



**REPORT ON ENVIRONMENTAL BASELINE STUDIES  
AROUND PIMPERKUNTA EXPLORATION BLOCK,  
BHEEMPUR MANDAL, ADILABAD DISTRICT, TELANGANA  
STATE**

**( Part-B: Environmental Baseline studies )**



By

**K. Rajasekhar Reddy, GM (Mining) & his officers Team**

Telangana State Mineral Development Corporation Limited

(A State Government Undertaking)

6-2-915, HMWSSB Premises, Rear Block, 3rd floor, Khairatabad, Hyderabad – 500004

**Hyderabad  
November 2022**

## Part-B: Environmental Baseline studies

### Report on Environmental Baseline studies around Pimperkunta Block, Bheempur Mandal, Adilabad District, Telangana State

Chapter	Contents	Page No
	<b>Executive Summary</b>	1-6
<b>CHAPTER – I</b>	<b>Introduction</b>	
1.1	Scope and Objective of work	7
1.2	Location and Accessibility of Study Area	7
1.3	Environmental Baseline Study Work Plan	9
<b>CHAPTER – II</b>	<b>Geomorphology, Land use and Biota (Flora &amp; Fauna)</b>	
2.10	Geomorphology	10
2.20	Land Use and Land Cover	11
2.30	Biota (Flora and Fauna)	14
<b>CHAPTER- III</b>	<b>Meteorology</b>	
3.1	Methodology	15
3.2	Temperature	15
3.3	Rainfall	16
3.4	Humidity	17
3.5	Wind	17
<b>CHAPTER – IV</b>	<b>Ambient air quality monitoring</b>	
4.1	Air Quality Monitoring Stations and Methodology	20
4.2	Data Generation	22
4.3	Observation on Air Quality Generated Data	24
<b>CHAPTER-V</b>	<b>Noise Level</b>	
5.1	Noise Level Monitoring Stations and Methodology Adopted	26
5.2	Data Generation	28
5.3	Observation on Results	28
<b>Chapter – VI</b>	<b>Soil</b>	
6.1	Description of Soil in Study area	29
6.2	Soil Sampling Methodology	29
6.3	Physico-Chemical Parameters Analyzed	32
6.4	Soil Quality Generated Data	32
6.5	Observation on Soil Quality Generated Data	38
<b>Chapter – VII</b>	<b>Water Regime</b>	
7.1	Methodology and Water Sample Location Detail	39
7.2	Data Generation	42
7.3	Observation on Surface and Ground Water Quality	48
<b>Chapter – VIII</b>	<b>Socio Economic Profile</b>	
8.1	Demography	51
8.2	Employment Pattern	52
8.3	Infrastructural and Public Utility Facilities	53
8.4	Religion, Language and Culture	54

Tables		
Table-2.1	List of Mandals and Villages in Adilabad District falling within study area of 10 kilometers radius	11-12
Table-2.2	Details of Land use / land cover classes in the study area	12
Table-2.3	The details of mining lease falling in the study area	13
Table-3.1	Month Wise Yearly Rainfall Data (2011-2021) Bheempur Mandal, Adilabad District, Telangana	16
Table-3.2	Shows the rainy days and % of total rainfall in four seasons of the year 2021	17
Table-3.3	Shows the mean rain fall and % of total rainfall in four seasons of the year 2021	17
Table-3.4	Frequency Distribution Wind Direction and Wind Speed recorded in Weather Station at Pimperkunta	18
Table-4.1	Location Details of Ambient Air Quality Stations in study area	20
Table-4.2	Air quality Data recorded at Pimperkunta Exploration Block (Station-A1)	22
Table-4.3	Air quality Data recorded at Pimperkunta Village (Station-A2)	22
Table-4.4	Air quality Data recorded at Nippani Village (Station-A3)	22
Table-4.5	Air quality Data recorded at Ghotkuri Village (Station-A4)	23
Table-4.6	Air quality Data recorded at Jamdapur Village (Station-A5)	23
Table-4.7	Air quality Data recorded at Guda Village (Station-A6)	23
Table-4.8	Air quality Data recorded at Khapparla Village (Station-A7)	24
Table-4.9	Summarized Air Quality Data Range for Station A-1 to A-7 in Study Area	24
Table-4.10	National Ambient Air Quality Standards Notified by Central Pollution Control Board	25
Table-5.1	Details of Noise Level Monitoring Stations Location and source of Noise in Study area	26
Table-5.2	Details of Noise Level Monitoring in Study Area	28
Table-5.3	Standard Acceptable Noise Level In dB	28
Table-6.1	Location details of Soil sample Sites in Study Area	30
Table-6.2	List of Physico-Chemical Parameters analyzed and method of analysis	32
Table-6.3	Soil Quality Data for Physical parameters of Soil Samples collected in the study area	33-35
Table-6.4	Soil Quality Data for Chemical parameters of Soil Samples collected in the study area	35-37
Table-6.5	Summarized Soil Quality Data Range for Soil Samples Drawn at different depths from Each Sample sites in the Study Area	37-38
Table 6.6	Grain Size Distribution Chart Based on Average Percentage of Grain size to a depth of 90 cm for each Sample sites in the Study Area	38
Table-7.1	Details of Water sample Collected in Study area	40
Table-7.2	The parameters analyzed and analytical methods Used	42
Table-7.3	Surface water physical and chemical analytical results data for Post Monsoon period drawn during 6 <sup>th</sup> January to 9 <sup>th</sup> January	43-44

	2021 in the study area	
Table-7.4	Surface water physical and chemical analytical results data for Pre Monsoon period drawn during 25 <sup>th</sup> June to 27 <sup>th</sup> June 2021 in the study area	44-45
Table-7.5A&B	Ground water physical and chemical analytical results data for Post Monsoon period drawn during 6 <sup>th</sup> January to 9 <sup>th</sup> January 2021 in the study area	45-47
Table-7.6A &B	Ground water physical and chemical analytical results data for Pre Monsoon period drawn during 25 <sup>th</sup> June to 27 <sup>th</sup> June 2021 in the study area	47-48
Table-7.7	Range of concentration of values in Surface Water samples of various parameters during Post and Pre Monsoon Period in the study area along with prescribed limit	49
Table-7.8	Range of concentration of values in Ground Water samples of various parameters during Post and Pre Monsoon Period in the study area along with prescribed limit	50
Table-8.1	Summary of information on the demographic attributes of study area.	52
Table-8.2	Percentage of Employment data in Study Area	53
<b>Figures</b>		
Figure-1	shows the Location of study area on topographical map	8
Figure-2	Shows Wind Speed and Direction Diagram from data recorded in Weather Station at Pimperkunta village	19
Figure-3	Location Map of Air Quality Monitoring Stations in study area	21
Figure-4	Location Map of Noise Monitoring Stations in Study Area	27
Figure-5	Location Map of Soil Sample sites in Study Area	31
Figure-6	Location Map of surface and ground water Samples in study area	41
<b>Photographs</b>		
Photo-1	Photo of Micrometeorological station point	55
Photo-2	Photographs of water sample collection	56
Photo-3	Photographs of Soil sample collection	57
Photo-4	Photograph of soil pit measurement	57

## EXECUTIVE SUMMARY

Telangana State Mineral Development Corporation Limited (TSMDC) has carried out General exploration (G-3/G-2) stage exploration for Manganese in Pimperkunta block at Pimperkunta village, Bheempur Mandal, Adilabad District, Telangana during 2020-2021 over an area of 0.50 Sq km. As per Government of India during this stage of exploration it is mandatory to collect baseline environmental data around 10 km radius from the center of the exploration block. The present baseline environmental studies have been carried out within a zone of 10 km radius from the center of the Pimperkunta manganese exploration block which includes core zone, the zone within 3 km radius from the center of the exploration block. This is based on the assumption that impact of mining would be maximum within 3 km radius zone and would be absolved within 10 km radius zone in case mining comes up on the basis of present exploration program. A zone of 10 km radius study area covers a total area of 31440.61 hectare falling in States of Telangana and Maharashtra. Maharashtra state area is around 2219.01 hectare thus area falling within Telangana state comes to around 29221.60 hectare where present environment baseline study has been carried out. The study area falls in survey of India toposheet number 56I/5, I/6, I/9, I/10.

The environmental studies were carried out in the form of primary data generation for attributes like meteorology, air quality, noise level, soil and water samples from the specific locations within the study area and collection of long term secondary data for attributes like Geology, Geomorphology, Meteorology, Biota, Socio-Economics from different sources including Primary Census data, Village & Town Directories and other Government/ departmental publication and websites. The generation and collection of baseline environmental data was to be carried out simultaneously with the other exploration activities. The soil and water sample collected from study area were analyzed at NABL accredited chemical laboratory M/s. Lucid laboratory Pvt. Ltd in Hyderabad. The salient summary of observations based on the present study is as follows.

**Geology, Geomorphology:** Study area comprises mostly of litho-units of Penganga basin sediments overlain by Deccan Traps. Landform regionally forms mostly moderate to gently sloping undulating terrain with isolated hill mass of  $\Delta 1031$  in the west and the hillock  $\Delta 1067$  in the east providing relief in an otherwise low rolling country of sedimentary rocks.

**Land use/Land Cover:** Out of present study total land area of 29221.60 ha govt land is 5329.20 ha (18.20%), forest land 865.97 ha (3%), and Private land 23026.43 ha (78.80%). In private land mining lease area is about 2.8% of private land.

**Biota:** The study area forms part of Adilabad district. Adilabad district is a cradle of biodiversity. It is dry deciduous forests and home to a host of rich flora and safe haven for hundreds of fauna species including endangered long-billed vultures and tigers. Present study area do not have any dense forest and do not have any endangered species of fauna but have rich flora.

**Meteorology:** Both macro and micro meteorological data collected from study area indicates that the minimum temperature in summer varies from 24.2°C to 38, in winter from 11.9 to 25.8. The long term relative humidity data collected from Telangana Govt. website show that during morning time the relative humidity varies between 54% to 87%. While during evening time it varies between 43 – 85%. The annual mean relative humidity at 8.30 hrs. is 71% while at 17.30 hrs. it is 64% only. The relative humidity data collected from installed weather station at Pimperkunta village showed that during 06.0 to 12.0 hrs. the relative humidity varies between 04.04 to 73.09 % (Average 18.30 %) ; from 12.05 hrs. to 18.00 hrs. the relative humidity ranged from 13.08 to 82.95 % (Average 30.60 %) and from 18.05 hrs. to 06.00 hrs. the relative humidity ranged from 16.14 to 78.04 % ( Average 47.05 %) relative humidity in the morning is 72.87% and in evening it is 46.30%.

The study area mostly receives rainfall during southwest monsoon. State Government data showed average total rainfall in a year is 1342.40 mm and rainfall during monsoon period is 1113 mm.

The examination of the long term data of Ramagundam observatory shows that the most notable wind directions are southwest (19%) southeast (11%), west (10%) and northeast (10%) with 36% time wind is calm and average annual wind speed is 3.6 kmph.

Frequency Distribution of Wind Speed and Direction in Percent recorded in Weather Station at Pimperkunta (Period: March – May, 2021).

Wind speed	No of Observation Frequency									Total
(Km/hr)	N	NE	E	SE	S	SW	W	NW	Calm%	
1 – 5	22.06	4.21	0.36	0.41	0.54	0.14	0.50	0.63	23.96	28.85
6 – 10	25.0	5.34	0.18	0.27	0.41	0.05	0.18	0.54		31.97
11 – 15	4.89	0.95	0.18	0.23	0.14	0.09	0.05	0.05		6.57
➤ 15	8.15	0.32	0.0	0.05	0.09	0.0	0.0	0.0		8.65
<b>Total %</b>	<b>60.10</b>	<b>10.82</b>	<b>0.72</b>	<b>0.95</b>	<b>1.18</b>	<b>0.27</b>	<b>0.72</b>	<b>1.27</b>	<b>23.96</b>	<b>100</b>

Note: Calm = V<1.0 km/hrs.

**Air Quality:** The Data were collected during 8.0 hrs. in morning to 18.0 hrs. in evening. The range of various pollutants are: SO<sub>2</sub> (from 4.43 to 10.01 µg/m<sup>3</sup>), NO<sub>3</sub> (from 6.17 to 11.60 µg/m<sup>3</sup>), CO (from 0.07 to 0.09 mg/m<sup>3</sup>), Respirable Particle Matter (RPM) PM-10 (from 42.14 to 61.28 µg/m<sup>3</sup>) and RPM PM-2.5 (from 16.57 to 32.43 µg/m<sup>3</sup>).

If we analyze the data all the gaseous pollutants viz SO<sub>2</sub>, NO<sub>x</sub> and CO and RPM of PM-10 and PM 2.5 show concentration well within the prescribed limit notified by Central Pollution Control Board (CPCB). The Table 4.10 provides the National Ambient Air Quality Standards notified by CPCB.

**Noise Level:** The noise level in study area range from 49 to 76dB. The study area exposed to various noises sources like village activity, rural transportation centers and open cast mining activity etc., are mostly within the prescribed limits but in few places locally in certain time it is >70db.

**Soil:** Summarized Soil Quality Data Range for Soil Samples Drawn at different depths from Each Sample sites in the Study Area is given below:

Sl. No.	PARAMETERS	RANGE OF Soil QUALITY DATA			
		DEPTH OF SAMPLE			TOTAL (30-90 cm)
		AT 30 cm	AT 60 cm	AT 90 cm	
1)	Bulk Density (g/c.c)	0.6354 – 1.1137	0.717 – 1.0531	0.6013 – 1.1028	0.717 – 1.1137
2)	Electrical Conductivity (EC)µs/cm	40.4 – 495	49.5 – 285	51.5 – 411	40.4 – 495
3)	pH value	5.6 – 8.1	5.5 – 8.3	7.4 – 8.9	5.5 – 8.9
4)	Nitrogen as N (%)	0.02 – 0.19	0.02 – 0.22	0.03 – 0.21	0.02 – 0.22
5)	Organic Matter (%)	0.04- 2.75	0.02 – 2.85	0.03 – 2.85	0.02 – 2.85
6)	Potassium as K <sub>2</sub> O (%)	0.16 – 0.57	0.10 – 0.46	0.10 – 0.47	0.10 – 0.57
7)	Phosphorous as P <sub>2</sub> O <sub>5</sub> (%)	0.22 – 3.54	0.29 – 2.14	0.12 – 2.41	0.12 – 3.54
8)	SAR	1.07 – 4.47	0.42 – 16.46	0.90- 25.68	0.42 – 25.68
9)	Iron as Fe(%)	0.47 – 3.39	0.40 – 3.52	0.50 – 3.32	0.40 – 3.52
10)	Molybdenum Mo(mg/kg)	<0.1 - <0.1	<0.1 - <0.1	<0.1 - <0.1	<0.1 - <0.1
11)	Manganese as Mn (%)	0.07 – 3.54	0.08 – 3.12	0.07 – 3.97	0.07 – 3.97
12)	Porosity	0.54 – 0.75	0.58 – 0.71	0.58 – 0.76	0.54 – 0.76
13)	Temperature (°C)	-	-	-	-
14)	Specific Gravity	2.39 – 2.60	2.37 – 2.60	2.3 – 2.61	2.3 – 2.61

If we analyze the soil quality data and grain size data provided in table 6.4 and 6.6 respectively the soil in the study area mostly fall in the sandy loam, loam, sandy clay loam and silty loam type. As it has got pH value ranging from 6.5 to 8 it is good for sustaining plant growth.

**Water Regime:** The quality of surface water and ground water in the study area is within permissible limit prescribed in general is good, potable and suitable for irrigation and domestic usage purpose. Water containing calcium carbonate at concentrations below 60 mg/l is generally considered as soft; 60–120 mg/l, moderately hard; 120–180 mg/l, hard; and more than 180 mg/l, very hard (McGowan, 2000). As most of surface and ground water showed > 150 mg/l calcium carbonate concentration the water in the area is considered as of hard to very hard.

Range of concentration of values for various parameters in Surface and Ground Water samples in the study area along with prescribed limit is provided below.

#### Surface Water:

Sl. No	Parameters	Post Monsoon		Pre Monsoon		Drinking Water Desirable limit (mg/l)	Drinking Water Permissible limit(mg/l)
		Min.	Max	Min	Max	IS: 10500 (1991)	IS: 10500 (1991)
Physical Parameters							
1	Colour, Hazen units	1	200	1	210	-	-
2	P <sup>H</sup> value	7.4	8.4	7.2	7.5	6.5 to 8.5	No relaxation
3	Total dissolved Solids(mg/l)	246	994	160	732	500	2000
4	Turbidity, NTU	0.6	4.2	0.27	1.59	-	-
5	Odour	Agreeable	Agreeable	Agreeable	Agreeable	-	-
Chemical Parameters							
6	Aluminium as Al (mg/l)	0.04	0.18	<0.01	4.6	-	-
7	calcium as Ca (mg/l)	25.6	98	14.3	75.4	75	200
8	Chloride as Cl (mg/l)	14	161	7.9	152.8	250	1000
9	Copper as Cu (mg/l)	0.02	0.07	<0.01	<0.01	-	-
10	Fluoride as F (mg/l)	0.21	0.72	<0.1	0.4	1.0	1.5
11	Free residual chlorine (mg/l)	<0.1	<0.1	<0.1	<0.1	-	-
12	Iron as Fe (mg/l)	0.05	0.23	<0.02	4.2	0.3	1.0
13	Magnesium as Mg (mg/l)	14.60	40.90	17.30	42.4	30	100
14	Manganese as Mn (mg/l)	0.06	0.20	<0.01	0.8	-	-
15	Nitrate as NO <sub>3</sub> (mg/l)	0.19	20.30	<1.0	18.30	45	No relaxation
16	Sulphate as SO <sub>4</sub> (mg/l)	17.48	30.62	<1.0	52.8	200	400



17	Total Alkalinity as calcium carbonate (mg/l)	136	364	87.4	285	200	600
18	Total hardness as CaCO <sub>3</sub> (mg/l)	150	384	102.10	346.50	300	600
19	Zinc as Zn (mg/l)	0.01	0.04	<0.01	0.10	-	-
20	Cadmium as Cd (mg/l)	<0.01	<0.01	<0.01	<0.01	-	--
21	Cyanide as CN (mg/l)	Nil	Nil	Nil	Nil	-	-
22	Mercury as Hg (mg/l)	<.0005	<.0005	<.0005	<.0005	-	-
23	Total Arsenic as As(mg/l)	<0.002	<0.002	<0.002	<0.002	-	-
24	Chromium as Cr (mg/l)	<0.01	<0.01	<0.01	<0.01	-	-
25	Total Selenium as Se (mg/l)	<0.002	<0.002	<0.002	<0.002	-	-

### Ground Water:

Sl. No	Parameters	Post Monsoon		Pre Monsoon		Desirable limit (mg/l)	Permissible limit(mg/l)
		Min.	Max	Min	Max	IS: 10500 (1991)	IS: 10500 (1991)
Physical Parameters							
1	Colour, Hazen units	1	1	1	1		
2	pH value	7.0	7.6	7.0	7.60	6.5 to 8.5	No relaxation
3	Total dissolved Solids(mg/l)	304	1376	516	1230	500	2000
4	Turbidity, NTU	<0.1	3.6	0.11	1.93		
5	Odour	Agreeable	Agreeable	Agreeable	Agreeable		
Chemical Parameters							
6	Aluminum as Al (mg/l)	0.02	0.13	<0.1	0.02		
7	calcium as Ca (mg/l)	65.70	143	56.10	196.40	75	200
8	Chloride as Cl (mg/l)	14	175	39.40	192.20	250	1000
9	Copper as Cu (mg/l)	<0.01	0.07	<0.01	0.02		
10	Fluoride as F (mg/l)	0.27	1.5	0.30	1.40	1.0	1.5
11	Free residual chlorine (mg/l)	<0.1	<0.1	<0.1	<0.1		
12	Iron as Fe (mg/l)	<0.02	0.49	<0.02	1.0	0.3	1.0
13	Magnesium as Mg (mg/l)	3.9	79.80	12.20	109.40	30	100
14	Manganese as Mn (mg/l)	0.02	0.11	<0.01	<0.01		
15	Nitrate as NO <sub>3</sub> (mg/l)	0.30	46.10	35.50	52.7	45	No relaxation
16	Sulphate as So <sub>4</sub> (mg/l)	8.54	59.11	25.10	82.20	200	400
17	Total Alkalinity as calcium carbonate (mg/l)	160	466	237.50	484.50	200	600
18	Total hardness as CaCo <sub>3</sub> (mg/l)	208	528	310	613.80	300	600
19	Zinc as Zn (mg/l)	<0.01	5.82	<0.1	1.90		
20	Cadmium as Cd (mg/l)	<0.01	<0.01	<0.1	<0.1		
21	Cyanide as CN (mg/l)	Nil	Nil	Nil	Nil		
22	Mercury as Hg (mg/l)	<.0005	<.0005	<.0005	<.0005		
23	Total Arsenic as As(mg/l)	<0.002	<0.002	<.002	<.002		
24	Chromium as Cr (mg/l)	<0.01	<0.01	<0.1	<0.1		
25	Total Selenium as Se (mg/l)	<0.002	<0.002	<0.002	<0.002		

**Socio Economic Profile:** Summary of information on the socio economic attributes of study area is provided below:

Sl. No.	Description	Total Study Area
1.	Number of villages	49
2.	Number of households	14,479
3.	Area	29221.60 hectare
4.	Population	<b>60,805 person</b>
	a) Male population	30,084
	b) Female population	30,721
	c) Density of population	194 (Person/sq. km.)
	d) Sex Ratio	1,022
5.	Child population (%)	
	a) Total population	6,557[10.78]%
	b) Male population	3,480[5.72]%
	c) Female population	3,066[5.06]%
6.	S C population	12, 846[21.12]
7.	S T population	8,889[14.61]
8.	Literacy Rate	
	a) Total population	33,185[54.57]
	b) Male literacy rate	19,217[65.31]
	c) Female literacy rate	14,009[45.60]
9.	Employment pattern	Main Workers (full time paid workers)47.65% of Population Marginal Workers (part time paid workers) 9.97% of Population Non workers (unpaid workers) 43.85% of Population
10	Infrastructure	well connected by roads, have good education institutions and medical facilities
11.	Language spoken	Telugu, Hindi, Marathi and Urdu. Gonds have their native tongue.
12.	Religion	Hinduism, Islam and Christianity

## **CHAPTER – I: INTRODUCTION**

### **1.1 Scope and Objective of work**

Environmental Baseline Study *surveys* determine the characterization of an area prior to the commencement of a new development Projects and establish the initial environmental status. Like any other area prior to the development of a projects, mining and allied activities also attract environmental issues, which need to be addressed at the beginning of mine planning stage itself by carrying out environmental baseline study survey. Keeping this in view, environmental baseline study has been included as one of the objectives while carrying out Preliminary Exploration/ General exploration (G-3/ G-2 stage) for manganese at Pimperkunta Block. This study is mandatory for completing the General Exploration stage (G-2) as per MEMC. Rule 2015/2021 for integrating environmental aspects/concerns into project planning and for obtaining environmental clearances. The study focus on defining the pre-existing environmental and social setting, within the immediate vicinity of the proposed Project as well as the surrounding landscape to determine characterization of an area prior to development of possible mining project of manganese in the block. The present report incorporates the results of the “Baseline Environmental Studies” carried out for the study area of 10 km radius of Pimperkunta Manganese block falling within Telangana state.

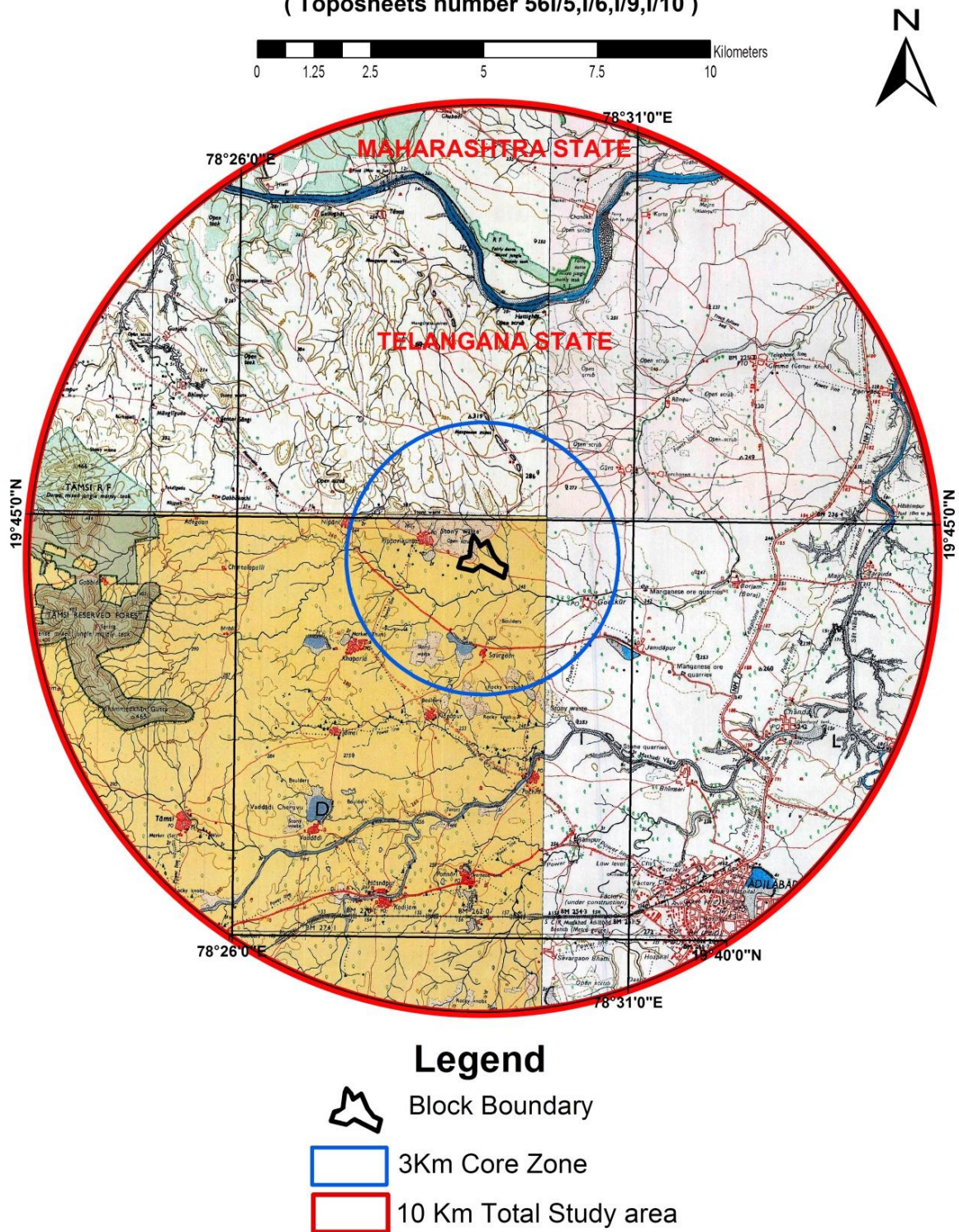
### **1.2 Location and Accessibility of Study Area**

The present baseline environmental studies have been carried out within a zone of 10 km radius from the center of the Pimperkunta manganese exploration block which is as per the guidelines of MOEF. A zone of 10 km radius includes core zone, the zone within 3 km radius from the center of the exploration block. This is based on the assumption that impact of mining would be maximum within 3 km radius zone and would be absolved within 10 km radius zone in case mining comes up on the basis of present exploration program.

A zone of 10 km radius covers a total area of 31440.61 hectare falling in States of Telangana and Maharashtra. Maharashtra state area is around 2219.01 hectare thus area falling within Telangana state comes to around 29221.60 hectare where present environment baseline study has been carried out. The study area falls in survey of India toposheets number 56I/5,I/6,I/9,I/10. Figure-1 shows the study area on topographical maps.

**Figure -1 : Location of the study area on topographical maps**

( Toposheets number 56I/5,I/6,I/9,I/10 )



Study area where G-3/G-2 stage exploration for manganese is in progress in Pimperkunta block is 1.21 km east of at Pimperkunta Village and 2.45 Km north-west of Ghotkuri village in the Bheempur Mandal of Adilabad District, Telangana State. The block can be approached from District Headquarter Adilabad through Pimperkunta and Ghotkuri located in the west and south east of the study block. Adilabad is about 20 km from Pimperkunta. Adilabad is connected from Hyderabad by National Highway number 7 and distance is about 310 km. The nearest railway station is Mudkhed Junction located on the Secunderabad - Manmad line of South Central Railway.

### **1.3 Environmental Baseline Study Work Plan**

The present study work plan covers the collection of following environmental attributes to assess the status of environment as prevailing at the time of exploration around 10 km radius of exploration block.

1. Geomorphology, Land Use and Biota (flora, Fauna)
2. Meteorology
3. Ambient Air Quality
4. Noise Level
5. Soil quality
6. Water Regime (quality of surface and ground water)
7. Socio-economic Profile

Data Generation and Chemical analysis: The environmental studies were carried out in the form of primary data generation for attributes like meteorology, air quality, noise level, soil and water samples from the specific locations within the study area and collection of long term secondary data for attributes like Geology, Geomorphology, Meteorology, Biota, Socio-Economics from different sources including Primary Census data, Village & Town Directories and other Government/ departmental publication and websites. The generation and collection of baseline environmental data was to be carried out simultaneously with the other exploration activities. The soil and water sample collected from study area were analyzed at NABL accredited chemical laboratory M/s. Lucid laboratory Pvt. Ltd in Hyderabad. This information is necessary to characterize the biological, physical, socioeconomic, and cultural conditions in the study area.

## **CHAPTER – II:**

### **GEOMORPHOLOGY, LAND USE / LAND COVER AND BIOTA (FLORA & FAUNA)**

#### **2.1: Geomorphology**

Geomorphology study is important for rehabilitation, planning for mines for designing of a stable landform for waste rock dumps or spoil piles, at the completion of mining, which minimize erosion and environmental impact offsite.

**Topography:** The study area regionally forms the lowland in the valley of the Penganga river, to the south of which lie, the Satnala Hills ( $\Delta$  2065 and  $\Delta$  1794). The hill mass of  $\Delta$ 1031 in the west and the hillock  $\Delta$  1067 in the east may be mentioned for providing relief in an otherwise low rolling country of sedimentary rocks. In the south-east and north-west, contrast in relief is accentuated because of the occurrence of Deccan Trap. Geomorphologically study area is Pediplain region showing almost gentle slightly undulating topography. Few NW-SE trending ridges of quartzite and limestone are observed. The topography appears to be at the youthful stage as exemplified by the state of dissection of hill mass of  $\Delta$ 1031. This limestone terrain is structurally an anticlinal roll.

**Drainage:** The river Penganga forming the northern border of the area under report flows from WNW to ESE and forms the chief drainage. From 730 ft above m.s.l. at Gomutri in the west, the bed of the river falls to 642 ft above m.s.l. at Mangurda in the east, i.e., a drop of about 88 ft. (27 m.) over a map distance of 33 miles (53 km). The greatest bank height of 120 ft (a cliff of flaggy limestone) is on the left bank north-east of Tamsi, but along the river it varies between 15 to 45 ft (4.5 to 13.7 m). Several tributaries originate in the Satnala range of Deccan Trap and. join the Penganga from the south, the chief of these being the Sat Nala which issues from the Khandala plateau and flows through the middle of the area. Mathadivagu flowing, by Bhimsari and the nalas flowing by Ankata (Anukunta), Yapalagudem and south-west of Sheoghat constitute the tributaries of Sat Nala and afford critical sections of the basal subdivision of the Penganga Group of rocks. The nalas of Dhanur in the west and the nala by Mesala Buzarg in the east constitute other tributaries to the Penganga River along which important sections of the middle-subdivision of the Penganga Group are exposed. All these streams joins the main stream which flows towards east direction and finally meets the Penganga River. The courses of tributaries bear clear influence of geologic structure viz. joint and fault control. In limestone terrain, In some of

these cases, there is solution widening along joints, particularly near major drainage indicating that the drainage pattern is mostly radial.

**2.2: Land Use and Land cover :** In the study area land use/land cover details has been collected from Government records and Census data of Adilabad district, 2011. The study area falls in Adilabad district in Telangana State comprising 5 Mandal and 49 villages within 10 km radius. Table 2.1 shows list of Mandals and villages falling in the 10 km radius:

Table 2.1: List of Mandals and Villages in Adilabad District falling within study area of 10 kilometers radius

S. No.	Village Name	Mandal Name
1	Battisawargoan	Adilabad
2	Bheemseri	
3	Chanda	
4	Dimma	
5	Jamdapur	
6	Landsangavi	
7	Nishanghat	
8	Pochara	
9	Rampoor (Royati)	
1	Bheempur	Bheempur (Tamsi)
2	Dabbakuchi	
3	Gollaghat	
4	Gona	
5	Gunjala	
6	Nipani	
7	Pimperkunta	
8	Tamshi (K)	
9	Wadgaon	
10	Rampur (Belsari)	
1	Akoli	Jainad
2	Belluri	
3	Bhoraj	
4	Fouzpur	
5	Gimma	
6	Guda	
7	Hathighat	
8	Hashampur	
9	Kedapur	
10	Korta	
11	Moudagada	Jainad

12	Pippalwada	
13	Poosai	
14	Rampur (Taraf)	
15	Sirsonna	
16	Tarada (Buzurg)	
1	Ambugaon	Tamsi
2	Bandalnagapur	
3	Ghotkuri	
4	Hasnapur	
5	Jamdi	
6	Khapperla	
7	Palodi (Ramngar)	
8	Ponnari	
9	Savargoan	
10	Tamsi (B)	
11	Waddadi	
1	Khodad	Talamaddugu
2	Sunkidi	
3	Ummadam	

Details of Land use / land cover classes in the study area is provided in table no –2.2.

**Table – 2.2: Details of Land use / land cover classes in the study area**

Sl No	Type of land	Class of Land	Area in hectare	Percentage of total area
	Total land area of study area in Telangana		29221.6	100%
1.	Government Land	Includes Pastures, grazing lands, waste land, roads, ponds and railways rivers canals and Barren and uncultivable land uses like mountains, etc.,	5329.20	18.20%
2.	Private Land	Includes Agriculture lands, mining areas, private buildings etc.,	23026.43	78.80%
3.	Forest Land	Scrub	865.97	3%

- i) **Government Land:** The total coverage of govt. Land in the study area is about 5329.20 hectares and percentage is about 18.20%. It includes Pastures, grazing lands area of about 1346.70 hectare (25.27%) and waste land, roads, ponds, railways rivers canals, Barren and uncultivable land and mountains area of about 3982.50 hectare (74.73%) of govt. land.



j) **Forest Land:** The total coverage of Forest Land in the study area is about 865.97 hectares and percentage is about 3%. Villages having more forest land are Palodi (Ramnagar), Wadgaon, Belsari and Rampur. Nature of Forest is of Scrub class. Scrub class forest is defined as all forest lands with poor tree growth mainly of small or stunted trees having canopy density of less than 10%.

ii) **Private Land:** The total coverage of Private Land in the study area is about 23026.43 hectares and percentage is about 78.80%. Private land includes agriculture land and mining lease areas.

- a. **Agricultural Land:** This land is divided in two classes i.e Irrigated land and Un-irrigated land. The total area of Irrigated land and Un-irrigated land is about 22378.87 ha out of which about 730 hectares is irrigated land and 21648.87 hectares is un-irrigated land.
- b. **Mining Lease:** Total mining lease area is about 647.56 hectare which is about 2.8% of private land. The details of mining lease falling in study area is as given in table-2.3:

**Table-2.3: The details of mining lease falling in study area**

No	Lease Holder	Location	Mineral	Area (hectare)
1.	M/S Aditya Minerals Private limited	Jamdapur	Manganese	106.31
2.	M/S Aditya Minerals Private limited	Dabakuchi	Manganese	73.94
3.	M/S Aditya Minerals Private limited	Guda	Manganese	22.73
4.	M/S Aditya Minerals Private limited	Pimperkunta &Guda	Manganese	89.03
5.	M/S Aditya Minerals Private limited	Ghotkuri&Guda	Manganese	23.99
6.	M/S Balaji Electro Smelters Limited	Pimperkunta	Manganese	32.63
7.	M/S Aditya Minerals Private limited	Bhoraj	Manganese	122.59
8.	M/S Sy Minerals (P) Limited	Jamdapur	Manganese	78.98
9.	Sri Suresh Agarwal	Gollaghat	Manganses	44.20
10.	Sri Suresh Agarwal	Chanda (T)	Manganese	39.28
11	M/S VBC Ferro Alloys Limited	Gollaghat	Manganese	13.89
			<b>Total</b>	<b>647.56</b>

### **2.3: Biota (Flora & Fauna)**

Study of Biological Environment is one of the most important aspects for Environmental Assessment Studies in view of the need for conservation of environmental quality and biodiversity. Biotic components comprise both plant and animal communities. The study area forms part of Adilabad district. Adilabad district is a cradle of biodiversity. It is home to a host of rich flora and fauna. It boasts of dry deciduous forests that prove to be a safe haven for hundreds of species including endangered long-billed vultures and tigers. Part of Kawal Tiger Reserve (KTS) falls in Adilabad district. Present study area do not have any dense forest nad do not have any endangered species of fauna.

Flora: The study area comprises of trees like Moduga (*Butea monosperma*), Mahua (*Maduca longifolia*) and Teak (*Tecton Grandis*). It also have trees of tamarind, mango, bamboos and Neem. The area is covered with Thorny bushes. Many exotic species such as Gulmohar (*Delonix regia*), White Gulmohar (*Delonix sp.*), *Peltophorum ferrugineum* & *Millingtonia hortensis* have been planted as avenue plantations along the roadsides. In habitation areas, neem (*Azadirachta indica*) was commonly found. The study area is well known for growing commercial crops like cotton, Soya bean, pigeon pea, ground nuts and chillies. Besides crops of maize, Jowar, wheat, rice, lentils and Til (gingeli) is also grown. Manganese mining project in the area mostly does not seem to have any negative impacts on the vegetation existing in the area.

Fauna: There are no endangered species of fauna existing in the study area.

## **CHAPTER – III: METEOROLOGY**

Meteorological factors play an important role in the environmental conditions, since the pollutants are carried either in suspension or in solution through media like air and water. The study area falls under the category of tropical wet and dry climate. strong winds and dust storms are frequent during the summer month of May.

### **3.1 Methodology**

Both macro and micro meteorological data has been collected for the study area. The macro meteorological data has been collected from various government sources, mostly taken from Ramagundam observatory and Telangana government website, to ascertain meteorological conditions prevailing regionally in and around the study area. The micro-meteorological data like relative humidity, wind direction and speed, minimum and maximum temperature were collected within study area by installing Auto Weather Station instrument supplied by Aveli Global Engineering solutions Pvt. Ltd. The meteorological auto weather station was installed on the upstairs of Bala Vikas Kendram building (19° 44'53.96"; 78° 28'22.17") located in Pimperkunta village. The micro-meteorological data was generated and recorded from the study area while carrying out detailed exploration in Pimperkunta Block during the period from March 1<sup>st</sup> 2021 to May 31<sup>st</sup> 2021 only.

The overview of the macro and micro meteorological data is discussed below:

### **3.2 Temperature**

*Summer Season:* The climate is characterized by an oppressively hot summer. Summer start from the month of March, and peak in May. The temperature data of Ramagundam observatory shows that regionally summer season commences in the last week of March when temperature begins to increase. May is the hottest month of the year. The monthly maximum mean temperature is 38°C in May and monthly minimum mean temperature is 24.2°C in May.

*Winter Season:* Winter starts from late November month and lasts until early February. The monthly mean maximum temperature differs from 25.8°C (Dec) to monthly mean minimum temperature of 11.9°C (Jan).

Temperature data recorded from meteorological auto weather station installed in Pimperkunta village from March to May indicates that minimum temperature is 19.21°C and maximum 45.44°C.

### 3.3 Rainfall

Monsoon starts from June and lasts until September. About 85% of annual rainfall is received during the south-west monsoon season. July being the peak rainy month. The rainfall data on the Climatological normals of Bheempur Mandal of Adilabad district have been collected from Telangana government website. The month wise rainfall for 10 years, season wise rainy days and season wise rainfall data are provided in Table-3.1, 3.2 and 3.3 respectively.

**TABLE-3.1: Month Wise Yearly Rainfall Data (PERIOD 2011-2021) Bheempur Mandal, Adilabad District, Telangana**

Year/ Month	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Average
Jan	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.1	0.0	3.57
Feb	6.2	0.0	21.2	7.2	0.0	21.8	0.0	15.7	0.0	0.0	0.00	6.55
March	0.0	0.0	16.8	80.0	49.6	39.2	33.6	5.3	0.0	20.5	2.1	22.46
April	0.0	0.0	19.2	0.0	64.6	14.0	0.0	8.4	5.4	3.6	4.3	11.95
May	0.0	0.0	0.0	37.6	49.8	128.4	41.6	20.3	2.3	1.3	32.5	28.53
June	103.2	86.4	497.2	57.6	334.6	334.0	133.0	239.3	72.7	84.9	222.6	196.86
July	288.0	386.6	514.2	121.8	130.2	453.8	140.3	181.5	293.1	183.0	249.5	267.45
Aug	438.0	306.0	368.0	312.8	89.2	88.0	157.5	395.4	101.2	174.9	122.1	232.10
Sept	102.4	170.4	125.4	248.0	254.2	236.8	75.3	90.1	333.1	102.9	245.4	180.36
Oct	25.2	90.6	235.6	42.2	19.6	29.0	17.5	0.0	54.4	31.0	49.8	54.08
Nov	0.0	38.0	2.0	2.2	0.0	0.0	0.0	0.0	1.3	0.0	6.2	4.52
Dec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.8	1.0	0.0	13	2.78
Total	963	1080.2	1799.6	909.4	991.8	1345	598.8	969.8	864.5	639.2	947.5	

**Table-3.2: Shows the rainy days and % of total rainfall in four seasons of the year 2021**

Season	Long Term	
	Rainy days	% of Total Rainfall
Winter (Nov – Feb)	4	4.94
Summer (Mar – May)	6	7.41
Monsoon (Jun – Oct)	71	87.65
<b>Annual Total</b>	<b>81</b>	<b>100.00</b>

**Table-3.3: Shows the mean rain fall and % of total rainfall in four seasons of the year 2021**

Season	Long Term	
	RF (mean) mm	% of Total Rainfall
<b>Summer (Mar–May)</b>	38.90	4.11
<b>Monsoon (Jun–Oct)</b>	889.40	93.86
<b>Winter (Nov–Feb)</b>	19.20	2.03
<b>Annual Total</b>	<b>947.5</b>	<b>100</b>

### 3.4 Humidity

The long term relative humidity data collected from Telangana govt. website show that during morning time the relative humidity varies between 54% to 87%. While during evening time it varies between 43 – 85%. The annual mean relative humidity at 8.30 hrs.is 71% while at 17.30 hrs. it is 64% only.

The relative humidity data collected from installed weather station at **Pimperkunta village** showed that during 06.0 to 12.0 hrs. the relative humidity varies between 04.04 to 73.09 % (Average 18.30 %); from 12.05 hrs. to 18.00 hrs. the relative humidity ranged from 13.08 to 82.95 % (Average 30.60 %) and from 18.05 hrs. to 06.00 hrs. the relative humidity ranged from 16.14 to 78.04 % ( Average 47.05 %).

### 3.5 Wind

The data details on wind directions for long term (1991-2012) have been collected from Ramagundam observatory and Micro-Meteorological data during from March 1<sup>st</sup> 2021 to May 31<sup>st</sup> 2021 from the Meteorological station established at Pimperkunta village.

Ramagundam observatory Long Term data details:

**Wind Direction:** The examination of the long term data of Ramagundam observatory shows the trends of the annual averages is as follows: at 8.30 hrs. The most notable wind directions are southwest (13%) and north east (11%) with 43% time wind is calm and at 17.30 hrs. the most notable wind directions are southwest (19%) southeast (11%), west (10%) and northeast (10%) with 36% time wind is calm.

**Wind Speed:** The long term daily average of wind speed (at 8.30 hrs.) at Ramagundam observatory shows that 231 days in a year the daily mean wind speed is between 20 and 61 km/hour and on 134 days wind is calm. While at 17.30 hrs. the mean wind speed on 253 days is between 1 and 19 kmph and on remaining 112 days wind is calm. The average annual wind speed is 3.6 kmph.

Micro Meteorological Data recorded from Meteorological station established at Pimperkunta village (Period: March – May, 2021):

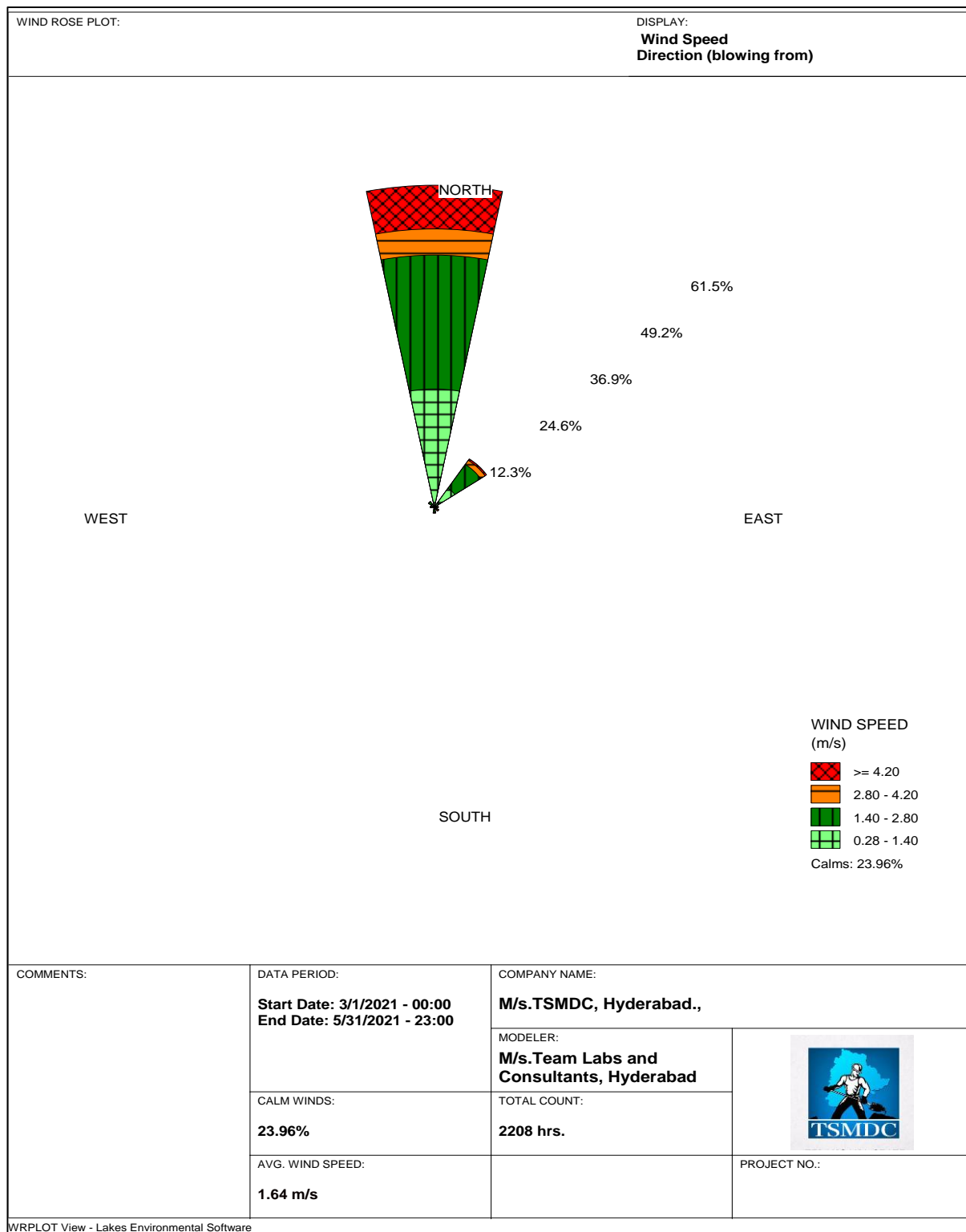
Table 3.4 provides frequency distribution of wind speed and direction in Percent recorded in Weather Station at Pimperkunta and figure-2 shows Wind Speed and Direction Diagram.

**Table-3.4: Frequency Distribution of Wind Speed and Direction in Percent recorded in Weather Station at Pimperkunta (Period: March – May, 2021)**

Wind speed	No of Observation Frequency									Total
(Km/hr)	N	NE	E	SE	S	SW	W	NW	Calm%	
1 – 5	22.06	4.21	0.36	0.41	0.54	0.14	0.50	0.63	23.96	<b>28.85</b>
6 – 10	25.0	5.34	0.18	0.27	0.41	0.05	0.18	0.54		<b>31.97</b>
11 – 15	4.89	0.95	0.18	0.23	0.14	0.09	0.05	0.05		<b>6.57</b>
➤ 15	8.15	0.32	0.0	0.05	0.09	0.0	0.0	0.0		<b>8.65</b>
<b>Total %</b>	<b>60.10</b>	<b>10.82</b>	<b>0.72</b>	<b>0.95</b>	<b>1.18</b>	<b>0.27</b>	<b>0.72</b>	<b>1.27</b>	<b>23.96</b>	<b>100</b>

Note: Calm =  $V < 1.0$  km/hrs.

**Figure-2: Shows Wind Speed and Direction Diagram from data recorded in Weather Station at Pimperkunta village**



## CHAPTER – IV: AMBIENT AIR QUALITY MONITORING

Identification of different air pollutant parameters and monitoring of their existing levels in the Ambient Air forms the basis for assessment of impact of the developing projects on air environment. It is essential to have a baseline data for proper interpretation of existing Ambient Air Quality status and for prediction of impact on air due to the likely mining activity developing projects. The Ambient Air Quality status of an air can be measured through air quality monitoring station. The harmful effects of pollution can be envisaged only if adequate data is available.

### 4.1 Air Quality Monitoring Stations and Methodology

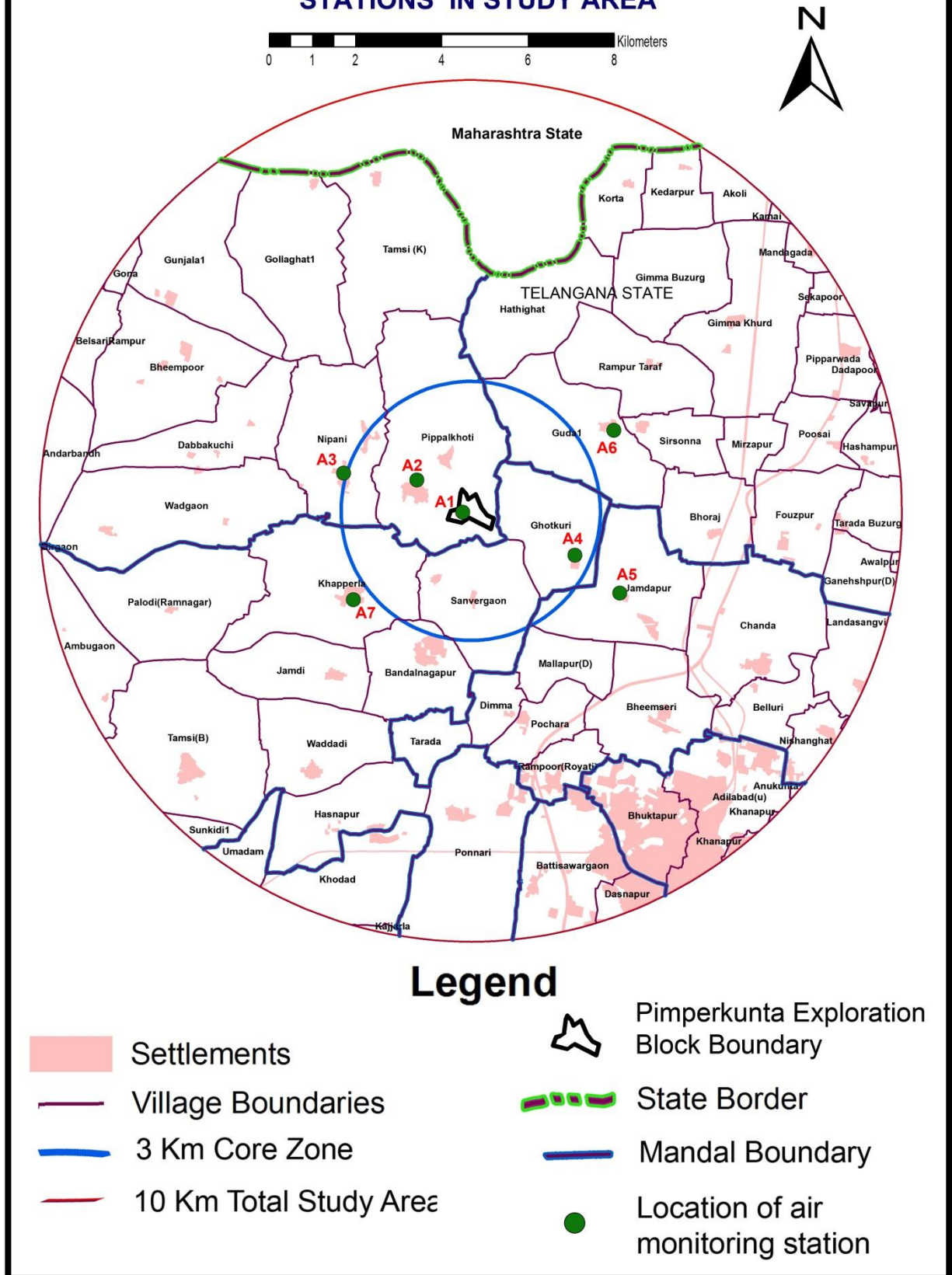
The prime objective of the Ambient Air Quality (AAQ) is to assess the existing air quality status in the neighborhood area i.e. within 10 km. radius zone around the Pimperkunta exploration block. Ambient Air Quality (AAQ) parameters such as Respirable Particulate Matter (RPM) PM-10 in  $\mu\text{g}/\text{m}^3$ ; Respirable Particulate Matter (RPM) PM-2.5 in  $\mu\text{g}/\text{m}^3$ ; Sulphur Dioxide ( $\text{SO}_2$ ) in ppm; Oxides of Nitrogen ( $\text{NO}_x$ ) in ppm and Carbon Monoxide (CO) in ppm were recorded in sampling stations in both core and buffer zone. Accordingly these air quality parameters were recorded in 7 stations using Ambient Air Quality Monitoring System instrument supplied by Aveli Global Engineering solutions Pvt Ltd. The location details of these 7 stations are provided in table-4.1 and in location map (Figure 3). The air quality data has been taken in these 7 stations during the period from 05-10-2021 to 13-10-2021.

**Table-4.1: Location Details of Ambient Air Quality Stations in Study area**

Sl. No	Station Code	Location	Height above ground level (Meters)	Co-ordinates		Zone
				Latitude	Longitude	
1	A-1	Pimperkunta Exploration block	> 3	19° 44'31.07"	78° 29'00.20"	Core
2	A-2	Pimperkunta village	> 3	19° 44'54.57"	78° 28'22.75"	Core
3	A-3	Nippani	> 3	19° 44'59.29"	78° 27'25.50"	Core
4	A-4	Ghotkuri	> 3	19° 43'59.55"	78° 30'29.23"	Core
5	A-5	Jamdapur	> 3	19° 44'31.38"	78° 31'05.20"	Buffer
6	A-6	Guda	> 3	19° 45'34.15"	78° 30'59.08"	Buffer
7	A-7	Khapparla	> 3	19° 43'24.18"	78° 27'33.36"	Buffer



**Figure -3 : LOCATION MAP OF AIR QUALITY MONITORING STATIONS IN STUDY AREA**



## 4.2 :Data Generation

Air quality Data recorded at different stations in study area are provided in table no.4.2 to table no 4.9 and about Ambient Air quality status Parameters in table no 4.10 to 4.14.

**Table-4.2: Air quality Data recorded at Pimperkunta Exploration Block (Station-A1)**

Date	Time	PM-10	PM-2.5	Sox (SO <sub>2</sub> )	NOx (NO <sub>2</sub> )	CO
	(hrs)	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(mg/m <sup>3</sup> )
05-10-2021	08.13	46	16	4.5	6.5	0.07
05-10-2021	09.13	45	15	4.5	6.7	0.08
05-10-2021	10.13	43	23	4.4	7.5	0.09
05-10-2021	11.13	47	28	5.2	9.3	0.08
05-10-2021	12.13	56	25	5.1	8.2	0.07
05-10-2021	14.25	42	23	6.5	9.5	0.07
05-10-2021	15.25	40	21	6.0	8.3	0.08
05-10-2021	16.25	43	20	5.5	10.5	0.09
05-10-2021	17.25	50	25	7.5	13.5	0.08
05.10.2021	18.25	62	32	11.3	11.5	0.07

**Table-4.3: Air quality Data recorded at Pimperkunta Village (Station-A2)**

Date	Time	PM-10	PM-2.5	Sox (SO <sub>2</sub> )	NOx (NO <sub>2</sub> )	CO
	(hrs)	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(mg/m <sup>3</sup> )
06-10-2021	08.20	42	16	4.4	6.9	0.08
06-10-2021	09.20	41	14	4.6	6.6	0.08
06-10-2021	10.20	45	18	5.3	7.5	0.09
06-10-2021	11.20	52	27	5.2	8.8	0.08
06-10-2021	12.20	46	25	4.9	7.9	0.09
06-10-2021	14.35	55	25	6.5	9.5	0.08
06-10-2021	15.35	57	27	5.6	10.5	0.08
06-10-2021	16.35	52	21	7.5	10.5	0.08
06-10-2021	17.35	61	28	11.4	13.8	0.09
06-10-2021	18.35	58	30	10.2	12.5	0.09

**Table-4.4: Air quality Data recorded at Nippani Village (Station-A3)**

Date	Time	PM-10	PM-2.5	Sox (SO <sub>2</sub> )	NOx (NO <sub>2</sub> )	CO
	(hrs)	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(mg/m <sup>3</sup> )
07-10-2021	08.06	48	20	5	7.2	0.06
07-10-2021	09.06	50	23	4.5	6.8	0.07
07-10-2021	10.06	46	17	4	8.5	0.08
07-10-2021	11.06	53	27	5.3	9.5	0.09
07-10-2021	12.06	57	25	5.1	9.2	0.09
07-10-2021	14.09	45	25	5.1	9.4	0.08
07-10-2021	15.09	50	20	6.2	8.5	0.07
07-10-2021	16.09	43	30	5.3	9.5	0.08
07-10-2021	17.09	55	33	9.8	13.6	0.09

**Table-4.5: Air quality Data recorded at Ghotkuri Village (Station-A4)**

Date	Time	PM-10	PM-2.5	Sox (SO <sub>2</sub> )	NOx (NO <sub>2</sub> )	CO
	(hrs)	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(mg/m <sup>3</sup> )
10-10-2021	08.34	45	25	5.5	7.3	0.07
10-10-2021	09.34	43	19	4.5	6.5	0.07
10-10-2021	10.34	55	28	6.5	8.7	0.08
10-10-2021	11.34	49	30	5.4	9.4	0.09
10-10-2021	14.19	49	26	5.2	8.6	0.09
10-10-2021	15.19	45	25	6.9	9.3	0.08
10-10-2021	16.19	55	20	10.5	8.5	0.07
10-10-2021	17.19	62	27	11.2	8.4	0.09

**Table-4.6: Air quality Data recorded at Jamdapur Village (Station-A5)**

Date	Time	PM-10	PM-2.5	Sox (SO <sub>2</sub> )	NOx (NO <sub>2</sub> )	CO
	(hrs)	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(mg/m <sup>3</sup> )
11-10-2021	08.02	45	17	4.5	6.4	0.08
11-10-2021	09.02	42	25	4.2	9.5	0.08
11-10-2021	10.02	59	30	6.4	7.3	0.09
11-10-2021	11.02	55	27	6.2	8.4	0.09
11-10-2021	12.02	49	19	5.4	9.2	0.08
11-10-2021	14.16	42	25	4.2	8.4	0.07
11-10-2021	15.16	60	32	6.4	8.6	0.09
11-10-2021	16.16	55	29	5.5	8.5	0.08

**Table-4.7: Air quality Data recorded at Guda Village (Station-A6)**

Date	Time	PM-10	PM-2.5	Sox (SO <sub>2</sub> )	NOx (NO <sub>2</sub> )	CO
	(hrs)	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(mg/m <sup>3</sup> )
12-10-2021	09.34	45	18	4.9	7.2	0.07
12-10-2021	10.34	51	25	4.6	8.5	0.07
12-10-2021	11.34	54	34	7.4	10.4	0.09
12-10-2021	12.34	52	27	6.5	9.5	0.08
12-10-2021	14.19	42	25	5.2	8.2	0.07
12-10-2021	15.19	55	19	7.9	11.5	0.08
12-10-2021	16.19	63	26	9.2	8.5	0.09
12-10-2021	17.19	57	36	8.5	9.2	0.08

**Table-4.8: Air quality Data recorded at KhapparlaVillage (Station-A7)**

Date	Time	PM-10	PM-2.5	Sox (SO <sub>2</sub> )	NOx (NO <sub>2</sub> )	CO
	(hrs)	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(µg/m <sup>3</sup> )	(mg/m <sup>3</sup> )
13-10-2021	08.22	46	16	4.6	7.5	0.07
13-10-2021	09.22	55	19	5.5	8.5	0.08
13-10-2021	10.22	64	25	8.2	6.7	0.09
13-10-2021	11.22	59	32	7.3	9.5	0.09
13-10-2021	14.41	55	24	5.6	3.2	0.08
13-10-2021	15.41	44	18	4.7	5.8	0.08
13-10-2021	16.41	61	27	9.6	9.5	0.09
13-10-2021	17.41	53	34	9.5	10.2	0.09
13-10-2021	18.41	59	32	10.8	8.5	0.09

**Table-4.9: Summarized Air Quality Data Range for Station A-1 to A-7 in Study Area**

Station	PM-10(µg/m <sup>3</sup> )		PM-2.5 (µg/m <sup>3</sup> )		Sox (SO <sub>2</sub> ) (µg/m <sup>3</sup> )		NOx (NO <sub>2</sub> ) (µg/m <sup>3</sup> )		CO (mg/m <sup>3</sup> )	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
A-1	40	62	15	32	4.4	11.3	6.5	13.5	0.07	0.09
A-2	41	61	14	30	4.4	11.4	6.6	13.8	0.08	0.09
A-3	43	57	17	33	4.0	9.8	6.8	13.6	0.06	0.09
A-4	43	62	19	30	4.5	11.2	6.5	9.4	0.07	0.09
A-5	42	60	17	32	4.2	6.4	6.4	9.2	0.07	0.09
A-6	42	63	18	36	4.9	9.2	7.2	11.5	0.07	0.09
A-7	44	64	16	34	4.6	10.8	3.2	10.2	0.07	0.09
<b>Average</b>	<b>42.14</b>	<b>61.28</b>	<b>16.57</b>	<b>32.43</b>	<b>4.43</b>	<b>10.01</b>	<b>6.17</b>	<b>11.6</b>	<b>0.07</b>	<b>0.09</b>

**4.3 Observation on Air Quality Generated Data:** The Data were collected during 8.0 hrs in morning to 18.0 hrs in evening. The range of various pollutants are: SO<sub>2</sub> (from 4.43 to 10.01 µg/m<sup>3</sup>), NO<sub>3</sub> (from 6.17 to 11.60 µg/m<sup>3</sup>), CO (from 0.07 to 0.09 mg/m<sup>3</sup>), Respirable Particle Matter (RPM) PM-10 (from 42.14 to 61.28 µg/m<sup>3</sup>) and RPM PM-2.5 (from 16.57 to 32.43 µg/m<sup>3</sup>).

If we analyze the data all the gaseous pollutants viz SO<sub>2</sub>, NOx and CO and RPM of PM-10 and PM2.5 show concentration well within the prescribed limit notified by Central Pollution Control Board (CPCB). The Table 4.10 provides the National Ambient Air Quality Standards notified by CPCB.

**Table-4.10: National Ambient Air Quality Standards Notified by Central Pollution Control Board**

Sl. No.	Pollutant	Time weighted Average	Concentration in Ambient Air	
			Industrial, Residential Rural	Ecologically Sensitive areas
1	Sulphur Dioxide (SO <sub>2</sub> ) µg/m <sup>3</sup>	Annual	50	20
		24 Hrs	80	80
2	Nitrogen Dioxide (NO <sub>2</sub> ) µg/m <sup>3</sup>	Annual	40	30
		24 Hrs	80	80
3	Carbon Monoxide (CO) mg/m <sup>3</sup>	8 hrs	2	2
		1 hrs	4	4
4	PM-10 µg/m <sup>3</sup>	Annual	60	60
		24 hrs	100	100
5	PM-2.5 µg/m <sup>3</sup>	Annual	40	40
		24 hrs	60	60

## CHAPTER – 5: NOISE LEVEL

The physical description of sound concerns its loudness as a function of frequency. Noise is defined, in a general sense, as an unpleasant and unwanted sound and is associated virtually with all new developments including mining industry. Noise is now recognized as a major and growing form of environmental pollution. A noise-problem (or pollution) is said to exist when noise intervenes with human activity and health. A noise level survey was carried out as a part of the baseline environmental studies to identify the noise sources and to determine the ambient noise level at different places within the study area to identify all the sources acceptable and unacceptable to study region and the temporal and spatial variations in noise levels. The environmental impact of noise can have several effects varying from Noise Induced Hearing Loss (NIHL) to annoyance depending on loudness of noise levels.

### 5.10 Noise Level Monitoring Stations and Methodology Adopted

A total of 5 stations in the study area were selected such that it covers the study area entirely. These stations were monitored at different hours for measuring the ambient noise levels at different villages. The main sources of noise within the study area are Local village activities, Community centers such as Market places, School, Bus Stands etc., & Mining activities.

Equipment used: A portable battery operated sound level meter (Make: LUTRON, Model: SL 4001) was deployed for this study. The machine has got three specific ranges i.e. 30 – 80 dB, 50 – 100 dB and 80 – 130 dB and has resolution of 0.1 db an accuracy of 23+/-5

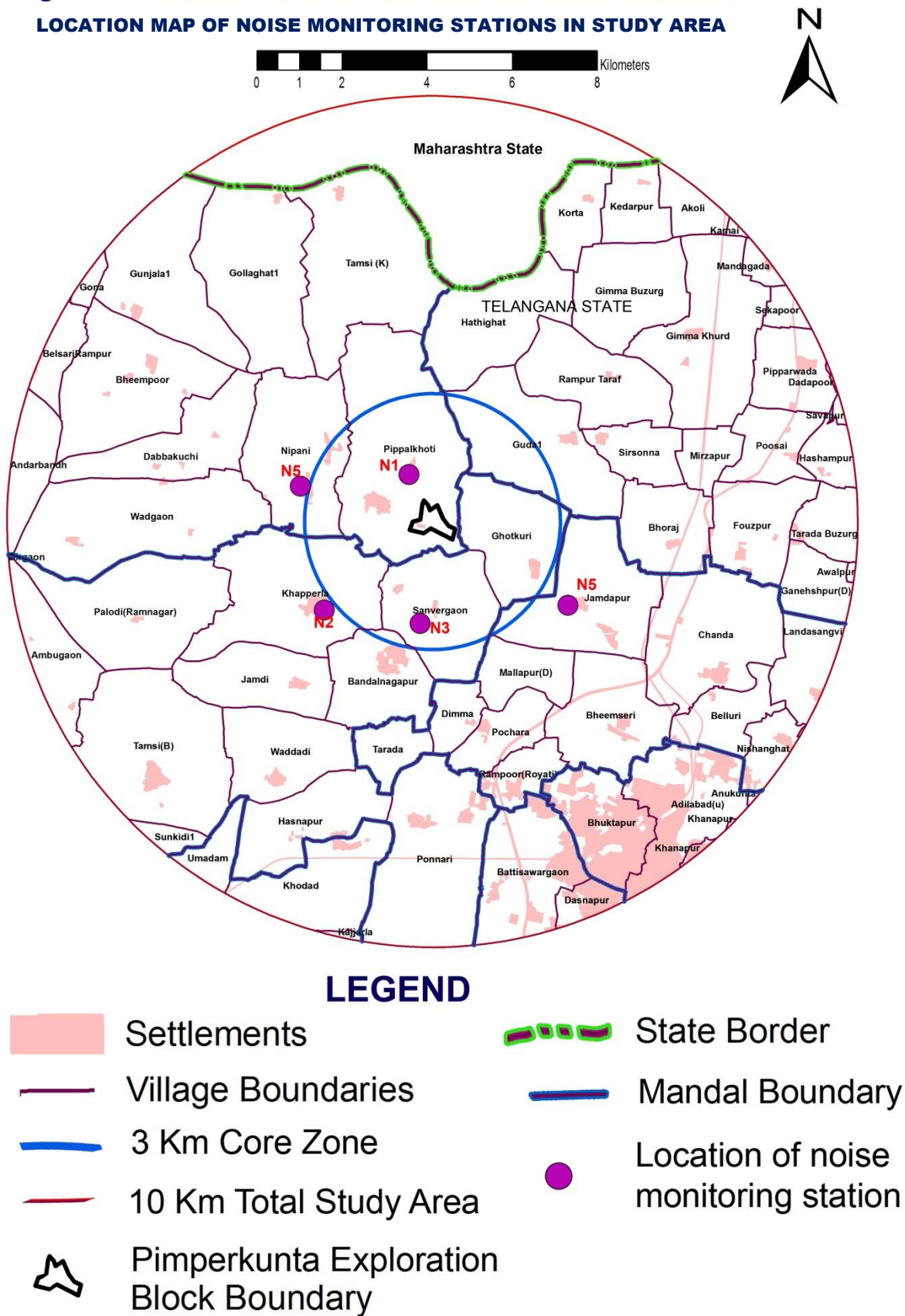
The details of the noise-level monitoring stations locations are provided in table-5.1 and in map in figure-4.

**Table-5.1: Details of Noise Level Monitoring Stations Location and source of Noise in Study area**

Station Code	Monitoring Station	Geo-Coordinates		Source of Noise	Zone	Location spot	Date
		Latitude	Longitude				
N-1	Pippalkhoti	19° 44'48.02"	78° 28'26.01"	Market	Core	Village center	5.10.21
N-2	Khapparla	19° 43'28.13"	78° 27'31.92"	Market	Buffer	Primary School	6.10.21
N-3	Savargaon	19° 43'23.99"	78° 29'08.39"	Market	Buffer	Anganwadi	7.10.21
N-4	Nippani	19° 44'59.29"	78° 27'25.50"	Market	Buffer	Village center	10.10.21
N-5	Jamdapur	19° 44'31.38"	78° 31'05.20"	Market	Buffer	Village center	12.10.21

**Figure- 4 : LOCATION MP OF NOISE MONITORING**

**LOCATION MAP OF NOISE MONITORING STATIONS IN STUDY AREA**



### 5.20 Data Generation

Noise level has been recorded in the selected five stations from 5<sup>th</sup> October 2021 to 12<sup>th</sup> October 2021 at hourly basis from 6.00 hrs in morning to 18.00 hrs in the evening. Details of noise level monitoring is provided in table-5.2.

**Table-5.2 :Details of Noise Level Monitoring in Study Area**

Station Code	Location	Zone	Noise Source	Number of records	Leg (dB(A) value Range	
					6.0 – 12.0hrs	12 – 18 hrs
N-1	PippalKhoti village center	Core	Residential	28	50 – 71	49 – 75
N-2	Khapperla	Buffer		14	63 – 74	--
N-3	Savergaon	Buffer		13	53 – 72	54 – 58
N-4	Nippani	Buffer		10	53 – 66	54 – 76
N-5	Jamdapur	Buffer		13	64 – 65	63 – 70

### 5.30 Observation on Results

The main sources of noise within the study area are Local village activities, Community centers such as market places, school, bus Stands and open cast Mining activities (at places). Table-5.3 provide the standard acceptable Noise level in dB.

**Table-5.3: Standard Acceptable Noise Level In dB**

Sl. No.	Category	Limit in dB	
		Day Time	Night Time
1	Residential Area	55	45
2	Commercial Area	65	55
3	Industrial Area	75	70
4	Silence zone (Hospital etc)	50	40

If we compare the recorded noise level value range with the standards provided in above table it is observed that noise levels are falling within the permissible limit of <70. A total of about 78 noise level recording has been noted in 5 monitoring stations and out of which only five records showed higher value ranging from >70 to <76 dB value. Remaining all record showed dB values ranging mostly from 49 to 63.



## CHAPTER – VI: SOIL

### 6.1 Description of Soil in Study area:

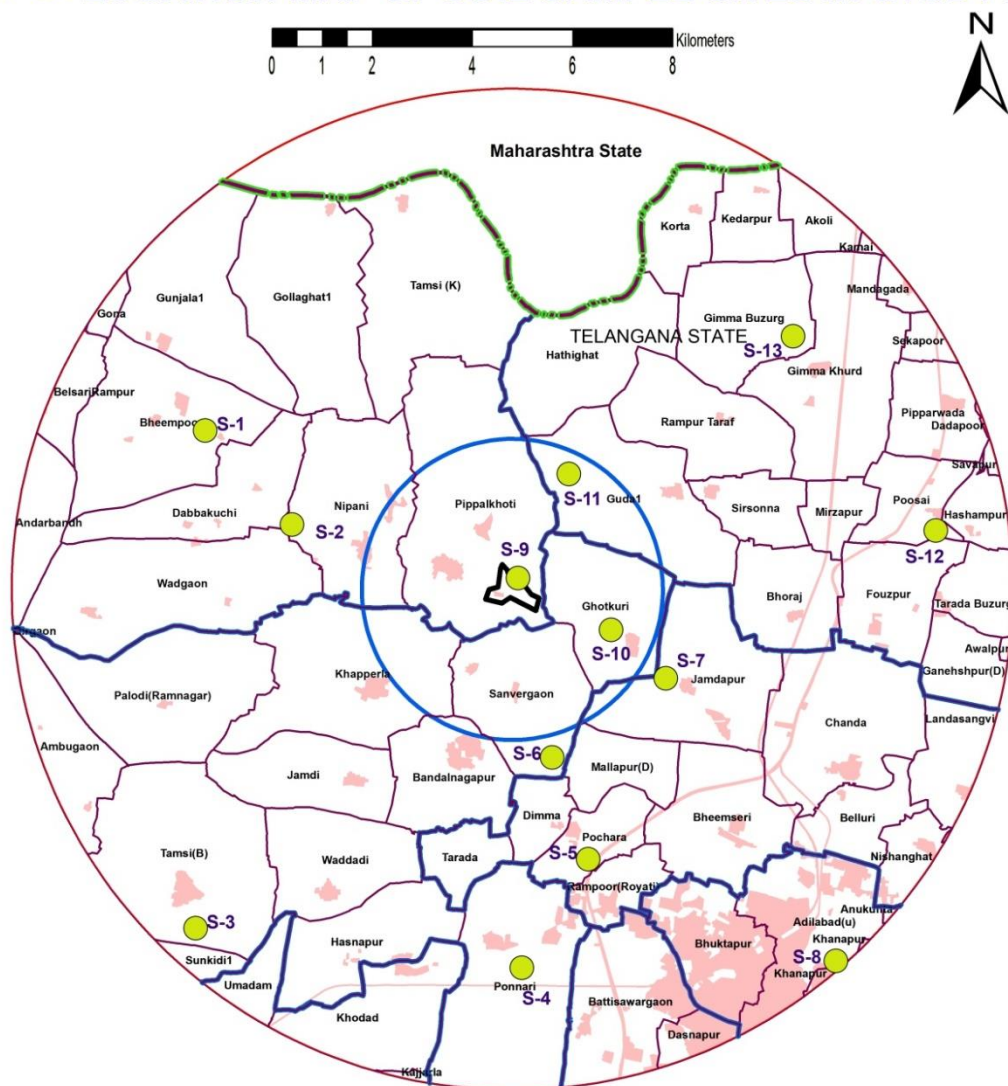
The study area spread over 10 km radius from exploration block in Pimperkunta village, Bheempur mandal, Adilabad district of Telangana comprises of litho-units of Penganga basin sediments overlain by Deccan Traps. Landform regionally forms mostly moderate to gently sloping undulating terrain with isolated hill mass of  $\Delta 1031$  in the west and the hillock  $\Delta 1067$  in the east providing relief in an otherwise low rolling country of sedimentary rocks. Soil formed in study area is reflection of litho-units and landform. The soils are grey to dark grey clayey black soil, red soils, calcareous black soils, clayey to gravelly clayey moderately deep dark brown soils, loamy to clayey deep reddish brown soil, loamy to gravelly clay deep dark reddish brown soils, fine loamy gravelly clayey shallow reddish brown soils and has manganiferous soil wherever manganese ores are exposed or mining activity has taken place.

**6.2 Soil Sampling Methodology:** The data on the soils has been studied as part of the baseline Environmental studies. Soil Sampling was carried out at 13 sites to understand the soil quality. At these locations the soil developed mostly over the limestone is exposed. After removing the surface vegetation cover, visible roots, gravel, plastic materials and other foreign materials 5 to 7 kg soil Samples were collected by using Agar at a depth of 30, 60 and 90 cm of each samplingsite, thus collecting three samples from each depth at each sampling site. The samples were sun dried on transparent plastic sheets, de-lumped and sieved through -120 mesh sieve and at least 1 kilogram from each sample were collected. These samples were then thoroughly mixed, coned and quartered, numbered and made into two parts of 500 gm each of which one was submitted for chemical analysis of different parameters at NABL accredited chemical laboratory and other one was kept as reference sample. A total of 39 soil samples were collected at 30 cm, 60 cm and 90 cm depth from each of 13 sample sites representing different soil types / land use to determine the soil quality. The location details of soil samples collected are provided in the table-6.1 and location map in figure-5.




**Table-6.1: Location details of Soil sample Sites in Study Area**

Sl. No	Sample No	Name of the village	Coordinates		Type of land	Zone	Date of sampling
			Latitude	Longitude			
1	S-1	Bheempur	19° 46' 12.06" N	78° 25' 34.56" E	Agriculture	Buffer	06.01.2021
2	S-2	Nippani	19° 45' 13.74" N	78° 26' 36.71" E	Agriculture	Buffer	06.01.2021
3	S-3	Tamsi-B	19° 40' 50.53" N	78° 25' 32.21" E	Agriculture	Buffer	06.01.2021
4	S-4	Near Talamadugu	19° 40' 19.57" N	78° 29' 11.65" E	Agriculture	Buffer	06.01.2021
5	S-5	Pochara Near highway	19° 41' 37.71" N	78° 30' 1.32" E	Agriculture	Buffer	07.01.2021
6	S-6	Near Saragoan	19° 42' 43.14" N	78° 29' 35.33" E	Agriculture	Buffer	07.01.2021
7	S-7	Jamdapur	19° 43' 35.32" N	78° 30' 51.52" E	Agriculture	Buffer	07.01.2021
8	S-8	Adilabad urban-1	19° 40' 33.04" N	78° 32' 52.20" E	Agriculture	Buffer	08.01.2021
9	S-9	Exploration block	19° 44' 39.33" N	78° 29' 9.77" E	Agriculture	Core	08.01.2021
10	S-10	Tamsi-2	19° 44' 7.07" N	78° 30' 14.53" E	Agriculture	Core	08.01.2021
11	S-11	Near Gura	19° 45' 47.03" N	78° 29' 43.81" E	Agriculture	Core	09.01.2021
12	S-12	Near Pusai	19° 45' 14.21" N	78° 33' 55.84" E	Agriculture	Buffer	09.01.2021
13	S-13	Near Korata	19° 47' 18.21" N	78° 32' 16.98" E	Agriculture	Buffer	09.01.2021

**Figure -5 : LOCATION MAP OF SOIL SAMPLE SITES IN STUDY AREA**



### LEGEND

- |                                                                                     |                        |                                                                                      |                                        |
|-------------------------------------------------------------------------------------|------------------------|--------------------------------------------------------------------------------------|----------------------------------------|
|  | Settlements            |   | Pimperkunta Exploration Block Boundary |
|  | Village Boundaries     |  | State Border                           |
|  | 3 Km Core Zone         |  | Mandal Boundary                        |
|  | 10 Km Total Study Area |   | Location of Soil sample                |

**6.3 Physico- Chemical Parameters Analyzed:** The collected soil samples were analyzed for all the important physico - chemical parameters in NABL accredited laboratory. The list of parameters analyzed along with IS method adopted for analysis is listed in the table 6.2.

**Table-6.2: List of Physico Chemical Parameters analyzed and method of analysis**

No.	Parameter	Method of Analysis
1	Type of soil	IS1498
2	PH value	IS 2720 Part-26
3	Electrical Conductivity (EC)	IS14767-2000, (RA2016)
4	Organic Matter (%)	IS2720 Part-22
5	Nitrogen as N(%)	IS10158 1982 (RA2014)
6	SAR	Flame Photometer by calculation Soil Analysis-ML Jackson
7	Porosity	By Calculation (from Bulk density and Specific Gravity)
8	Bulk Density(g/cc)	ASTMD7263-09
9	Potassium as K <sub>2</sub> O(%)	Flame Photometer by calculation Soil Analysis-ML Jackson
10	Iron as Fe(%)	USEPA 3050B
11	Molybdenum as MO(%)	USEPA 3050B
12	Manganese as Mn (%)	USEPA 3050B
13	Phosphorous as P <sub>2</sub> O <sub>5</sub>	USEPA 3050B
14	Soil Texture	
	Gravel	IS2720(P-4)
	Sand	IS2720(P-4)
	Silt & Clay	IS2720(P-4)
15	Specific Gravity	IS2720(P-3)

#### 6.4 Soil Quality Generated Data

The analytical results of soil samples providing information for soil quality data for physical parameters are provided in table-6.3 and of Chemical parameters in table-6.4.

**Table-6.3: Soil Quality Data for Physical parameters of Soil Samples collected in the study area**

Sample Site/ No	Village/ land type	Soil Type/ Texture	Depth	EC	pH	Porosity	Sp.gr. /BD (g/cc)	Grain size (%)		
			Cm	$\mu\text{/cm}$				Gravel	Sand	Silt & Clay
<b>S-1</b>										
S-1/1	Bheempur/ Crop Land	Grey clayey soil Fine gr.	30	193	7.8	0.65	2.55/0.902	3.38	35.26	61.35
S-1/2		Grey sandy soil Coarse gr	60	160	8.3	0.69	2.48/0.767	23.18	39.71	37.11
S-1/3		Grey sandy soil coarse gr.	90	220	8.9	0.61	2.54/0.978	30.84	44.69	24.47
			<b>Avg</b>	<b>191</b>	<b>8.3</b>	<b>0.65</b>	<b>2.52/0.882</b>	<b>19.13</b>	<b>39.88</b>	<b>40.98</b>
<b>S-2</b>										
S-2/1	Nippani/ Crop land	Grey clayey soil Fine gr.	30	161	8	0.69	2.6/0.795	2.02	16.66	81.32
S-2/2		Grey clayey soil Fine gr.	60	210	8.2	0.69	2.54/0.786	0.47	13.14	86.39
S-2/3		Grey clayey soil Fine gr.	90	164	8.3	0.66	2.61/0.882	1.86	14.62	83.52
			<b>Avg</b>	<b>178</b>	<b>8.1</b>	<b>0.68</b>	<b>2.59/0.821</b>	<b>1.45</b>	<b>14.81</b>	<b>83.74</b>
<b>S-3</b>										
S-3/1	Tamsi-B crop land	Grey clayey soil Fine gr.	30	115	7.8	0.72	2.56/0.723	2.88	45.03	52.09
S-3/2		Grey clayey soil Fine gr.	60	111	6.5	0.66	2.37/0.813	4.36	45.13	50.51
S-3/3		Grey clayey soil Fine gr.	90	121	7.7	0.61	2.48/0.958	1.42	42.90	55.68
			<b>Avg</b>	<b>115.6</b>	<b>7.3</b>	<b>0.66</b>	<b>2.47/0.831</b>	<b>2.89</b>	<b>44.35</b>	<b>52.76</b>
<b>S-4</b>										
S-4/1	Talamadugu /crop land	brownish soil fine gr	30	40.4	6.6	0.65	2.47/0.869	0.59	56.79	42.62
S-4/2	Talamadugu /crop land	brownish soil Med gr	60	104	7.7	0.60	2.46/0.980	3.89	67.38	28.73
S-4/3	Talamadugu /crop land	Brownish soil Coarse gr	90	203	7.4	0.58	2.55/1.071	33.67	46.85	19.48
			<b>Avg</b>	<b>115.8</b>	<b>7.2</b>	<b>0.61</b>	<b>2.49/0.973</b>	<b>12.72</b>	<b>57.01</b>	<b>30.28</b>
<b>S-5</b>										
S-5/1	Pochara crop land	Grey Clayey soil, Fine Gr.	30	495	7.7	0.66	2.44/0.836	2.21	23.33	74.46
S-5/2	Pochara crop land	Grey Clayey soil, Fine gr.	60	211	7.8	0.66	2.44/0.834	2.8	17.65	79.55
S-5/3	Pochara crop land	Grey Clayey soil, Fine gr.	90	225	7.7	0.76	2.47/0.601	5.2	19.63	75.17
			<b>Avg</b>	<b>310</b>	<b>7.7</b>	<b>0.69</b>	<b>2.45/0.757</b>	<b>3.40</b>	<b>20.20</b>	<b>76.39</b>

<b>S-6</b>										
S-6/1	Savaragaon crop land	Brownish soil Medium	30	48.9	7	0.56	2.53/ 1.114	5.29	71.1	23.61
S-6/2	Savaragaon crop land	Brownish soil Medium	60	48.5	7.2	0.58	2.52/ 1.053	13.08	67.47	19.45
S-6/3	Savaragaon crop land	Brownish soil Coarse	90	51.5	7.4	0.62	2.47/ 0.937	43.73	44.37	11.90
			<b>Avg</b>	<b>49.6 3</b>	<b>7.2</b>	<b>0.59</b>	<b>2.51/ 1.034</b>	<b>20.70</b>	<b>60.98</b>	<b>18.32</b>
<b>S-7</b>										
S-7/1	Jamdapur crop land	Grey clayey soil	30	176	8.1	0.69	2.49/ 0.76	3.42	19.04	77.54
S-7/2	Jamdapur crop land	Grey clayey soil	60	285	8.2	0.71	2.44/ 0.717	1.43	17.55	81.02
S-7/3	Jamdapur crop land	Grey clayey soil, Fine gr	90	411	8.8	0.75	2.50/ 0.635	1.30	17.49	81.21
			<b>Avg</b>	<b>291</b>	<b>8.3</b>	<b>0.72</b>	<b>2.48/ 0.704</b>	<b>2.05</b>	<b>18.03</b>	<b>79.92</b>
<b>S-8</b>										
S-8/1	Adilabad crop land	Grey clayey soil, Fine gr	30	188	7.9	0.75	2.54/ 0.635	1.84	26.5	71.66
S-8/2	Adilabad crop land	Grey clayey soil, Fine gr	60	160	7.9	0.68	2.41/ 0.774	1.75	33.45	64.80
S-8/3	Adilabad crop land	Grey clayey soil, Fine gr	90	211	8.1	0.65	2.46/ 0.857	1.32	25.81	72.87
			<b>Avg</b>	<b>186</b>	<b>7.9</b>	<b>0.69</b>	<b>2.47/ 0.755</b>	<b>1.64</b>	<b>28.59</b>	<b>69.78</b>
<b>S-9</b>										
S-9/1	Exploration block Crop land	Brownish coarse grained soil	30	159	7.8	0.59	2.56/ 1.056	23.77	42.72	33.51
S-9/2	Exploration block Crop land	Brownish coarse grained soil	60	125	7.8	0.61	2.54/ 0.996	43.54	32.43	24.03
S-9/3	Exploration block Crop land	Brownish coarse grained soil	90	-	-		-	-	--	-
			<b>Avg</b>	<b>142</b>	<b>7.8</b>	<b>0.60</b>	<b>2.55/ 1.026</b>	<b>33.65</b>	<b>37.58</b>	<b>28.77</b>
<b>S-10</b>										
S-10/1	Tamsi-2 crop land	Brownish soil, fine gr	30	163	7.3	0.65	2.54/ 0.883	4.4	15.49	80.11
S-10/2	Tamsi-2 crop land	Brownish soil, fine gr	60	184	7.8	0.60	2.37/ 0.937	20.9	13.13	65.97
S-10/3	Tamsi-2 crop land	Brownish soil, fine gr	90	290	7.8	0.60	2.48/ 1.000	9.63	11.65	78.72
			<b>Avg</b>	<b>212</b>	<b>7.6</b>	<b>0.62</b>	<b>2.46/ 0.940</b>	<b>11.37</b>	<b>13.42</b>	<b>74.93</b>
<b>S-11</b>										
S-11/1	Gura crop land	Brownish soil, Coarse	30	87.7	5.6	0.54	2.39/ 1.102	64.3	18.44	17.26
S-11/2	Gura crop land	Brownish soil, Coarse	60	110	5.5	0.65	2.42/ 0.845	43.07	28.36	28.57
S-11/3	Gura crop land	Brownish soil, Coarse	90	109	7.9	0.63	2.30/ 0.848	32.83	31.65	35.52

			<b>Avg</b>	<b>102</b>	<b>6.3</b>	<b>0.61</b>	<b>2.37/ 0.932</b>	<b>46.73</b>	<b>26.15</b>	<b>27.12</b>
<b>S-12</b>										
S-12/1	Pusai village crop land	Brown. shaly soil, fine	30	235	8	0.66	2.56/ 0.882	14.62	17.34	68.04
S-12/2	Pusai village crop land	Brown. shaly soil, fine	60	203	8.2	0.64	2.60/ 0.937	10.77	15.18	74.05
S-12/3	Pusai village crop land	Brown. shaly soil, fine	90	154	7.6	0.58	2.61/ 1.103	5.72	34.76	59.52
			<b>Avg</b>	<b>197</b>	<b>7.9</b>	<b>0.63</b>	<b>2.59/ 0.974</b>	<b>10.37</b>	<b>22.43</b>	<b>67.20</b>
<b>S-13</b>										
S-13/1	Korata crop land	Dark grey clay soil, fine	30	161	7.9	0.69	2.45/ 0.756	6.13	20.2	73.67
S-13/2	Korata crop land	Dark grey clay soil, fine	60	149	7.4	0.68	2.46/ 0.782	3.74	19.91	76.35
S-13/3	Korata crop land	Dark grey clay soil, fine	90	151	8.2	0.69	2.55/ 0.789	5.51	18.94	75.55
			<b>Avg</b>	<b>154</b>	<b>7.8</b>	<b>0.69</b>	<b>2.49</b>	<b>5.13</b>	<b>19.68</b>	<b>75.19</b>

**Table-6.4: Soil Quality Data for Chemical parameters of Soil Samples collected in the study area**

<b>Site/ Sample no</b>	<b>Village/soil land</b>	<b>Depth</b>	<b>Organic matter</b>	<b>N</b>	<b>SAR</b>	<b>K<sub>2</sub>O</b>	<b>Fe</b>	<b>Mo</b>	<b>Mn</b>	<b>P<sub>2</sub>O<sub>5</sub></b>
		<b>M</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>mg/kg</b>	<b>%</b>	<b>%</b>
<b>S-1</b>										
S-1/1	Bheempur Crop land	30	2.5	0.14	1.66	0.31	3.39	<0.1	1.87	2.34
S-1/2	Bheempur Crop land	60	1.55	0.09	1.34	0.14	2.31	<0.1	2.49	2.14
S-1/3	Bheempur Crop land	90	0.85	0.03	1.69	0.12	1.94	<0.1	2.96	2.41
		<b>Avg</b>	<b>1.633</b>	<b>0.087</b>	<b>1.56</b>	<b>0.19</b>	<b>2.55</b>	<b>&lt;0.1</b>	<b>2.44</b>	<b>2.296</b>
<b>S-2</b>										
S-2/1	Nippani Crop land	30	2.40	0.16	2.75	0.31	3.29	<0.1	2.71	1.91
S-2/2	Nippani Crop land	60	2.85	0.18	2.0	0.24	2.70	<0.1	2.48	1.68
S-2/3	Nippani Crop land	90	1.90	0.21	4.39	0.30	3.15	<0.1	3.44	1.91
		<b>Avg</b>	<b>2.38</b>	<b>0.18</b>	<b>3.05</b>	<b>0.28</b>	<b>3.05</b>	<b>&lt;0.1</b>	<b>2.88</b>	<b>1.83</b>
<b>S-3</b>										
S-3/1	Tamsi-B crop land	30	2.40	0.11	3.92	0.33	2.16	<0.1	1.69	1.10
S-3/2	Tamsi-B crop land	60	1.45	0.09	0.42	0.22	1.84	<0.1	1.09	0.97
S-3/3	Tamsi-B crop land	90	2.85	0.12	2.19	0.28	2.33	<0.1	2.64	0.94

		Avg	2.23	0.11	2.18	0.28	2.11	<0.1	1.81	1.00
<b>S-4</b>										
S-4/1	Talamadugu crop land	30	2.75	0.15	1.12	0.31	1.33	<0.1	0.57	0.69
S-4/2	Talamadugu crop land	60	2.05	0.10	1.13	0.22	1.30	<0.1	0.42	0.44
S-4/3	Talamadugucrop land	90	1.40	0.08	2.25	0.14	1.04	<0.1	0.35	0.12
		Avg	2.07	0.11	1.50	0.22	1.22	<0.1	0.45	0.42
<b>S-5</b>										
S-5/1	Pochara crop land	30	2.75	0.20	1.07	0.57	2.51	<0.1	1.97	3.54
S-5/2	Pochara crop land	60	2.60	0.18	1.98	0.29	1.94	<0.1	0.87	1.25
S-5/3	Pochara crop land	90	2.50	0.19	3.71	0.34	3.49	<0.1	1.92	1.62
		Avg	2.62	0.19	2.25	0.40	2.65	<0.1	1.59	2.14
<b>S-6</b>										
S-6/1	Savaragaon crop land	30	0.95	0.02	2.02	0.28	0.47	<0.1	0.36	0.45
S-6/2	Savaragaon crop land	60	1.05	0.07	1.95	0.28	0.40	<0.1	0.25	0.29
S-6/3	Savaragaon crop land	90	1.45	0.03	2.88	0.23	0.50	<0.1	0.20	0.35
		Avg	1.15	0.04	2.28	0.26	0.46	<0.1	0.27	0.36
<b>S-7</b>										
S-7/1	Jamdapur crop land	30	2.0	0.15	4.47	0.52	2.40	<0.01	3.21	1.76
S-7/2	Jamdapur crop land	60	3.0	0.22	16.46	0.35	2.25	<0.01	3.122	1.37
S-7/3	Jamdapur crop land	90	2.0	0.11	25.64	0.42	2.39	<0.01	3.97	1.30
		Avg	2.33	0.16	15.52	0.43	2.35	<0.01	3.43	1.48
<b>S-8</b>										
S-8/1	Adilabad crop land	30	2.65	0.07	2.52	0.25	1.37	<0.01	2.0	0.75
S-8/2	Adilabad crop land	60	1.45	0.09	2.62	0.25	1.57	<0.01	1.81	0.59
S-8/3	Adilabad crop land	90	1.65	0.06	3.84	0.17	1.16	<0.01	1.29	0.84
		Avg	1.92	0.073	2.99	0.22	1.37	<0.01	1.70	0.73
<b>S-9</b>										
S-9/1	Exploration block Crop land	30	1.20	0.04	1.15	0.16	2.07	<0.01	2.41	0.22
S-9/2	Exploration block Crop land	60	1.55	0.05	0.69	0.10	2.11	<0.01	1.41	0.85
S-9/3	Exploration block Crop land	90	-	-	-	-	-	-	-	--
		Avg	1.38	0.045	0.92	0.13	2.09	<0.01	1.91	0.535
<b>S-10</b>										



S-10/1	Tamsi-2 crop land	30	2.65	0.12	1.3	0.19	3.18	<0.01	0.38	1.80
S-10/2	Tamsi-2 crop land	60	1.20	0.06	1.48	0.26	3.52	<0.01	0.35	1.39
S-10/3	Tamsi-2 crop land	90	2.95	0.18	1.09	0.29	3.03	<0.01	0.43	1.85
		Avg	2.27	0.12	1.29	0.25	3.24	<0.01	0.39	1.68
<b>S-11</b>										
S-11/1	Gura crop land	30	2.15	0.11	1.63	0.26	1.36	<0.01	1.07	1.27
S-11/2	Gura crop land	60	1.80	0.09	2.04	0.18	1.93	<0.01	1.31	0.85
S-11/3	Gura crop land	90	1.55	0.06	3.24	0.20	1.95	<0.01	1.35	0.86
		Avg	1.83	0.09	2.30	0.21	1.75	<0.01	1.24	0.99
<b>S-12</b>										
S-12/1	Pusai crop land	30	1.40	0.04	1.9	0.19	1.08	<0.01	0.07	1.09
S-12/2	Pusai crop land	60	1.05	0.02	2.13	0.14	1.01	<0.01	0.08	1.34
S-12/3	Pusai crop land	90	1.40	0.05	2.74	0.10	1.04	<0.01	0.07	2.07
		Avg	1.28	0.04	2.26	0.14	1.04	<0.01	0.07	1.50
<b>S-13</b>										
S-13/1	Korata crop land	30	2.90	0.19	2.38	0.53	3.16	<0.01	0.15	2.53
S-13/2	Korata crop land	60	1.20	0.04	2.64	0.46	2.90	<0.01	0.10	1.32
S-13/3	Korata crop land	90	1.65	0.17	3.04	0.47	3.32	<0.01	0.13	1.30
		Avg	1.92	0.13	2.69	0.49	3.13	<0.01	0.126	1.72

Table-6.5 provides summarized soil quality data range for samples drawn at different depths from each sample sites in the study area and table-6.6 provides the grain size distribution chart based on average percentage of grain size to a depth of 90 cm for each soil sample sites in the Study Area.

**Table-6.5: Summarized Soil Quality Data Range for Soil Samples Drawn at different depths from Each Sample sites in the Study Area**

Sl. No.	PARAMETERS	RANGE OF Soil QUALITY DATA			
		DEPTH OF SAMPLE			TOTAL (30-90 cm)
		AT 30 cm	AT 60 cm	AT 90 cm	
1)	Bulk Density (g/c.c)	0.6354 – 1.1137	0.717 – 1.0531	0.6013 – 1.1028	0.717 – 1.1137
2)	Electrical Conductivity (EC)µs/cm	40.4 – 495	49.5 – 285	51.5 – 411	40.4 – 495
3)	pH value	5.6 – 8.1	5.5 – 8.3	7.4 – 8.9	5.5 – 8.9
4)	Nitrogen as N (%)	0.02 – 0.19	0.02 – 0.22	0.03 – 0.21	0.02 – 0.22
5)	Organic Matter (%)	0.04- 2.75	0.02 – 2.85	0.03 – 2.85	0.02 – 2.85
6)	Potassium as K2O (%)	0.16 – 0.57	0.10 – 0.46	0.10 – 0.47	0.10 – 0.57
7)	Phosphorous as P2O5 (%)	0.22 – 3.54	0.29 – 2.14	0.12 – 2.41	0.12 – 3.54

8)	SAR	1.07 – 4.47	0.42 – 16.46	0.90- 25.68	0.42 – 25.68
9)	Iron as Fe(%)	0.47 – 3.39	0.40 – 3.52	0.50 – 3.32	0.40 – 3.52
10)	Molybdenum Mo(mg/kg)	<0.1 - <0.1	<0.1 - <0.1	<0.1 - <0.1	<0.1 - <0.1
11)	Manganese as Mn (%)	0.07 – 3.54	0.08 – 3.12	0.07 – 3.97	0.07 – 3.97
12)	Porosity	0.54 – 0.75	0.58 – 0.71	0.58 – 0.76	0.54 – 0.76
13)	Temperature (°C)				
14)	Specific Gravity	2.39 – 2.60	2.37 – 2.60	2.3 – 2.61	2.3 – 2.61

**Table-6.6 :Grain Size Distribution (textural) Chart Based on Average Percentage of Grain size to a depth of 90 cm for each Sample sites in the Study Area.**

Sample Site.	Sample Location	Land Type	Gravel (%)	Sand (%)	Silt & Clay (%)
S-1	Bheempur Village		19.13	39.88	40.98
S-2	Nippani Village		1.45	14.81	83.74
S-3	Tamsi-B Village		2.89	44.35	52.76
S-4	Talamadugu near		12.72	57.01	30.28
S-5	Pochara Near highway		3.40	20.20	76.39
S-6	Savargaon Near		20.70	60.98	18.32
S-7	Jamdapur Village		2.05	18.03	79.92
S-8	Adilabad urban-1		1.64	28.59	69.78
S-9	Exploration Block		33.65	37.58	28.77
S-10	Tamsi-2		11.37	13.42	74.93
S-11	Gura near Village		46.73	26.15	27.12
S-12	Pusai Village near		10.37	22.43	67.20
S-13	Korata near Village		5.13	19.68	75.19

### 6.5 Observation on Soil Quality Data

If we analyze the soil quality data and grain size data provided in table 6.4 and 6.6 respectively the soil in the study area mostly fall in the sandy loam, loam, sandy clay loam and silty loam type. As it has got pH value ranging from 6.5 to 8 it is good for sustaining plant growth.

## CHAPTER – VII: WATER REGIME

Stream /tube well/dug well water represents the water quality of the area. The chemical quality of water from these sources is very important to human health as well as the plants and animals that live in and around streams. So, it is necessary to assess the chemical attributes of water.

### 7.1 Methodology and Water Sample Location Detail

Water samples were collected during pre and post monsoon seasons. A total of 24 water samples were collected from different water sources i.e., surface water and ground water for abiotic parameter study at surrounding places of study area. The collected water samples contains 8 surface water samples and 16 Ground water samples. In all 5 samples are located in core zone of Exploration block and remaining 18 samples are buffer zone about 10 km radius center of the Exploration block. The water samples were collected using following procedures:

- Used food grade polymer bottles for collection of water samples in study area
- Before collection of water the bottles/cans were washed 2-3 times with the same water
- At each location 1 liter and 500 ml of water samples were collected
- In 500ml water 10 drops of 1: 1 concentration of nitric acid was mixed
- proper labeling and numbering of water samples bottles at the site
- Field observations were recorded in the field note book

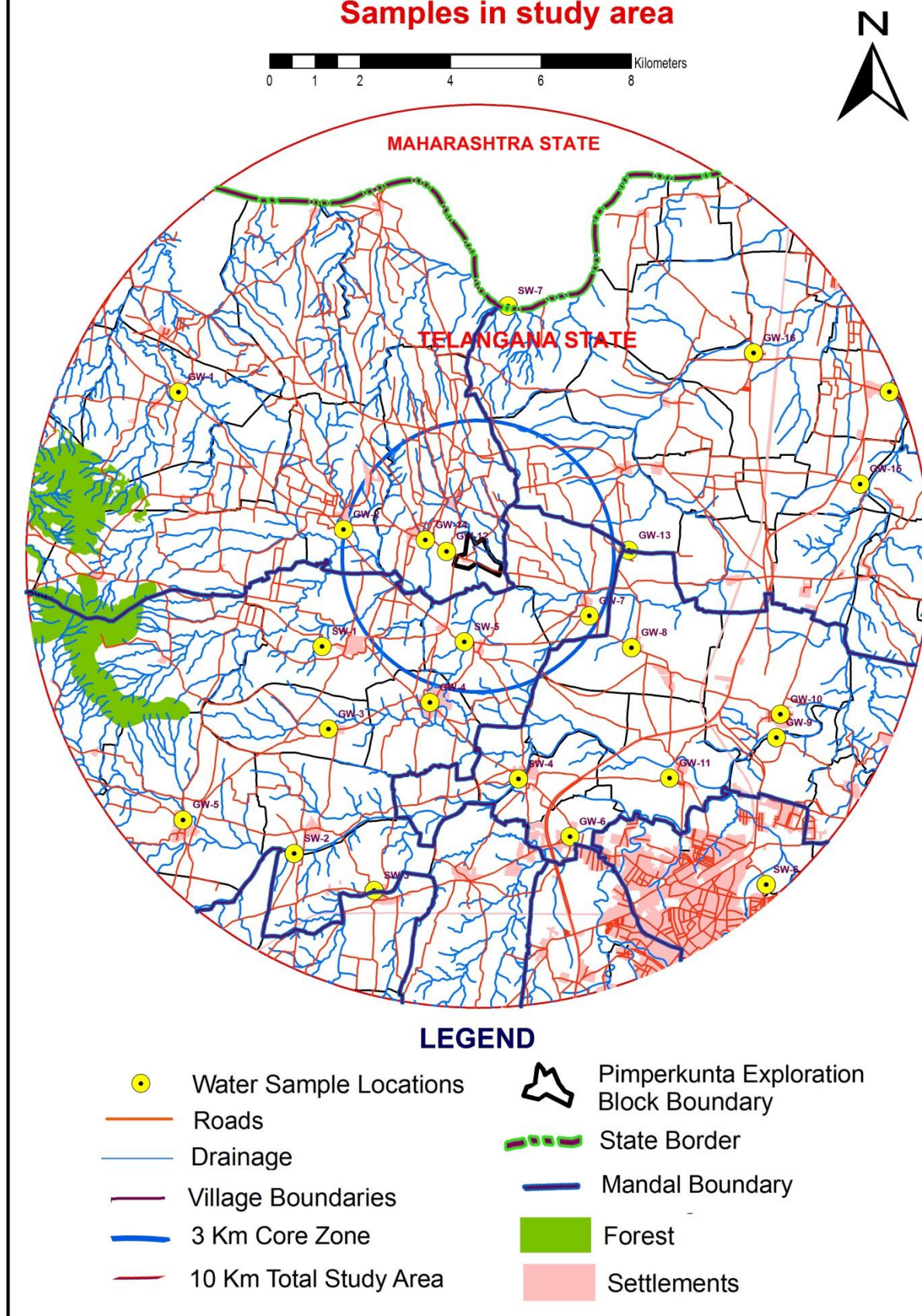
The location details of water samples collected are provided in the following table 7.1 and location map in Figure-6.

**Table-7.1:Details of Water sample Collected in Study area**

S. No.	Water sample No.	Geo-coordinates		Village Name	Source of water	Zone	Post Monsoon	Pre Monsoon
		Lat	Long				Date	Date
1	GW-1	19°46'27.52"	78°25'17.46"	Bheempur Mandal	Hand Pump	Buffer	06.01.2021	25.06.2021
2	GW-2	19°44'50.10"	78°27'23.90"	Nippani	Hand Pump	Core	06.01.2021	25.06.2021
3	GW-3	19°42'26.54"	78°27'14.34"	Gammidi village	Bore Well	Buffer	06.01.2021	25.06.2021
4	GW-4	19°42'46.50"	78°28'31.04"	Nagpur Near school	Hand Pump	Buffer	06.01.2021	25.06.2021
5	GW-5	19°41'20.00"	78°25'24.87"	Tamsi(b) mandal	Hand Pump	Buffer	07.01.2021	25.06.2021
6	GW-6	19°41'11.29"	78°30'18.38"	Rampur Village	Hand Pump	Buffer	07.01.2021	25.06.2021
7	GW-7	19°43'50.04"	78°30'31.21"	Ghotkori village	Bore Well	Core	08.01.2021	26.06.2021
8	GW-8	19°43'27.63"	78°31'03.54"	Jamdapur village	Hand Pump	Buffer	08.01.2021	26.06.2021
9	GW-9	19°42'24.06"	78°32'54.07"	Belluri village	Hand Pump	Buffer	08.01.2021	26.06.2021
10	GW-10	19°42'40.94"	78°32'57.10"	Chanda	Hand Pump	Buffer	08.01.2021	26.06.2021
11	GW-11	19°41'54.11"	78°31'33.42"	Bhimsari village	Bore Well	Buffer	08.01.2021	26.06.2021
12	GW-12	19°44'35.27"	78°28'42.27"	Pimparkunta village	Hand Pump	Core	09.01.2021	26.06.2021
13	GW-13	19°44'37.49"	78°31'0.58"	Guda village	Hand Pump	Buffer	09.01.2021	27.06.2021
14	GW-14	19°44'43.32"	78°28'26.13"	Near pimparkunta village	Bore Well	Core	09.01.2021	27.06.2021
15	GW-15	19°45'27.06"	78°33'55.44"	Pusai village	Bore Well	Buffer	09.01.2021	27.06.2021
16	GW-16	19°47'0.35"	78°32'33.63"	Gimma village	Hand Pump	Buffer	09.01.2021	27.06.2021
17	SW-1	19°43'25.87"	78°27'08.75"	Khaparla pond	Surface	Buffer	06.01.2021	25.06.2021
18	SW-2	19°40'56.78"	78°26'49.46"	Waddadi Pond-project	Surface	Buffer	07.01.2021	25.06.2021
19	SW-3	19°40'30.90"	78°27'50.45"	Hasnapur	Surface	Buffer	07.01.2021	26.06.2021
20	SW-4	19°41'52.24"	78°29'38.81"	Pochera village	Surface	Buffer	07.01.2021	26.06.2021
21	SW-5	19°43'30.31"	78°28'56.53"	Saragoan village pond	Surface	Core	07.01.2021	26.06.2021
22	SW-6	19°40'38.38"	78°32'47.77"	Khanapur village	Surface	Buffer	08.01.2021	26.06.2021
23	SW-7	19°47'32.21"	78°29'26.84"	Penganga river	Surface	Buffer	09.01.2021	27.06.2021
24	SW-8	19°46'33.60"	78°34'16.82"	Near pipalwada village	Surface	Buffer	09.01.2021	27.06.2021

Note: GW= Ground Water SW= Surface Water

**Figure-6: Location Map of surface and ground water Samples in study area**



**7.2 Data Generation:** In the present study all the physical and chemical parameters for surface and ground water have been recorded/ analysed as per APHA, 22<sup>nd</sup> edition & IS: 3025. The details of parameters analyzed and analytical methods used for it is provided in table- 7.2.

**Table-7.2: The parameters analyzed and analytical methods Used**

S. No.	Parameters	Methods
<b>Physical Parameters</b>		
1.	Colour, Hazen units	IS 3025 (Part 4)
2.	P <sup>H</sup> value	IS 3025 (Part 11)
3.	Total dissolved Solids(mg/l)	IS 3025 (Part 16)
4.	Turbidity, NTU	IS 3025 (Part 10)
5	Odour	IS 3025 (Part 5)
<b>Chemical Parameters</b>		
6	Aluminium as Al (mg/l)	IS 3025 (Part 2)
7	calcium as Ca (mg/l)	IS 3025 (Part 40)
8	Chloride as Cl (mg/l)	IS 3025 (Part 32)
9	Copper as Cu (mg/l)	IS 3025 (Part 2)
10	Fluoride as F (mg/l)	IS 3025 (Part 60)
11	Free residual chlorine (mg/l)	IS 3025 (Part 26)
12	Iron as Fe (mg/l)	IS 3025 (Part 2)
13	Magnesium as Mg (mg/l)	IS 3025 (Part 46)
14	Manganese as Mn (mg/l)	IS 3025 (Part 2)
15	Nitrate as NO <sub>3</sub> (mg/l)	IS 3025 (Part 34)
16	Sulphate as SO <sub>4</sub> (mg/l)	IS 3025 (Part 24)
17	Total Alkalinity as calcium carbonate (mg/l)	IS 3025 (Part 23)
18	Total hardness as CaCO <sub>3</sub> (mg/l)	IS 3025 (Part 21)
19	Zinc as Zn (mg/l)	IS 3025 (Part 2)
20	Cadmium as Cd (mg/l)	IS 3025 (Part 2)
21	Cyanide as CN (mg/l)	IS 3025 (Part 27)
22	Mercury as Hg (mg/l)	IS 3025 (Part 48)/Mercury analyzer
23	Total Arsenic as As(mg/l)	IS 3025 (Part 37)
24	Chromium as Cr (mg/l)	IS 3025 (Part 52)
25	Total Selenium as Se (mg/l)	IS 3025 (Part 37)
26	Coliforms	IS 15185
27	E Coli	IS 15185

**Surface Water:** Physical and chemical parameters analytical results of surface water samples of post monsoon period drawn during 6<sup>th</sup> January to 9<sup>th</sup> January is given in table-7.3 and for pre monsoon period drawn during 25<sup>th</sup> June to 27<sup>th</sup> June is provided in Table-7.4 below.

**Table-7.3: Surface water physical and chemical analytical results data for Post Monsoon period drawn during 6<sup>th</sup> January to 9<sup>th</sup> January 2021 in the study area**

Sl. No	Parameters	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8
	<b>Physical</b>								
1	Colour, Hazen units	1	1	1	1	1	200	1	1
2	P <sup>H</sup> value	7.4	7.8	7.9	7.8	7.6	7.5	7.2	8.4
3	Total dissolved Solids(mg/l)	246	338	416	422	326	994	324	398
4	Turbidity, NTU	7.5	2.7	1.7	1	0.6	0.9	4.2	1.5
5	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
	<b>Chemical</b>								
6	Al (mg/l)	0.18	0.04	0.09	0.08	0.07	0.04	0.16	0.07
7	Ca (mg/l)	36.1	37	38.5	46.5	38.5	98	25.6	49.7
8	Cl (mg/l)	14	28.1	28.1	28.1	28.1	161	35.1	28
9	Cu (mg/l)	0.03	0.02	0.03	0.03	0.04	0.02	0.07	0.03
10	F (mg/l)	0.26	0.02	0.03	0.03	0.04	0.02	0.07	0.03
11	Free residual chlorine (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
12	Fe (mg/l)	0.23	0.06	0.07	0.09	0.15	<0.02	0.17	0.05
13	Mg (mg/l)	14.6	33.1	35	34	28.2	34	28.2	40.9
14	Mn (mg/l)	0.11	0.07	0.08	0.06	0.08	0.2	0.12	0.07
15	No <sub>3</sub> (mg/l)	0.19	0.3	0.21	7.08	0.28	20.3	3.14	8.85
16	So <sub>4</sub> (mg/l)	18.58	26.44	19.73	23.78	17.48	30.62	25.49	17.67
17	Total Alkalinity as CaCO <sub>3</sub> (mg/l)	136	188	230	242	190	364	164	216
18	Total hardness as CaCO <sub>3</sub> (mg/l)	150	228	240	256	212	384	180	292
19	Zn (mg/l)	0.04	0.01	0.04	0.03	0.03	0.02	0.04	0.03
20	Cd (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

21	Cn (mg/l)	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
22	Hg (mg/l)	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005
23	Total As(mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
24	Cr (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Total Se (mg/l)	<0.002	<.002	<.002	<0.002	<.002	<0.002	<.002	<.002

**Table-7.4: Surface water physical and chemical analytical results data for Pre Monsoon period drawn during 25<sup>th</sup> June to 27<sup>th</sup> June 2021 in the study area**

Sl. No	Parameters	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8
	<b>Physical</b>								
1	Colour, Hazen units	70	5	1	5	5	50	210	80
2	P <sup>H</sup> value	7.5	7.3	7.2	7.5	7.5	7.1	7.5	7.5
3	Total dissolved Solids(mg/l)	160	438	732	378	302	726	264	314
4	Turbidity, NTU	0.46	0.27	0.30	1.59	0.27	0.46	0.46	0.46
5	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
	<b>Chemical</b>								
6	Al (mg/l)	2.4	0.02	0.02	0.40	0.03	<0.01	4.6	1.5
7	Ca (mg/l)	12.7	19	75.4	14.3	9.5	59.5	17.5	15.9
8	Cl (mg/l)	7.9	33.5	113.3	23.7	23.7	152.8	15.8	19.7
9	Cu (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
10	F (mg/l)	<0.1	0.40	<0.1	0.30	0.20	<0.1	<0.1	0.30
11	Free residual chlorine (mg/l)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
12	Fe (mg/l)	1.9	<0.02	<0.02	0.20	<0.02	<0.02	4.20	1.10
13	Mg (mg/l)	17.3	42.4	38.5	39.5	24.1	36.1	24	26
14	Mn (mg/l)	0.14	0.80	<0.01	0.12	<0.01	0.09	0.30	0.01
15	No <sub>3</sub> (mg/l)	2.80	<1.0	3.3	1.40	<1.0	18.3	8.5	6.9
16	So <sub>4</sub> (mg/l)	5.70	35.4	52.8	24.8	21.6	<1.0	<1.0	1.2
17	Total Alkalinity as CaCO <sub>3</sub> (mg/l)	87.4	193.8	256.5	201.4	133	285	121.6	144.4



18	Total hardness as CaCO <sub>3</sub> (mg/l)	102.1	221.8	346.5	198	122.8	297	142.6	146.5
19	Zn (mg/l)	<0.01	<0.1	0.1	<0.1	<0.01	<0.01	<0.01	<0.01
20	Cd (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
21	Cn (mg/l)	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
22	Hg (mg/l)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
23	Total As(mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
24	Cr (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Total Se (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
26	Coliforms	Present	Present	Present	Present	Present	Present	Present	Present
27	E Coli	Present	Present	Present	Present	Present	Present	Present	Present

**Ground Water:** Physical and chemical parameters analytical results of ground water samples of post monsoon period drawn during 6<sup>th</sup> January to 9<sup>th</sup> January is given in table-7.5 A & 7.5B and for pre monsoon period drawn during 25<sup>th</sup> June to 27<sup>th</sup> June is provided in Table 7.6A & 7.6B.

**Table-7.5A: Ground water physical and chemical analytical results data for Post Monsoon period drawn during 6<sup>th</sup> January to 9<sup>th</sup> January 2021 in the study area**

Sl. No	Parameters	GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	GW-7	GW-8
	<b>Physical</b>								
1	Colour, Hazen units	1	1	1	1	1	200	1	1
2	P <sup>H</sup> value	7.4	7.1	7.1	7	7.4	7.3	7.3	7.6
3	Total dissolved Solids(mg/l)	842	4086	786	902	1120	840	530	304
4	Turbidity, NTU	0.7	0.7	<0.1	0.3	4.7	0.6	3.6	1.5
5	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
	<b>Chemical</b>								
6	Al (mg/l)	0.02	0.02	0.02	0.04	0.04	0.02	0.13	0.03
7	Ca (mg/l)	69.74	143	107	146	90	96.2	117	65.7
8	Cl (mg/l)	63.2	126	63.2	119	98.3	91.2	42.1	14
9	Cu (mg/l)	<0.01	<0.01	<0.01	0.02	0.04	<0.01	0.07	0.02

10	F (mg/l)	0.95	0.63	1.05	1.5	0.87	0.75	0.77	0.14
11	Free residual chlorine (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
12	Fe (mg/l)	0.08	<0.02	<0.02	0.1	0.4	0.02	0.49	0.45
13	Mg (mg/l)	79.8	19	43.3	6.8	43.2	59.3	23.4	10.7
14	Mn (mg/l)	0.02	0.04	0.01	0.04	0.02	0.02	0.06	0.05
15	No <sub>3</sub> (mg/l)	46.1	46.1	45.2	45.6	45.9	44.66	42.2	0.3
16	So <sub>4</sub> (mg/l)	23.46	32.05	46.27	33.45	59.11	48.78	26.71	8.54
17	Total Alkalinity as CaCO <sub>3</sub> (mg/l)	372	362	348	308	392	346	254	186
18	Total hardness as CaCO <sub>3</sub> (mg/l)	502	434	444	392	484	484	388	208
19	Zn (mg/l)	0.04	0.11	<0.01	5.82	0.23	0.06	0.88	0.04
20	Cd (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
21	Cn (mg/l)	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
22	Hg (mg/l)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
23	Total As(mg/l)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
24	Cr (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Total Se (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

**Table-7.5B: Ground water physical and chemical analytical results data for Post Monsoon period drawn during 6<sup>th</sup> January to 9<sup>th</sup> January 2021 in the study area**

Sl.No	Parameters	GW-9	GW-10	GW-11	GW-12	GW-13	GW-14	GW-15	GW-16
	<b>Physical</b>								
1	Colour, Hazen units	200	1	1	1	1	1	1	1
2	P <sup>H</sup> value	7.4	7.2	7.1	7.0	7.0	7.5	7.1	7.2
3	Total dissolved Solids(mg/l)	938	1136	916	692	774	410	728	1376
4	Turbidity, NTU	0.3	0.2	0.8	0.6	0.1	0.3	1	0.3
5	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
	<b>Chemical</b>								
6	Al (mg/l)	0.02	0.02	0.07	0.08	0.03	0.1	0.04	0.02
7	Ca (mg/l)	89.8	86.6	106	137	162	65.7	104.2	69
8	Cl (mg/l)	84.2	113	105	77.2	84.2	42.1	77.2	175
9	Cu (mg/l)	<0.01	<0.01	<0.05	0.04	0.03	0.01	0.02	<0.01
10	F (mg/l)	0.33	0.32	0.89	0.42	0.27	0.2	0.85	0.53
11	Free residual chlorine (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
12	Fe (mg/l)	0.19	<0.02	0.38	0.29	0.1	<0.02	0.07	<0.02
13	Mg (mg/l)	51.6	46.7	64.2	19.0	3.9	17.5	58.4	36
14	Mn (mg/l)	0.03	0.03	0.05	0.06	0.03	0.03	0.03	0.04
15	No <sub>3</sub> (mg/l)	44.5	45.3	45.8	41.1	45.6	34.11	41.2	45.9
16	So <sub>4</sub> (mg/l)	42.3	50.37	28.49	24.79	34.8	20.25	15.33	57.76
17	Total Alkalinity as CaCO <sub>3</sub> (mg/l)	396	466	308	334	260	160	356	446
18	Total hardness as CaCO <sub>3</sub> (mg/l)	436	408	528	420	420	236	500	320
19	Zn (mg/l)	0.03	0.06	0.46	0.78	1.87	0.04	0.16	0.42
20	Cd (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

21	Cn (mg/l)	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
22	Hg (mg/l)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
23	Total As(mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
24	Cr (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Total Se (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

**Table-7.6A: Ground water physical and chemical analytical results data for Pre Monsoon period drawn during 25<sup>th</sup> June to 27<sup>th</sup> June 2021 in the study area**

Sl.No	Parameters	GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	GW-7	GW-8
	<b>Physical</b>								
1	Colour, Hazen units	1	1	1	1	1	1	1	1
2	P <sup>H</sup> value	7.6	7.2	7.5	7.1	7.2	7.3	7.5	7.5
3	Total dissolved Solids(mg/l)	876	1162	1180	786	1230	1160	714	516
4	Turbidity, NTU	0.23	0.75	0.30	0.17	1.01	0.15	0.37	0.48
5	Odour	Agreable	Agreable	Agreable	Agreable	Agreable	Agreable	Agreable	Agreable
	<b>Chemical</b>								
6	Al (mg/l)	<0.01	0.02	0.02	<0.01	0.01	<0.01	<0.01	<0.01
7	Ca (mg/l)	64.1	124.2	111.1	95.2	87.3	124.2	104.2	84.2
8	Cl (mg/l)	54.2	142.9	123.2	93.6	123.2	157.7	54.2	39.4
9	Cu (mg/l)	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
10	F (mg/l)	1.2	0.7	1	1.4	1.10	0.97	0.7	0.4
11	Free residual chlorine (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
12	Fe (mg/l)	0.07	1.0	0.7	<0.02	0.5	0.03	0.6	0.4
13	Mg (mg/l)	87.6	51	81.9	48.2	84.3	109.4	24.3	24.3
14	Mn (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
15	No <sub>3</sub> (mg/l)	52.5	51	49.9	50.9	52.7	51.6	47.5	35.5
16	So <sub>4</sub> (mg/l)	30.9	44.5	77.9	42.8	63.6	82.2	33	33.7
17	Total Alkalinity as CaCO <sub>3</sub> (mg/l)	408.5	418	380	313.5	465.5	408.5	323	237.5
18	Total hardness as CaCO <sub>3</sub> (mg/l)	520	520	613.8	435.6	564.3	760	360	310
19	Zn (mg/l)	0.02	0.19	0.02	0.8	0.2	0.05	0.09	0.01
20	Cd (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
21	Cn (mg/l)	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
22	Hg (mg/l)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
23	Total As(mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
24	Cr (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Total Se (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
26	Coliforms	Absent	Absent	Present	Present	Present	Absent	Present	Present
27	E Coli	Absent	Absent	Present	Absent	Present	Absent	Present	Present

**Table-7.6B: Ground water physical and chemical analytical results data for Pre Monsoon period drawn during 25<sup>th</sup> June to 27<sup>th</sup> June 2021 in Study Area**

Sl.No	Parameters	GW-9	GW-10	GW-11	GW-12	GW-13	GW-14	GW-15	GW-16
	<b>Physical</b>								
1	Colour, Hazen units	1	1	1	1	1	1	1	1
2	P <sup>H</sup> value	7.5	7.5	7.5	7	7.2	7.1	7.4	7.6
3	Total dissolved Solids(mg/l)	1006	1096	926	916	798	1086	924	1146
4	Turbidity, NTU	0.24	0.59	0.11	1.93	0.35	0.21	0.75	1.11
5	Odour	Agreable	Agreable	Agreable	Agreable	Agreable	Agreable	Agreable	Agreable
	<b>Chemical</b>								
6	Al (mg/l)	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
7	Ca (mg/l)	96.2	76.2	56.1	132.3	156.3	196.4	104.2	60.1
8	Cl (mg/l)	108.4	137.1	147.8	98.6	103.5	142.9	103.5	192.2
9	Cu (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
10	F (mg/l)	0.6	0.7	1.1	0.7	0.6	0.3	1.1	0.7
11	Free residual chlorine (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
12	Fe (mg/l)	0.2	0.6	0.3	0.8	0.04	<0.02	0.8	0.3
13	Mg (mg/l)	53.5	80.3	87.6	26.8	4.9	12.2	68.1	75.4
14	Mn (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
15	No <sub>3</sub> (mg/l)	51.4	52.4	50.6	46.7	52	52.2	50.9	52.3
16	So <sub>4</sub> (mg/l)	53.8	66.8	45.6	36.6	51.3	45.7	25.1	60.5
17	Total Alkalinity as CaCO <sub>3</sub> (mg/l)	399	484.5	361	351.5	323	342	389.5	484.5
18	Total hardness as CaCO <sub>3</sub> (mg/l)	460	520	500	440	410	540	540	460
19	Zn (mg/l)	<0.01	1.3	0.8	0.9	1.9	<0.01	1.4	0.2
20	Cd (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
21	Cn (mg/l)	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
22	Hg (mg/l)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
23	Total As(mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
24	Cr (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Total Se (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
26	Coliforms	Present	Absent	Absent	Present	Absent	Present	Absent	Present
27	E Coli	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present

### 7.3 Observation on Surface and Ground Water Quality

Surface and ground water quality is being assessed from the collected water samples from surface water bodies and ground water bodies within the 10 Km buffer zone of the mine. The water sample is collected during the pre and post monsoon season to find out seasonal impacts. The

quality of surface water and ground water in the study area is within prescribed permissible limit and in general is good, potable and suitable for irrigation and domestic use purpose. Water containing calcium carbonate at concentrations below 60 mg/l is generally considered as soft; 60–120 mg/l, moderately hard; 120–180 mg/l, hard; and more than 180 mg/l, very hard (McGowan, 2000). As most of surface and ground water showed > 150 mg/l calcium carbonate concentration the water in the area is considered as of hard to very hard.

The observations are discussed below.

#### Surface Water:

**Table-7.7: Range of concentration of values in Surface Water samples of various parameters during Post and Pre Monsoon Period in the study area along with prescribed limit**

Sl. No	Parameters	Post Monsoon		Pre Monsoon		Drinking Water Desirabl e limit (mg/l)	Drinking Water Permissible limit(mg/l)
		Min.	Max	Min	Max	IS: 10500 (1991)	IS: 10500 (1991)
Physical Parameters							
1	Colour, Hazen units	1	200	1	210	-	-
2	p <sup>H</sup> value	7.4	8.4	7.2	7.5	6.5 to 8.5	No relaxation
3	Total dissolved Solids(mg/l)	246	994	160	732	500	2000
4	Turbidity, NTU	0.6	4.2	0.27	1.59	-	-
5	Odour	Agreeable	Agreeable	Agreeable	Agreeable	-	-
Chemical Parameters							
6	Aluminium as Al (mg/l)	0.04	0.18	<0.01	4.6	-	-
7	calcium as Ca (mg/l)	25.6	98	14.3	75.4	75	200
8	Chloride as Cl (mg/l)	14	161	7.9	152.8	250	1000
9	Copper as Cu (mg/l)	0.02	0.07	<0.01	<0.01	-	-
10	Fluoride as F (mg/l)	0.21	0.72	<0.1	0.4	1.0	1.5
11	Free residual chlorine (mg/l)	<0.1	<0.1	<0.1	<0.1	-	-
12	Iron as Fe (mg/l)	0.05	0.23	<0.02	4.2	0.3	1.0
13	Magnesium as Mg (mg/l)	14.60	40.90	17.30	42.4	30	100
14	Manganese as Mn (mg/l)	0.06	0.20	<0.01	0.8	-	-
15	Nitrate as No <sub>3</sub> (mg/l)	0.19	20.30	<1.0	18.30	45	No relaxation
16	Sulphate as So <sub>4</sub> (mg/l)	17.48	30.62	<1.0	52.8	200	400
17	Total Alkalinity as calcium carbonate (mg/l)	136	364	87.4	285	200	600
18	Total hardness as CaCo <sub>3</sub> (mg/l)	150	384	102.10	346.50	300	600
19	Zinc as Zn (mg/l)	0.01	0.04	<0.01	0.10	-	-
20	Cadmium as Cd (mg/l)	<0.01	<0.01	<0.01	<0.01	-	--
21	Cyanide as CN (mg/l)	Nil	Nil	Nil	Nil	-	-
22	Mercury as Hg (mg/l)	<.0005	<.0005	<.0005	<.0005	-	-
23	Total Arsenic as As(mg/l)	<0.002	<0.002	<0.002	<0.002	-	-
24	Chromium as Cr (mg/l)	<0.01	<0.01	<0.01	<0.01	-	-
25	Total Selenium as Se (mg/l)	<0.002	<0.002	<0.002	<0.002	-	-

If we analyze the above table (Table 7.3, 7.4 and 7.7) most of the surface water samples physical and chemical parameters are falling within prescribed limit making it suitable for human consumption. All the surface water samples are good for drinking purposes as the chemical parameters come far below the acceptable limit prescribed.

#### Ground Water:

**Table-7.8: Range of concentration of values in Ground Water samples of various parameters during Post and Pre Monsoon Period in the study area along with prescribed limit**

Sl. No	Parameters	Post Monsoon		Pre Monsoon		Desirable limit (mg/l)	Permissible limit(mg/l)
		Min.	Max	Min	Max	IS: 10500 (1991)	IS: 10500 (1991)
Physical Parameters							
1	Colour, Hazen units	1	1	1	1		
2	pH value	7.0	7.6	7.0	7.60	6.5 to 8.5	No relaxation
3	Total dissolved Solids(mg/l)	304	1376	516	1230	500	2000
4	Turbidity, NTU	<0.1	3.6	0.11	1.93		
5	Odour	Agreeable	Agreeable	Agreeable	Agreeable		
Chemical Parameters							
6	Aluminium as Al (mg/l)	0.02	0.13	<0.1	0.02		
7	calcium as Ca (mg/l)	65.70	143	56.10	196.40	75	200
8	Chloride as Cl (mg/l)	14	175	39.40	192.20	250	1000
9	Copper as Cu (mg/l)	<0.01	0.07	<0.01	0.02		
10	Fluoride as F (mg/l)	0.27	1.5	0.30	1.40	1.0	1.5
11	Free residual chlorine (mg/l)	<0.1	<0.1	<0.1	<0.1		
12	Iron as Fe (mg/l)	<0.02	0.49	<0.02	1.0	0.3	1.0
13	Magnesium as Mg (mg/l)	3.9	79.80	12.20	109.40	30	100
14	Manganese as Mn (mg/l)	0.02	0.11	<0.01	<0.01		
15	Nitrate as NO <sub>3</sub> (mg/l)	0.30	46.10	35.50	52.7	45	No relaxation
16	Sulphate as So <sub>4</sub> (mg/l)	8.54	59.11	25.10	82.20	200	400
17	Total Alkalinity as calcium carbonate (mg/l)	160	466	237.50	484.50	200	600
18	Total hardness as CaCo <sub>3</sub> (mg/l)	208	528	310	613.80	300	600
19	Zinc as Zn (mg/l)	<0.01	5.82	<0.1	1.90		
20	Cadmium as Cd (mg/l)	<0.01	<0.01	<0.1	<0.1		
21	Cyanide as CN (mg/l)	Nil	Nil	Nil	Nil		
22	Mercury as Hg (mg/l)	<.0005	<.0005	<.0005	<.0005		
23	Total Arsenic as As(mg/l)	<0.002	<0.002	<.002	<.002		
24	Chromium as Cr (mg/l)	<0.01	<0.01	<0.1	<0.1		
25	Total Selenium as Se (mg/l)	<0.002	<0.002	<0.002	<0.002		

If we analyze the above table (Table 7.5, 7.6 and 7.8) most of the ground water samples physical and chemical parameters are falling within prescribed limit making it suitable for human consumption and for agricultural and industrial use.

## CHAPTER – 8:

### SOCIO ECONOMIC PROFILE

Socio-economic study includes description of demography, available basic amenities like housing, healthcare services, transportation, education and cultural activities. Information on the above said factor has been collected to define the socio-economic profile of the study area (10 km radius). The information on socio-economic aspect of the study area has been compiled from secondary source of information which is available in Census Department. The socio-economic details of the study area is discussed below with reference to demography, Employment pattern, Infrastructural facilities and social and cultural activities.

#### 8.1 Demography

The study area consists Adilabad mandal (9 villages), and Tamsi mandal (21 villages), Jainath mandal (16 villages) and Talamadugu mandal (3 villages) in Adilabad District.

**Total population & Population Density:** The study area total population is 60,805 persons with an average population density of 194 persons/ sq. km. Battisavergaon and Hathighat village of Adilabad District has the lowest population density of 3 persons/sq. km. 26 villages have population in the range of 1000 – 7172 persons, 12 villages have population in the range between 500 – 999 persons and 11 villages have population between 37 – 499 persons.

**Sex Ratio:** The study area has total male population of 30084 and of female population is 30721 with an average sex ratio of 1: 12.

**Child Population:** Census data provides on child age is 0-6 years. The study area total child population is about 10.78 % (6557 children) of the total population and male & female child population of the study area is 3480 (5.72%) and 3066 (5.06%) respectively with an average sex ratio of 881.

**Schedule Caste:** The study area total schedule caste population is 12846 persons amounting 21.12% of total population and sex ratio is 1030 with male to female population being 6327 and 6519 persons.

**Schedule Tribe:** The study area total ST population is 8889 persons amounting 14.61% of the total population with a sex ratio (i.e. female per thousand male) of 989 with male to female population being 4470 and 4419 persons.

Literacy Rate: A person who can both read and write with understanding in any language has been treated as literate in 2011 census. All children of the age of 6 years or less have been excluded from total population while calculating the literacy rate. The total literacy rate of the study area 60.65% of the total population. The male literacy rate is 65.31 % of total population and female literacy rate is 50.15 % of total population in the study area. Table–8.1 briefly summarizes information collected on the demographic attributes of study area.

**Table–8.1: Summary of information on the demographic attributes of study area.**

Sl. No.	Description	Total Study Area
1.	Number of villages	49
2.	Number of households	14,479
3.	Area	29221.60 hectare
4.	Population	<b>60,805 person</b>
	a) Male population	30,084
	b) Female population	30,721
	c) Density of population (Person/sq. km.)	194
	d) Sex Ratio	1,022
5.	Child population (%)	
	a) Total population	6,557[10.78]%
	b) Male population	3,480[5.72]%
	c) Female population	3,066[5.06]%
6.	S C population	12, 846[21.12]
7.	S T population	8,889[14.61]
8.	Literacy Rate	
	a) Total population	33,185[54.57]
	b) Male literacy rate	19,217[65.31]
	c) Female literacy rate	14,009[45.60]

## 8.2 Employment Pattern

The employment pattern on the basis of the economic activity and the population has been classified into three main categories, viz. main workers, marginal workers and non-workers. the predominant categories of main workers are cultivators, agricultural labourers, those engaged in live-stock, forestry, fishing, mining and quarrying; manufacturing, processing and repairs in household industry and other services. The marginal workers are those who are employed for some part of the year and remain unemployed during the remaining part of the year. The non-workers include those engaged in unpaid household duties, students, retired persons, dependents, beggars, vagrants etc.;



The data on employment pattern with proportion of the main, marginal and non-workers out of the total population are given in Table 8.2

**Table 8.2: Percentage of Employment data in Study Area**

Workers	Male Employment		Female Employment		Total Employment
	Male Population (%)	Total Population (%)	Female Population (%)	Total Population (%)	Total Population (%)
<b>Main Workers</b>	52.23	25.84	43.17	21.81	47.65
<b>Marginal Workers</b>	4.07	4.48	10.86	5.48	9.97
<b>Non Workers</b>	40.29	19.13	47.33	23.91	43.85

### 8.3 Infrastructural and Public Utility Facilities

Infrastructural facilities in the study area is fairly good. It is well connected by roads, have good education institutions and medical facilities. The salient features of the various infrastructural facilities available in the study area are discussed below.

- (i) **Educational facilities:** In the entire study area, 47 villages have at least one primary school and 2 Hamlet villages do not have primary school. 28 villages have Middle School facility and 16 villages are having secondary school facility.
- (ii) **Medical facilities:** Medical amenities in the study area are fair. In the study area, five villages are having Primary health center and seven villages are having primary health sub centers.
- (iii) **Drinking Water Facilities:** Drinking Water facilities are very good in the study area; almost every facility is available in each village. The main sources of “**potable water**” in the study area are Dug well, Tank, Hand pump, River and spring. Majority of the villages are having dug wells, Tanks and hand pumps. The additional sources of potable water are spring and river in the study area.
- (iv) **Communication facilities:** Communication facilities are good in the study area. There are only 1 village having post office facilities and 14 villages sub post offices facility and every village have Telephone facilities in study area. Telecommunication

sector mobile phones are available in each and every village. All villages mobile phone coverage towers are present in study area.

- (v) **Power supply:** The power supply position in the overall study area is very good. All 49 villages have power supply for domestic, agriculture, commercial and for all other purposes
- (vi) **Industries:** The major economic source in the study area is agriculture. There are no major industries in the 10 km radius study area. However, small manganese and Iron ore mines and cotton Ginning industries are situated in the study area.

#### **8.4 Religion, Language and Culture**

Religion: The Main religions of the study area are Hinduism, Islam and Christianity

Language: Main languages spoken is Telugu, Hindi, Marathi and Urdu. Gonds communicate amongst themselves in their native tongue.

Culture: The main festivals celebrated by Hindus are Ugadi, Dusshera, Deepawali, Muslims celebrate Idul-fitr, Idul-Zuh, Urs and observe Moharrum and Christians celebrate Christmas, New year and Easter. Badi is found to be an ancient settlement of Gond chiefs. There is a fort to the west of the village in ruins and a bund built by them 1.6 km south of the Shiva temple is now in a breached condition. At Sehaj, on the left bank of the Sat Nala occurs a temple, probably of Kakatiya age, which is set to collapse due to differential movement of the limestone beds on which it is founded.



**Photograph 1: Photo of Micrometeorological station point  
( Location : Upstairs of the Bala vikasa Kendram Building at  
Pimperkunta village )**

**Photograph 2 : Photographs of water sample collection**



**(a)**



**(b)**



**(c)**



**(d)**

- a) Jamdapur village**
- b) Gimma village**
- c) Khapparla village pond**
- d) Nagpur village near school**



**Photograph 3 : Photographs of Soil sample collection**



**(a)**



**(b)**

**Photograph 4 : Photographs of soil pit measurement**



**(c)**



**(d)**



**(e)**

- a) Thalamadugu village crop land**
- b) Pimperkunta Exploration block**
- c) Nippani village crop land**
- d) Bheempur village (Mandal) crop land**
- e) Bheempur village (Mandal) crop land**