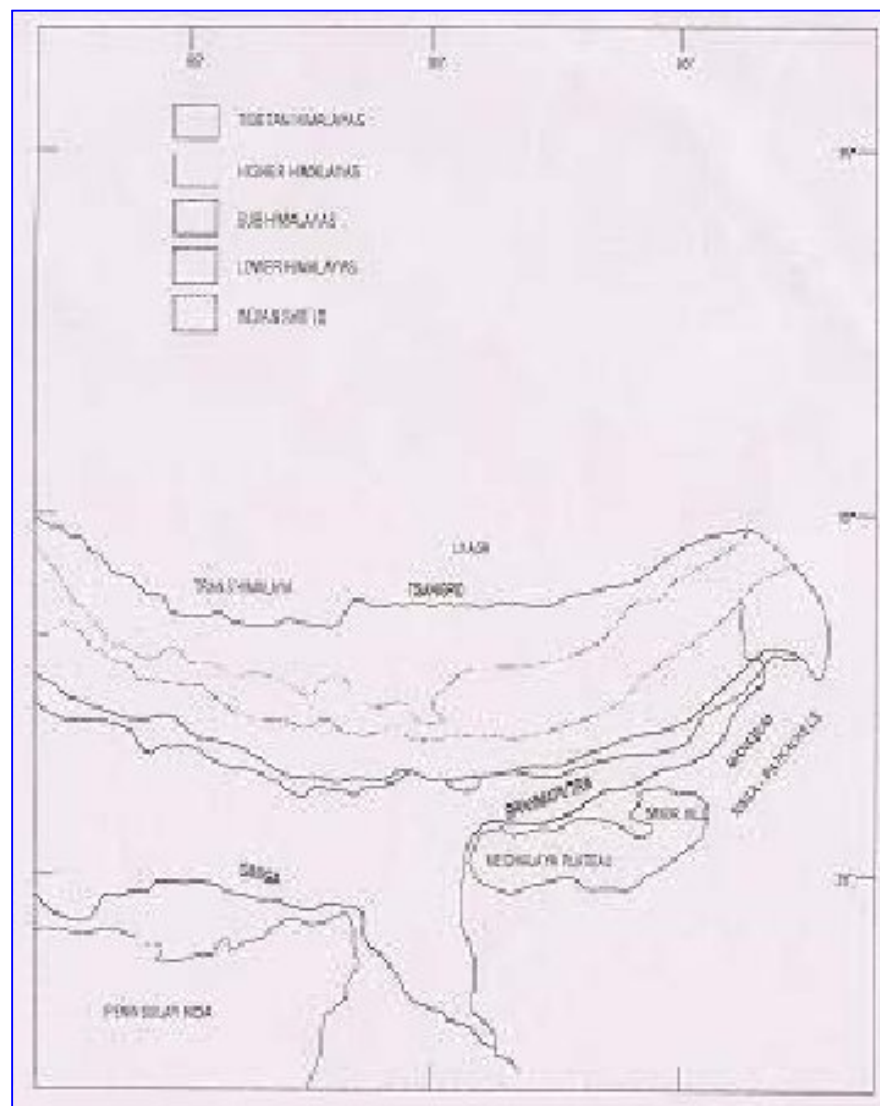
The plain areas bordering Brahmaputra river and in between the inselbergs are occupied by alluvial sediments belonging to Quaternary ages. Based on such criteria such as sedimentation, soil characteristics and geomorphic features, the Quaternary sediments can be grouped into two subdivisions, viz.

- (i) Older Alluvium, and
- (ii) Younger Alluvium.

The Older alluvium by virtue of its relative maturity is composed of somewhat oxidized sediments comprising yellow and the reddish brown colour sand, silt and clay in contrast to the light colour, less compact

Younger alluvial sediments. The Older alluvium always occupies the higher grounds than the adjacent Younger alluvium but takes the proper stratigraphical position underlying the Younger alluvium sediments in the plain areas.

The entire Assam falls within Brahmaputra river basin. The Brahmaputra valley in Assam is underlain by recent alluvium approximately 200 - 300 m thick consisting of clay, silt, sand and pebbles. Geological Map of Brahmaputra valley covering entire Assam state is presented by Figure - 3.1.1.



**Figure 3.1.1: Geological Map of Brahmaputra Valley  
Covering Entire Assam State**

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### GEO-HYDROGY OF THE STUDY AREA

The drainage of the entire study area is controlled by two different systems of rivers. Towards the east, a northerly flowing river system drains the area, which consists of tributaries of the mighty Brahmaputra River. In the west of Agia, the drainage is controlled by Jinrana River, which flows in a westerly direction parallel to Brahmaputra River.

Ground water occurs under water table conditions in the near surface aquifers in older alluvium within fine sand and sandy clay at a maximum depth of about 20 mbgl. It also occurs under semi-confined to confined conditions in the deeper aquifers tapped by medium/heavy duty deep tube wells. In Younger alluvium, ground water occurs under unconfined conditions and it is extracted by means of open wells and small diameter tube wells for both domestic and irrigation purposes.

Geo-hydrologically, entire Goalpara has been grouped into two main units, viz. (i) Unconsolidated formation, and (ii) Consolidated formation. Further subdivisions like Older and Younger alluvium have been made on the basis of (a) geomorphology including land use (b) lithology and soil characteristics (c) hydrological properties like yield characteristics etc. The aerial distributions of the unconsolidated formations are rather discontinuous occurring in between the inselbergs, but are broadly bordering the Brahmaputra River. The Older alluvium has a major development in the northern part of the area.

A continuous stretch of Younger alluvium of about 100 sq. km. has been developed near Ambari in the northwestern part adjacent to Brahmaputra river. Isolated but broad patches have been developed all along the Brahmaputra river particularly near south east of Goalpara and east of Dalgoma. It has also been developed in patches as low-level terraces along the small river valleys in this tract. Consolidated formations including the isolated inselbergs cover approximately 250 sq. km, which are mainly occupied by forest and barren lands.

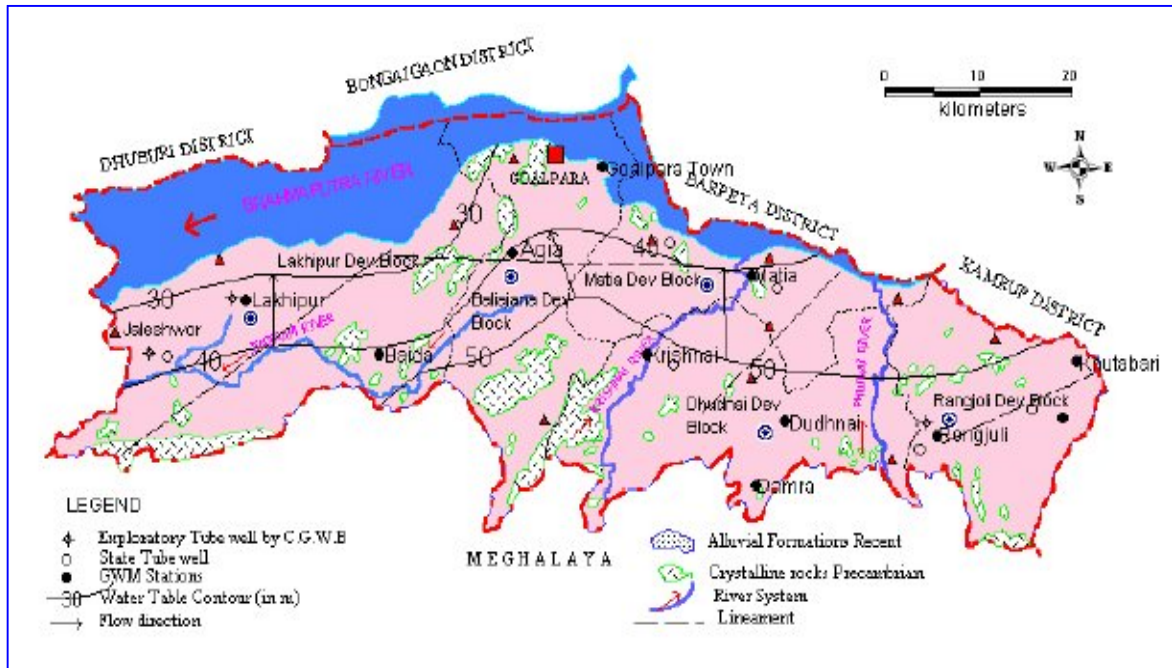
Depth to water level during pre-monsoon (2007) ranged from 1.38 to 8.67 m bgl and it varied from 0.94 to 8.57 m bgl during post-monsoon (2007) period in the area. It is observed that water level fluctuation in April 2007 ranged from 1.840 to 0.310 m, whereas in November 2007 it ranged from 0.330 to 0.410 m. The mean fluctuation for pre and post-monsoon periods varies from 0.719 to 0.219 m.

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The estimated gross annual dynamic groundwater resource in the area is 131.985 mcm while net ground water resource is 1187.87 mcm. The stage of ground water development is 20%. Natural discharge during non-monsoon season is 131.99 mcm. Future provision for domestic and industrial use is 32.65 mcm and for Irrigation use, it is 933.17 mcm.

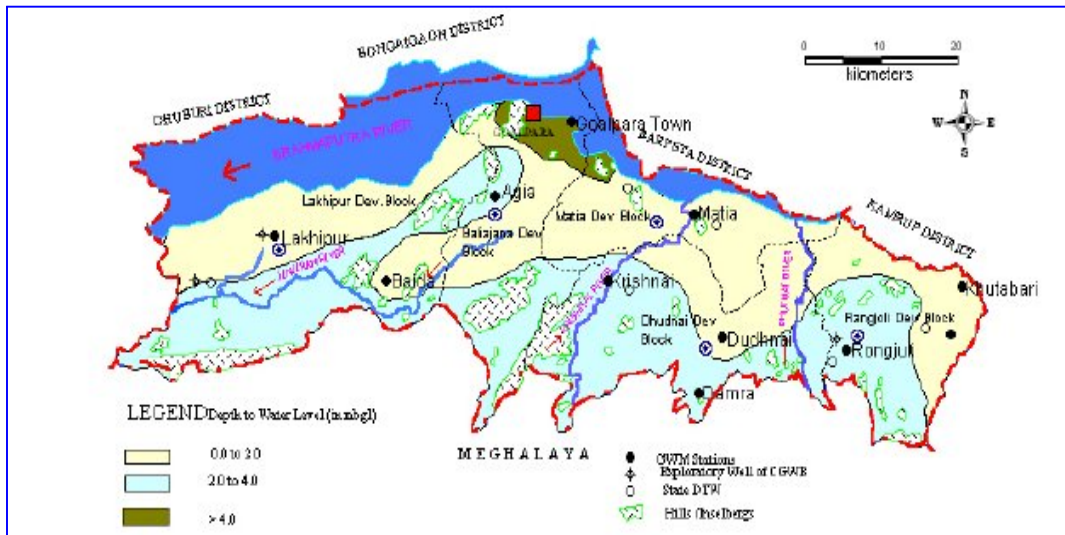
At present ground water is being utilized for domestic and to some extent for agricultural purpose as there is no major industry in the area. A total of 2236 households are getting their water supply through tube wells, 1916 households are getting their water supply through tap water, 21,236 households are getting their water supply through hand pump, 20,200 households are getting their water supply through dug wells and 2344 households are getting their water supply from other sources in the area.

Geo-hydrological setup of Goalpara District, Assam has been presented by Figure – 3.1.2.



**Figure 3.1.2 : Geo-hydrological Setup of Goalpara District, Assam**

Pre-Monsoon (April 2007) Depth to Water Level Map of Goalpara District, Assam has been presented by Figure – 3.1.3.



**Figure 3.1.3 : Pre-Monsoon (April 2007) Depth to Water Level Map of Goalpara District, Assam**

Post-Monsoon (November 2007) Depth to Water Level Map of Goalpara District, Assam has been presented by Figure – 3.1.4.



**Figure 3.1.4 : Post-Monsoon (November 2007) Depth to Water Level Map of Goalpara District, Assam**

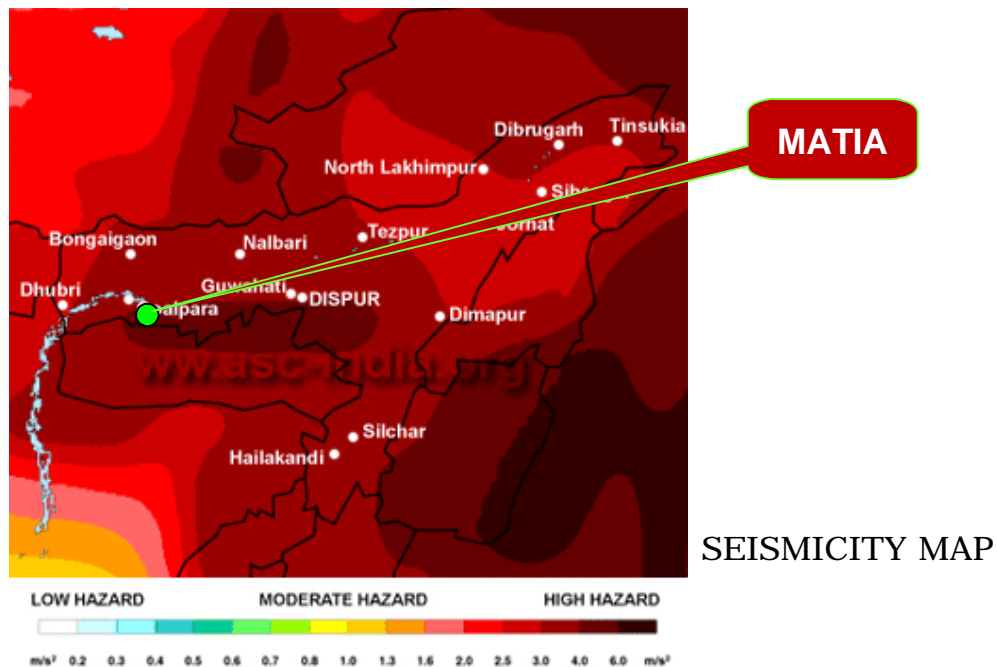
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### BRAHMAPUTRA RIVER

Brahmaputra River is also called as Tsangpo-Brahmaputra. It is a trans-boundary river and one of the major rivers of Asia. At its origin in southwestern Tibet the river is known as Yarlung Tsangpo River. It flows across southern Tibet to break through the Himalayas in great gorges and into Arunachal Pradesh (India) where it is known as Dihang. Then it flows southwest through the Assam Valley where the river is known as Brahmaputra and then south through Bangladesh as Jamuna (not to be mistaken with Yamuna of India). There the river merges with Ganges to form a vast delta, the Sunderbans. The river is about 1,800 miles (2,900 km) long and it is an important source for irrigation and transportation. Its upper course was long unknown, and its identity with the Yarlung Tsangpo was only established by exploration in 1884-86. This river is often called Tsangpo-Brahmaputra river. The average depth of the river is 124 feet (38 m) and maximum depth is 380 feet (120 m). In Bangladesh the river merges with the Ganges and splits into two: the Padma and Meghna River. The Brahmaputra is navigable for most of its length. The average discharge of the river is about 19,300 cubic metres per second (680,000 cu ft/s).

### SEISMIC HISTORY OF THE AREA

According to IS: 1893-1984, the study area falls under Zone - V. It means that the area is covered under “high hazard zone”.



### FLOOD PRONE AREAS IN GOALPARA DISTRICT

**Vulnerable Areas:** The low lying areas along river Brahmaputra and the areas adjacent to the beels are prone to floods during monsoons. However, the phenomenon of flash floods experienced during October, 2004 also suggests that likely hood of similar nature cannot be ruled out. The areas adjoining rivers originating from the Garo hills are prone to sudden inundation due to flash floods.

**Flood Prone Areas:** The flood prone areas identified in Goalpara District are as follows:

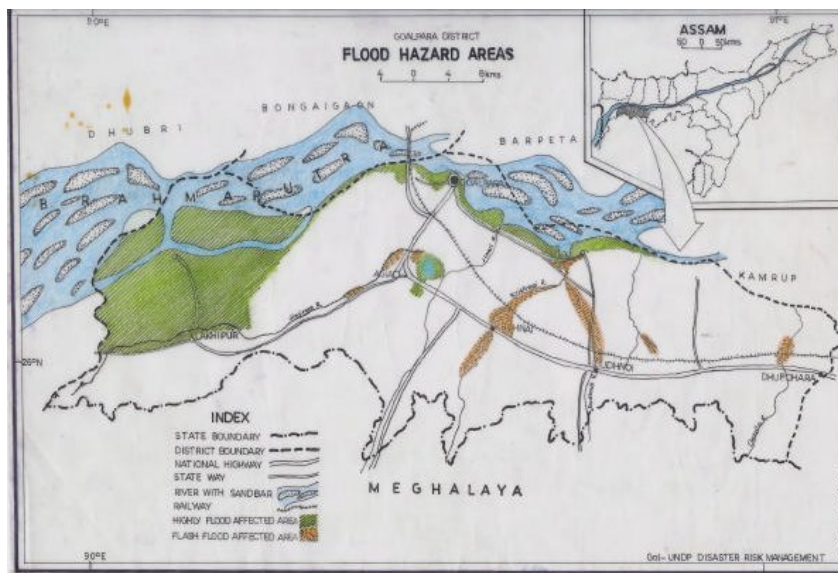
- (a) Matia Area - Tiplai, Simlitola, Damnapara, Medhipara, Buduxhar, Dalguma, MajerChar, Kadamtola char
- (b) Mornoi Area - Dubapara, Singimari, Begnarbhita, Bahatichar, Pakhiura)
- (c) Dudhnai Area - Bamunpara, Nayapara, Karipara, Bakaitari)
- (d) Karbala Area - Near Hasila beel
- (e) Kharmuza Area - Kharmuza, Kaljani, Rakhaldubi, Joypur, Sonahara, Taparvita, Balarvita
- (f) Chunari Area - Bawrartol, Sonalurtol, Dampara, Chilarvita, Fetengapara
- (g) Jaleswar Area - Jaleswar, Beldubi
- (h) Balbala Area - Balijana, Dalak, Bhimajuli, Khagrabari, Godarbori, Chandamari, Nalipara, Nengdup, Goalparaiagaon, Kokira, Khalisamari

The flood prone areas in Goalpara District have been priorities as under,

Priority 1: Lakhipur, Jaleswar, Chunari & Char areas under Matia & Balijana circle.

Priority 2: Matia, Mornoi, Kharmuza area and Goalpara town.

Priority 3: Dudhnoi, Rongjuli and Balbola area.



FLOOD  
HAZARD MAP  
OF  
GOALPARA  
DISTRICT

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#### RAIN FALL IN THE AREA

The total annual mean rainfall received in the area is about 2500 mm. As per IMD Data, Goalpara, rainfall peaks during the month of June (mean monthly being about 575 mm) followed by July (mean monthly being about 457 mm). Total mean number of rainy days is about 100 days per annum in the area.

### 3.2 MAJOR INDUSTRIES IN 10 KMS RADIUS AREA AROUND THE PROJECT SITE

There is no major industry falling within 10 kms radius area around the project site.

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### 3.3 LANDUSE

#### 3.3.1 INTRODUCTION

The proposed unit of M/s Kohinoor Pulp & Paper Private Limited shall be located at Industrial Growth Centre (IGC), Plot Block C, Village Mornoi, Matia, District Goalpara, of Assam. The geographical coordinates are 26°05'45.61"N and 90°43'51.28"E.

#### 3.3.2 LAND USE BASED ON 2001CENSUS

The land use classification used in this report has been adopted from District Census for the year 2001. The break up of land use has been presented in the following 5 categories:

1. Forest Land
2. Irrigated Land
3. Non-irrigated Land
4. Culturable Waste Land
5. Land not available for cultivation

Irrigated and non-irrigated lands are break-up of agricultural land. Culturable wastes include lands within culturable holdings such as permanent pastures, other grazing lands, meadows, lands under miscellaneous tree crops and groves not included in the net area sown, and other culturable wastes. Lands under that ching grasses, bamboo bushes and other groves for fuel, etc. which are not included in forest or orchard are also included in this category. Fallow lands which have not been cultivated during the current year and the last five years or more in succession are also included in this category. Area not available for cultivation includes (a) barren lands and un-culturable lands within cultivable holdings which cannot be brought under cultivation without incurring a huge cost and (b) lands put to non-agricultural use.

The land use pattern of the study area, based on Census Data of 2001 is presented in Table-3.3.1 and shown in Figure 3.3.1 & 3.3.2. About 30.12% of the study area consists of agricultural land that is mostly non-irrigated (about 22.69% of the agricultural land). Cultivable waste lands occupy about 10.73% of the total study area and land not available for cultivation occupy about 9.31% of the total study area. About 3.86% of the study area is covered under the Forests.

**Table 3.3.1**  
**Land Use Pattern of the Study Area**  
 (Based on Census Data of 2001)

S.N.	Class	Area in Ha.	% of Study Area
1	Agricultural Land	9458	30.12
	Irrigated Land: 2333 (7.43%)		
	Non-irrigated Land: 7125 (22.69%)		
2	Cultivable Waste Land	3368	10.73
3	Area not available for Cultivation	2922	9.31
4	Forest Land	1213	3.86
5	Others (settlements, water bodies, roads, railway lines, hills, valleys etc.)	14439	45.98
TOTAL		31,400	100.00

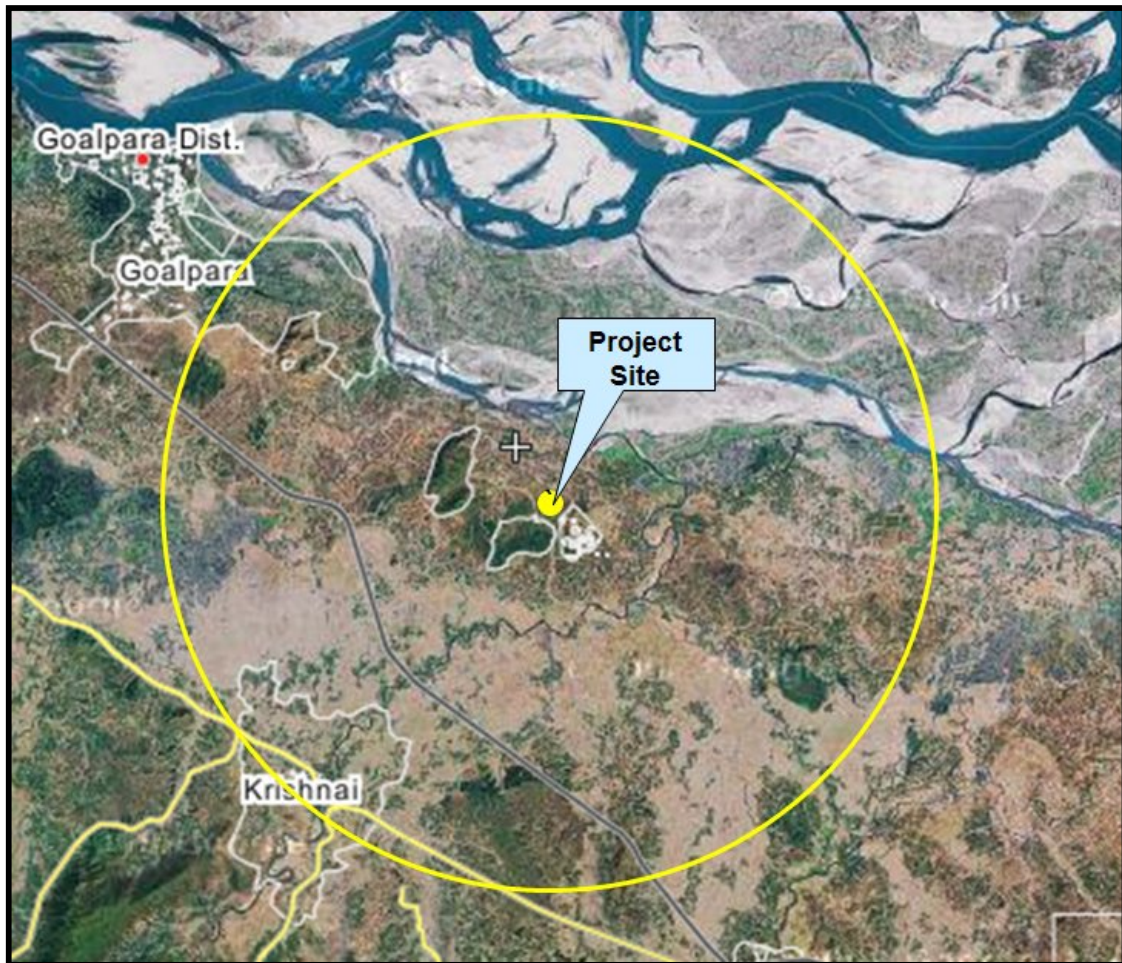


Figure 3.3.1: Land use and Land cover of the study area

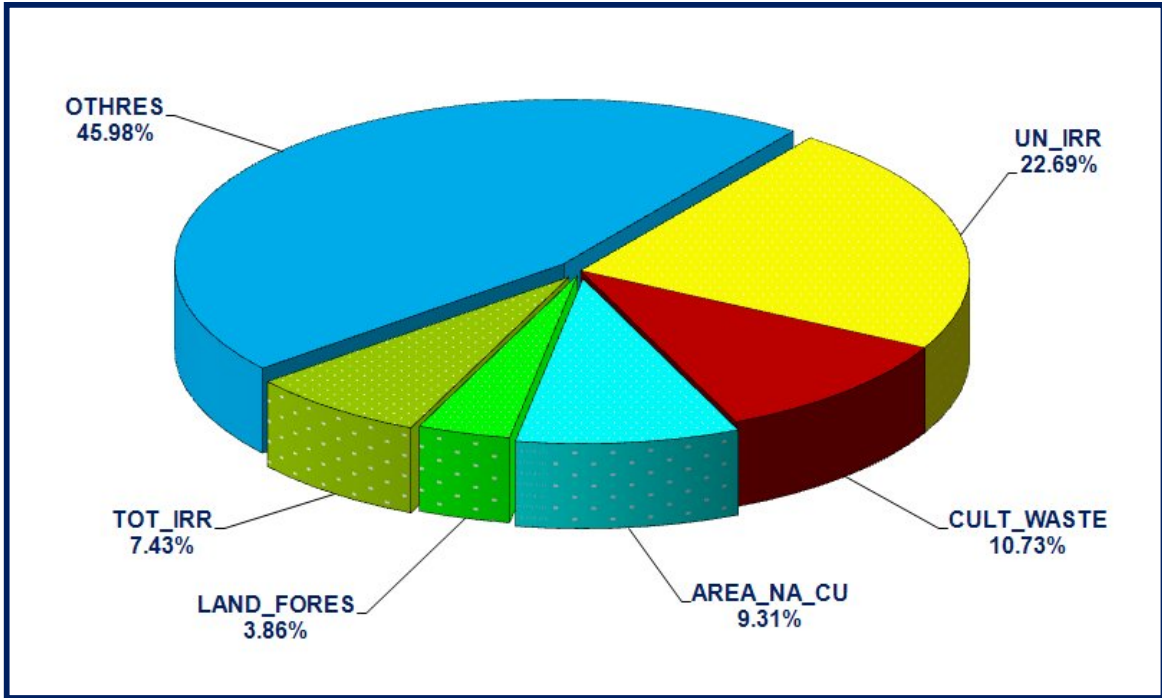


Figure 3.3.2: Land use Pattern of the study area

### 3.4 SOILS

To examine the impacts of urban/rural activities on the soil in the area, the physico-chemical characteristics of soils within the study area have been examined by obtaining soil samples from selected points and analysis of the same. Four sampling points are selected for studying soil characteristics, the locations of which are depicted in Figure 3.4.1.

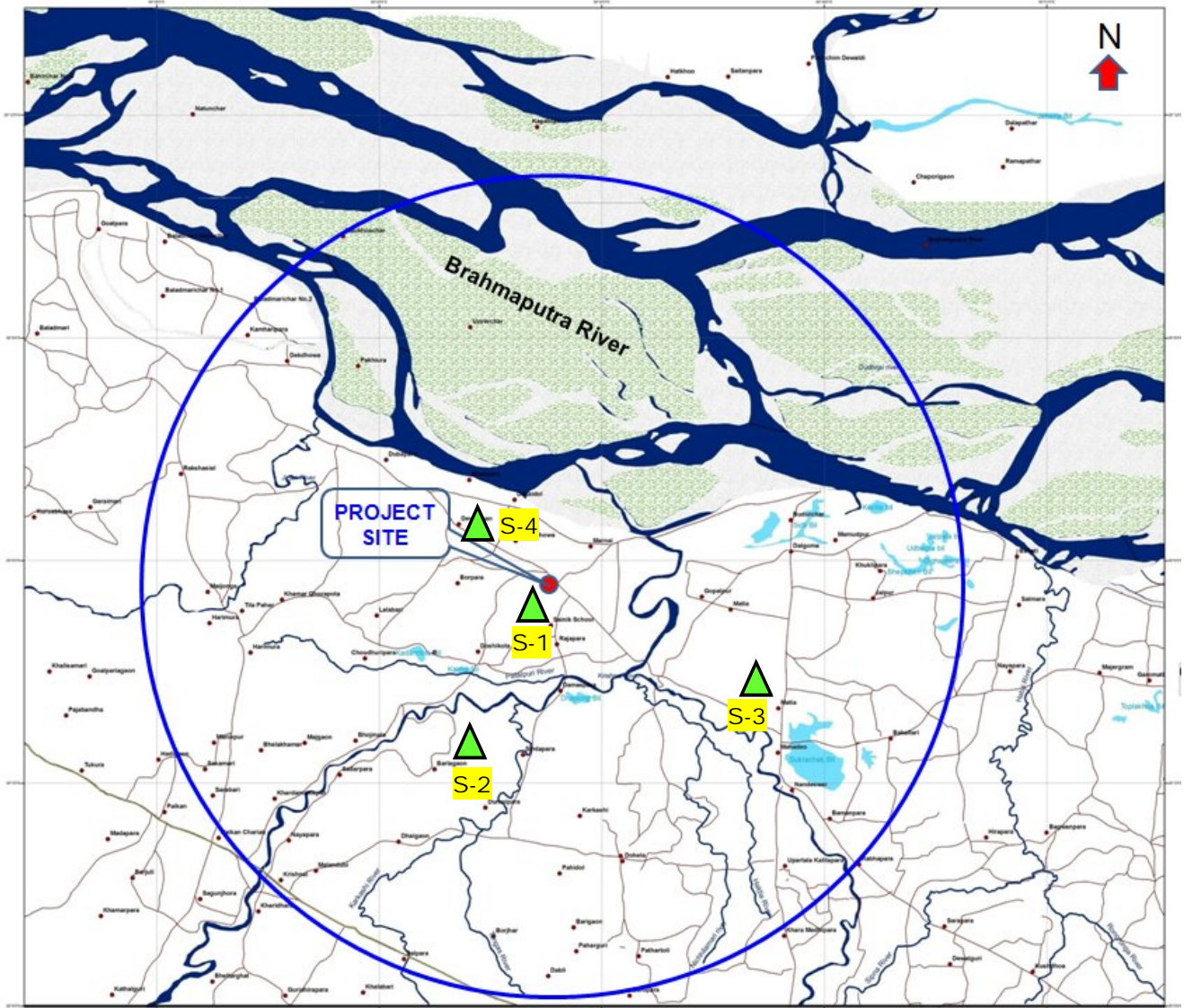
A number of parameters are determined which are indicative of physical, chemical and fertility characteristics. The soil characteristics are summarized in Table 3.4.1.

Table 3.4.1.		Sample Type : Soil Sample		Sample Collected by			
Code		Sampling Location	Sampling date	The representatives of			
S-1		Near Project Site	December, 2010	Envirotech East Pvt. Ltd.			
S-2		Barlagaon					
S-3		Devasthan					
S-4		Matia					
ALANYSIS RESULTS							
Sl.No.	Parameter	Unit	Sample Code				
			S-1	S-2	S-3	S-4	
PHYSICAL CHARACTERISTICS							
1	COLOUR		Redish Black Clay	Redish Black Clay	Redish Black Clay	Redish Black Clay	
2	TEXTURE						
a)	Gravel		16	20	14	18	
b)	Sand		26	20	27	22	
c)	Silt		14	16	13	17	
d)	Clay		44	44	46	43	
3	BULK DENSITY (g/cm <sup>3</sup> )		1.2	1.3	1.22	1.14	
4	POROSITY (%)		48.2	44.3	46.2	42.6	
5	WATER HOLDING CAPACITY(%)		42.2	47.2	46.4	43.3	
CHEMICAL CHARACTERISTICS							
1	pH		7.3	7.7	7.2	7.6	
2	EC (µmhos/cm) (50% Extraction)		575	602	675	593	
3	CALCIUM (%)		0.32	0.42	0.36	0.43	
4	MAGNESIUM (%)		0.13	0.23	0.16	0.2	
5	SODIUM (%)		0.49	0.63	0.52	0.66	
6	POTASSIUM (%)		0.12	0.21	0.11	0.15	
7	SULPHUR (%)		0.08	0.11	0.09	0.08	
8	NITROGEN (%)		0.22	0.32	0.19	0.21	
9	PHOSPHORUS (%)		0.13	0.12	0.17	0.16	

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10	CEC ( meq/100 g)	29.3	26.6	25.8	27.9
11	ORGANIC MATTER (%)	3.3	2.1	2.7	1.9
12	COPPER (mg/Kg)	1.6	2.1	1.9	2.3
13	CHROMIUM (mg/Kg)	2.3	3.3	4.2	7.3
14	ZINC (mg/Kg)	1.5	8.2	2	4.4
15	LEAD (mg/Kg)	0.8	0.4	0.3	0.5

**FIG. 3.4.1: SOIL QUALITY MONITORING LOCATIONS**



SAMPLE CODE	LOCATION
SQ-1:	Near Project Site
SQ-2:	Barlagaon
SQ-3:	Devasthan
SQ-4:	Matia

 Soil Sampling Location

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### 3.5 AIR QUALITY

#### 3.5.1 SELECTION OF MONITORING STATIONS

Eight numbers of monitoring stations were set up to assess the existing air quality of the area. One station was located at the proposed project site and the seven others, outside the proposed project site. The locations of the monitoring stations were based on the frequent wind directions in order to site the stations as close as feasible to the anticipated maximum pollutant deposition areas, moreover, duly considering human habitation and proximity to sensitive zones within the study area. Logistic considerations as ready accessibility, security, availability of reliable power supply etc. were examined while finalizing the monitoring locations.

The sources of air pollution in the region are vehicular traffic, minor Industrial activities, dust arising from unpaved village roads and domestic fuel burning.

The Ambient Air Quality Monitoring locations have been shown in Figure - 3.5.1. The relative direction and distance of these locations with respect to the plant site have been given in Table- 3.5.1.

#### 3.5.2 PARAMETERS & FREQUENCY OF MONITORING

Ambient Air Quality Monitoring has been conducted for the period (1<sup>st</sup> October 2010 - 31<sup>st</sup> December 2010) at a frequency of twice a week at each station adopting a continuous 24 hours schedule in respect of the following parameters:

- Particulate Matter 10 (PM10)
- Particulate Matter 2.5 (PM 2.5)
- Sulphur Dioxide (SO<sub>2</sub>)
- Nitrogen Dioxide (NO<sub>2</sub>)

The equipment was placed at a height of 3.0 to 4.5 metres above ground level at each monitoring station, thus negating the effects of wind blown ground dust. The equipment was placed at open space free from trees and other obstruction which otherwise act as a sink of pollutants resulting in lower levels in monitoring results. At locations close to highways, the equipment was placed at least 100 m away from such highways/roads to avoid influence of traffic exhaust emissions.

#### 3.5.3 RESULTS & DISCUSSIONS

Statistical analysis (minimum, maximum, arithmetic mean and 98-percentile values) of the ambient air quality in study area for the entire three months monitoring period are shown in Table-3.5.2. The results of

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such analysis are pictorially presented in Figure-3.5.2 through 3.5.5. The Concentration of Poly-Aromatic Hydrocarbons (PAH) as well as other chemical composition including heavy metals in particular matter (PM10) as monitored in a few locations in the study area are presented in Annexure-IV.

The following implications can be made on the basis of the obtained results:

#### 3.5.3.1 Particulate Matter 10 (PM10)

Arithmetic Mean of the 24-hourly average values of PM10 varied station-wise between 29.79  $\mu\text{g}/\text{m}^3$  (at Near Barlagaon) and 36.54  $\mu\text{g}/\text{m}^3$  (at Lalabari). The overall mean for the 8 stations was 32.98  $\mu\text{g}/\text{m}^3$ .

The 24-hourly average 98-percentile values of PM 10 (max 55.54  $\mu\text{g}/\text{m}^3$  at Doshikota) at all the locations were observed to be well within the limit of National Ambient Air Quality Standards.

#### 3.5.3.2 Particulate Matter 2.5 (PM2.5)

Arithmetic Mean of the 24-hourly average values of PM 2.5 varied station-wise between 16.75  $\mu\text{g}/\text{m}^3$  (at Near Lalabari) and 13.56  $\mu\text{g}/\text{m}^3$  (at Barlagaon) with overall mean of the 8 stations being 15.25  $\mu\text{g}/\text{m}^3$ .

The maximum 24-hourly average 98-percentile value of PM 2.5 (max 27.16  $\mu\text{g}/\text{m}^3$  at Marnai), at all the locations were observed to be much within the limit of National Ambient Air Quality Standards.

#### 3.5.3.3 Sulphur Dioxide (SO<sub>2</sub>)

The overall mean of 24-hourly average values of SO<sub>2</sub> over the study area was derived to be 4.36  $\mu\text{g}/\text{m}^3$  with station-wise variation of arithmetic mean values at the 8 stations between 5.21  $\mu\text{g}/\text{m}^3$  (at Simlapara) and 3.54  $\mu\text{g}/\text{m}^3$  (at Near Project Site).

The 24-hourly average 98-percentile values of SO<sub>2</sub> (max 7.54  $\mu\text{g}/\text{m}^3$  at Simlapara) at all the locations were well below the permissible limit National Ambient Air Quality Standards.

#### 3.5.3.4 Oxides of Nitrogen (NO<sub>x</sub>)

The overall mean of 24-hourly average values of NO<sub>x</sub> over the entire area was 9.07  $\mu\text{g}/\text{m}^3$  while individual arithmetic mean levels computed at the 8 stations ranged between 9.75  $\mu\text{g}/\text{m}^3$  (at Near Project Site) and 8.00  $\mu\text{g}/\text{m}^3$  (at Marnai).

The 24-hourly average 98-percentile values of NO<sub>x</sub> (max 16.54  $\mu\text{g}/\text{m}^3$  at Devasthan) at all the locations were well below the permissible limit of National Ambient Air Quality Standards.

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### 3.5.4 Conclusion

The values of all the pollutants at the respective locations were within the acceptable ranges on all the occasions.

Sl. No.	Location Code	Location	Distance w.r.t. Plant site (in km)	Direction w.r.t. Plant site
1.	AQ1	Near Project Site	-	-
2.	AQ2	Doshikota	3.40	SW
3.	AQ3	Lalabari	5.00	WSW
4.	AQ4	Devasthan	2.95	NW
5.	AQ5	Marnai	2.00	NE
6.	AQ6	Matia	5.30	ESE
7.	AQ7	Simlapara	4.50	S
8.	AQ8	Barlagaon	6.90	SSW

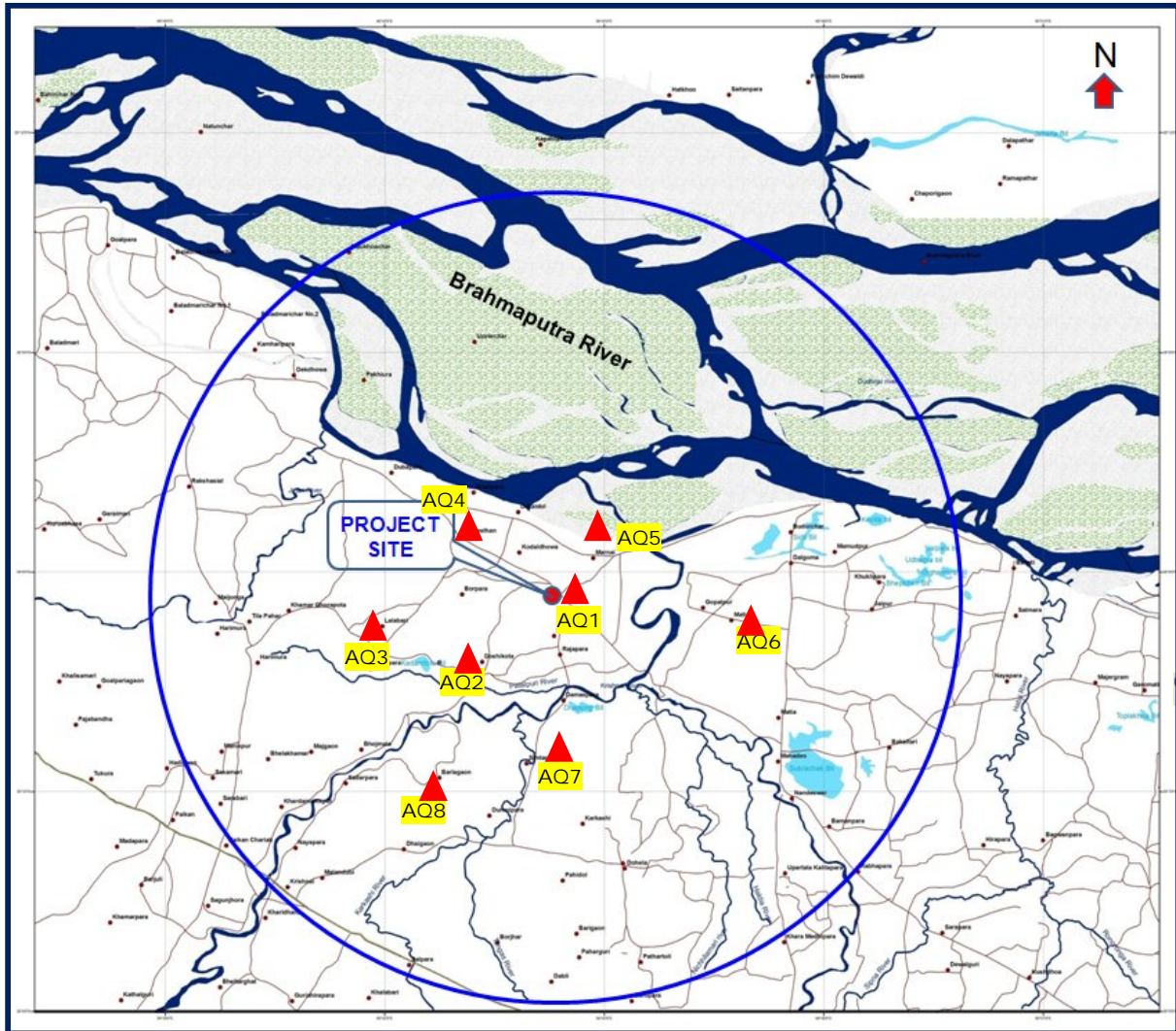
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Table : 3.5.2 STATISTICAL ANALYSIS OF POLLUTANTS (PERIOD: OCTOBER, 2010 - DECEMBER, 2010)						
Pollutants	Locations	MES	Min	Max	A.M.	P - 98
PM 10 ( $\mu\text{g}/\text{m}^3$ )	Near Project Site	24	16	44	30.08	43.54
	Doshikota	24	19	56	33.83	55.54
	Lalabari	24	26	52	36.54	49.24
	Devasthan	24	20	53	33.08	48.86
	Marnai	24	20	55	31.13	53.62
	Matia	24	18	51	33.54	50.54
	Simlapara	24	24	56	35.88	54.16
	Barlagaon	24	16	53	29.79	48.40
	Overall	192	16	56	32.98	55.35
PM 2.5 ( $\mu\text{g}/\text{m}^3$ )	Near Project Site	24	6	21	13.71	20.66
	Doshikota	24	8	27	15.13	25.89
	Lalabari	24	11	25	16.75	23.94
	Devasthan	24	10	26	15.43	23.49
	Marnai	24	8	29	15.43	27.16
	Matia	24	7	25	15.69	24.49
	Simlapara	24	10	27	16.28	25.91
	Barlagaon	24	7	28	13.56	24.18
	Overall	192	6	28	15.25	26.99

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Pollutants	Locations	MES	Min	Max	A.M.	P - 98
SO <sub>2</sub> (µg/m <sup>3</sup> )	Near Project Site	24	<3	6	3.54	6.00
	Doshikota	24	4	7	5.08	7.00
	Lalabari	24	3	6	4.71	6.00
	Devasthan	24	<3	7	3.96	7.00
	Marnai	24	3	5	4.00	5.00
	Matia	24	<3	6	3.96	6.00
	Simlapara	24	4	8	5.21	7.54
	Barlagaon	24	3	6	4.42	6.00
	Overall	192	3	8	4.36	7.46
NO <sub>x</sub> (µg/m <sup>3</sup> )	Near Project Site	24	6	14	9.75	14.00
	Doshikota	24	5	16	8.88	15.08
	Lalabari	24	6	14	9.29	13.54
	Devasthan	24	5	17	9.38	16.54
	Marnai	24	4	13	8.00	13.00
	Matia	24	5	14	9.54	14.00
	Simlapara	24	7	11	8.63	11.00
	Barlagaon	24	5	15	9.13	14.08
	Overall	192	4	17	9.07	16.34

**FIG. 3.5.1: AMBIENT AIR QUALITY MONITORING LOCATIONS**

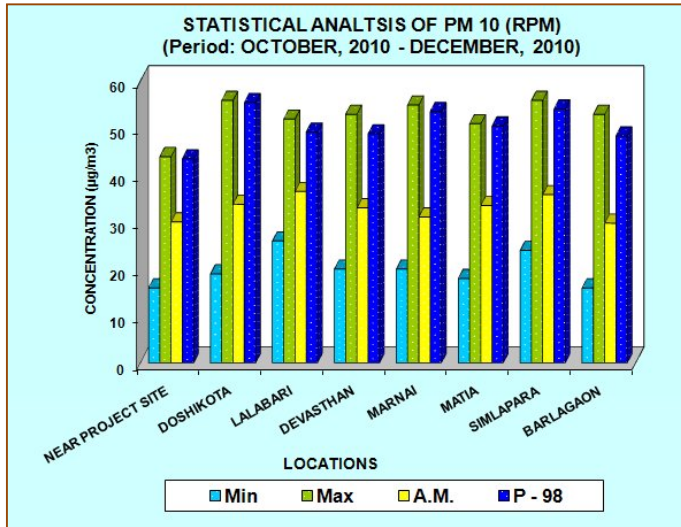


▲ - Ambient Air Quality Monitoring Station

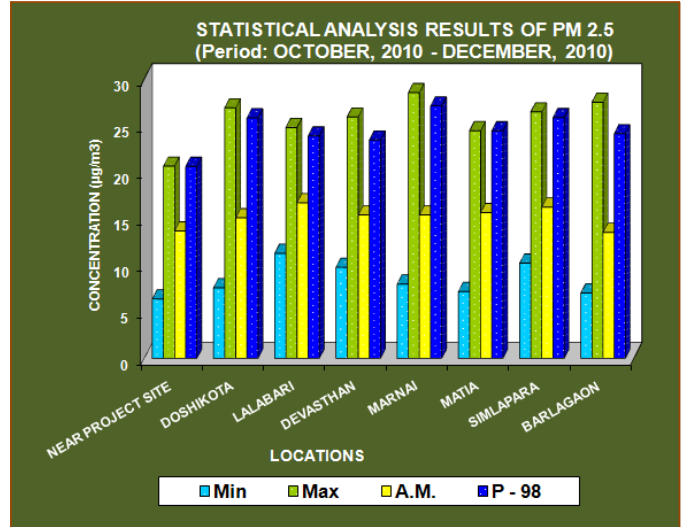
AQ - 1 : NEAR PROJECT SITE  
 AQ - 3 : LALABARI  
 AQ - 5 : MARNAI  
 AQ - 7 : SIMLAPARA

AQ - 2 : DOSHIKOTA  
 AQ - 4 : DEVASTHAN  
 AQ - 6 : MATIA  
 AQ - 8 : BARLAGAON

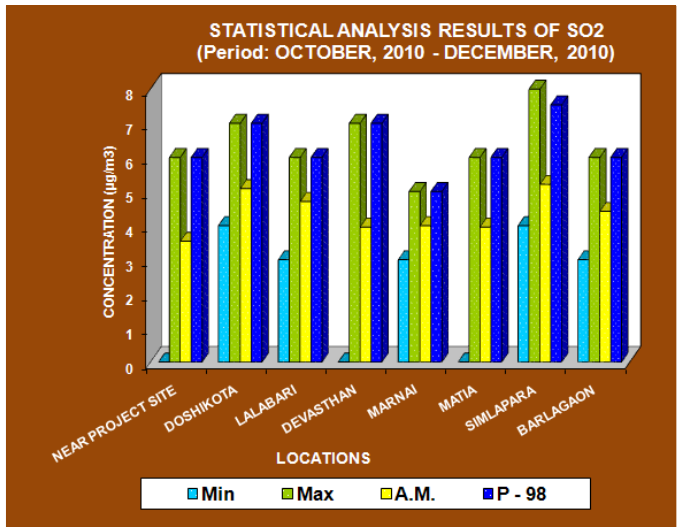
## GRAPHICAL PRESENTATION OF STATISTICAL DATA



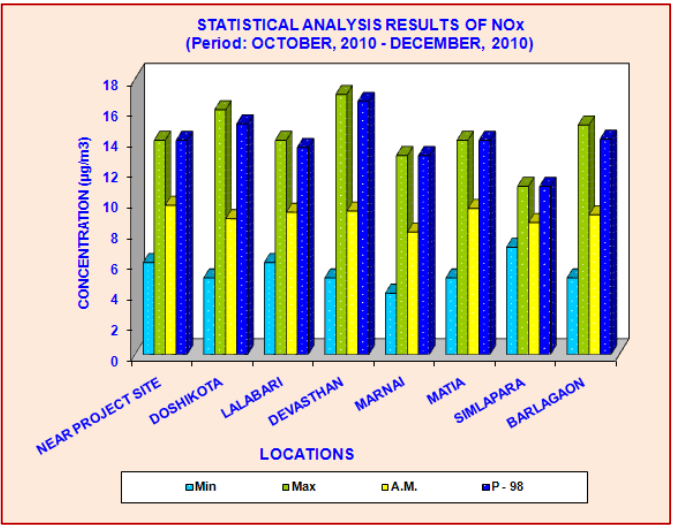
**FIGURE 3.5.2 : PM10**



**FIGURE 3.5.3 : PM2.5**



**FIGURE 3.5.3 : SO2**



**FIGURE 3.5.4 : NOx**

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### 3.6 METEOROLOGY

#### 3.6.1 Seasons

The climate of the project area is humid and tropical. It is characterised by a hot and dry summer from March to May, a south-west monsoon or rainy season from June to September, a pleasant post-monsoon or retreating monsoon from October to November and a cool winter from December to February. Therefore, climatologically, four seasons viz. summer (pre-monsoon), monsoon, post-monsoon and winter could be deciphered comprising the following months:

Summer	:	March, April, May
Monsoon	:	June, July, August, and September
Post-monsoon	:	October, November
Winter	:	December, January, and February

#### 3.6.2 Past Records of IMD, Goalpara

##### 3.6.2.1 Data Collected

The meteorological data described in this section have been collected from the IMD Station located at Goalpara, which are located in nearby areas which deemed representative of the study area. The station is observed to be well manned and equipped. Available meteorological data for the past 30-years' period (1951-80) have been collected and summarised. The climatic features of this station are presented in Tables-3.6.1.

##### 3.6.2.2 Temperature

At Goalpara, the maximum (37.2°C) of the mean daily maximum temperatures has been recorded during April and the minimum (6.5°C) of the mean daily minimum temperatures recorded during January (Table-3.6.1).

##### 3.6.2.3 Relative Humidity

Humidity is fairly high through the major part of the year and the mean relative humidity rises to above 80% during the monsoon months, particularly July to September ranging between 79-88% at Goalpara (Table 3.6.1). As expected, humidity is comparatively low in the dry summer months (March-May), winter months (December-February) and in November the mean relative humidity ranging between 85 - 53% at Goalpara. The above trend in humidity in various seasons clearly shows a discernible influence of rain on humidity.

##### 3.6.2.4 Atmospheric Pressure

The data on atmospheric pressure does not portray any unusual features. The pressure varies slightly around the annual mean value of about 1005.4 millibars (mb) at 0830 IST and 1001.6 mb at 1730

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IST at Keonjhar (Table-3.6.1). As usual in diurnal variation, the pressure in the morning (0830 IST) is more than that in the evening (1730 IST) during all the months.

### 3.6.2.5 Rainfall and Rainy Days

The total annual mean rainfall received is about 2514.7 mm at Goalpara (Table-3.6.1). Rainfall peaks during the month of June (mean monthly being about 574.3 mm at Goalpara) followed by July (mean monthly being about 456.9 mm at Goalpara). Total mean number of rainy days is about 100 days per annum at Goalpara.

### 3.6.2.6 Wind Speed

The annual mean wind speed is around 3.0 km/hr at Goalpara with the mean monthly wind speed ranging between 1.60 km/hr and 5.0 km/hr at Goalpara (Table-3.6.1).

## 3.6.3 On-Site Meteorological Observations

### 3.6.3.1 Temperature

The monthly maximum and minimum temperatures recorded on-site during the aforesaid monitoring period (1<sup>st</sup> October, 2010 – 31<sup>st</sup> December, 2010) varied between (32.5 – 35.0)°C and (9.5 – 13.5)°C respectively with overall maximum and minimum temperatures being 35.0°C and 9.5°C respectively (Table-3.6.2). It could be observed that, the pattern of data recorded on-site generally matches with the past data of IMD.

### 3.6.3.2 Relative Humidity

The monthly minimum and maximum relative humidity recorded on-site during the said monitoring period varied between (53 – 58)% and (77 – 81)% respectively, the overall minimum and maximum being 53 % & 81 % respectively (Table-3.6.2).

### 3.6.3.3 Atmospheric Pressure

The overall minimum and maximum atmospheric pressures recorded on-site during the said monitoring period were 751.8 mm Hg and 760.4 mm Hg respectively (Table-3.6.2).

### 3.6.3.4 Wind Speed and Direction

During the said monitoring period, the monthly mean wind speed measured on-site varied between 1.9 km/hr (November, 2010) to 2.6 km/hr (October, 2010) (Table-3.6.2). The overall mean wind speed during the period was 2.27 km/hr. The most predominant wind direction was observed from overall wind rose diagram NE & SE.

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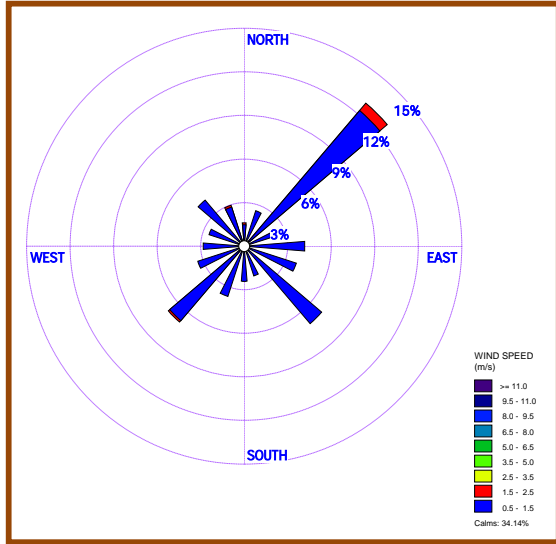
**TABLE – 3.6.1**  
**MEAN MONTHLY SUMMARY OF CLIMATOLOGICAL DATA COLLECTED FROM IMD, GOALPARA (1951-1980)**

MONTH	DAILY TEMPERATURE (°C)		RELATIVE HUMIDITY (%)		ATMOSPHERIC PRESSURE (mb)		TOTAL RAINFALL (mm)	NO. OF RAINY DAYS	CLOUD COVER (Oktas of Sky)		MEAN WIND SPEED (KM/H)
	MAX	MIN	0830	1730	0830	1730			0830	1730	
JAN	27.1	6.5	81	61	1013.1	1008.9	15.4	1.2	2.0	1.1	2.1
FEB	30.8	7.4	78	53	1010.1	1006.3	11.8	1.1	1.4	1.2	2.3
MAR	35.5	10.7	72	51	1007.9	1003.5	49.1	3.7	2.2	1.8	4.0
APR	37.2	14.8	77	61	1004.9	1000.4	183.0	8.7	3.6	2.9	5.0
MAY	36.6	17.5	84	72	1001.7	997.4	470.8	17.1	5.4	4.3	4.3
JUNE	35.7	19.9	88	82	997.7	994.4	574.3	19.2	7.0	6.2	3.4
JUL	35.2	21.2	88	82	997.3	994.4	456.9	17.6	6.7	6.5	3.2
AUG	36.4	21.5	88	81	998.8	995.3	334.9	14.2	6.6	6.1	2.9
SEP	35.7	20.8	87	79	1002.2	998.2	262.1	10.1	5.6	5.1	2.5
OCT	34.9	16.4	83	76	1007.1	1003.6	129.9	5.3	3.7	2.5	2.6
NOV	31.2	11.3	80	72	1011.3	1007.3	22.9	1.4	1.9	1.2	2.1
DEC	28.7	8.1	85	69	1013.1	1008.8	3.6	0.2	1.7	0.7	1.6
ANNUAL TOTAL OR MEAN	38.3	6.3	83	70	1005.4	1001.6	2514.7	99.8	4.0	3.3	3.0

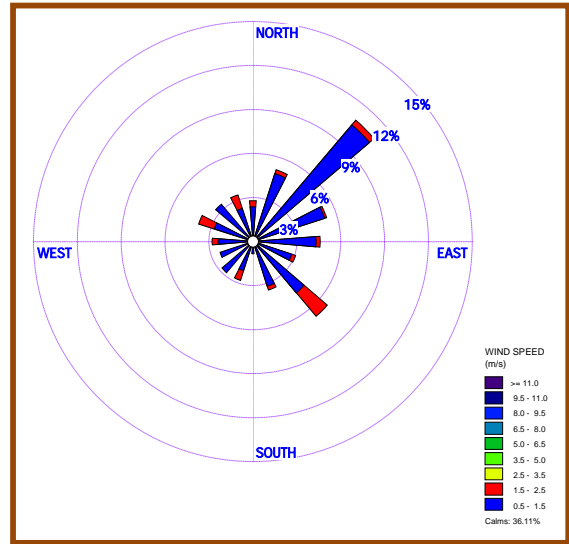
**TABLE – 3.6.2**  
**ONSITE METEOROLOGICAL DATA (OCTOBER, 2010 – DECEMBER, 2010)**

Month	Temperature		Relative Humidity		Barometric Pressure		Average Velocity (Km/h)
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	
	(°C)		(%)		(mm Hg)		
OCTOBER, 2010	32.5	13.5	77	53	757.1	752.8	2.6
NOVEMBER, 2010	32.5	9.5	81	57	760.4	754.4	1.9
DECEMBER, 2010	35.0	13.5	81	58	757.4	751.8	2.3
OVERALL	35.0	9.5	81	53	760.4	751.8	2.27

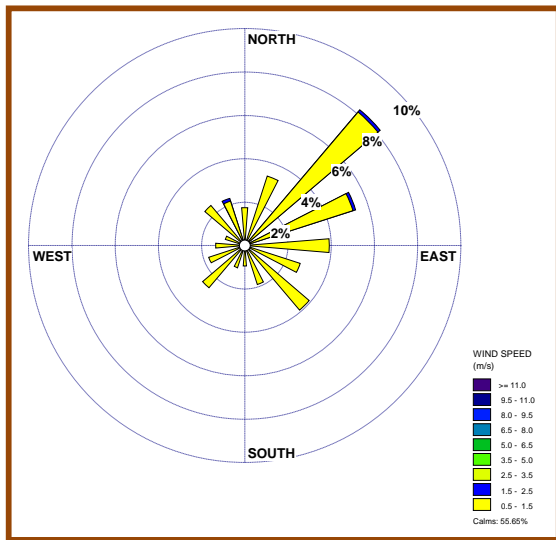
FIG. 3.6.1: WINDROSE DIAGRAMS



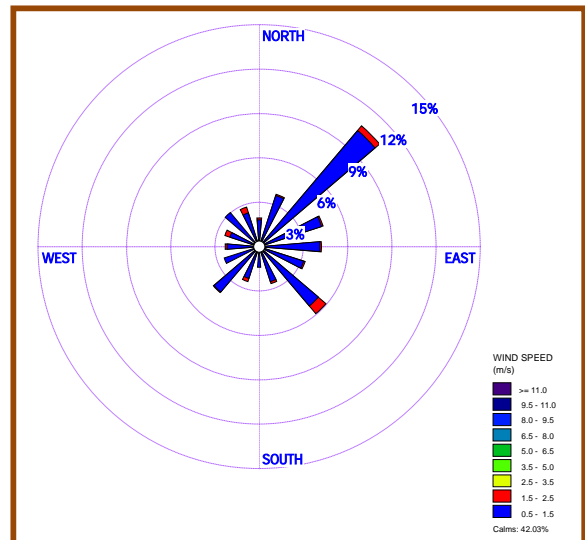
OCTOBER 2010



NOVEMBER 2010



DECEMBER 2010



OCTOBER, 2010 TO  
DECEMBER, 2010

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### 3.7 WATER ENVIRONMENT

#### 3.7.1 Water bodies in the study area

The main surface water body in the study area is the river Brahmaputra. Brahmaputra is a perennial river, which flows about 2 km away towards north from the project Site. Besides, a number of scattered confined water bodies, viz. Tanks, ponds roadside burrows etc. exist within the study area.

The water demand of the area can be broadly classified into two major groups, viz. Domestic and industrial. All these demands are met from the surface water source.

#### 3.7.2 Water Quality

Surface Water samples were collected and analysed at 8 locations, once during the study period to assess the water quality of Brahmaputra River (2 Points) (Please refer Figure - 3.7.1). Besides, water samples were collected from eight (8) locations once during the study period to assess the baseline status of the ground water quality surrounding 10 km periphery of the study area.

All the samples were analyzed with respect to physical, chemical and biological parameters including toxic organics and metals, adopting Standard methods. The locations of the sampling points are presented in Table 3.7.1.

#### 3.7.3 Water Quality of Brahmaputra River

The water quality monitoring results of the Brahmaputra River have been compiled in Table 3.7.2. The average values are taken in this context.

The pH value of the collected sample was found in the range of (7.2-7.4). Dissolved Oxygen was observed in the range of 6.5-6.7 mg/l. The Total Dissolved Solids were found in the range of 163-167 mg/l while total Hardness of the collected sample was found in the range of 96-102 mg/l. Calcium & Magnesium were found 27-31 mg/l and 6-7 mg/l respectively. Oil and grease was below detected limit (<1.4 mg/l).

The Sulphate, Nitrate and Chloride in the collected sample were observed in the range between 2-3 mg/l, 1.4-1.5 mg/l and 15-18 mg/l respectively. The Iron & Zinc contents were found in the range of 0.9 - 1.1 mg/l & 0.06 - 0.07 mg/l respectively.

Heavy metals like Copper, Lead, Mercury, Cadmium and Chromium were below their respective detection limits.

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### 3.7.4 Water Quality of other Surface Water Sources

The pond and Beel water quality monitoring results have been presented in Table 3.7.2. Water samples from two pond and three others from Beel were examined for this purpose.

The pH value of the collected sample was found in the range of (6.9-7.8). Dissolved Oxygen was observed in the range of 5.8-6.2 mg/l. The Total Dissolved Solids were found in the range of 175-211 mg/l while total Hardness of the collected sample was found in the range of 128-156 mg/l. Calcium & Magnesium were found 34-44 mg/l and 8-13 mg/l respectively. Oil and grease was below detected limit (<1.4 mg/l).

The Sulphate, Nitrate and Chloride in the collected sample were observed in the range between 4-8 mg/l, 1.6-3.6 mg/l and 24-36 mg/l respectively. The Iron & Zinc contents were found in the range of 0.62 – 1.5 mg/l & 0.09 - 0.20 mg/l respectively.

Other heavy metals like Copper, Chromium, Cadmium, Arsenic and Lead were below their respective detection limits.

Conclusion can be drawn in the light of the overall analysis made so far that the ground water in the study area is free of any kind of industrial and urban pollution and has been found to be generally fit for human consumption.

Sample Code	Ground Water	Sample Code	Surface Water
GW1	Tube well water (Near Rajapara)	SW1	Brahmaputra River(Near Dakaidol)
GW2	Tube well water (Near Marnai)	SW2	Brahmaputra River(Near Budurchar)
GW3	Tube Well water (Near Matia)	SW3	Dhapong Beel
GW4	Tubewell water (Near Lalabari)	SW4	Kadamtola Beel
GW5	Tube well water (Near Karkashi)	SW5	Sukrachak Beel
GW6	Borewell water (Near Barlagaon)	SW6	Krishnai River (Near Damaspara)
GW7	Tube well water (Near Borpara)	SW7	Pond Water (at Gopalpur)
GW8	Tube well water (Near Kodaldhowa)	SW8	Pond Water (at Borpara)

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**Table 3.7.2  
Surface Water Quality**

S. No.	Parameter	Unit	SW1	SW2	SW3	SW4
1	Colour		Colourless	Colourless	Colourless	Colourless
2	Odour		Unobj.	Unobj.	Unobj.	Unobj.
3	pH		7.4	7.2	7.6	7.5
4	Conductivity	µmhos/cm	288	285	302	312
5	Dissolved Oxygen	mg/L	6.7	6.5	6.2	6.1
6	Biochemical Oxygen Demand (3 days at 27°C)	mg/L	2	2	4	3
7	Total Coliforms	MPN/100	356	410	768	846
8	Total Dissolved Solids	mg/L	167	163	175	178
9	Oil & Grease	mg/L	<1.4	<1.4	<1.4	<1.4
10	Cyanide ( as CN )	mg/L	<0.05	<0.05	<0.05	<0.05
11	Phenol ( as C <sub>6</sub> H <sub>5</sub> OH )	mg/L	<0.001	<0.001	<0.001	<0.001
12	Total Hardness ( as CaCO <sub>3</sub> )	mg/L	96	102	135	128
13	Chloride ( as Cl )	mg/L	15	18	32	24
14	Sulphate ( as SO <sub>4</sub> )	mg/L	3	2	5	4
15	Nitrate ( as NO <sub>3</sub> )	mg/L	1.4	1.5	2.1	1.6
16	Fluride ( as F )	mg/L	0.11	0.1	0.2	0.32
17	Calcium ( as Ca )	mg/L	27	31	34	38
18	Magnessium ( as Mg )	mg/L	7	6	12	8
19	Copper ( as Cu )	mg/L	<0.05	<0.05	<0.05	<0.05
20	Iron ( as Fe )	mg/L	0.9	1.1	1.5	0.85
21	Manganese ( as Mn )	mg/L	<0.05	<0.05	<0.05	<0.05
22	Zinc ( as Zn )	mg/L	0.06	0.07	0.12	0.11
23	Boron ( as B )	mg/L	<0.02	<0.02	<0.02	<0.02
24	Arsenic ( as As )	mg/L	<0.002	<0.002	<0.002	<0.002
25	Mercury ( as Hg )	mg/L	<0.001	<0.001	<0.001	<0.001
26	Lead ( as Pb )	mg/L	<0.05	<0.05	<0.05	<0.05
27	Cadmium ( as Cd )	mg/L	<0.01	<0.01	<0.01	<0.01
28	Hexavalent Chromium ( as Cr <sup>+6</sup> )	mg/L	<0.05	<0.05	<0.05	<0.05

WHERE,  
SW1 : Brahmaputra River (Near Dakaidol)  
SW2 : Brahmaputra River (Near Budurchar)  
SW3 : Dhapong Beel  
SW4 : Kadamtola Beel

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**Table 3.7.2 (Cont...)  
Surface Water Quality**

S. No.	Parameter	Unit	SW5	SW6	SW7	SW8
1	Colour		Colourless	Colourless	Colourless	Colourless
2	Odour		Unobj.	Unobj.	Unobj.	Unobj.
3	pH		7.8	7.3	6.9	7.5
4	Conductivity	µmhos/cm	344	292	376	360
5	Dissolved Oxygen	mg/L	6.0	6.3	5.8	6.0
6	Biochemical Oxygen Demand (3 days at 27°C)	mg/L	5	3	6	5
7	Total Coliforms	MPN/100	741	512	912	866
8	Total Dissolved Solids	mg/L	196	164	211	205
9	Oil & Grease	mg/L	<1.4	<1.4	<1.4	<1.4
10	Cyanide ( as CN )	mg/L	<0.05	<0.05	<0.05	<0.05
11	Phenol ( as C <sub>6</sub> H <sub>5</sub> OH )	mg/L	<0.001	<0.001	<0.001	<0.001
12	Total Hardness ( as CaCO <sub>3</sub> )	mg/L	140	118	148	156
13	Chloride ( as Cl )	mg/L	28	14	30	36
14	Sulphate ( as SO <sub>4</sub> )	mg/L	6	4	7	8
15	Nitrate ( as NO <sub>3</sub> )	mg/L	1.8	1.5	2.5	3.6
16	Fluride ( as F )	mg/L	0.24	0.22	0.36	0.42
17	Calcium ( as Ca )	mg/L	34	29	39	44
18	Magnessium ( as Mg )	mg/L	13	11	12	11
19	Copper ( as Cu )	mg/L	<0.05	<0.05	<0.05	<0.05
20	Iron ( as Fe )	mg/L	0.62	0.42	0.8	0.74
21	Manganese ( as Mn )	mg/L	<0.05	<0.05	<0.05	<0.05
22	Zinc ( as Zn )	mg/L	0.09	0.13	0.17	0.2
23	Boron ( as B )	mg/L	<0.02	<0.02	<0.02	<0.02
24	Arsenic ( as As )	mg/L	<0.002	<0.002	<0.002	<0.002
25	Mercury ( as Hg )	mg/L	<0.001	<0.001	<0.001	<0.001
26	Lead ( as Pb )	mg/L	<0.05	<0.05	<0.05	<0.05
27	Cadmium ( as Cd )	mg/L	<0.01	<0.01	<0.01	<0.01
28	Hexavalent Chromium ( as Cr <sup>+6</sup> )	mg/L	<0.05	<0.05	<0.05	<0.05

WHERE,  
SW5 : Sukrachak Beel  
SW6 : Krishnai River (Near Damaspara)  
SW7 : Pond Water (at Gopalpur)  
SW8 : Pond Water (at Borpara)

**Table 3.7.3  
Ground Water Quality**

S. No.	Parameter	Unit	GW1	GW2	GW3	GW4
1	Colour		Colourless	Colourless	Colourless	Colourless
2	Odour		Unobj.	Unobj.	Unobj.	Unobj.
3	Taste		Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	1	2	3	2
5	pH	-	6.8	7.1	6.8	6.7
6	Conductivity	µmhos/cm	310	357	377	382
7	Total Hardness ( as CaCO <sub>3</sub> )	mg/L	144	150	122	146
8	Iron ( as Fe )	mg/L	0.12	0.14	0.09	0.12
9	Chloride ( as Cl )	mg/L	22	40	35	30
10	Residual Free Chlorine	mg/L	nil	nil	nil	nil
11	Fluride ( as F )	mg/L	0.12	0.16	0.13	0.1
12	Total Dissolved Solids	mg/L	174	200	215	210
13	Calcium ( as Ca )	mg/L	36	42	34	39
14	Magnessium ( as Mg )	mg/L	13	11	9	12
15	Copper ( as Cu )	mg/L	<0.05	<0.05	<0.05	<0.05
16	Manganese ( as Mn )	mg/L	<0.05	<0.05	<0.05	<0.05
17	Sulphate ( as SO <sub>4</sub> )	mg/L	4	3	4	5
18	Nitrate ( as NO <sub>3</sub> )	mg/L	1.8	2.1	1.8	2.3
19	Phenol Compounds ( as C <sub>6</sub> H <sub>5</sub> OH )	mg/L	<0.001	<0.001	<0.001	<0.001
20	Mercury ( as Hg )	mg/L	<0.001	<0.001	<0.001	<0.001
21	Cadmium ( as Cd )	mg/L	<0.01	<0.01	<0.01	<0.01
22	Arsenic ( as As )	mg/L	<0.002	<0.002	<0.002	<0.002
23	Cyanide ( as CN )	mg/L	<0.05	<0.05	<0.05	<0.05
24	Lead ( as Pb )	mg/L	<0.05	<0.05	<0.05	<0.05
25	Zinc ( as Zn )	mg/L	0.07	0.1	0.08	0.1
26	Hexavalent Chromium ( as Cr <sup>+6</sup> )	mg/L	<0.05	<0.05	<0.05	<0.05
27	Alkalinity ( as CaCO <sub>3</sub> )	mg/L	105	121	140	131
28	Boron ( as B )	mg/L	<0.02	<0.02	<0.02	<0.02
29	Total Coliforms	MPN/100	absent	absent	absent	absent

WHERE,  
 GW1 : Tube well water (Near Rajapara)  
 GW2 : Tube well water (Near Marnai)  
 GW3 : Tube Well water (Near Matia)  
 GW4 : Tubewell water (Near Lalabari)

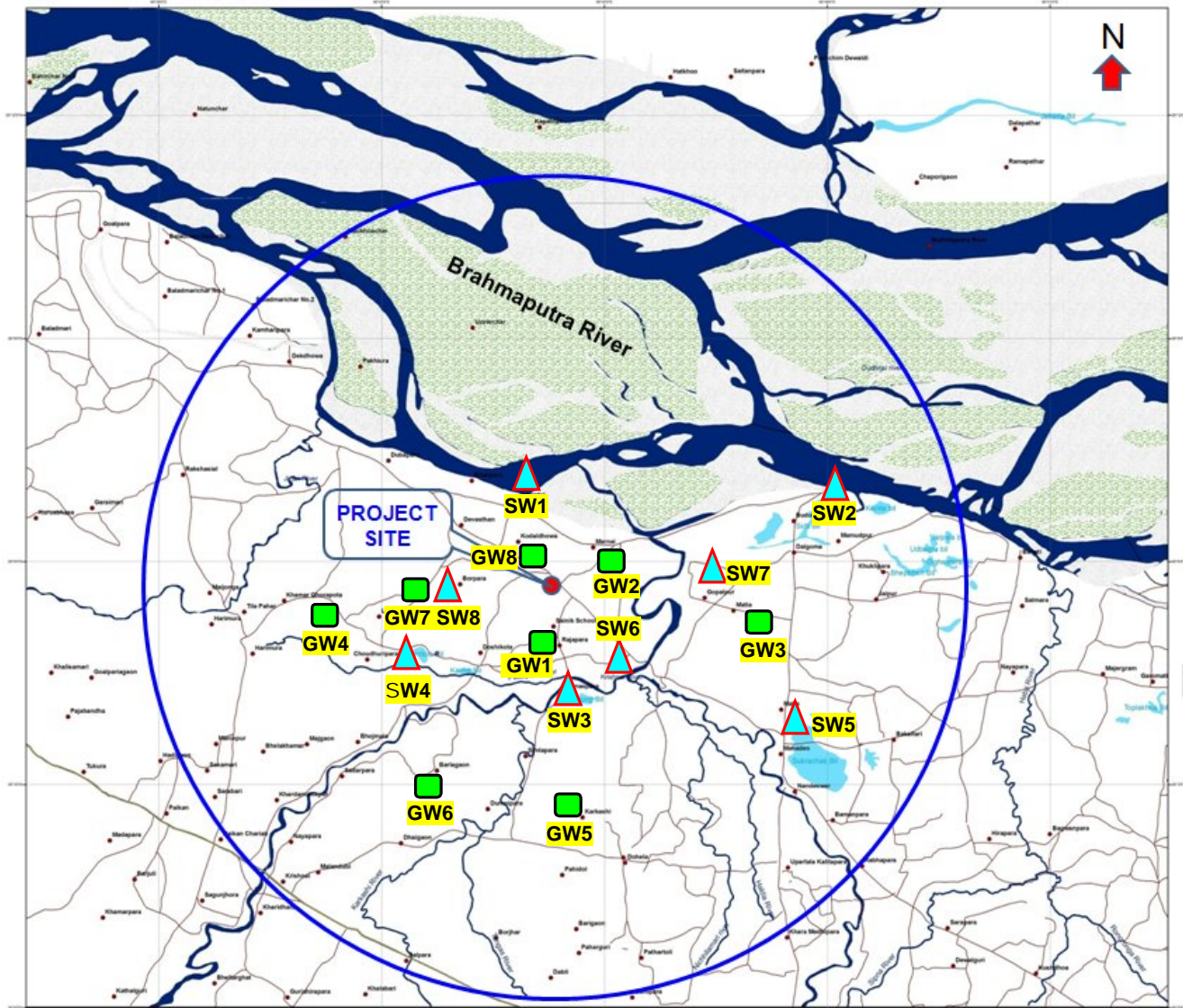
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**Table 3.7.3 (Contd...)  
Ground Water Quality**

S. No.	Parameter	Unit	GW5	GW6	GW7	GW8
1	Colour		Colourless	Colourless	Colourless	Colourless
2	Odour		Unobj.	Unobj.	Unobj.	Unobj.
3	Taste		Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	NTU	1	3	1	2
5	pH		7.3	6.9	7.2	7.1
6	Conductivity	µmhos/cm	345	397	428	385
7	Total Hardness ( as CaCO <sub>3</sub> )	mg/L	174	155	184	140
8	Iron ( as Fe )	mg/L	0.18	0.2	0.16	0.21
9	Chloride ( as Cl )	mg/L	32	45	34	37
10	Residual Free Chlorine	mg/L	nil	nil	nil	nil
11	Fluride ( as F )	mg/L	0.14	0.12	0.15	0.24
12	Total Dissolved Solids	mg/L	193	226	235	216
13	Calcium ( as Ca )	mg/L	46	31	49	43
14	Magnesium ( as Mg )	mg/L	14	19	15	8
15	Copper ( as Cu )	mg/L	<0.05	<0.05	<0.05	<0.05
16	Manganese ( as Mn )	mg/L	<0.05	<0.05	<0.05	<0.05
17	Sulphate ( as SO <sub>4</sub> )	mg/L	3	4	6	4
18	Nitrate ( as NO <sub>3</sub> )	mg/L	1.9	1.6	2	2.7
19	Phenol Compounds ( as C <sub>6</sub> H <sub>5</sub> OH )	mg/L	<0.001	<0.001	<0.001	<0.001
20	Mercury ( as Hg )	mg/L	<0.001	<0.001	<0.001	<0.001
21	Cadmium ( as Cd )	mg/L	<0.01	<0.01	<0.01	<0.01
22	Arsenic ( as As )	mg/L	<0.002	<0.002	<0.002	<0.002
23	Cyanide ( as CN )	mg/L	<0.05	<0.05	<0.05	<0.05
24	Lead ( as Pb )	mg/L	<0.05	<0.05	<0.05	<0.05
25	Zinc ( as Zn )	mg/L	0.06	0.07	0.09	0.07
26	Hexavalent Chromium ( as Cr <sup>+6</sup> )	mg/L	<0.05	<0.05	<0.05	<0.05
27	Alkalinity ( as CaCO <sub>3</sub> )	mg/L	103	132	138	135
28	Boron ( as B )	mg/L	<0.02	<0.02	<0.02	<0.02
29	Total Coliforms	MPN/100	absent	absent	absent	absent

WHERE,  
 GW5 : Tube well water (Near Karkashi)  
 GW6 : Borewell water (Near Barlagaon)  
 GW7 : Tube well water (Near Borpara)  
 GW8 : Tube well water (Near Kodaldhowa)

**Fig. 3.7.1: WATER QUALITY MONITORING LOCATIONS**



- ▲ - Surface Water
- - Ground Water

Sample Code	Ground Water	Sample Code	Surface Water
GW1	Tube well water (Near Rajapara)	SW1	Brahmaputra River(Near Dakaidol)
GW2	Tube well water (Near Marnai)	SW2	Brahmaputra River(Near Budurchar)
GW3	Tube Well water (Near Matia)	SW3	Dhapong Beel
GW4	Tubewell water (Near Lalabari)	SW4	Kadamtola Beel
GW5	Tube well water (Near Karkashi)	SW5	Sukrachak Beel
GW6	Borewell water (Near Barlagaon)	SW6	Krishnai River (Near Damaspara)
GW7	Tube well water (Near Borpara)	SW7	Pond Water (at Gopalpur)
GW8	Tube well water (Near Kodaldhowa)	SW8	Pond Water (at Borpara)

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### 3.8 NOISE

A total of ten (10) locations within an area of 10 km radius around the project site have been selected for measurement of ambient noise levels, covering commercial, residential areas as well as sensitive zones.

#### 3.8.1 MAJOR SOURCES OF NOISE IN THE STUDY AREA

Vehicular movement on the roads is another source of noise. This significantly increases the ambient noise levels. There are also a number of other domestic and commercial noise sources such as generator sets, sirens, television, radio, loud speakers, etc.

#### 3.8.2 AMBIENT NOISE MONITORING

In the present study, a sound level meter has measured sound pressure levels. Since loudness of sound is important for its effects on people, the dependence of loudness on frequency must be taken into account in environmental noise assessment. This has been achieved by using A-weighting filters in the noise measuring instrument which gives a direct reading of approximate loudness. Moreover, A-weighted equivalent continuous sound pressure level ( $L_{eq}$ ) values have been computed from the values of A-weighted sound pressure level (SPL) measured with the help of a noise meter.

At each location, readings were taken at uniform interval over a twenty-four hours period, divided into day and night shifts. For a particular location daytime  $L_{eq}$  has been computed from the SPL values measured between 6.00 A.M to 10.00 P.M and night time  $L_{eq}$  from the SPL values measured between 10.01 P.M to 5.59 A.M, such that comparison could be made with the National Ambient Noise Standards.

#### 3.8.3 NOISE LEVELS IN THE STUDY AREA

The noise levels were monitored at 10 (Ten) locations. Monitoring was done, covering both day and night time.

Noise levels in  $L_{eq}$  at the respective locations separately for Day and Nighttime have been presented in Table 3.8.1.

During the day time, the equivalent noise levels were found to vary in the range of (55.1-51.4) dB (A) while in the night time, the equivalent noise levels were observed to be varying in the ranges of (46.4 - 42.8) dB (A).

As usual, the day time noise levels were found to be higher than those observed at night level.

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Table 3.8.1 Equivalent Noise Level in the Study Area, Leq in dB(A)				
S.NO.	CODE	LOCATIONS	EQUIVALENT NOISE LEVEL Leq in dB(A)	
			DAY	NIGHT
1	N1	Project Site	52.6	44.1
2	N2	Near Sainic School	51.4	45.3
3	N3	Devasthan	54.4	46.4
4	N4	Choudhuripara	51.9	45.2
5	N5	Dumnipara	53.1	43.7
6	N6	Dohela Village Market	55.1	44.4
7	N7	Matia	52.2	42.8
8	N8	Dalgoma	53.4	45.5
9	N9	Gopalpur Primary School	51.5	44.1
10	N10	Damaspara	53.4	45.1
N.B. Day time is reckoned between 0600 HOURS TO 2200 HOURS				
Night Time is reckoned between 2200 HOURS TO 0600 HOURS				

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### 3.9 ECOLOGY

#### 3.9.1 Biological Environment

Natural flora and fauna is an integral component of Ecosystem and is a good indicator of Environmental quality of the habitat. Different communities present in it show different degree of responses and sensitiveness to physical (biotic) influences. Therefore, any environmental analysis where integration of ecological thoughts into planning process is required, the analysis of biological status of the area is very important to project possible deterioration in natural environment on account of Industrial development in the area and designing suitable management corrective action plan.

#### 3.9.2 Reconnaissance survey

The project is located at Industrial Growth Center, Matia, District Goalpara, Assam. Survey was conducted within 10 kms radius of the project site for preparing check list of Flora - fauna and identifying other ecological features of the area once during the study period. The area is mainly plain and undulating dotted with low hills.

#### 3.9.3 Terrestrial Ecology

Flora of the representative areas within the study area of 10 km radius around the project site was studied to find out the vegetation pattern in the study area (Ref. Table - 3.9.1).

The observations on faunal composition within the 10 km range in and around the project site. One of the important aquatic mammal species, the freshwater gangatic Dolphin commonly known as Sisoo (*Platinista gangatica*) is frequently available in the Brahmaputra river. Other important species like monkeys, scally anit eater, Indian porcupine, civet cat, leopard cat, barking deer are seen within the range with considerable populations (Ref. Table - 3.9.2).

#### 3.9.4 Aquatic Ecology

Rivers, streams, swamp are very common around the project site. These habitats are rich in diverse flora and fauna (Ref. Table 3.9.3).

##### Planktons

A total 49 phytoplanktons and 33 zooplanktons of diverse classes are already recorded from this area. A detailed checklist is given in the Table- 3.9.4 and 3.9.5.

### Aquatic Fauna

A detailed checklist of common fresh water fishes were also prepared on the basis of field survey data (Table- 3.9.6).

On the whole it appears that the area is both floristically and faunistically fairly rich.

Table- 3.9.1  
List of Plants in the Study Area

Sl. No.	Scientific Name	Common Name
<b>Trees</b>		
1	<i>Adina cordifolia</i>	Taveaksopa
2	<i>Aegle marmelos</i>	Bel
3	<i>Alangium chinensia</i>	Kodalkonia
4	<i>Albizia lucidor</i>	Hoj
5	<i>A odoratissima</i>	Chamkorai Heharu
6	<i>Alstonia scholaris</i>	Sotiana
7	<i>Anthocephalus chinensis</i>	Kodam
8	<i>Antidesma bunius</i>	Paniheloch
9	<i>Aporosa oblonga</i>	Chem-chholja
10	<i>Artocarpus chama</i>	Chamkathal
11	<i>A. integrifolia</i>	Kathal
12	<i>Acacia auriculaeformis</i>	Akasmani
13	<i>A. catechu</i>	Khair
14	<i>A. polyacantha</i>	
15	<i>Adansonia digitata</i>	Baobab
16	<i>Adenantha pavonina</i>	Kuchandana
17	<i>Acrocarpus fraxinifolius</i>	Mandhani
18	<i>Ailanthus wxcelsa</i>	Tree of heaven
19	<i>A. integrifolia</i>	Borpat
20	<i>Albizia afalcataria</i>	
21	<i>A. procera</i>	Korai
22	<i>A stipulate</i>	Sankorai
23	<i>Alseodaphne owdesii</i>	Jatisundi
24	<i>Anacardium occidentale</i>	Cashew nut
25	<i>Anona squamosa</i>	Custard apple
26	<i>Antidesma ghesambilla</i>	Helock
27	<i>Averrhoa carambola</i>	Kordoi
28	<i>Aquilaria malaccensis</i>	Sari Agar
29	<i>Azadirachta indica</i>	Neem
30	<i>Bauhinia purpurea</i>	Kanchan
31	<i>Bridelia retusa</i>	Kohir
32	<i>Baccauria sapida</i>	Leteku
33	<i>Bauhinia malabarica</i>	Tenga kotra
34	<i>Barringtonia acutangula</i>	Hijal

35	<i>Bombax malabarica</i>	Simalu
36	<i>Careya arborea</i>	Kumbhi
37	<i>Carallia lucida</i>	Mohi thekara
38	<i>Callicarpa arborea</i>	Maskiita
39	<i>Casearia glomerata</i>	Telbhurukia
40	<i>C. Kurzii</i>	Dieng-sch-Mara
41	<i>Cassia fistula</i>	Sonam
42	<i>Celtis timorensis</i>	Mahila
43	<i>Cordia dichotoma</i>	Ghap akharea
44	<i>Craetera religiosa</i>	Barun
45	<i>Creton oblongifolius</i>	Makhunda
46	<i>Cycas pectinata</i>	
47	<i>Callistemon linearis</i>	Bottle brush
48	<i>C. citrinus</i>	Bottle brush
49	<i>Canarium bengalensis</i>	Dhuna
50	<i>C. strictum</i>	Dhuna
51	<i>Cassia javanica</i>	Malayan cassia
52	<i>C roseburghii</i>	Vikai
53	<i>C. siamea</i>	Mirjati
54	<i>Chrysophyllus lanceolatum</i>	Bon pitha
55	<i>Casuarina Equisetifolia</i>	Beef wood tree
56	<i>Celba pentandra</i>	White silk cotton
57	<i>Chockrasia tabutaris</i>	Bogi poma
58	<i>Cinnamomum camophora</i>	Karpur
59	<i>Citrus grandis</i>	Robab tenga
60	<i>C. aurantium</i>	Kamala tenga
61	<i>Cordia sebestina</i>	Lolu
62	<i>Crescentia cujete</i>	Bilatibel
63	<i>Cynometrea polyandra</i>	Piog
64	<i>Caesalpinia pulcherina</i>	Radhasurea
65	<i>Dalbergia sissoo</i>	Sisu
66	<i>Dalbergia assamica</i>	
67	<i>Derris robusta</i>	Kothriakorai
68	<i>Dillenia indica</i>	Outenga
69	<i>D pentagyna</i>	Ogochi
70	<i>D. scabrella</i>	Banjole
71	<i>Diospyros variengata</i>	Koliori
72	<i>Dysoxylum binectariformum</i>	Bandardima
73	<i>Dalbergia latifolia</i>	Rose wood
74	<i>Dipterocarpus retusus</i>	Holang
75	<i>D turbinatus</i>	Garjan
76	<i>Delonix ragia</i>	
77	<i>Ehretia acuninata</i>	Gual
78	<i>Englehardtia spicata</i>	Lewa
79	<i>Erythrina stricta</i>	Modre
80	<i>Eugenia balsamea</i>	Goolhajam
81	<i>Elaeocarpus floribundus</i>	Jalpai

82	<i>E. ganitrus</i>	Rudrakesha
83	<i>Enterolobium timbouva</i>	
84	<i>Enterolibium samon</i>	
85	<i>Eucalyptus tereticornis</i>	Red gum
86	<i>E. globules</i>	Blue gum
87	<i>E. citriodora</i>	Lemon scented Eucalyptus
88	<i>Exbucklandia populnea</i>	Dieng dok
89	<i>Ficus bengalensis</i>	Bot
90	<i>F. benjamina</i>	Joribor
91	<i>F. elastica</i>	Athabor, Indian rubber
92	<i>F. hispida</i>	Dimoru
93	<i>F. Insfactoria</i>	Tengapor
94	<i>F. religiosa</i>	Ahat
95	<i>F. rumphii</i>	Pakori
96	<i>F. cunia</i>	Kongroy
97	<i>Firmiana colorata</i>	Kath udal
98	<i>Flacourtia jongomus</i>	Poniyal
99	<i>Garcinia cowa</i>	Kuji thekera
100	<i>G. pedunculata</i>	Bor thekera
101	<i>G. xanthochymus</i>	Tepon tenga
102	<i>Gliricidea sepium</i>	Madera
103	<i>Grevillea robusta</i>	Silver oak
104	<i>Garuga pinnata</i>	Rohini
105	<i>Glochidion lancedarum</i>	Armlochan
106	<i>Glochiolion sphaerogynum</i>	Bob Jagru
107	<i>Gmelina arborea</i>	Gamari
108	<i>Grewia rothii</i>	Phakdima
109	<i>Haplophrajma adenophyllum</i>	Dhopaparuli
110	<i>Holarrhena antidysentrica</i>	Dudh khori
111	<i>Hymenodictyon excelsum</i>	Bhuokhunoli Panikadam
112	<i>Kydia calycina</i>	Pichhola
113	<i>Lagerstroemia parviflora</i>	Sida
114	<i>L. speciosa</i>	Ajhava
115	<i>L. indica</i>	Parul
116	<i>Lannea grandis</i>	Jiya
117	<i>L. sebifera</i>	Baghnala
118	<i>Litsaea citrata</i>	Mejankeri
119	<i>Mangifera sylvatica</i>	Bon am
120	<i>Mansonia dipikii</i>	Jati badam
121	<i>Magnolia griffithii</i>	Gahori sopa
122	<i>Machilus bombycina</i>	Som
123	<i>Manilkara hexandra</i>	Oubard
124	<i>Mesua ferrea</i>	Nahae
125	<i>Melia azedarch</i>	Ghoranim
126	<i>Memelylon cerasiforma</i>	Kakoi chera
127	<i>Michelia champaca</i>	Tita sopa
128	<i>M. oblonga</i>	Phul sopa

129	M Montana	Phulsopa
130	Magnolia insignis	Pansopa
131	Mimusops elongi	Bakul
132	Morus macroura	Bola
133	Moringa oleifera	Sajina
134	Myristica kingii	Amol
135	Mallotus ferrugineus	Larubandha
136	M. philippinensis	Jarath lochan
137	Mangifera indica	Am
138	Micromelum minutum	Sagladi
139	Nyctanthes arbortristis	Sewali
140	Oroxylum indicum	Bhatghila
141	Premha latifolia	Gonara
142	P racemosa	Dieng thalapa
143	Protium serratum	Mirtenga
144	Pteropermum lancaefolium	Bon bagari
145	Palaquium polyanthum	Kurta
146	Pongamia pinrata	Tamsica
147	Phoebe goalparensis	Bonscn
148	Polyalthia longifolia	Debdaru
149	P. pendula	Pendulum tree
150	Psidium guajara	Madhuriam
151	Pterospermum acerifolium	Hatipolia
152	Putrajiva roxburghii	Putranjibi
153	Phyllanthus emblica	Amlakhi
154	Ravenala madagascariensis	Traveller's tree
155	Sapium baccatum	Cheleng
156	Schima wallichii	Mekrisal
157	Semecarpus anacardium	Bhela
158	Siderayla assamicum	
159	Sterculia villosa	Udal
160	Striblus asper	Sawea
161	Syzygium cumini	Kalajam
162	S. syzygioides	Khudjam
163	Saraca indica	Ashok
164	Salix babylonica	Weeping willow
165	Shorea robusta	Sal
166	Spathodea campanulata	Fountain tree
167	Spondius pinnata	Amorea
168	Sterculia alata	Paharibadam
169	Swietenia macrophylla	Mahogeni
170	S. mahagoni	Mahogeni
171	Santalum album	Chanolan
172	Talauma hodgsonii	Bovehamthuri
173	T phellocarpa	Khariansopa
174	Tectona grandis	Segun
175	Terminalia chebula	Silikka

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176	T Arjuna	Arjun
177	T. alata	Chain
178	T. belerica	Bhoora
179	T myriocarpa	Holok
180	Thevetia nenilifolia	Yellow oleander
181	Trewia nudiflora	Bhelkor
<b>Bamboos</b>		
182	Bambusa vulgaris	Golden bamboo
183	B balcooa	Bhaluka
184	B ventricosa	Pitcher bamboo
185	B arunolinacea	Kotoha bah
186	B tulda	Bijuli bah
187	B nutans	Jati bah

Table- 3.9.2  
List of Animals in the Study Area

S. No.	Scientific Name	Common Name
<b>Amphibian</b>		
1	Bufo melanostictus	House toad
2	Pelobates leucomystax	Tree frog
3	Microhyla oranata	Micro hylla
4	Hoplobatrachus tigerina	Indian bull frog
5	Emphyetis cyanophlyetis	Skipper frog
<b>Reptiles</b>		
<b>Snakes</b>		
1	Typhlina braminus	Typhlops
2	Python morulus	Python
3	Eryx conicus	Sand boa
4	Elaphe radiata	Colubrids
5	Ptyas mucosus	Colubrids
6	Ptyas korros	Colubrids
7	Oligodon albocinctus	Colubrids
8	Dendrelaphis stristis	Colubrids
9	Chrysopelea ornata	Colubrids
10	Lycodon jara	Colubrids
11	Amphisma stolata	Colubrids
12	Boiga gokool	Colubrids

**Table- 3.9.2 (contd....)**  
**List of Animals in the Study Area**

S. No.	Scientific Name	Common Name
<b>Reptiles</b>		
<b>Snakes</b>		
13	Bungurus fasciatus	Banded kruit
14	Naja naja	Cobra
15	Ophiophagus hanuah	King cobra
16	Trimeresurus albolabris	Green pit viper
	Other Reptiles	
17	Varanus bengalensis	Monitor lizard
18	Gecko gecko	Wall lizard
19	Hemidactylus broki	House lizard
20	Hemidactylu frenatus	Common house lizard
21	Calotes versicolor	Garden lizard
22	Ptyctolaemus gularis	Blue throated lizard
23	Mabuya carinata	Common shink
	<b>Rodents</b>	
1	Rattus rattus	Common house rat
2	Mus musculus	House mouse
3	Mus booduga	Indian field mouse
4	Vandeleuria oleracea	Long tailed tree mouse
5	Bandicota bangalensis bangalensis	Indian mole rat
	<b>Others</b>	
6	Funambulus palmarum	Three striped palm squirrel
7	Hystrix indica	Indian porcupine
8	Herpestes edwardsi	Common mangoose
9	F chaus	Jungle cat
10	Felix viverrina	Fishing cat
11	Viverra zibetha	Large Indian civet
12	Canis aureus	Jackal
13	Vupex bengaleusis	Bengal fox
14	Maccaca assamensis	Assamese macaque
15	Maccaca mulata	Rhesus monkey
16	Muntiacus muntjak	Barking deer
17	Hylobates hoolock	Hoolock gibbon
18	Platynista gangetica	Gangetic dolphin
19	Manis crassicaudata	Scaly ant eater
20	Lutra lutra	Lutra (ud)

**Table- 3.9.3  
List of Birds**

S. No.	Scientific Name	Common Name
1	<i>Podiceps ruficollis</i>	Little grebe
2	<i>Phalacrocorax niger</i>	Little cormorant
3	<i>Ardea cineria</i>	Grey Heron
4	<i>A purpurea</i>	Purple Heron
5	<i>A grayii</i>	Pond Heron
6	<i>Bubulcus ibis</i>	Cattle egret
7	<i>Ardea alba</i>	Large egret
8	<i>Egretta intermedia</i>	Smaller egret
9	<i>E garzetta</i>	Little egret
10	<i>Nycticorax nycticorax</i>	Night Heron
11	<i>Ixobrychus cinnamomeus</i>	Bittern
12	<i>Leptoptilos dubius</i>	Stork
13	<i>L javanivus</i>	Lesser adjutant stork
14	<i>Dendrocygna bicolor</i>	Large whistling teal
15	<i>D javanica</i>	Lasser whistling teal
16	<i>Tadorna ferruginea</i>	Ruddy shelduck
17	<i>Anas acuta</i>	Pintail
18	<i>A crecca</i>	Common teal
19	<i>Nettapus coromandelianus</i>	Cotton teal
20	<i>Milvus migrans goviora</i>	Pariah kite
21	<i>Haliastur Indus</i>	Brahminy kite
22	<i>Accipiter nisus</i>	Sparrow stawk
23	<i>Aguila pomarina</i>	Lesser spotted eagle
24	<i>Gyps indicus</i>	Long billed vulture
25	<i>G bengalensis</i>	White backed vulture
26	<i>Cirus macrourus</i>	Pale harrier
27	<i>C. melanoleucus</i>	Pied Harrier
28	<i>Spilornis cheela</i>	Crested Serpent eagle
29	<i>Rallus aquaticus</i>	India water rail
30	<i>Amourornis phoenicurus</i>	White brested waterhen
31	<i>Gallinule chloropus</i>	Moorhen
32	<i>Fulica atra</i>	Coot
33	<i>Hydrophasianus chirurgus</i>	Pheasant tailed jacana
34	<i>Metopidius indicus</i>	Bronze winged jacana
35	<i>Rostratula benghalensis</i>	Painted snipe
36	<i>Vanellus vanellus</i>	Lopwing
37	<i>V cinereus</i>	Grey headed lapwing
38	<i>V indicus</i>	Red wattled lapwing
39	<i>Charadrius dubius</i>	Little rined plover
40	<i>Tringa hypoleucos</i>	Common Sand pipere
41	<i>Gallinago gallinago</i>	Fantailed snipe
42	<i>Treron curvirostra</i>	Green pigeon
43	<i>Columba livia</i>	Blue Rock pigeon

44	<i>Streptopelia decaocto</i>	Indian ringed dove
45	<i>S chinensis</i>	Spotted dove
46	<i>Psittacula kramere</i>	Rose ringed parakeet
47	<i>Cuculus bugux</i>	Common hawk cuckoo
48	<i>C. micropterus</i>	Indian cuckoo
49	<i>C. canorus</i>	The cuckoo
50	<i>Eudynamys scolopacea</i>	Koel
51	<i>Centropus sinensis</i>	Craw pheasant
52	<i>Tyto alba</i>	Burn owl
53	<i>Athene brama</i>	Spotted owl
54	<i>Caprimulgus macrurus</i>	Common Indian night jar
55	<i>Apus affinis</i>	House swift
56	<i>Ceryle rudis</i>	Lesserpied kingfisher
57	<i>Allcedo atthis</i>	Common kingfisher
58	<i>Alcedo meninting</i>	Blue eared kingfisher
59	<i>Pelargopsis caperisis</i>	Stork billed kingfisher
60	<i>Carecias benghalensis</i>	Indian Roller
61	<i>Upupa eops</i>	Hoopoe
62	<i>Megalamea lineate</i>	Lineated Barbet
63	<i>M. heemacephala</i>	Copper smith
64	<i>Picus myrmecophoneus</i>	Green woodpecker
65	<i>Dinopium benghalense</i>	Lesser golden backed wood pecker
66	<i>Picoides atreatus</i>	Pied wood pecker
67	<i>Lanius excubitor</i>	Grey shrike
68	<i>Lanius schack</i>	Rufous backed shrike
69	<i>L. cristatus</i>	Brown shrike
70	<i>Oriolus xanthornus</i>	Black headed oriole
71	<i>Dicrurus adsimilies</i>	Black drongo
72	<i>D. aeneus</i>	Bronzed Drongo
73	<i>Sturnus malabaricus</i>	Grey headed Myna
74	<i>S. contra</i>	Pied Myna
75	<i>Acridotheres tristis</i>	Common Myna
76	<i>A. ginginianus</i>	Bank Myna
77	<i>A. fuscus</i>	Jungle Myna
78	<i>Dendrocitta vagabunda</i>	Indian Treepie
79	<i>Corvus splendens</i>	House crow
80	<i>C. macrorhynchos</i>	Jungle crow
81	<i>Tephrodornis pondiecerianus</i>	Common wood shrike
82	<i>Chloropsis auriffons</i>	Leaf bird
83	<i>Pycnonotus cafer</i>	Red vented bulbul
84	<i>P jocosus</i>	Red wishekered bulbul
85	<i>Turdoides striatus</i>	Jungle babbler
86	<i>Muscicapa parvalbicilla</i>	Red breasted fly catcher
87	<i>Orthotomus sutorius</i>	Tailor bird
88	<i>Copsychus saularis</i>	Magpie robin
89	<i>Myiophonus caruleus</i>	Blue whistling thrush

90	<i>Parus major</i>	Grey tit
91	<i>Anthus trivialis</i>	Tree pipet
92	<i>Motacilba alba dukhunensis</i>	Pied wagtail
93	<i>Motacilla cineria</i>	Grey wagtail
94	<i>Nectarinia asiatica</i>	Purple sunbird
95	<i>Zosterpos pappebrosa</i>	White eye
96	<i>Passer domesticus</i>	House sparrow
97	<i>Ploceus philippinus</i>	Spotted munia
98	<i>Emberiza spodocephala</i>	Black faced banting
99	<i>Anas querquedula</i>	Garganey
100	<i>Aythya nyroca</i>	White eyed pochard
101	<i>Ciconia episcopus</i>	White necked stork
102	<i>Butorides striatus</i>	Little green heron
103	<i>Ixobrychus cinnamomeus</i>	Black bitteren
104	<i>Aredea insignis</i>	Great white bellied heron
105	<i>Egretta gularis</i>	Reef Heron
106	<i>Ixobrychus sinensis</i>	Yellow bittern
107	<i>I minutus</i>	Little bittern
108	<i>Gypactus barbatus</i>	Beared vulture
109	<i>Milvus milvus</i>	Red kite
110	<i>Pernis ptilorhynchus</i>	Siberian honey buzzard
111	<i>Buteobuteo</i>	Buzzard
112	<i>Buteo hemilasius</i>	Upland buzzard
113	<i>Glucedium radiatum</i>	Jungle owlet
114	<i>Aquila rapose nepalensis</i>	Eastern steppe eagle
115	<i>Aquila clanga</i>	Greater spotted eagle
116	<i>Bubo nepalensis</i>	Forest eagle-owl
117	<i>Otus bakkamoeradettia</i>	Collared scops owl
118	<i>Raparia riparia</i>	Collard sand martin
119	<i>Raparia paludicola</i>	Plain sand martin
120	<i>Hirundo obsolete</i>	Pale crag martin
121	<i>Delichon nipalensis</i>	Nepal house martin
122	<i>Rhipidura aureda</i>	White browed fontail
123	<i>Phipidura albicollis</i>	White throated fantail fly catcher
124	<i>Lanius collurio</i>	Red backed shrike
125	<i>L. sonator</i>	Wood chat shrike
126	<i>Cinclus cinclus</i>	White breasted dipper
127	<i>Cinclus pallasii</i>	Brown dipper
128	<i>Aeridotheres albocinctus</i>	Collard myna
129	<i>A javanicus</i>	Orange billed jungle myna
130	<i>Gracula religiosa</i>	Hill myna
131	<i>Garrulous laneolatus</i>	Black throated jay
132	<i>Caprimulgus maharathensis</i>	Skyes's nightjar
133	<i>Halcyon coromanda</i>	Ruddy kingfisher
134	<i>Alcedo hercules</i>	Blyth's kingfisher
135	<i>Merops superciliosus</i>	Blue checked bee eater

136	<i>Marops orientalis</i>	Small green bee eater
137	<i>Alcedo althis</i>	Small blue kingfisher
138	<i>Halcyon symrnensis</i>	White breasted kingfisher
139	<i>Ceyx erithacus</i>	Three toed kingfisher
140	<i>Cypsiurus parvus</i>	Palm swift
141	<i>Glaucidium cuculoides</i>	Barred owlet
142	<i>Megalaema jeylanica</i>	Large green barbet
143	<i>Loriculus vernalis</i>	Indian lorikeet
144	<i>Prittacula columboides</i>	Blue winged parakeet
145	<i>Picus squamatus</i>	Scaly bellied green wood pecker
146	<i>Dinopium shorii</i>	Himalayan Golden backed three toed wood pecker
147	<i>Sasia ochracea</i>	Rubous piculet
148	<i>Megalaima franklinii</i>	Golden throated barbet
149	<i>Chrysocolaptes lucidus</i>	Larger golden backed wood pecker
150	<i>Picoides conicapillus</i>	Grey crowned pigmy wood pecker
151	<i>Fynx torquiella</i>	Wryneck
152	<i>Gyps himalayensis</i>	Himalayan gibbon

Table- 3.9.4  
List of Phytoplankton Available in the Study area

Sl. No.	Phytoplankton
1	<i>Odogonium subreolatum</i>
2	<i>Ankistrodemum falcatus</i>
3	<i>Oscillatoir acela</i>
4	<i>Chloroeocccum humicola</i>
5	<i>C obevacum</i>
6	<i>C diplobionticum</i>
7	<i>Ulothrik tenerrima</i>
8	<i>U zonata</i>
9	<i>U variabilis</i>
10	<i>U. subtilissima</i>
11	<i>Odogonum crassiusculum</i>
12	<i>O westir</i>
13	<i>O subareolatum</i>
14	<i>Clostirium setacum</i>
15	<i>C. acerosum</i>
16	<i>C. pritchardianum</i>
17	<i>C. Knetzingii</i>
18	<i>Chlorella vulgaris</i>
19	<i>Cosmarium circulatae</i>
20	<i>C. javanicum</i>
21	<i>Cosmarium mansangense</i>

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22	<i>C subspecisum</i>
23	<i>C quadrifirum</i>
24	<i>C binum</i>
25	<i>Spirogyra congata</i>
26	<i>S occidentalis</i>
27	<i>S daelalae</i>
28	<i>S. quadrimalinatos</i>
29	<i>Secnedesmus quadricauta</i>
30	<i>S. longus</i>
31	<i>S armatus</i>
32	<i>S quadricanda</i>
33	<i>Demidum uptogonum</i>
34	<i>D gracileps</i>
35	<i>Oscillatoria formosa</i>
36	<i>O profius</i>
37	<i>O. granulata</i>
38	<i>Euglena mutabilis</i>
39	<i>Microcystis alruginosa</i>
40	<i>M. robusta</i>
41	<i>Calothrix brevissima</i>
42	<i>Anabaena catenula</i>
43	<i>Anabaena costricata</i>
44	<i>Pinnularia viridis</i>
45	<i>Navicula sp.</i>
46	<i>Euglwena oculus</i>
47	<i>Spinulina laxa</i>
48	<i>Chlorella vulgaris</i>
49	<i>Micrasteria elenticulata</i>

Table- 3.9.5  
List of Zooplankton Available in the Study area

Sl. No.	Zooplankton
<b>Rotifers</b>	
1	<i>Keratella sp.</i>
2	<i>Brachirus sp.</i>
3	<i>Rotaria sp.</i>
4	<i>Asplanchna sp.</i>
5	<i>Filinia sp.</i>
6	<i>Chromogastor sp.</i>
7	<i>Polyarthra sp</i>
8	<i>Ascomosropha sp</i>
9	<i>Salpina sp</i>
10	<i>Lecane sp.</i>
<b>Copepods</b>	
1	<i>Naylins sp.</i>
2	<i>Diaptomus sp</i>

3	Cyclops sp.
<b>Protozoans</b>	
1	Arcella sp
2	Achinosphaerium sp
3	Paramaecium sp
4	Centrophyxis sp
5	Nochilaca sp
6	Monas sp
7	Euglena sp
8	Ceratium sp
9	Peridinium sp
10	Diffugia sp
11	Arcella sp
12	Coelosphaerium sp
13	Ichthyoptheriasis sp.
<b>Cladoccranus</b>	
1	Daphnia sp
2	Moina sp
3	Bosmina sp
4	Alonela sp
5	Ceriodaphnia sp
6	Diaphanosoma sp
7	Leotodora sp.

Table - 3.9.6  
List of Fishes Available in the Study Area

S.No.	Sc. Name of Fish	S.No.	Sc. Name of Fish
1	Danio equipinatus	2	Danio rerio
3	Danio deverior	4	Danio dangila
5	Puntius ticto ticto	6	Puntius sarana
7	Puntius chola	8	Puntius sophore
9	Puntius conehonicus	10	Channa marulias
11	Channa striatus	12	Channa punctatus
13	Channa garinchua	14	Barilius barila
15	Barilius bola	16	Bariluis barna
17	Barilius bendelises	18	Bariluis vogra
19	Labeo boga	20	Labeo rohita
21	Labeo calbasu	22	Labeo bata
23	Labeo punguisa	24	Chela atpar
25	Chela loubuca	26	Colisa fasciata
27	Chlisa chuna	28	Colisa lalea
27	Macrosgnathus acecebatum	28	Rhinomugil corsula
29	Sicamugil cascasia	30	Ailichthics punctatus
31	Aila coila	32	Eutropichtys murius

33	Tetradon cutcutia	34	Wallago attoo
35	Mystus vitatus	36	Mystus eavagius
37	Mystus aor	38	Mystus seenghala
39	Mystus bleekari	40	Rita rita
41	Anabus testudineus	42	Ambasis raga
43	Ambhypharyngodon mola	44	Ambasis nama
45	Acrossochailus hexagonolepis	46	Amphipnous cuchia
47	Aspidoparia joya	48	Mestocembelus armatus
49	Rasbora daniconius	50	Ompok bimaculatus
51	Catla catla	52	Cirrhinus mrigala
53	Clupisoma garua	54	Gadusia chapra
55	Osteobrama colio	56	Rasbora elenga
57	Heteropneustis fossilis	58	Xenentodon caceila
59	Hilsa elisa	60	Notopterus notopterus
61	Rasbora rasbora	62	Glossogobius guris
63	Setipina phasa	64	Psilorhyncus sucatio
65	Johnius castor	66	Oxygaster bacaila
67	Silonia silonia	68	Gadusia variegata
69	Esomus denricus	70	Rasbora elenga
71	Lepidocephalichthys bormorce	72	Chagunius chagunio
73	Crosochallus latius latius	74	Gagata gagata
75	Gagata viridecens	76	Nomachailus botica
77	Clarius batracus	78	Pungasius pungasius
79	Nandus nandus	80	Ompok bimulatus
81	Notopterns chitala	82	Lepidocephalihthys guntia

### 3.9 DEMOGRAPHY & SOCIO-ECONOMICS

The Baseline Demographic and Socio economic characteristics with regards to demography, literacy and occupational status have been described, based on the Primary Census Abstract, 2001, while the relevant details of the Infrastructure Facilities have also been extracted from the Primary Census Abstract, 2001. The proposed project is located in Goalpara district, Assam. Total 50 villages and some urban area of Goalpara district fall under the area of 10 km. radius around the proposed project. A comparative assessment has been made for the respective demographic aspects, based on the year 2001 data, which has been discussed in the following sections.

Majority of the study area is Rural and semi-urban in nature and moderately populated with the total population of 77368 (as per 2001 Census). Scheduled Caste (SC) and Scheduled Tribe (ST) population is about 6.21% and 8.12% of the total population respectively. The sex ratio is about 960 females per 1000 males. The principal language is Assamese. The principal staple food is rice. The primary sources of drinking water are tube wells and Hand pump water.

#### 3.10.1 DEMOGRAPHIC ASPECTS

##### 3.10.1.1 Distribution of population

The total population of the study area was 77368 as per Census Data of 2001. The distribution of the total population in the study area is presented in Table 3.10.1 (Based on 2001 Census Data). The average family size is 5.3.

Particulars	As per 2001 Census
NO OF HOUSEHOLDS	13364
TOTAL POPULATION	77368
MALE POPULATION	39461
FEMALE POPULATION	37907
POPULATION DENSITY	246 NOS. PER SQ.KM
SIZE OF HOUSE HOLD	6.92

##### 3.10.1.2 Social structure

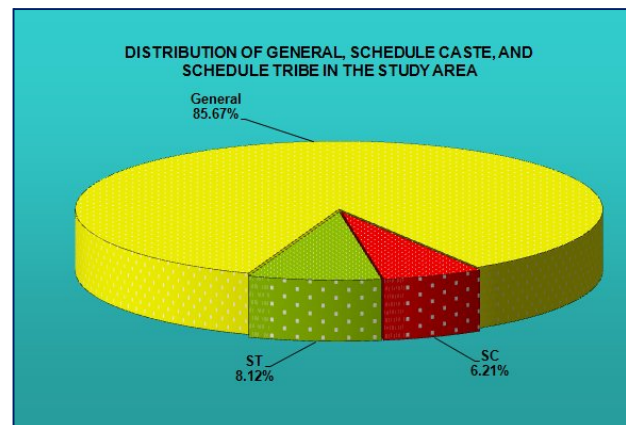
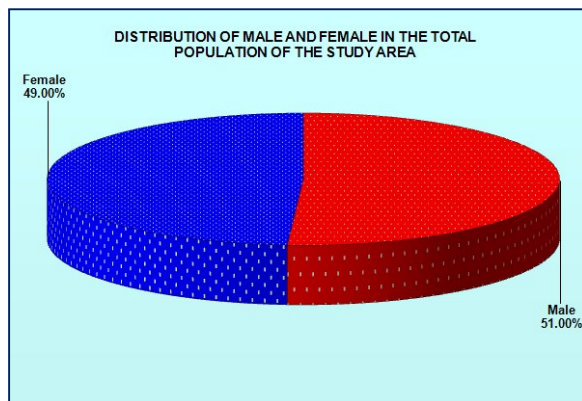
In 2001, about 6.21% of the total population belonged to Scheduled Castes (SC). Similarly, 8.12% of the total population belonged to Scheduled Tribes (ST). The distribution of population in the study area by social structure is presented in Table 3.10.2. (Based on 2001 Census Data).

Particulars	As per 2001 Census
Total Scheduled Castes	4802
Scheduled Castes Male	2448
Scheduled Castes Female	2354
Total Scheduled Tribes	6286
Scheduled Tribes Male	3146
Scheduled Tribes Female	3140

### 3.10.3 INFRASTRUCTURE FACILITIES

Many of the villages and in town in the study area have primary schools, middle schools, secondary schools. Medical facilities (primary health centre, allopathic & homeopathic dispensary, maternity and child welfare centre) are not enough in the study area. Water supply in the study area is mainly from supply, tank, well, bore well and hand pumps. Electricity is being supplied for domestic, agriculture, and public lighting purposes. Post Office, Electricity and telephone connections are available within the study area.

### GRAPHICAL PRESENTATION OF 2001 CENSUS DATA



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**VILLAGEWISE POPULATION DISTRIBUTION  
IN THE STUDY AREA (AS PER 2001 CENSUS)**

S. No.	Distric-East Medinipur	No of House Hold	Total Population		
			Total	Male	Female
1	Borar Char Pt-II	64	364	197	167
2	Rajapara	48	476	233	243
3	Tilapara	74	402	209	193
4	Matia	66	5318	2777	2541
5	Baladmari Char Pt-II	803	5164	2669	2495
6	Dekdhowa	276	1659	866	793
7	Dekdhowa N.C. (Dekdhowa Natunbasti)	88	539	288	251
8	Ujirer Char Nc(Fakir Para)	93	605	318	287
9	Ujirer Char (Ujirer Char & Dobapa)	162	995	505	490
10	Dubapara Lupta Char	315	2014	1022	992
11	Dubapara	412	2048	1038	1010
12	Harimura	312	1453	740	713
13	Lalabori	306	1474	698	776
14	Bhojmala Pt-I(Mornoi)	138	732	383	349
15	Pakhiura N.C.	148	989	515	474
16	Singimari Char	184	1118	582	536
17	Mornai	527	2413	1202	1211
18	Pachim Matia	631	3129	1581	1548
19	Kodamtola Gopalpur	583	2626	1326	1300
20	Buduchar	653	3642	1864	1778
21	Mamudpur Pt. -II	356	2026	1025	1001
22	Dalgoma	231	1123	577	546
23	Bakaitari Pt-I	165	768	372	396
24	Nayapara Pt-I	348	1859	956	903
25	Bakaitari Pt-II	300	1517	741	776
26	Bakaitari Pt-III	124	598	284	314
27	Khalaipara	108	507	271	236
28	Bamunpara	101	541	262	279
29	Rabhapara	49	330	169	161
30	Sarapara	254	1455	756	699
31	Karipara Pt-IV	209	1045	529	516
32	Barigaon	139	719	364	355
33	Dabli	132	675	346	329
34	Hadigaon	230	1262	634	628
35	Bujruk Manikpur	358	1933	983	950

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**VILLAGEWISE POPULATION DISTRIBUTION  
IN THE STUDY AREA (AS PER 2001 CENSUS) (Contd..)**

S. No.	Distric-East Medinipur	No of House Hold	Total Population		
			Total	Male	Female
36	Paikan Pt-I	513	2615	1342	1273
37	Khamar Manikpur	414	2086	1047	1039
38	Bhela Khamar	150	826	426	400
39	Salpara Molandubi Pt.-I	1491	8530	4374	4156
40	Khairapara	73	367	183	184
41	Dhaigaon	325	1825	936	889
42	Khilasastra	92	541	287	254
43	Bhojmala Pt-II	149	897	462	435
44	Karkasi Damas	67	344	169	175
45	Dhaigaon Damas	102	553	280	273
46	Karkashi	167	859	436	423
47	Pahidal	77	375	187	188
48	Krishnai Guria Pt-II	336	1834	953	881
49	Khamari	241	1264	640	624
50	Ghoraputa	180	934	457	477