Executive Summary for comparison of baseline data for summer 2013 and post monsoon 2016

As per the ToR (Validity Extension) issued vide letter no-J-13012/01/2013-IA.II (T) dated 08.11.2016, fresh baseline data collected for post monsoon season (September to November 2016) and compared with baseline data of summer season 2013.

The secondary metrological data collected from the nearest IMD station at Dibrugarh and primary data at site with the help of automatic weather station. During 2013 summer the pre dominant wind direction is NE and average wind speed observed was 2.94 m/s. whereas in post monsoon 2016 the pre dominant wind direction is also NE and average wind speed observed was 2.13 m/s.

Ambient Air quality was monitored at 10 locations within the study area. Important air quality parameters were monitored as per the NAAQ standards. The 98th percentile values of PM<2.5µm, PM<10µm, SO_2 and NO_x during summer 2013 were in the range of 18.5 to 36.3 µg/m^3, 47.6 to 70.6 µg/m^3 , 11.4 to 18.3 µg/m^3 and 16.9 to 25.6 µg/m^3 and during post monsoon (2016) were in the range of 16.9 to 35.9 µg/m^3, 43.8 to 69.1 µg/m^3, 13.5 to 20.4 µg/m^3 and 19.8 to 29.1 µg/m^3 respectively. All the parameters were within the standards.

To assess water quality 9 Ground and 3 surface water samples were collected from different sources within the study area and analyzed for important physical and chemical parameters and compared ground waters with IS: 10500- 2012 drinking water standards and surface waters with IS 2296 – 1992 Inland surface water standards respectively. In ground waters, parameters pH, TDS, chloride, hardness and fluoride values were in the range of 6.2 to 7.47, 38 to 244 mg/l , 10 to 49mg/l, 23 to 143 mg/l and 0.18 to 0.34 mg/l during summer 2013, Whereas in post monsson 2016 they were in the range of 6.7 to 7.2, 51 to 224 mg/l, 14 to 38 mg/l, 36 to 116 mg/l and 0.21 to 0.28 mg/l respectively. All the parameters are meeting the norms as per the IS: 10500- 2012. In surface waters, parameters pH, TDS, chloride, hardness and fluoride values were in the range of 6.5 to 8.03, 68 to 95 mg/l, 12 to 14 mg/l , 33 to 46.4 mg/l and 0.15 to 0.3 mg/l during summer 2013 and whereas in post monsson 2016, thet were in the range of 6.9 to 7.1, 72 to 121 mg/l, 16 to 26 mg/l , 61 to 73 mg/l and 0.22 to 0.32 mg/l respectively.

Noise was monitored at 10 locations within the study area of the project site. The day and night equivalents were ranging in between 52.6 to 55.6 dB (A) and 41.2 to 42.5 dB (A) during summer 2013, whereas in post monsoon 2016, they were ranging in between 53.1 to 55.9 dB (A) and 42.1 to 44.4 dB (A) respectively. Day and Night equivalents in all locations were within the Ambient Noise Standards of residential and industrial area standards.

The site is accessible by a NH-38 and traffic survey was conducted for both the years. The highest peak observed in traffic survey was 1350 PCU/hr during summer 2013, whereas in post monsoon season 2016 the highest peak observed in traffic survey was 1366 PCU/hr. The level of service observed was E during both the years, Hence there was not much difference in traffic.

Soil Quality was monitored at 10 locations within the study area of the project site. Analyzed for all important physical and chemical parameters and compared with Standard Soil Classification – (Indian Council of Agricultural Research, New Delhi) standards.

The parameters pH, EC, N, P, and K values were in the range of 6.46 to 7.35 , 123 to 194 µmhos/cm, 215 to 289 kg/ha , 11.3 to 35.6 kg/ha and 25.7 to 63.2 kg/ha during summer 2013, whereas during post monsoon 2016, the values were in the range of 6.8 to 7.3, 124 to 175 µmhos/cm, 280 to 374 kg/ha, 13 to 28 kg/ha and 26 to 58 kg/ha respectively. All the parameters were falling lower to medium category and requires addtion of fertilisers for cultivation.

Comparative Baseline Data Report for Summer 2013 and Post Monsoon 2016

1.1 Introduction

As per the ToR (validity extension) issued vide letter no-J-13012/01/2013-IA.II (T) dated 08.11.2016, fresh baseline data has to be collected for post monsoon season (September to November 2016).

Baseline environmental status in and around proposed project depicts the existing environmental conditions of Air, Water, Noise and Soil with proposed project as the centre. A radial distance of 10 km is considered as 'study area' for baseline data collection and environmental monitoring. Baseline data was collected for various environmental attributes so as to compute the impacts that are likely to arise due to proposed power project at Saleki & Lekhapani (V), Makum Mouza (T), Margherita Revenue Circle, Tinsukia (D), Assam.

The main aim of the comparative baseline data for summer 2013 and post monsoon 2016 season is to identify the critical environmental attributes which will be affected and have adverse impacts on the surrounding systems due to proposed project.

The scope of the baseline studies include detailed characterization of the following environmental components, which are most likely to be influenced by setting up the proposed coal based thermal power plant:

- Meteorological conditions
- Ambient Air Quality
- Noise Levels
- Water Quality (Surface & Ground water)
- Soil Quality

a) Study period

The baseline data generation for the rapid EIA has been carried out during the summer season of 2013 from April to June and also during post monsoon season of 2016 from September to November as per the TOR amendment issued during 2016.

Summary of the comparative baseline data i.e., for Summer (April-June 2013) and post monsoon (September – November 2016) seasons is as follows:

1.2 Comparison of Meteorological Data:

The comparative details of temperature, relative humidity and rainfall observed during the

study period April to June 2013 and September to November 2016 are given in **Table 1.1**.

Table 1.1
Comparison of Meteorological Data

Parameter		Summer 2013			Post Monsoon 2016		
		Apr	May	Jun	Sep	Oct	Nov
Temperature (^{o}C)	Min	15	19	21	18	20	12
	Max	33	35	35	29	30	28
Relative Humidity (%)	Min	27	39	40	64	62	68
	Max	72	74	79	94	93	96
Rainfall (mm)		227	272	394	120	52	9
Predominant wind direction from		NE followed by ENE			NE followed by E		

Wind speed and direction data recorded during the study period is useful in identifying the influence of meteorology on the air quality of the area.

During summer season (2013) the wind direction observed was predominantly recorded from NE closely followed by ENE. Calm conditions prevailed for 11.46 % of the total time. Average wind speed for the summer season was 2.94 m/sec.

Whereas for post monsoon season (2016) the winds direction observed were predominantly from NE closely followed by E. Calm conditions prevailed for 13.23% of the total time. Average wind speed for the post monsoon season was 2.13 m/sec.

Wind rose diagrams on sixteen sector basis have been drawn. Wind directions and wind speed frequency observed during the study periods are given in **Table 1.2 & 1.3** and wind rose diagrams are given in **Figure 1.1 & 1.2.**

Table 1.2
Frequency Distribution for Summer Season (April to June 2013)

Directions / Wind Classes (m/s)	0.5 - 2.1	2.1 - 3.6	3.6 - 5.7	5.7 - 8.8	8.8 - 11.1	> 11.1	Total (%)
N	2.2	1.3	0.8	0.2	0	0	4.6
NNE	3.1	2.4	3.0	0.9	0	0	9.4
NE	3.8	4.4	5.5	2.7	0.6	0.05	17.1
ENE	2.2	3.6	3.9	1.8	0.2	0	11.7
E	3.8	2.2	2.2	1.0	0.09	0	9.2
ESE	2.3	1.4	0.9	0.6	0	0	5.1
SE	1.3	1.2	1.1	0.3	0	0	3.9
SSE	1.3	0.7	0.8	0.5	0	0	3.2
S	1.5	0.8	0.7	0.3	0	0	3.3
SSW	1.0	0.8	0.7	0.3	0.05	0	2.7
SW	1.3	0.8	0.5	0.1	0	0	2.8
WSW	1.4	0.6	0.5	0.3	0	0	2.7
W	1.4	0.8	0.7	0.3	0	0	3.2
WNW	2.0	0.5	0.5	0.2	0	0	3.2
NW	1.0	0.8	1.0	0.3	0.09	0	3.1
NNW	1.4	1.0	0.6	0.4	0	0	3.3
Sub-Total	**30.7**	**23.2**	**23.2**	**10.1**	**1.09**	**0.05**	**88.5**
Frequency of Calm Winds (<0.5 m/s)							**11.5**
Average Wind Speed							**2.94 m/s**

Note: All values are in Percentage

Figure 1.1
Wind Rose Diagram Summer Season (April to June 2013)

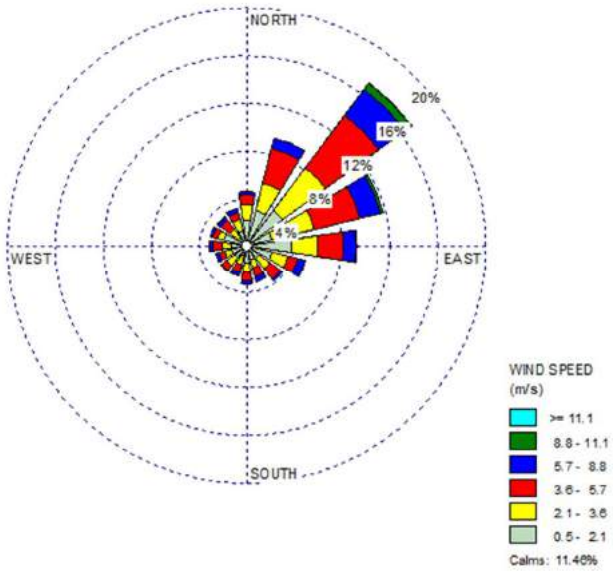
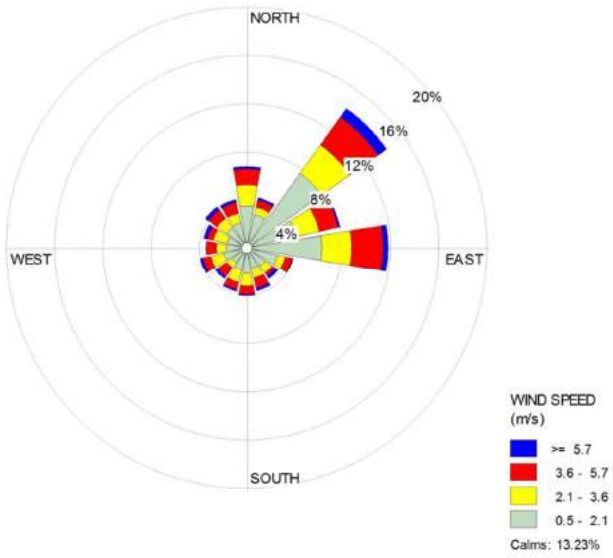


Table 1.3
Frequency Distribution for Post Monsoon season (September to November 2016)

Wind Directions	Wind Classes (m/s)				Total
	0.5 - 2.1	2.1 - 3.6	3.6 - 5.7	> 5.7	
N	3.53	1.74	1.33	0.18	6.78
NNE	2.88	0.64	0.60	0.18	4.30
NE	7.65	2.88	2.84	0.87	14.24
ENE	4.26	1.97	1.60	0.14	7.97
E	6.27	2.47	2.61	0.41	11.77
ESE	2.70	0.64	0.60	0.05	3.98
SE	1.92	0.73	0.27	0.32	3.25
SSE	1.83	0.82	0.87	0.23	3.75
S	2.20	1.05	0.69	0.14	4.08
SSW	1.97	1.05	0.64	0.14	3.80
SW	1.56	0.55	0.92	0.23	3.25
WSW	2.01	1.10	0.69	0.23	4.03
W	1.74	0.82	0.82	0.05	3.43
WNW	1.74	1.14	0.50	0.32	3.71
NW	2.11	0.96	0.87	0.32	4.26
NNW	2.20	0.82	0.92	0.23	4.17
Sub-Total	**46.57**	**19.41**	**16.76**	**4.03**	**86.77**
Calms (<0.5 m/s)					**13.23**
Total					**100.00**

Note: 1. Average Wind Speed is 2.13 m/s
2. All values are in percentages

Figure 1.2
Wind Rose Diagram Post Monsoon season September to November 2016



1.2 Ambient Air Quality

The baseline status of the ambient air quality has been assessed through a scientifically designed ambient air quality network.

- Meteorological conditions on a synoptic scale
- Topography of the study area
- Representation of the regional background levels
- Representation of the plant site
- Influence of the existing sources
- Major settlements in the study area

Ambient Air Quality Monitoring (AAQM) stations were installed at 10 different locations with consideration in the above mentioned points. AAQ locations were selected in downwind, cross wind and upwind direction of the proposed project location. The details of the monitoring stations are given in **Table 1.4.** The sampling locations for AAQ are given in **Figure 1.3 .**

At each sampling station monitoring was carried for a frequency of 2 days per week for 4 weeks in a month during the study period. The Common air pollutants namely Suspended, Respirable Particulate Matter (PM<2.5µm, PM<10µm), Sulphur dioxide (SO_2), Oxides of nitrogen (NO_x), were sampled on 8/24 hourly basis and the results were averaged to 24 hours to meet the requirements of the MoEFCC and compared with the standards stipulated by CPCB. In addition to the above parameters Ozone (O_3) is also monitored.

Table 1.4
Ambient Air Quality Monitoring Locations

Code	Name of the station	Wind type	W.R.T. Site		Latitude (North)	Longitude (East)
			Direction	Distance (km)		
A1	Nearest to Site	Core	-	-	27° 17'33.5"	95° 48' 53.4"
A2	Ledo	Downwind	W	6.5	27° 17'51.4"	95° 44' 51.4"
A3	Paharpur	Up Wind	NE	6.0	27° 19'16.2"	95° 52' 3.6"
A4	Tipang	Cross Wind	SE	7.3	27° 15'38.2"	95° 53' 5.2"
A5	Brahamacamp	Cross Wind	NWN	1.6	27° 18'52.6"	95° 48' 9.8"
A6	Lekhapani	Up Wind	NE	2.2	27° 19'13.6"	95° 49' 43.2"
A7	Hasak	Crosswind	NEN	7.5	27° 21'46.8"	95° 48' 57.4"
A8	Etakhala	Downwind	W	5.0	27° 17'47.4"	95° 45' 31.4"
A9	Pasegaon	Cross Wind	NW	3.0	27° 18'25.2"	95° 47' 17.2"
A10	Kambagaon	Cross Wind	W	2.0	27° 17' 53.2"	95° 47' 39.5"

Comparitive data values of air pollutants as mentioned above are presented in **Table 1.5 (a to d)**.

Statistical parameters like minimum, maximum and 98th percentiles have been computed from the observed raw data for all sampling stations. These are compared with the standards prescribed by Central Pollution Control Board (CPCB) for Industrial, Residential and Rural zone.

Table 1.5 (a)
Comparison of Ambient Air Quality Levels in the Study Area (µg/m^3)

Code	Location	Summer 2013			Post monsoon 2016		
		SPM			SPM		
		Min	Max	98th Percentile	Min	Max	98th Percentile
A1	Site	118	128	128	113	125	125
A2	Ledo	214	298	292	182	274	270
A3	Paharpur	120	141	140	116	138	137
A4	Tipang	122	138	137	118	135	135
A5	Brahamacamp	135	158	155	132	150	149
A6	Lekhapani	124	143	141	129	160	160
A7	Hasak	121	140	140	117	137	137
A8	Etakhala	128	154	151	125	152	151
A9	Pasegaon	125	178	172	121	160	160
A10	Kambagaon	126	152	151	122	149	148

Table 1.5 (b)

Comparison of Ambient Air Quality Levels in the Study Area (µg/m^3)

Code	Location	Summer 2013						Post monsoon 2016					
		PM <10µ			PM <2.5µ			PM <10µ			PM <2.5µ		
		Min	Max	98th Per	Min	Max	98th Per	Min	Max	98th Per	Min	Max	98th Per
A1	Nearest to Site	39.3	47.7	47.6	14.1	18.5	18.5	38.1	43.9	43.8	15.6	16.9	16.9
A2	Ledo	49.6	72.3	70.6	22.1	36.8	36.3	48.3	69.4	69.1	24.2	36.3	35.9
A3	Paharpur	37.1	49.6	49.6	15.3	24.6	24.6	40.3	45.4	45.4	14.2	21.8	21.5
A4	Tipang	40.2	48.3	48.3	13.6	21.3	20.7	42.3	50.4	49.6	16.5	24.8	23.1
A5	Brahamacamp	41.2	50.3	50.0	16.8	22.8	22.6	39.1	46.5	46.5	14.7	20.6	20.2
A6	Lekhapani	43.2	54.8	53.9	14.9	26.4	25.6	45.4	56.4	55.9	19.5	30.5	30.0
A7	Hasak	44.4	53.4	53.4	17.2	25.2	25.2	43.2	48.9	48.8	16.1	22.8	22.4
A8	Etakhala	45.4	58.9	57.7	19.4	28.4	27.8	42.2	54.4	54.3	17.3	25.4	24.9
A9	Pasegaon	39.4	52.6	51.8	17.6	30.6	30.4	41.3	49.4	49.4	14.8	26.2	25.9
A10	Kambagaon	42.1	51.8	51.5	18.6	29.2	29.0	42.3	48.8	48.2	16.5	24.6	24.5
98th Percentile Range		**47.6 to 70.6**			**18.5 to 36.3**			**43.8 to 69.1**			**16.9 to 35.9**		
NAAQ Standards 2009 (24 hourly)		**100**			**60**			**100**			**60**		
Annually		**60**			**40**			**60**			**40**		

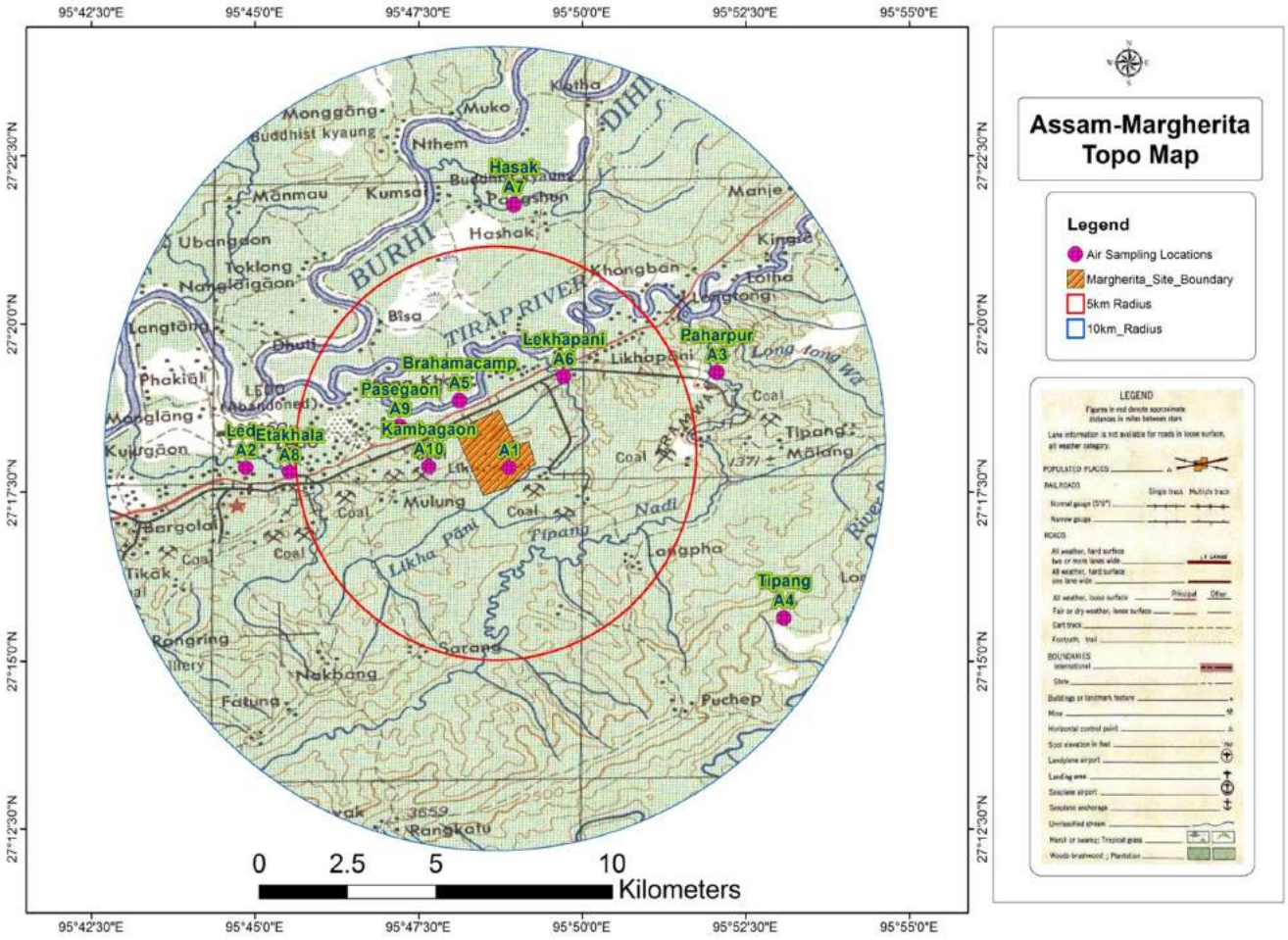
Table 1.5 (c)
Comparison of Ambient Air Quality Levels in the Study Area (µg/m^3)

Code	Location	Summer 2013						Post monsoon 2016					
		Sulphur dioxide (SO_2)			Nitrogen dioxide (NO_x)			Sulphur dioxide (SO_2)			Nitrogen dioxide (NO_x)		
		Min	Max	98th Per	Min	Max	98th Per	Min	Max	98th Per	Min	Max	98th Per
A1	Site	6.3	11.6	11.4	10.6	17.4	16.9	8.9	13.5	13.5	13.2	21.2	19.8
A2	Ledo	11.2	18.3	18.3	14.5	26.3	25.6	14.3	20.7	20.4	18.1	29.5	29.1
A3	Paharpur	8.5	13.9	13.6	12.4	20.4	18.7	10.9	14.8	14.8	15.6	22.5	21.9
A4	Tipang	9.5	14.4	14.0	13.6	21.3	20.8	11.9	15.7	15.7	16.5	24.5	23.4
A5	Brahamacamp	10.4	15.4	15.4	14.3	22.6	21.7	12.8	17.8	17.7	15.1	23.5	23.2
A6	Lekhapani	7.8	12.7	12.7	12.6	20.5	20.0	11.8	18.5	18.1	17.3	25.8	25.8
A7	Hasak	7.1	11.8	11.8	10.8	17.6	16.9	9.5	14.2	14.1	16.2	21.8	21.7
A8	Etakhala	9.1	16.3	16.1	16.6	24.5	24.2	9.8	17.1	17.1	17.2	24.9	24.9
A9	Pasegaon	9.7	15.1	14.8	15.6	23.6	23.6	10.5	16.5	16.4	16.2	24.7	24.7
A10	Kambagaon	8.6	14.8	14.7	12.8	19.6	19.1	9.4	15.9	15.9	14.5	23.8	23.7
98th Percentile Range		**11.4 to 18.3**			**16.9 to 25.6**			**13.5 to 20.4**			**19.8 to 29.1**		
NAAQ Standards 2009 (24 hourly)		**80**			**80**			**80**			**80**		
Annually		**50**			**40**			**50**			**40**		

Table 1.5 (d)
Comparison of Ambient Air Quality Levels in the Study Area (µg/m^3)

Code	Location	Summer 2013			Post monsoon 2016		
		Ozone (O_3)					
		Min	Max	98th Per	Min	Max	98th Per
A1	Site	7.6	14.4	13.3	9.8	15.8	15.8
A2	Ledo	11.5	22.4	21.7	15.5	24.6	24.5
A3	Paharpur	9.4	17.4	16.9	11.9	19.4	19.4
A4	Tipang	10.6	18.3	17.8	12.8	18.6	18.6
A5	Brahamacamp	11.3	19.6	19.0	13.2	19.5	19.2
A6	Lekhapani	9.6	17.5	17.0	14.6	20.3	20.1
A7	Hasak	7.8	14.6	14.6	10.5	16.8	16.4
A8	Etakhala	12.3	19.8	19.6	13.2	20.6	20.6
A9	Pasegaon	12.6	20.6	20.3	14.6	20.1	20.1
A10	Kambagaon	9.8	16.6	16.6	12.6	18.2	18.2
98th Percentile Range		**13.3 to 21.7**			**15.8 to 24.5**		
NAAQ Standards 2009 (8 hourly)		**100**					

Figure 1.3
Sampling Locations Map - Air



1.2.1 Regional Scenario Comparison for Summer 2013 and Post Monsoon 2016 data

a) Suspended Particulate Matter (SPM)

In summer season (2013), the 98th percentile values of SPM recorded in the study area were in the range of 128 to 292 µg/m^3. Where as in post monsoon season (2016), the 98th percentile of SPM recorded in the study area were in the range of 125 to 270 µg/m^3.

b) Particulate Matter <2.5µ & <10µ

In summer season (2013), the 98th percentile values of Particulate Matter <2.5µm recorded within the study area were in the range of 18.5 to 36.3 µg/m^3. the 98th percentile of Particulate Matter <10µm recorded within the study area were in the range of 47.6 to 70.6 µg/m^3.

Where as in post monsoon season (2016), the 98th percentile values of Particulate Matter <2.5µm recorded within the study area were in the range of 16.9 to 35.9 µg/m^3, the 98th percentile values of Particulate Matter <10µm recorded within the study area were in the range of 43.8 to 69.1 µg/m^3.

The 24 hourly average values of Particulate Matter <2.5µm & Particulate Matter <10µm were compared with the national ambient air quality standards (NAAQ) during both the seasons and it was found that all sampling stations recorded values within the applicable limits (100 µg/m^3 for PM10 & 60 µg/m^3 for PM 2.5) in industrial, residential, rural and other areas.

c) Sulfur Dioxide

In summer season (2013), the 98th percentile values of SO_2 recorded within the study area were in the range of 11.4 to 18.3 µg/m^3. Whereas in Post monsoon season (2016), the 98th percentile values of SO_2 recorded within the study area were in the range of 13.5 to 20.4 µg/m^3.

The 24 hourly average values of SO_2 were compared with the national ambient air quality standards during both seasons and was found that all sampling stations recorded values much lower than the applicable limit of 80 µg/m^3 for Industrial, residential, rural and other areas.

d) Oxides of Nitrogen

In summer season (2013), the 98th percentile values of NO_x recorded within the study area were in the range of 16.9 to 25.6 µg/m^3. Whereas Post monsoon season (2016), the 98th percentile values of NO_x recorded within the study area were in the range of 19.8 to 29.1 µg/m^3.

The 24 hourly average values of NOx were compared with the national ambient air quality standards during both seasons and was found that all sampling stations recorded values much lower than the applicable limit of 80µg/m^3 for Industrial, residential, rural and other areas.

e) Ozone (O_3)

In summer season (2013), the 98th percentile values of O_3 recorded within the study area were in the range of 13.3 to 21.7 µg/m^3. Whereas in post monsoon season (2016), the 98th percentile of O_3 recorded within the study area were in the range of 15.8 to 24.5 µg/m^3.

The 8 hourly average values of Ozone were compared with the national ambient air quality standards during both seasons and was found that all sampling stations recorded values within the applicable limits of industrial, residential, rural and other areas.

1.3 Water quality

1.3.1 Water quality assessment

9 ground and 3 surface water samples were identified and collected from the study area to assess the water quality during the study periods. The ground water samples were drawn from the hand pumps and bore wells used by the villagers for their domestic needs. Surface water sampling was carried out from the river/ nallahs in the study area. The details of the locations are given in **Table 1.6. and Figure 1.4 & 1.5.**

Table 1.6
Water Quality Sampling Locations

S. No	Code	Name of the Station	Source Type	Elevation in (m)	W.R.T. Site		Latitude (North)	Longitude (East)
					Direction	Distanc (km)		
Subsurface (Ground Water)								
1	GW1	Ledo	Hand Pump	135	W	6.5	27° 17' 43.56"	95° 44'13.38
2	GW2	Paharpur	Hand Pump	158	NE	6.0	27° 19' 09.84"	95° 52'03.06"
3	GW3	Brahamacamp	Hand Pump	142	NWN	1.6	27° 18' 49.26"	95° 48' 10.44"
4	GW4	Lekhapani	Well Water	136	NE	2.2	27° 19'13.26"	95° 49'43.32"
5	GW5	Hassak	Hand Pump	146	NEN	7.5	27° 21' 46.08"	95° 48' 57.54"
6	GW6	Etakhala	Well Water	132	W	5.0	27° 17' 48.06"	95° 45' 31.26"
7	GW7	Tipang	Hand Pump	138	SE	7.3	27° 15' 38.16"	95° 53' 5.22"
8	GW8	Pasegaon	Hand Pump	124	NW	3.0	27° 18' 25.2"	95° 47' 17.52"
9	GW9	Kambagaon	Hand Pump	121	W	2.0	27° 17' 53.04"	95° 47' 39.48"
Surface Water								
1	SW1	Plant Site	Nallah water	122	-	-	27° 17' 33.48"	95° 48' 53.34"
2	SW2	Tirap River	River water	110	-	-	27° 21' 36.78"	95° 53' 14.16"
3	SW3	Buridihing River	River water	145	-	-	27° 21' 46.08"	95° 47' 28.15"

The water samples collected from the above locations were analyzed for important water quality parameters and the analytical results of the ground water samples were compared with IS: 10500-2012 drinking water standards. Surface water samples were compared with IS:2296-1992 Inland surface water standards. Comparison of water sample analysis results for ground water & surface water are shown in **Tables 1.7 & 1.8.**

Figure 1.4
Sampling locations Map – Ground Water

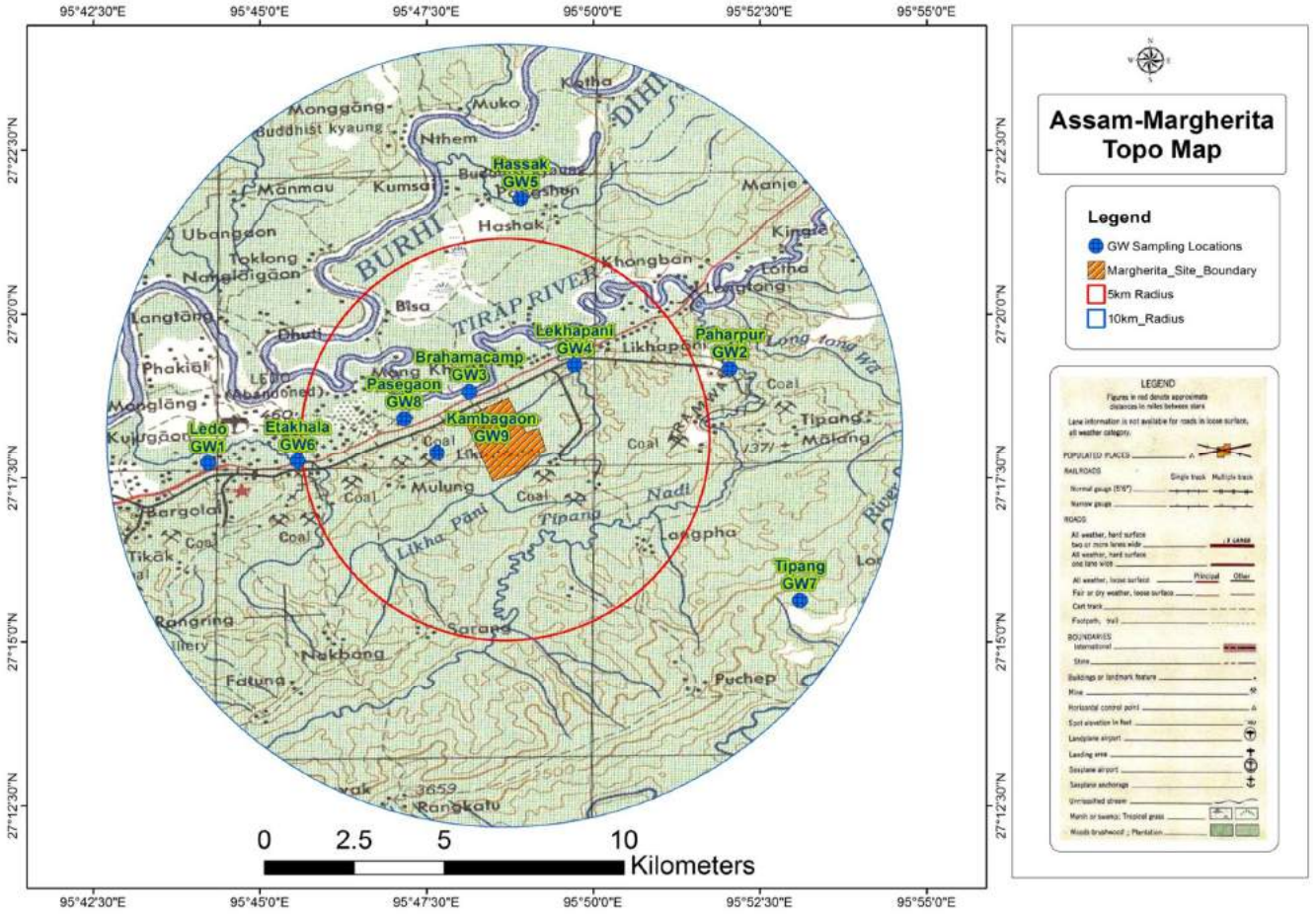


Figure 1.5
Sampling locations Map – Surface Water

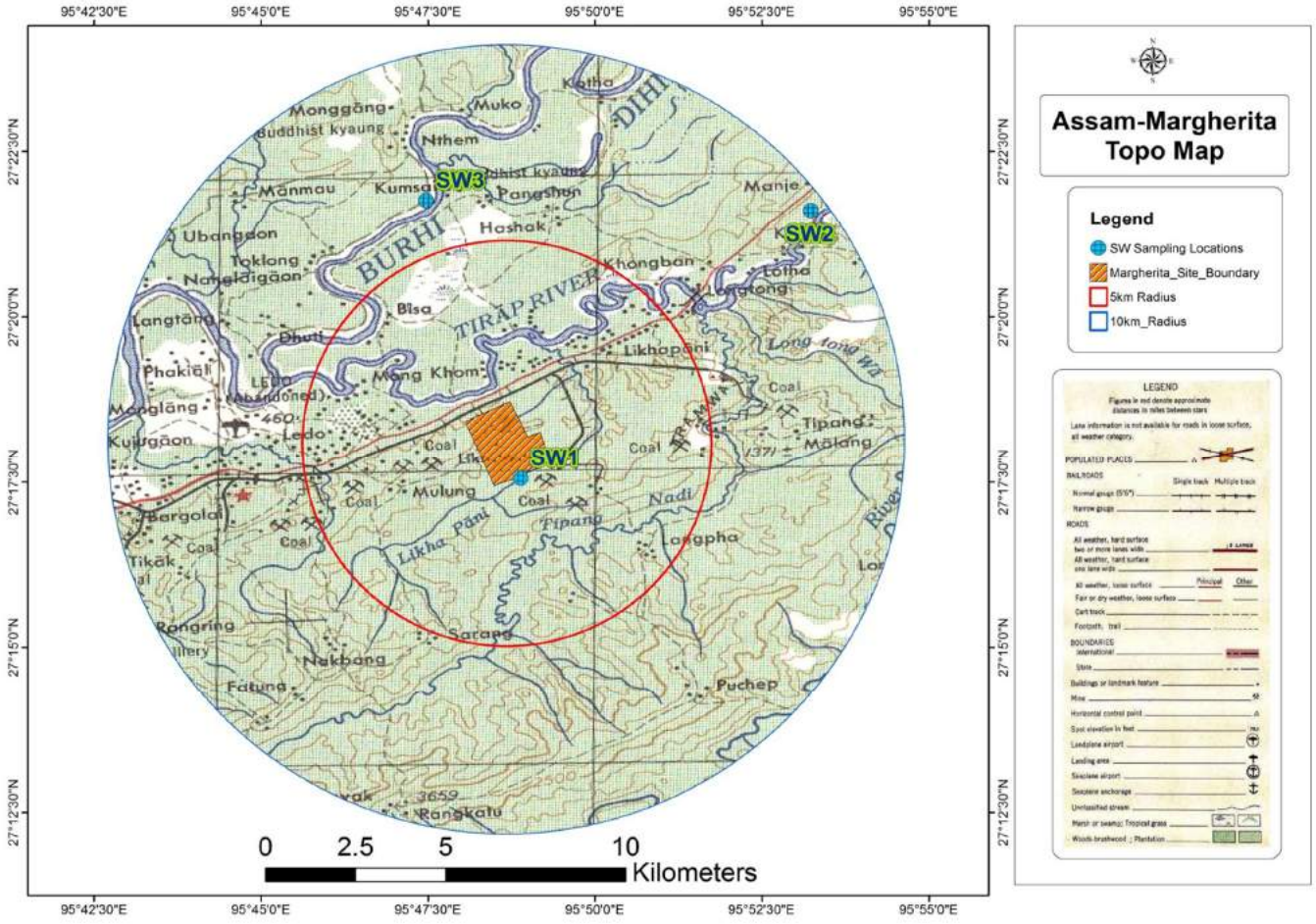


Table 1.7
Comparison of Water Sample Analysis Results – Ground water

Parameter	Unit	Ledo (GW1)		Paharpur (GW2)		Brahamacamp (GW3)		Lekhapani (GW4)		Hassak (GW5)		IS: 10500- 2012 Standard	
		2013	2016	2013	2016	2013	2016	2013	2016	2013	2016	Acceptable	Premissible
Colour	Pt-Co	1.2	2.0	3.4	2.0	2.7	2.0	3.8	3.0	2.2	2.0	5	15
Odour	-	Agreeable										Agreeable	Agreeable
pH	-	6.5	6.7	6.5	6.9	6.2	6.8	6.4	6.9	7.4	7.1	6.5-8.5	NR*
Turbidity	NTU	10.9	1.0	1.4	1.0	8.3	1.0	1.0	1.5	1.4	1.5	1	5
Elec. Cond	µs/cm	301	346	148	186	171	152	353	335	65	82	--	--
Total Dissolved solids	mg/l	184	224	98	122	112	98	232	212	38	51	500	2000
Alkalinity as CaCO3	mg/l	32	51	38	42	42	39	64	52	16	20	200	600
Chlorides as Cl	mg/l	26	34	20	24	22	14	49	38	10	16	250	1000
Sulphates as SO4	mg/l	6.8	18	4.3	6.6	6.4	2.7	32.8	29	1.13	5	200	400
Nitrate as NO3	mg/l	24.5	14	8.8	9	13.1	8.2	4.5	4.2	3.6	6	45	NR*
Hardness as CaCO3	mg/l	68	108	44	78	58	46	124	95	28	36	200	600
Calcium as Ca	mg/l	14	23	11	18	13	10	28	18	6	6	75	200
Magnesium as Mg	mg/l	8	12	4	8	6	5	13	12	3	5	30	100
Sodium as Na	mg/l	34.2	28	11.8	12	11.6	11	18.1	19	2.6	8	-	-
Potassium as K	mg/l	16.8	15.2	2.5	5.2	1.3	3.8	7.8	7.2	0.2	3.4	-	-
Flouride as F	mg/l	0.26	0.28	0.22	0.23	0.28	0.21	0.25	0.22	0.24	0.23	1.0	1.5
Iron as Fe	mg/l	<0.2	<0.2	<0.2	<0.2	0.25	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	NR*
Zinc as Zn	mg/l	0.0078	0.0062	0.0061	0.0052	0.0052	0.0006	0.0006	0.0006	0.0006	0.0001	0.0001	15
Lead as Pb	mg/l	0.0088	0.0061	0.0063	0.0008	0.0008	0.0005	0.0005	0.0005	0.0005	0.0004	0.0004	NR*
Mercury as Hg	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.001	NR*
Cadmium as Cd	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.003	NR*
Chromium as Cr	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.05	NR*
Copper as Cu	mg/l	0.0051	0.0041	0.0006	0.0004	0.0048	0.0008	0.0005	0.0004	0.0001	0.0001	0.05	1.5
Arsenic as As	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.01	0.05
Cyanide as CN-	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NR*

Parameter	Unit	Etakhala (GW6)		Tipang (GW7)		Pasegaon (GW8)		Kambagaon (GW9)		IS: 10500- 2012 limits	
		2013	2016	2013	2016	2013	2016	2013	2016	Acceptable	Premissible
Colour	Pt-Co	1.7	2.0	1.4	2.0	1.8	2.0	2.3	2.0	5	15
Odor	-	Agreeable								Agreeable	Agreeable
pH	-	6.5	7.1	7.3	6.8	6.4	7.1	6.4	7.2	6.5-8.5	NR*
Turbidity	NTU	1.0	1.5	1.3	1.0	1.4	1.0	1.4	2.0	1	5
Elec. Cond	µs/cm	164	188	365	334	284	245	345	323	--	--
Total Dissolved solids	mg/l	108	128	244	224	174	148	226	208	500	2000
Alkalinity as CaCO3	mg/l	30	41	62	58	44	34	64	59	200	600
Chlorides as Cl	mg/l	15	19	38	32	42	32	44	38	250	1000
Sulphates as SO4	mg/l	10.8	13	26	23	16	12	21	18	200	400
Nitrate as NO3	mg/l	6.3	7.8	5.3	4.3	5.8	4	6.1	5.8	45	NR*
Total Hardness as CaCO3	mg/l	23	63	143	116	101	84	125	111	200	600
Calcium as Ca	mg/l	6	12	32	28	27	22	30	26	75	200
Magnesium as Mg	mg/l	2	8	15	11	8	7	12	11	30	100
Sodium as Na	mg/l	20.5	21	22	18	18	14	24	22	-	-
Potassium as K	mg/l	9.8	10.2	6.8	5.5	7.3	6.2	8.3	7.8	-	-
Flouride as F	mg/l	0.24	0.22	0.34	0.28	0.18	0.21	0.26	0.24	1.0	1.5
Iron as Fe	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	NR*
Zinc as Zn	mg/l	0.0024	0.0031	0.0006	0.0004	0.0032	0.0031	0.0045	0.0037	5	15
Lead as Pb	mg/l	0.0008	0.0005	0.0014	0.0006	0.0025	0.0007	0.0021	0.0004	0.01	NR*
Mercury as Hg	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.001	NR*
Cadmium as Cd	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.003	NR*
Chromium as Cr	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.05	NR*
Copper as Cu	mg/l	0.0002	0.0003	0.0005	0.0003	0.0012	0.0005	0.0035	0.0008	0.05	1.5
Arsenic as As	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.01	0.05
Cyanide as CN-	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	NR*

***N R – No Relaxation**

Table 1.8 -Comparison of Water Sample Analysis Results – Surface water

Parameter	Units	Site (SW1)		Tirap river (SW2)		Buridhing river(SW3)		IS 2296 – 1992 Inland surface water standards				
		2013	2016	2013	2016	2013	2016	A	B	C	D	E
pH	---	6.5	7.0	8.03	6.9	7.72	7.1	6.5-8.5	6.5-8.5	6.0-9.0	6.5- 8.5	6.0- 8.5
EC	µs/cm	107	110	164	174	150	188	-	-	-	-	2250
Color	Pt-Co	5.6	5.6	3.5	3.5	3.8	3.8	10	300	300	-	-
Odor	--	Unobjectionable						Unobjectionable			-	-
TSS	mg/l	<10	<10	26	<10	10	<10	-	-	-	-	-
TDS	mg/l	68	72	94	112	95	121	500	-	1500	-	2100
Turbidity	NTU	0.1	4.5	1.3	4.8	2.1	11.5	-	-	-	-	-
Alkalinity as CaCO3	mg/l	34	35	30	34	35	38	-	-	-	-	-
Chloride as Cl-	mg/l	12	16	14	22	12	26	250	-	600	-	600
Sulphate as SO4-2	mg/l	2.2	8	10.5	14	6	12	400	-	400	-	1000
Nitrates as NO3	mg/l	9.1	7.4	6.1	6	6.3	6	20	-	50	-	-
Total Hardness	mg/l	46.4	61	35.7	68	33	73	200	-	-	-	-
Calcium as CaCO3	mg/l	30	38	27.5	43	25	45	200	-	-	-	-
Magnesium as CaCO3	mg/l	16.4	23	8.2	25	8	28	200	-	-	-	-
Sodium as Na	mg/l	4.1	5	20.3	12	15	14	-	-	-	-	-
Potassium as K	mg/l	0.4	5	1.0	5	0.9	5	-	-	-	-	-
Fluoride as F-	mg/l	0.2	0.22	0.15	0.23	0.3	0.32	1.5	1.5	1.5	-	-
Iron as Fe	mg/l	In All samples Fe <0.2						0.3	-	0.5	-	-
Lead as Pb	mg/l	0.0017	0.0006	0.0020	0.0007	0.0001	0.0001	0.1	-	0.1	-	-
Zinc as Zn	mg/l	0.0046	0.0012	0.0055	0.0024	0.0014	0.0011	15	-	15	-	-
Copper as Cu	mg/l	0.0011	0.0006	0.0004	0.0005	0.0002	0.0002	1.5	-	1.5	-	-
DO	mg/l	5.3	6.1	5.1	5.8	4.8	5.7	6	5	4	4	-
COD	mg/l	15	18	8	22	8	28	-	-	-	-	-
BOD	mg/l	3	4	2	5	2	6	2	3	3	-	-
Oil & Grease	mg/l	<10	<10	<10	<10	<10	<10	-	-	-	-	-
In All samples Hg, As, Cd and Cr <0.0001 mg/l												
Class A Drinking water source without Conventional Treatment; Class B Outdoor Bathing; Class C Drinking Water Source with Conventional Treatment Followed by Disinfection; Class D Fish Culture and Wild Life Population; Class E Irrigation, Industrial Cooling												

1.3.2 Regional Scenario Comparison for Summer 2013 and Post Monsoon 2016 data

➢ During summer 2013, the pH was varying for ground water from 6.2 to 7.47 and in surface water the pH was varying between 6.5 to 8.03. Whereas in post monsoon 2016, the pH was varying for ground water from 6.7 to 7.2 and in surface water the pH was varying between 6.9 to 7.1. During both the periods pH values for all the samples collected in the study area were found to be within the limits.

➢ During summer 2013, in ground water samples collected from the study area, the total dissolved solids were varying from 38 to 244 mg/l. Whereas in Post Monsoon 2016, in ground water samples collected from the study area, the total dissolved solids are varying from 51 to 224 mg/l. During both the periods the TDS of all the samples were within the desirable limit. In surface water during summer 2013, the total dissolved solids were in the range of 68 to 95 mg/l, where as in post monsoon 2016 the total dissolved solids were in the range of 72 to 121 mg/l showing that, they were within the desirable limit during both periods.

➢ During summer 2013, chloride levels in the ground water samples collected in the study area were ranging from 10 to 49 mg/l . Whereas in post monsoon 2016 the chloride values observed were 14 to 38 mg/l. In surface water during summer 2013, the chlorides were in the range of 12 to 14 mg/l, and in post monsoon 2016 in the chlorides were in the range of 16 to 26 mg/l, showing that the values are are within the desirable limits.

➢ During summer 2013, in ground water samples collected from the study area, the hardness is varying from 23 to 143 mg/l. In surface water the hardness is varying between 33 to 46.4 mg/l. Whereas during post monsoon 2016 the ground water samples collected from the study area, the hardness is varying from 36 to 116 mg/l. In surface water the hardness is varying between 61 to 73 mg/l.

➢ During summer 2013, in ground water samples of study area the fluoride values were in the range of 0.18 to 0.34 mg/l. where as in the surface water the fluoride was in range of 0.15 to 0.3 mg/l. During post monsoon 2016, in the ground water samples of study area, the fluoride value were in the range of 0.21 to 0.28 mg/l. Whereas in the surface water the fluoride was in range of 0.22 to 0.32mg/l.

➢ From the above results, for both the seasons 2013 and 2016, all surface and ground water samples are meeting the norms as per IS: 2296-1992 inland surface water Standards and IS: 10500- 2012 limits for ground water respectively, it can be concluded that the ground and surface water were found to be fit for human use purpose.

1.4 Noise Environment

1.4.1 Sources of Noise

The main sources of noise in the study area are domestic activities, industrial activities and vehicular traffic.

1.4.2 Noise Levels in the study area

Baseline noise levels have been monitored at 10 locations within the study zone, using a spot noise measurement device. Random noise level measurement locations were identified for assessment of existing noise level status, keeping in view of the land use pattern, residential areas in villages, schools, bus stands, etc. The day levels of noise were monitored during 6 AM to 9 PM and the night levels during 10 PM to 6 AM. The noise monitoring stations are shown in **Table 1.9 & Figure 1.6.** The results for comparison of summer 2013 and post monsoon Season 2016 - Noise Levels in the study area are presented in **Table 1.10.**

Table 1.9
Noise Monitoring Locations

S. No	Code	Name of the Station	W.R.T. Site		Latitude (North)	Longitude (East)
			Direction	Distance (km)		
1	N1	Site	-	0	27° 17'33.48"	95° 48' 53.34"
2	N2	Ledo	W	6.5	27° 17' 51.84"	95° 44' 34.32"
3	N3	Paharpur	NE	6.0	27° 19' 16.92"	95° 52' 03.06"
4	N4	Tipang	SE	7.3	27° 15' 38.16"	95° 53' 05.22"
5	N5	Brahamacamp	NWN	1.6	27° 18' 52.26"	95° 48' 09.48"
6	N6	Lekhapani	NE	2.2	27° 19' 13.26"	95° 49' 43.32"
7	N7	Hasak	NEN	7.5	27° 21' 46.08"	95° 48' 57.54"
8	N8	Etakhala	W	5.0	27° 17' 47.94"	95° 45' 31.74"
9	N9	Pasegaon	NW	3.0	27° 18' 25.02"	95° 47' 17.46"
10	N10	Kambagaon	W	2.0	27° 17' 53.04"	95° 47' 39.48"

Figure 1.6
Sampling locations Map – Noise

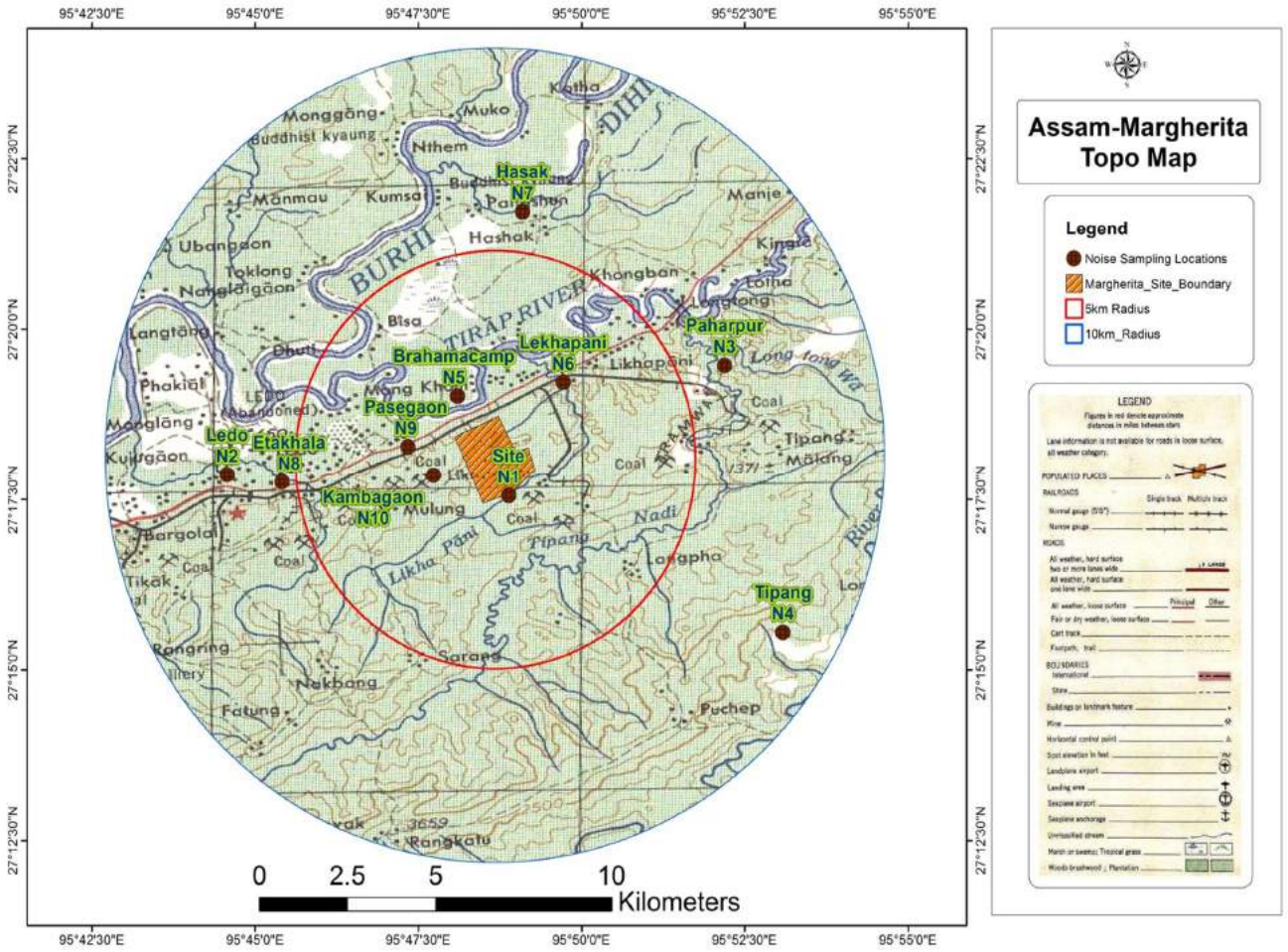


Table 1.10
Comparison of Noise Levels in the Study Area – dB (A)

Location	N1		N2		N3		N4		N5		N6		N7		N8		N9		N10	
Hours	Site		Ledo		Paharpur		Tipang		Brahamacamp		Lekhapani		Hasak		Etakhala		Pasegaon		Kambagaon	
	2013	2016	2013	2016	2013	2016	2013	2016	2013	2016	2013	2016	2013	2016	2013	2016	2013	2016	2013	2016
Min	40.4	40.9	41.9	42.3	41.4	41.2	41.6	41.4	41.2	41.1	40.9	42.3	41.1	41.7	41.2	40.6	42.6	42.1	40.8	40.6
Max	55.8	55.9	56.7	59.6	55.1	56.5	53.3	58.1	52.1	56.7	57.4	58.7	53.9	57.2	53.8	57.4	54.6	57.7	54.6	57.2
Lday	52.6	53.1	55.6	55.9	53.1	53.4	53.2	54.6	54.1	54.5	54.2	54.7	53.0	54.1	53.9	53.8	53.1	54.8	53.9	54.1
Lnight	41.5	42.5	42.1	43.4	41.8	42.6	42.5	42.8	42.4	43.4	41.8	44.4	41.2	43.3	41.7	42.2	42.5	43.5	41.9	42.1

1.4.3 Regional Scenario Comparison for Summer 2013 and Post Monsoon 2016 data

In summer season 2013, day equivalents are ranging in between 52.6 to 55.6 dB (A) and the night equivalents were in the range of 41.2 to 42.5 dB (A). Whereas in post monsoon season 2016, day equivalents are ranging in between 53.1 to 55.9 dB (A) and the night equivalents were in the range of 42.1 to 44.4 dB (A). From the above results it can be seen that Day equivalents and Night equivalents for 2013 and 2016 datas were within the Ambient Noise standards of residential and industrial area standards.

1.5 Traffic Study

Traffic studies are required to assess the traffic density pattern of the region and to assist the project proponent in planning effective vehicular movement through proper management plan during the project activity.

The methodology adopted for carrying out the traffic study was to select the major roads around the project site and count the various categories of vehicles moving on these roads. The site is accessible by a NH 38 which is 24 feet wide while the inner road into the site is 12 feet wide. The traffic survey was carried out at Tipang Village towards Margherita to Jagun.

Table 1.11

Summer 2013 Traffic Survey at Tipang Road

Hours	Two wheeler		Three wheelers		Passenger cars		Medium vehicles, lorries and buses		Total	
	V/hr	@0.75 PCU	V/hr	@2 PCU	V/hr	@1 PCU	V/hr	@3.7 PCU	Total	Total@ PCU/hr
6-7 am	45	34	26	52	14	14	18	67	103	166
7-8 am	98	74	78	156	45	45	48	178	269	452
8-9 am	184	138	168	336	68	68	63	233	483	775
9-10 am	285	214	264	528	93	93	78	289	720	1123
10-11 am	369	284	341	601	124	125	112	340	946	**1350**
11-12 pm	345	259	274	548	136	136	102	377	857	1320
12-1 pm	275	206	198	396	124	124	86	318	683	1044
1-2 pm	258	194	163	326	89	89	74	274	584	882
2-3 pm	189	142	146	292	79	79	69	255	483	768
3-4 pm	265	199	224	448	117	117	78	289	684	1052
4-5 pm	386	290	278	556	143	143	94	348	901	1336
5-6 pm	347	260	207	414	78	78	63	233	695	985
6-7 pm	278	209	213	426	48	48	57	211	596	893
7-8 pm	234	176	158	316	36	36	41	152	469	679
8-9pm	142	107	124	248	27	27	23	85	316	467
9-10pm	96	72	64	128	18	18	18	67	196	285
10-11pm	53	40	26	52	12	12	16	59	107	163
11pm-12am	28	21	14	28	8	8	11	41	61	**98**
The highest peak observed is 1350 PCU/hr during 10 am to 11 am										
Total width of the road in meters (Arterial Roads)										**7**
Carrying capacity of the road (the road is 2 lane 2 way road) PCU/Hr										**1500**
As per IRC ; 106-1990 (PCU's per hour)										
Passenger Car Unit (PCU) **Indian road congress (IRC)**										

Table 1.12

Post Monsoon 2016 Traffic Survey at Tipang Road

Hours	Two wheeler		Three Wheeler		Passenger cars &Pick-up Vans		Heavy commercial Vehicles (HCV)		Total vehicles	
	v/hr	PCU/hr	v/hr	PCU/hr	v/hr	PCU/hr	v/hr	PCU/hr	Total	Total PCU/hr
6-7 am	49	37	28	56	18	18	21	78	116	188
7-8 am	102	77	81	162	48	48	50	185	281	472
8-9 am	182	137	172	32	71	71	64	237	489	476
9-10 am	286	215	271	542	95	95	81	300	733	1151
10-11 am	350	262	312	624	114	114	99	366	875	**1366**
11-12 pm	348	261	282	564	142	142	105	389	877	1356
12-1 pm	280	210	194	388	132	132	88	326	694	1056
1-2 pm	263	197	175	350	103	103	76	281	617	931
2-3 pm	194	146	152	304	87	87	71	263	504	799
3-4 pm	270	203	228	456	118	118	82	303	698	1080
4-5 pm	391	293	272	544	153	153	103	381	919	1371
5-6 pm	352	264	212	424	86	86	66	244	716	1018
6-7 pm	283	212	223	446	53	53	59	218	618	930
7-8 pm	239	179	161	322	42	42	48	178	490	721
8-9pm	147	110	132	264	32	32	32	118	343	525
9-10pm	98	74	68	136	22	22	23	85	211	317
10-11pm	55	41	28	56	14	14	18	67	115	178
11-12am	30	23	16	32	10	10	13	48	69	**113**
The highest peak observed is 1366 PCU/hr during 10 am to 11 am										
Total width of the road in meters (Arterial Roads)										7
Carrying capacity of the road (the road is 2 lane 2 way road) PCU/Hr										1500
As per IRC ; 106-1990 (PCU's per hour)										

Road	Towards	Volume (V) PCU's/hr (Worstcase)		Capacity (C)PCU's/hr	Existing V/C	Level of service
NH 38	Margherita to Jagun	**2013**	**2016**	1500	**2013**	**2016**
		1350	1366		0.9	E
					0.91	E

V/C	Level of service	Performance	V/C
0.0 – 0.2	A	Excellent	0.0 – 0.2
0.2 - 0.4	B	Very good	0.2 - 0.4
0.4 - 0.6	C	Average	0.4 - 0.6
0.6 - 0.8	D	Poor	0.6 - 0.8
0.8 - 1.0	E	Very Poor	0.8 - 1.0

During the summer 2013, the minimum level of Traffic Survey at Tipang Road was 98 PCU/hr and whereas the maximum level of Traffic Survey was 1350 PCU/hr. The total worst case baseline PCU/hr for summer 2013 is 1350, whereas in 2016 post monsoon, the minimum level of Traffic Survey at was 113 PCU/hr and whereas the maximum level of Traffic Survey was 1366 PCU/hr.

The highest peak of traffic was observed during 10am – 11am in both the years of 2013 & 2016, whereas PCU's slightly increased in 2016 period (i.e. from 1350 to 1366) and the level of service of the road was E for both the years. Hence there was not much difference in traffic. Vehicular traffic is presently predominant due to two wheelers followed by three wheelers, traffic due to commercial vehicles and buses were minimal.

1.6 Soil Quality

1.6.1 Soil Sampling Locations

Details of the soil sampling locations and are given in **Table 1.13.** Comparison of summer 2013 (April-June) and post monsoon season 2016 (September -November) soil analysis results are shown in **Table 1.14.**

Table 1.13
Soil Sampling Locations

Code	Name of the Station	Elevation in (m)	W.R.T. Site		Latitude (North)	Longitude (East)
			Direction	Distance(km)		
S1	Site	122	-	0	27° 17' 33.48"	95° 48' 53.34
S2	Ledo	138	W	6.5	27° 17' 44.22"	95° 44' 17.16
S3	Paharpur	162	NE	6.0	27° 19' 16.92"	95° 52' 3.66"
S4	Tipang	140	SE	7.3	27° 15' 38.22"	95° 53' 5.22"
S5	Brahamacamp	126	NWN	1.6	27° 18' 49.26"	95° 48' 10.44"
S6	Lekhapani	139	NE	2.2	27° 19' 13.26"	95° 49' 43.32"
S7	Hasak	146	NEN	7.5	27° 21' 46.08"	95° 48' 57.54"
S8	Etakhala	135	SW	5.0	27° 17' 47.94"	95° 45' 31.74"
S9	Pasegaon	123	NW	3.0	27° 18' 25.02"	95° 47' 17.52"
S10	Kambagaon	120	W	2.0	27° 17' 53.04"	95° 47' 39.48"

Figure 1.7
Sampling locations Map – Soil

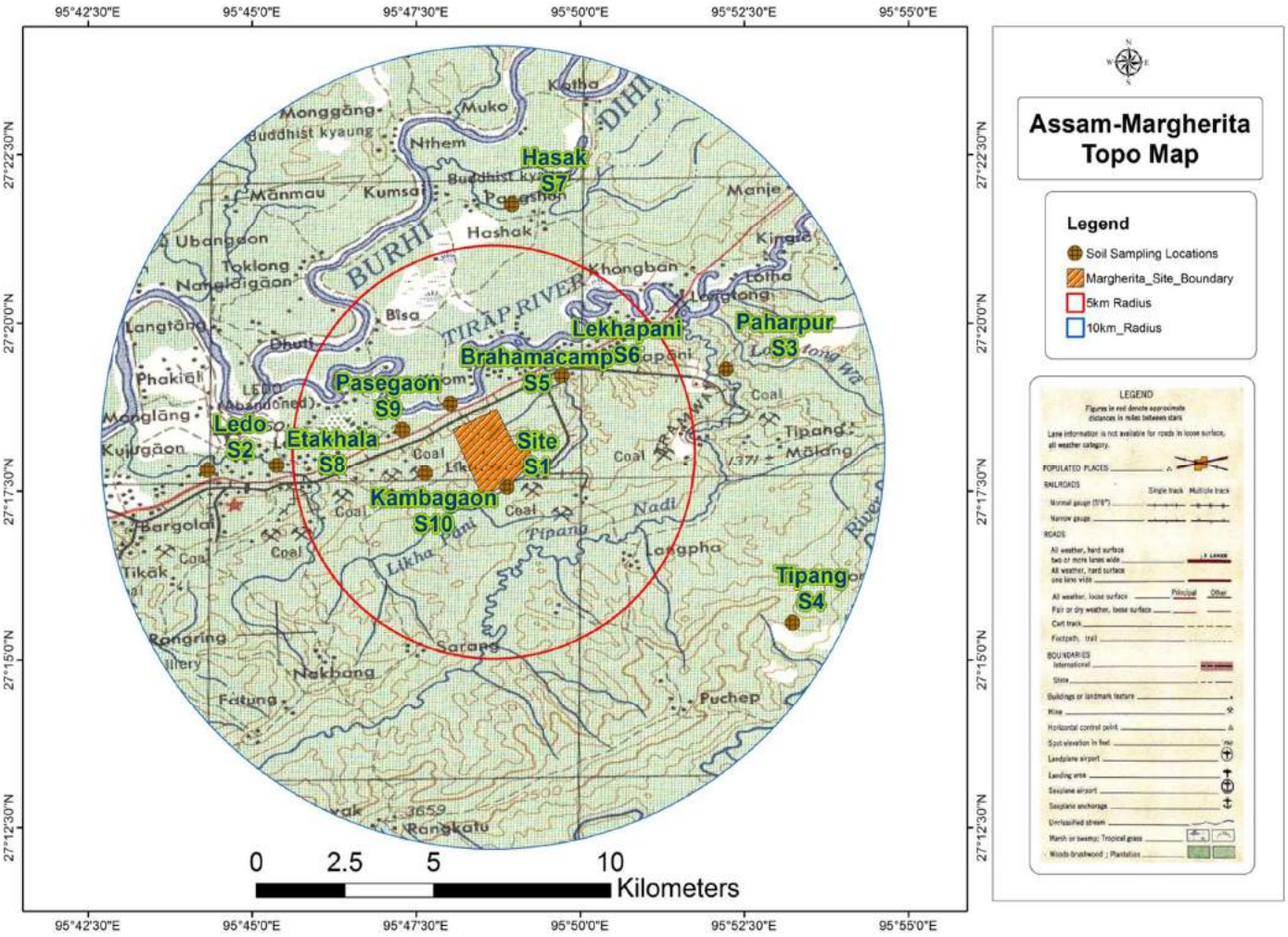


Table 1.14

Comparison of Soil Analysis Results

Parameter	Unit	Site (S1)		Ledo (S2)		Pasegaon (S3)		Tipang (S4)		Brahamacamp (S5)		Standard Soil Classification – (Indian Council of Agricultural Research, New Delhi)
		2013	2016	2013	2016	2013	2016	2013	2016	2013	2016	
Color		Brown	Brown	Light Yellow	Light Yellow	Grey	Grey	Brown	Brown	Brown	Brown	
Texture		Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	
pH (1: 5 extraction)	--	6.5	7.3	6.5	6.9	6.4	7.1	7.2	6.9	6.5	7.1	Acidic<6.0, Normal to Saline 6.0-8.5, Tending to become Alkaline 8.6 to 9.0, Alkaline above 9.
EC (1: 5 extraction	µs/cm	139	127	169	175	194	159	123	142	146	144	Normal<1000, Critical for germination 1000-2000, Critical for growing 2000 - 4000, Injurious to most crops>4000
Organic Carbon	%	0.46	0.60	0.72	0.70	0.68	0.50	0.51	0.70	0.5	0.6	Low < 0.5 , Medium 0.5 – 0.75, High > 0.75
Sodium as Na	mg/kg	359	312	437	443	433	387	324	343	386	434	-
Available Nitrogen as N	kg/ha	237	288	270	374	289	282	255	299	230	284	Low below 280, Medium 280-560, High above 560
Available Potassium as K	kg/ha	25.7	29.0	35.0	42.0	26.8	29.0	30.8	32.0	28.9	26.0	Low below 110, Medium 110-280 High above 280
Available Phosporus as P	kg/ha	28.8	22.0	35.6	28.0	11.3	13.0	25.2	22.0	23.4	22.0	Low below 10, Medium 10-25,High above 25
Calcium as Ca	mg/kg	2750	2556	3550	3645	4030	3376	2895	3243	3256	2987	
Magnesium as Mg	mg/kg	1910	987	2380	2123	2570	2233	2245	2332	2457	1978	
Lead as Pb	mg/kg	1.10	1.20	1.28	1.40	0.9	0.8	0.85	0.90	0.74	0.80	
Chromium as Cr	mg/kg	1.91	1.50	2.89	2.10	2.0	1.8	1.96	1.40	1.84	1.60	
Zinc as Zn	mg/kg	76.1	54.0	101.1	93.0	136.1	77.0	123.0	86.0	88.6	67.0	

Parameter	Unit	Lekhapani (S6)		Hasak (S7)		Etakhala (S8)		Paharpur (S9)		Kambagaon (S10)		Standard Soil Classification – (Indian Council of Agricultural Research, New Delhi)
		2013	2016	2013	2016	2013	2016	2013	2016	2013	2016	
Color		Grey	Grey	Grey	Grey	Brown	Brown	Brown	Brown	Brown	Brown	
Texture		Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	
pH (1: 5 extraction)	--	6.5	6.9	7.3	7.2	6.5	6.9	6.5	6.8	6.5	7.2	Acidic<6.0, Normal to Saline 6.0-8.5, Tending to become Alkaline 8.6 to 9.0, Alkaline above 9.
EC (1: 5 extraction	µs/cm	129	126	142	128	154	135	165	135	138	124	Normal<1000, Critical for germination 1000-2000, Critical for growing 2000 - 4000, Injurious to most crops>4000
Organic Carbon	%	0.47	0.70	0.57	0.50	0.55	0.60	0.52	0.40	0.56	0.60	Low < 0.5 , Medium 0.5 – 0.75, High > 0.75
Sodium as Na	mg/kg	426	367	286	298	306	302	312	294	325	289	
Available Nitrogen as N	kg/ha	235	288	243	280	228	302	242	323	215	283	Low below 280, Medium 280-560, High above 560
Available Potassium as K	kg/ha	32.1	38.0	41.8	35.0	32.1	28.0	33.8	34.0	63.2	58.0	Low below 110, Medium 110-280 High above 280
Available Phosporus as P	kg/ha	25.1	21.0	15.9	14.0	25.1	19.0	18.4	16.0	17.3	16.0	Low below 10, Medium 10-25,High above 25
Calcium as Ca	mg/kg	3145	2856	3845	3054	2946	2567	3654	3143	3142	2987	
Magnesium as Mg	mg/kg	2687	1867	2854	1967	1844	1545	2454	1756	2125	1876	
Lead as Pb	mg/kg	0.89	0.90	0.96	0.70	0.91	0.80	0.94	0.70	0.82	0.90	
Chromium as Cr	mg/kg	1.95	1.50	2.42	1.80	2.13	1.70	1.74	1.50	2.04	1.50	
Zinc as Zn	mg/kg	68.6	53.0	72.4	52.0	65.3	48.0	62.3	58.0	75.5	54.0	

1.6.2 Regional Scenario Comparison for Summer 2013 and Post Monsoon 2016 data

The analytical results of the soil samples collected during the study period are summarized below.

- During summer season 2013, Soil samples collected from the study area, pH values in the study area were varying from 6.46 to 7.35. Whereas in Post Monsoon 2016, pH values in the study area were varying from 6.8 to 7.3 During both the periods pH of all the samples were in normal to saline range.
- During summer season 2013, electrical conductivity levels in soil samples collected in the study were varying from 123 to 194 µmhos/cm. Whereas in the Post Monsoon 2016, electrical conductivity in the study area was varying from 124 to 175 µmhos/cm indicating that EC levels in soil falling under Normal category for both the season.
- During summer season 2013, organic carbon levels in the study area were varying from 0.46 to 0.72 %. Whereas in Post Monsoon 2016, organic carbon levels in the study area were varying from 0.4 to 0.7 %, indicating that organic carbon levels in soil falling under low to medium range for both the seasons.
- During summer season 2013, available Nitrogen as N in the study area is varying from 215 to 289 kg/ha.Whereas in Post Monsoon 2016, available Nitrogen as N in the study area is varying from 280 to 374 kg/ha, indicating that available Nitrogen levels in soil falling under low to medium range for both the seasons.
- During summer season 2013, in the study area available Phosphorus is varying from 11.3-35.6 kg/ha.Whereas in Post Monsoon 2016, available Phosphorus in study area is varying from 13-28 kg/ha, which indicates that the available phosphorus levels in soil falling in medium category for both the seasons.
- During summer season 2013, available potassium in the study area is varying between 25.7 to 63.2 kg/ha. Whereas in the post monsoon season 2016, available potassium in the study area is varying between 26 to 58 kg/ha which indicates all samples are falling under lower category for both the seasons.

The baseline study photographs for summer season 2013 and post monsoon 2016 are given in **Figure 1.8** & **1.9** respectively.

Figure 1.8
Baseline Study Photographs for Summer Season 2013

AAQ monitoring at Ledo

Ground water sampling at Brahama Camp

Soil sampling at project site

Noise monitoring at Lekhapani

Traffic studies for NH 38 & NH 153

Flora fauna studies at Hasak

Socio-economic studies at Pasegaon

Discussion with Shri. S.K.Thakruia, ACF, Digboi Forest Division

Figure 1.9
Baseline Study Photographs for Postmonsoon season 2016


AAQ monitoring at study area


Soil sampling at study area


Surface & Ground water sampling at study area

Ambient Noise monitoring at study area

Traffic Study monitoring at study area