ENVIRONMENTAL QUALITY MONITORING REPORT

SUMMER 2018

M/S HINDALCO INDUSTRIES LIMITED

DHANGARWADI BAUXITE MINE

DHANGARWADI VILLAGE,
SAHUWADI TALUK,

KOLHAPUR DISTRICT,
MAHARASHTRA

IND.BH.41.17.0348/HSR

BHAGAVATHI ANA LABS

PREPARED BY

BHAGAVATHI ANA LABS PVT LTD.,
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Sanathnagar, Hyderabad
500 018

CONTENTS

PREFACE

Environmental quality monitoring at **Dhangarwadi bauxite mine** situated at Dhangarwadi village, Shahuwadi taluka, Kolhapur, Maharashtra of **M/S. Hindalco Industries Limited** entrusted to **Bhagavathi Ana Labs Pvt. Limited, Hyderabad** during summer season of the year 2018.

The monitoring was carried out in the selected locations in core zone and buffer zone around the mine lease area during the months of March 2018, April 2018 & May 2018 for the following environmental parameters.

- → Micro-meteorology,
- → Ambient air quality,
- → Ambient noise level quality,
- → Water quality
- → Soil quality

The data was compiled to assess the current environmental status due to mining as well as allied activities around the surrounding villages in the study area.

Bhagavathi Ana Labs Pvt. Limited, gratefully acknowledges the cooperation extended by management and staff of M/S Hindalco Industries Limited and the village people to their field staff.

EXECUTIVE SUMMARY

Dhangarwadi Bauxite Mine of **M/S Hindalco Industries Limited** includes the study of the ambient air quality, noise level quality, water quality & Soil quality in core zone and buffer zone around the mine lease area during the summer season of the year 2018.

AMBIENT AIR QUALITY

The scenario of the existing ambient air quality in the study region has been assessed through a network of selected ambient air quality locations. Pre-calibrated respirable dust and fine particulate sampler has been used for AAQ monitoring. Maximum, minimum, average and percentile values have been computed from the data collected at all individual sampling stations to represent the ambient air quality status.

AMBIENT NOISE LEVEL MONITORING

Mining and allied activities usually cause noise pollution. Excessive noise levels will cause adverse effects on human beings and associated environment including domestic animals, wild life, natural ecosystem and structures. To know the ambient noise levels in the study area, noise levels were recorded at mining area and nearby villages using noise level meter.

WATER QUALITY MONITORING

Water quality monitoring consists of the study of surface and ground water sources and its quality in the core and buffer zone of the lease area. Assessment of water quality in the study area and in the mine area includes the quality assessment of parameters as per the Indian Standard IS 10500 (Drinking water standard). Water samples were collected from selected locations during study period and analyzed in the laboratory as per the standard IS & APHA procedures.

SOIL QUALITY MONITORING

The normal mineral composition of plants is affected by alteration in soil conditions. Organic remains accumulate mainly on the surface of the soil. Soils that have low stability of structure disperse and slake when they are wetted by

rains or water from irrigation and may develop a hard crust as the soil surface dries. This crust presents a serious barrier for emerging seedlings. With some crops, often, it is the main cause for poor growth. Alkaline soils are especially problematic (USDA, 1973). In the present study, soil samples were collected from the identified locations and are analyzed in the laboratory.

MICROMETEOROLOGY

Meteorological scenario helps to understand the trends of the climatic factors. It also helps in the identification of sampling stations in the study area. Meteorological scenario exerts a critical influence on air quality as the pollution arises from the interaction of atmospheric contaminants with adverse meteorological conditions

AREA DETAILS

INTRODUCTION

Hindalco Industries is one of the leading producer of aluminum in the country. The company business involves bauxite mining to alumina refining. Alumina metal conversion, sheet, extrusion, foil manufacturing and is spread all over the country. The company is operating number of bauxite mines in Maharashtra, Orissa, Chhattisgarh and Jharkhand to feed the Alumina Plants located in Belgaum, Renukut and Muri.

On getting concurrence from Central Government, Government of Maharashtra has indicated its intention to grant mining lease over of 122.63 ha, out of which 41.80 ha falls under non forest area. As per the directions of the Government of Maharashtra the mining plan was prepared for the entire lease area of 122.63 ha and the same was approved by the Indian Bureau of Mines vide letter no. MP/KLP/MAH-73-SZ, DT.11/11/2003. On submission of approved mining plan Government of Maharashtra has sanctioned mining lease for the production of bauxite for the revenue land of 41.80 and keeping pending of sanction of mining lease for the forest land of 80.83 ha subject to obtaining "No Objection certificate" from the Ministry of Environment and Forest, Govt. of India. The Environmental Clearance was obtained for the production of 0.6 million TPA of bauxite over an entire area of 122.63 ha.

Considering the delay in the process of forest clearance for the area falling under forest land, the Government of Maharashtra has granted mining lease only for the non forest land of 41.80 ha. by keeping pending the grant of mining lease for the forest area. Accordingly, the mining lease was executed by the collector of Kolhapur over an area 41.80 ha. on 05/05/2008 for period of 30 years.

MINE DETAIL

Dhangarwadi bauxite mine is located near Dhangarwadi village of Shahuwadi taluka of Kolhapur District in Maharashtra state.

GEOGRAPHICAL DETAILS:

Latitude	:	$16^0\,52'$ to $16^0\,56'$
Longitude	:	$73^0\,48'$ to $73^0\,51'$

INDEX MAP


N
INDIA
MAHARASTRA
ARABIAN SEA
KOLHAPUR
DHANGARWADI BAUXITE MINE
M/s Hindalco Industries Limited
NOT TO SCALE

Details of lease area

The following table gives the details of the area in terms of district, taluka, village, gat no., etc.

District	Taluka	Village	Gat No.	Area granted (ha)	Owner/Occupier.
Kolhapur	Shahuwadi	Dhangarwadi			
"	"	"	45	12.32	Private land
"	"	"	46(part)	6.53	Private land
"	"	"	50(part)	2.17	Private land
"	"	"	52	10.58	Private land
"	"	"	53(part)	5.09	Private land
"	"	"	56(part)	2.76	Private land
Kolhapur	Shahuwadi	Ainwadi	106(part)	2.35	Private land
				41.80	

ACCESSIBILITY

The district headquarter Kolhapur is connected to Mumbai by broad gauge railway line of South Central Railway of Indian Railway. Daily trains services are available from Mumbai and many other important places to Kolhapur. The nearest (i) railway station is Kolhapur at a distance of 56 kms eastwards with respect to the mines. The district is well served by a network of good roads - National Highways, State Highways and Major District roads. The National Highway Mumbai – Pune- Bangalore passes through Kolhapur.

Road

Dhangarwadi is approachable by a distance of 8 kms from Dhopeshwar Junction, located 6 kms from Malkapur Town on Ratnagiri – Nagpur National Highway.

Rail head

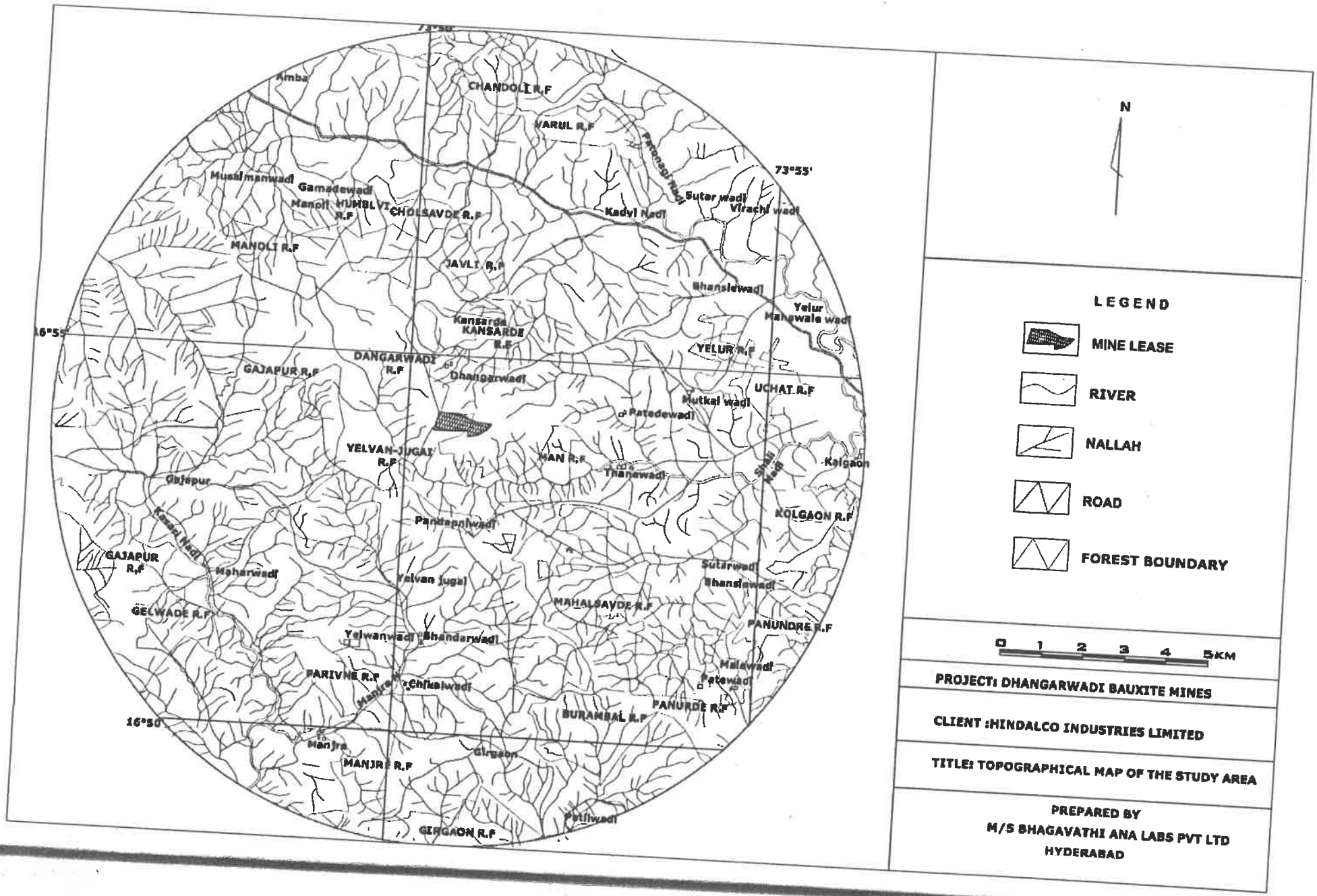
The nearest railway head is Kolhapur which is situated at a distance of about 56 kms by road from the lease area.

Sea Port

The nearest sea port is Ratnagiri sea port is about 95 kms form the mine

Airport

The nearest airport is at Kolhapur which is around 60 kms by road from the lease area.


Amba
CHANDOLI R.F
VARUL R.F
Musalmanwadi
Gamadewadi
Manoli HUMBLVI R.F
CHOLSAVDE R.F
MANOLI R.F
JAVLI R.F
Kadvi Nadi
Sutar wadi
Virachi wadi
73°55'
Bhanslewadi
Yelur Mahawale wadi
16°55'
Kansarde
KANSARDE R.F
YELUR R.F
DANGARWADI R.F
GAJAPUR R.F
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MAN R.F
Thanewadi
Shedi Nadi
Kolgaon
Gajapur
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Pandapnlwadi
Sutarwadi
Bhanslewadi
GAJAPUR R.F
Maharwadi
Yelvan jugai
MAHALSAVDE R.F
GELWADE R.F
PANUNDRE R.F
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16°50'
Manjra
Girgaon
MANJRE R.F
Patilwadi
GIRGAON R.F
N
LEGEND
MINE LEASE
RIVER
NALLAH
ROAD
FOREST BOUNDARY
0 1 2 3 4 5KM
PROJECT: DHANGARWADI BAUXITE MINES
CLIENT :HINDALCO INDUSTRIES LIMITED
TITLE: TOPOGRAPHICAL MAP OF THE STUDY AREA
PREPARED BY
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HYDERABAD

DHANGARWADI BAUXITE MINE
(M/s. Hindalco Industries Limited)

DETAILS

State	Maharashtra
District	Kolhapur
Taluka	Shahuwadi
Village	Dhangarwadi
Latitude	16^0 52′ to 16^0 56′
Longitude	73^0 48′ to 73^0 51′
Nature of the area	Plateau terrain
Topposheet no.	47 H/13.

GENERAL CLIMATIC CONDITIONS

Maximum temperature	40.0 °C
Minimum temperature	16.0° C

ACCESSIBILITY

Road connectivity	Approached by road connecting to Dhopeshwar Junction which is at a distance of 8 kms, located 6 kms from Malkapur Town on Ratnagiri-Nagpur National Highway (NH-4).
Rail connectivity	Kolhapur railway station (56km)
Airport	Kolhapur(60km)
Biosphere reserve	Not any
Sanctuary	Chandoli wild life sanctuary is situated at about 50 kms .

MICRO-METEOROLOGY

Meteorological data within the project area during the air quality survey period was assessed

PRIMARY / BASIC METEOROLOGICAL PARAMETERS

→ Wind Speed

→ Wind Direction

Since the dispersion and diffusion of pollutants mainly depend on the above factors these factors are considered as primary meteorological parameters.

SECONDARY METEOROLOGICAL PARAMETERS

→ Ambient Temperature

MICRO-METEOROLOGICAL DATA

DATE	TEMPERATURE			WIND SPEED Km/h			WIND DIRECTION
	MIN	MAX	AVERAGE	MIN	MAX	AVERAGE	
06-03-2018	23	33	73.5	0	7	3.5	SSE & NE
08-03-2018	22	33	68.5	0	11	5.5	ESE & N
13-03-2018	22	36	49.5	0	5	2.5	WNW & N
15-03-2018	26	31	68.0	0	6	3.0	NNW & SE
20-03-2018	23	33	68.5	0	8	4.0	NW & E
22-03-2018	23	32	54.5	0	9	4.5	NNW & N
27-03-2018	27	32	80.0	0	4	2.0	NW & N
29-03-2018	24	31	78.0	0	3	1.5	SSE & WSW

MICRO-METEOROLOGICAL DATA

DATE	TEMPERATURE			WIND SPEED Km/h			WIND DIRECTION
	MIN	MAX	AVERAGE	MIN	MAX	AVERAGE	
03-04-2018	23	32	71.0	0	3	1.5	ESE & ENE
05-04-2018	26	31	76.0	0	9	4.5	E & W
10-04-2018	24	32	62.5	0	2	1.0	NE & N
12-04-2018	25	33	72.0	0	5	2.5	NNE & NW
17-04-2018	27	32	75.0	0	7	3.5	N & E
19-04-2018	28	32	77.5	0	3	1.5	WSW & NE
24-04-2018	24	33	71.5	0	6	3.0	SE & NW
26-04-2018	25	33	71.5	0	10	5.0	N & NNW

MICRO-METEOROLOGICAL DATA

DATE	TEMPERATURE			WIND SPEED Km/h			WIND DIRECTION
	MIN	MAX	AVERAGE	MIN	MAX	AVERAGE	
02-05-2018	26	32	70.5	0	2	1.0	N & NW
04-05-2018	26	32	82.5	0	8	4.0	SE & NW
09-05-2018	28	34	63.5	0	4	2.0	N & NW
11-05-2018	27	34	68.0	0	7	3.5	SE & W
16-05-2018	30	34	65.5	0	5	2.5	E & WNW
18-05-2018	26	32	71.0	0	9	4.5	ENE & W
25-05-2018	28	33	70.5	0	11	5.5	NNE & NW
30-05-2018	29	32	71.0	0	4	2.0	NW

Summer 2018,

ENVIRONMENTAL QUALITY

Environmental quality monitoring at **Dhangarwadi Bauxite Mine** of **M/S Hindalco Industries Limited** at Dhangarwadi village of Shahuwadi taluka, Kolhapur district, Maharashtra includes monitoring of various environmental components like air, noise, water & soil quality status within core zone and buffer zone around the mine lease area.

AMBIENT AIR QUALITY

The main aim of the ambient air quality monitoring within core zone and buffer zone was to assess the environmental condition and to know the existing levels of the air pollution in the project area. Air pollution forms an important and critical factor to study the environmental issues in the mining areas. Thus, air quality has to be frequently monitored to know the extent of pollution due to mining and allied activities. Ambient air quality monitoring stations were set up at eight selected locations, 4 in core zone and 4 in buffer zone.

SELECTION OF SAMPLING LOCATIONS

The status of the ambient air quality has been assessed through ambient air quality-monitoring network. The design of monitoring network in the air quality surveillance program has been based on the following considerations:

- Meteorological conditions on synoptic scale
- Topography of the study area
- Representatives of regional background air quality for obtaining

Ambient air quality monitoring stations were set up at eight locations, 4 in core zone and 4 in buffer zone with due considerations to the above mentioned points.

INSTRUMENT USED FOR SAMPLING

Respirable dust samplers APM-460 BL & APM 550 Equipments were used for monitoring particulate matter(PM10), particulate matter(PM2.5), gaseous pollutants etc.

METHOD FOR TESTING PM10/PM 2.5

Name of Pollutant	PM10/pm 2.5
Medium	Air
Instrument	Respirable Dust Sampler/Fine particulate sampler
Duration	Every 24 hours
Mode	Continuous
Unit	$\mu g/m^3$
Method	Gravimetric

METHOD FOR TESTING

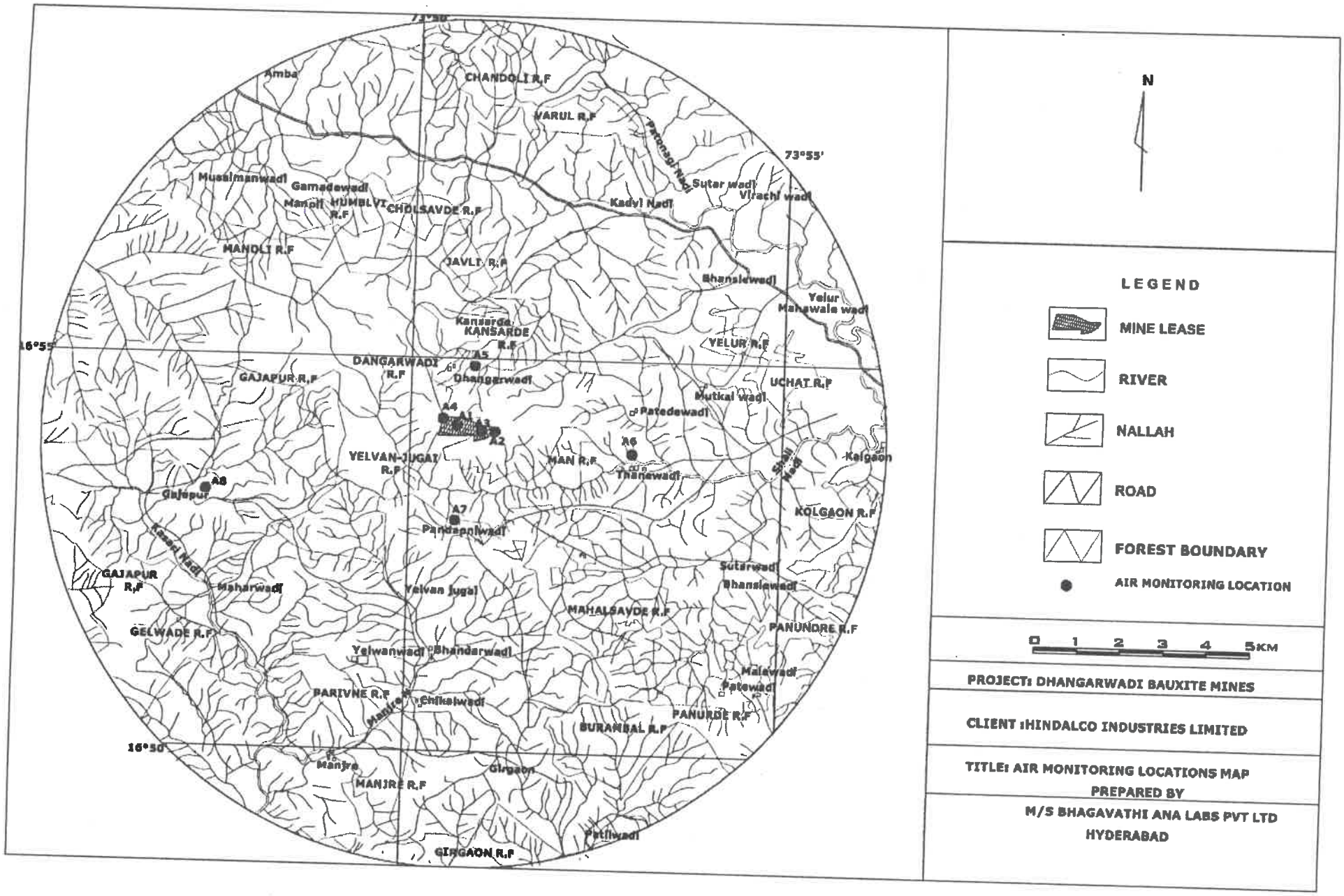
Name of Pollutant	Sulphur dioxide	Oxides of Nitrogen
Method	Modified West & Geake Method	Modified Jacob & Hochheiser Modified (Na-Arsenite) Method
Frequency	8 hourly	8 hourly
Mode	Continuous	Continuous
Unit	$\mu g/m^3$	µg/m3
Procedure	As per IS 5182 (Part II)	As per IS 5182 (Part IV),

AMBIENT AIR QUALITY MONITORING STATION

SL. NO	STATION CODE	NAME OF SAMPLING STATION	DIRECTION w.r.t MINES LEASE AREA	DISTANCE FROM LEASE AREA (Arial distance)
1	A – 1	Core zone	- - -	- - -
2	A – 2	Near Dumping Site	- - -	- - -
3	A – 3	Near Haulage Road	- - -	- - -
4	A– 4	Near Mines office	- - -	- - -
5	A – 5	Dhangarwadi village	N	2.1km
6	A – 6	Thanewadi village	ESE	3.7km
7	A – 7	Pandapniwadi village	S	2.2km
8	A – 8	Gajapur village	WSW	5.6km

Monitoring Location Details

Respirable dust sampler and Fine Particulate sampler was placed at a height of 3 m above the ground level in above mentioned monitoring locations. These stations were selected so as to assess present pollution level due to mining and allied activities. The observed levels of, PM 10,PM 2.5, SO_2, NO_x,CO collected during summer season of the year 2018 are presented in annexure and are summarized in the following table.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Patedewadi
A6
YELVAN-JUGAI R.F
MAN R.F
Thanewadi
Shirai Nadi
Kalgaon
A8
Gajapur
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N
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MINE LEASE
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FOREST BOUNDARY
AIR MONITORING LOCATION
0 1 2 3 4 5KM
PROJECT: DHANGARWADI BAUXITE MINES
CLIENT :HINDALCO INDUSTRIES LIMITED
TITLE: AIR MONITORING LOCATIONS MAP
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SUMMARY OF AMBIENT AIR QUALITY

Sl. No.	Location		PM 10	PM 2.5	SO_2	NOx
1	Core zone	Min	32.6	10.5	4.8	9.4
		Max	64.5	19.5	8.8	19.1
		Average	49.0	15.2	6.6	13.8
		98th %tile	63.0	19.2	8.6	18.7
2	Near Dumping site	Min	34.0	10.7	4.7	10.0
		Max	61.2	19.6	8.9	19.0
		Average	47.2	15.1	6.5	14.3
		98th %tile	59.6	19.1	8.9	18.7
3	Near Haulage Road	Min	33.0	11.9	5.9	11.3
		Max	67.5	23.1	11.6	21.0
		Average	53.7	18.7	9.4	17.0
		98th %tile	66.1	22.7	11.3	20.6
4	Near Mines office	Min	32.0	10.9	5.4	10.3
		Max	57.5	18.4	9.2	17.5
		Average	47.0	15.2	7.6	14.4
		98th %tile	56.7	18.4	9.2	17.4
5	Dhangarwadi village	Min	36.1	11.7	5.6	10.1
		Max	72.9	24.3	11.6	19.5
		Average	56.4	18.4	8.8	15.6
		98th %tile	71.2	23.6	11.2	19.3
6	Thanewadi village	Min	41.6	13.5	7.8	14.8
		Max	67.6	21.6	12.5	22.7
		Average	53.8	17.2	10.0	18.2
		98th %tile	67.3	21.6	12.5	22.5
7	Pandapaniwadi village	Min	35.2	10.8	5.4	11.9
		Max	53.2	16.1	8.1	18.0
		Average	44.1	13.2	6.6	14.4
		98th %tile	53.1	16.1	8.0	17.7
8	Gajapur village	Min	43.0	13.4	6.7	13.4
		Max	65.5	19.7	9.9	21.1
		Average	54.3	16.3	8.2	17.7
		98th %tile	65.3	19.7	9.8	21.0

NOTE: The results relate only to the condition prevailing at the time of sampling
Method of measurement: As per IS 5182

AMBIENT NOISE LEVEL QUALITY

Noise is nothing but unwanted sound produced due to various activities. As a part of occupational health and safety measures, certain safeguards have been incorporated to mitigate noise pollution in working environment. Noise pollution survey has been carried out in the study area to assess the impacts of the mining activities. So noise level surveys were carried out at 8 selected locations in and around the mine lease area. Noise survey has been conducted in the study area for the period of 24 hr at each location.

AMBIENT NOISE LEVEL MONITORING STATIONS

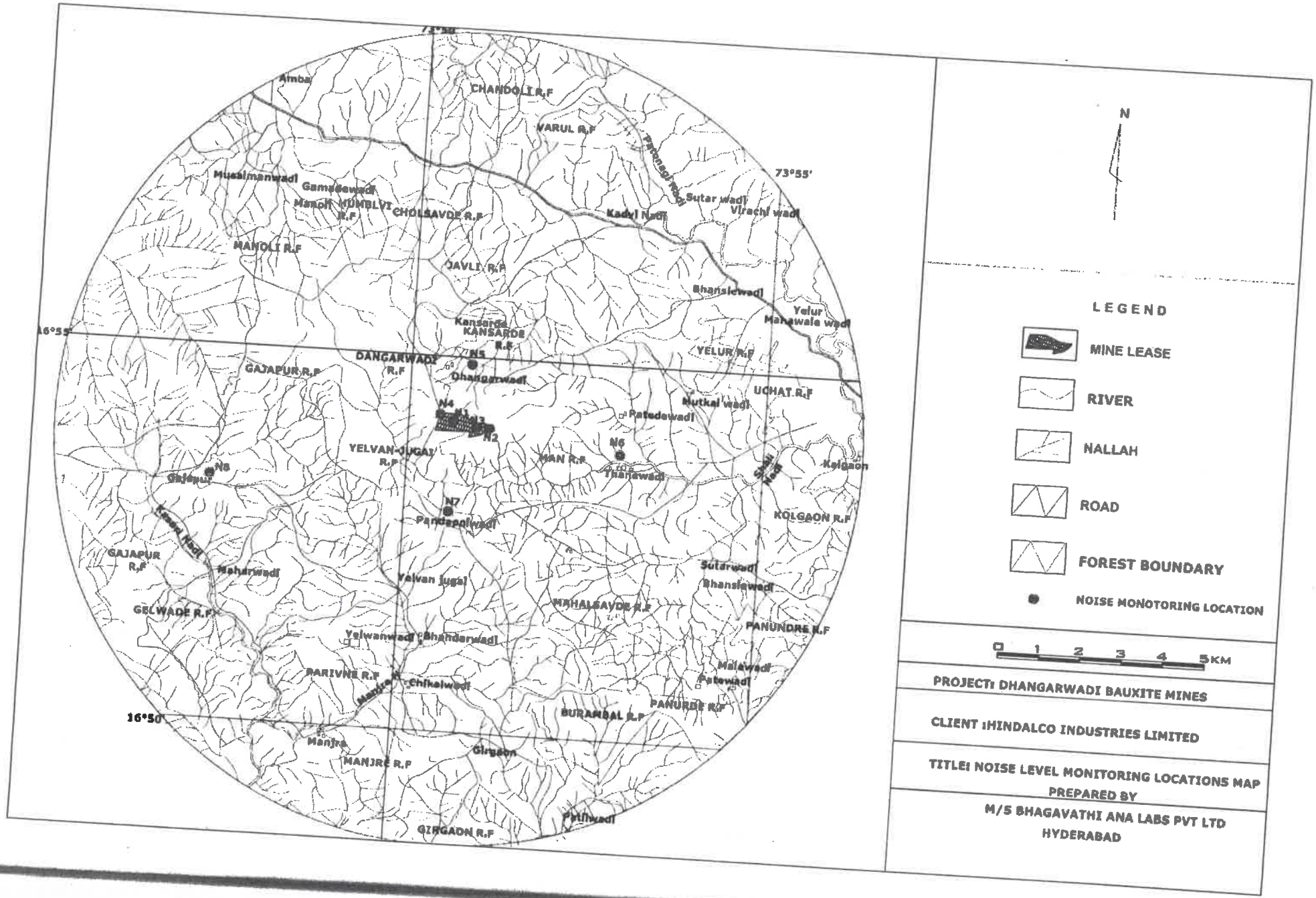
SL. NO	STATION CODE	NAME OF SAMPLING STATION	DIRECTION w.r.t MINES LEASE AREA	DISTANCE FROM LEASE AREA (Arial distance)
1	N- 1	Core zone	- - -	- - -
2	N - 2	Near Dumping Site	- - -	- - -
3	N - 3	Near Haulage Road	- - -	- - -
4	N- 4	Near Mines office	- - -	- - -
5	N - 5	Dhangarwadi village	N	2.1km
6	N - 6	Thanewadi village	ESE	3.7km
7	N - 7	Pandapniwadi village	S	2.2km
8	N - 8	Gajapur village	SW	5.6km

NATIONAL AMBIENT NOISE QUALITY STANDARDS

AREA CODE	CATEGORY OF AREA	LIMIT IN dB (A) Leq	
		DAY TIME	NIGHT TIME
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

Note:

1. **Day time is reckoned in between 6 am and 9 pm.**
2. **Night time is reckoned in between 9 pm and 6 am.**
3. **Silence zone is defined as area upto 100 meters around such premises as hospitals, educational institutions and courts. The silence zones are to be declared by the Competent Authority.**
4. **Mixed categories of areas should be declared as "one of the four above mentioned categories by the Competent Authority and the corresponding standards shall apply.**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N2
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YELVAN-JUGAI R.F
HAN R.F
Kolgaon
N8
Gajapur
Tharlawadi
N7
Pandzapalwadi
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Yelwanwadi
Bhandarwadi
PARIVNE R.F
Malawadi
Chikalwadi
Patewadi
16°50'
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Pathiwadi
GIRGAON R.F
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NOISE MONOTORING LOCATION
0 1 2 3 4 5KM
PROJECT: DHANGARWADI BAUXITE MINES
CLIENT :HINDALCO INDUSTRIES LIMITED
TITLE: NOISE LEVEL MONITORING LOCATIONS MAP
PREPARED BY
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AMBIENT NOISE LEVEL MONITORING RESULTS [Leq in dB(A)]

Time	N1, Core zone	N2, Near Dumping site	N3 Near Haulage road	N4, Near Mines Office	N5, Dhangarwadi village	N6, Thanewadi village	N7, Pandapniwadi village	N8, Gajapur village
06:00	56.8	58.7	60.2	60.4	62.1	46.7	48.5	48.6
07:00	58.1	59.2	60.6	61.0	61.9	54.7	56.4	56.2
08:00	59.5	60.8	62.5	62.2	63.5	56.5	58.6	58.3
09:00	62.9	63.3	63.1	64.6	65.1	59.3	61.3	60.7
10:00	66.1	65.1	66.4	67.0	68.0	61.9	63.2	63.3
11:00	68.0	68.8	68.3	69.6	70.4	69.3	71.2	71.4
12:00	68.6	68.7	68.3	70.1	70.3	70.7	72.0	72.9
13:00	69.0	68.1	68.6	70.6	70.8	69.2	70.2	71.1
14:00	68.7	69.3	70.5	70.6	72.2	69.3	70.3	70.5
15:00	67.4	67.4	67.5	68.4	69.9	67.7	68.8	69.1
16:00	72.4	72.5	71.4	72.1	72.8	66.3	67.3	67.0
17:00	73.7	74.6	68.0	71.9	70.4	64.5	66.3	65.0
18:00	69.8	70.0	70.5	71.3	72.2	62.6	64.8	63.3
19:00	65.4	65.0	65.2	66.3	67.0	61.8	64.1	62.1
20:00	61.1	61.5	61.8	62.1	63.4	56.5	58.6	57.1
21:00	60.5	61.0	60.7	62.0	62.6	55.2	57.5	56.3
22:00	60.3	61.7	62.2	62.3	63.3	49.4	51.4	49.8
23:00	60.4	60.7	60.8	62.3	62.7	48.0	50.6	48.9
00:00	60.3	61.2	62.9	63.1	64.3	47.6	50.1	48.7
01:00	60.0	60.1	61.0	61.7	61.6	48.5	50.6	49.7
02:00	59.6	59.4	59.2	60.9	61.3	48.5	51.0	49.9
03:00	59.5	59.8	60.5	62.0	61.7	48.6	51.4	50.7
04:00	59.6	60.3	62.9	63.1	64.7	43.7	46.5	46.1
05:00	59.5	60.6	61.8	62.4	63.5	43.4	46.4	46.1
Min	**56.8**	**58.7**	**59.2**	**60.4**	**61.3**	**43.4**	**46.4**	**46.1**
Max	**73.7**	**74.6**	**71.4**	**72.1**	**72.8**	**70.7**	**72.0**	**72.9**

All the obtained noise level quality values in core zone and buffer zone are compared with the noise level standards prescribed by Central Pollution Control Board. The values are found to be within the limit.

WATER QUALITY

Water quality monitoring consists of the study of water sources and its quality in the core and buffer zone of the lease area. Its study consists of following two important systems of water bodies:

- Surface water quality.
- Ground water quality.

- **Surface water quality**

  Tamrapani and Ghataprabha River are the surface water source in the study area. There are others seasonal nallah which flows in the study area. Proper drainage system has prepared to drag the monsoon water into the mine pit so as to reduce the water pollution. Buffer zone has many seasonal nallah and spring which used to recharge the ground during summer.

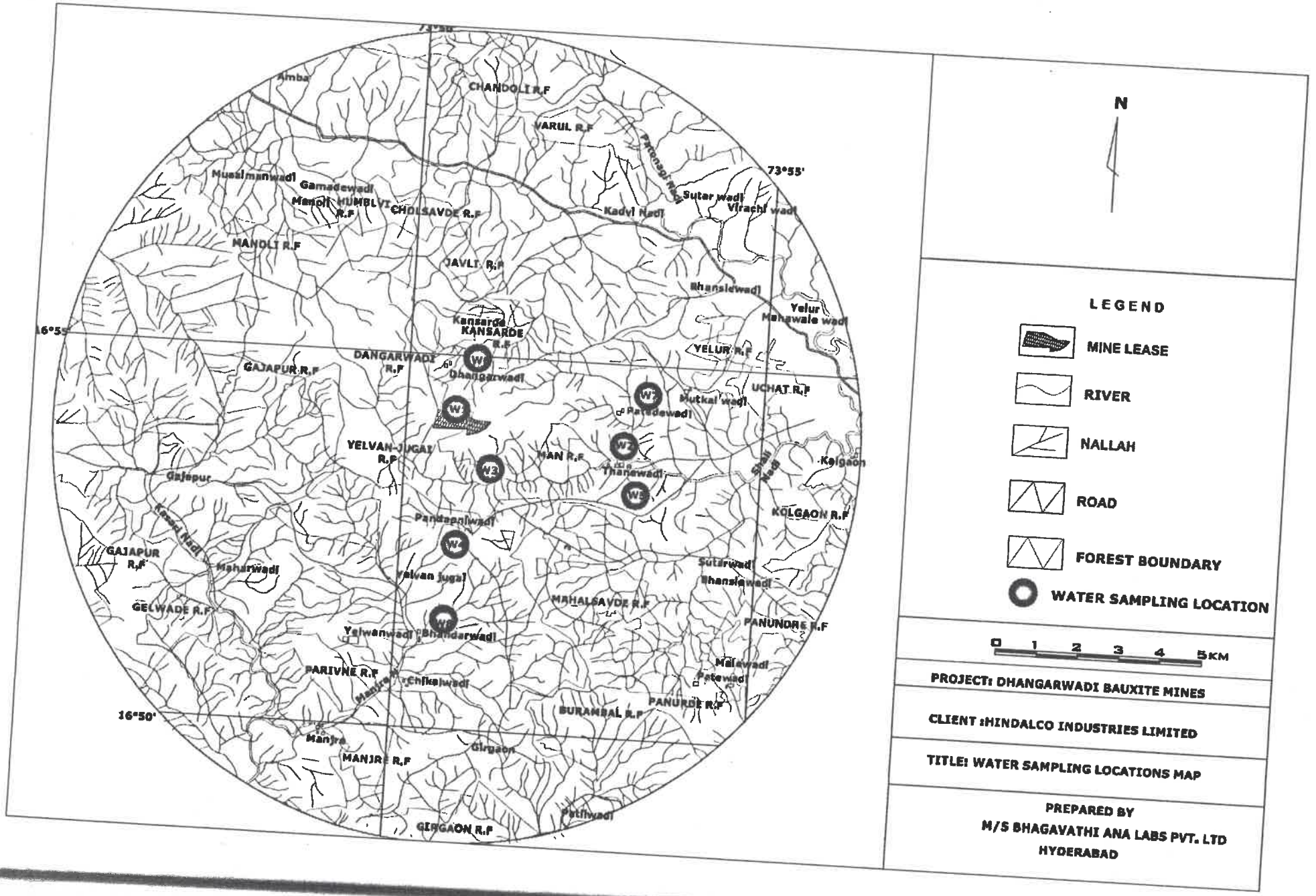
- **Ground water quality**

  The most important source of drinking water in the study area is the ground water, which is tapped by a bore well. The buffer zone is good in ground water source. The ground water in the study area gets recharged by rainwater in monsoon season.

Assessment of water quality in the study area and in the mine area includes the quality assessment of parameters as per the Indian Standard IS 10500 (Drinking water standard). A total of 8 locations have selected, out of which one in core zone and seven are in buffer zone. Location of water quality monitoring stations is given below.

WATER QUALITY MONITORING LOCATIONS

Code		Name of sampling station	Source of water
W – 1		Near mine office borewell	Surface water
W – 2		Shali nadi (up stream)	Surface water
W – 3		Shali nadi (down stream)	Surface water
W – 4		Pandapniwadi village	Ground water
W – 5		Thanewadi village	Ground water
W – 6		Dhangarwadi village	Ground water
W –7		Patewadi village	Ground water
W – 8		Bhandarwadi village	Ground water


N
73°55'
16°55'
16°50'
Amba
CHANDOLI R.F
VARUL R.F
Musalmanwadi
Gamadewadi
Manoli
HUMBLVI R.F
CHOLSAVDE R.F
MANOLI R.F
JAVLI R.F
Kadvi Nadi
Sutar wadi
Virachi wadi
Bhansiwadi
Yelur Mahawale wadi
Kansarde
KANSARDE R.F
DANGARWADI R.F
Dhangarwadi
GAJAPUR R.F
YELUR R.F
UCHAT R.F
Mutkal wadi
Patildewadi
YELVAN-JUGAI R.F
MAN R.F
Thanewadi
Kolgaon
Gajapur
Kasal Nadi
Pandagalwadi
KOLGAON R.F
GAJAPUR R.F
Maharwadi
Yelvan jugai
Sutarwadi
Bhansiwadi
GELWADE R.F
MAHALSAVDE R.F
PANUNDRE R.F
Yelwanwadi
Bhandarwadi
Malewadi
PARIVNE R.F
Manjra
Chikalwadi
Patewadi
PANURDE R.F
BURAMBAL R.F
Manjra
Girgaon
MANJRE R.F
Patilwadi
GIRGAON R.F
LEGEND
MINE LEASE
RIVER
NALLAH
ROAD
FOREST BOUNDARY
WATER SAMPLING LOCATION
0 1 2 3 4 5KM
PROJECT: DHANGARWADI BAUXITE MINES
CLIENT :HINDALCO INDUSTRIES LIMITED
TITLE: WATER SAMPLING LOCATIONS MAP
PREPARED BY
M/S BHAGAVATHI ANA LABS PVT. LTD
HYDERABAD

SAMPLING DETAILS

The water samples were collected from selected sampling locations, which are coming under core zone and buffer zone around the mine lease area. Samples were collected in the summer season of the year 2018 as per the prescribed sample collecting methods and analyzed as per the IS standard procedures. Complete analysis report of water samples are given below.

SURFACE WATER QUALITY

Date of Sampling: 31.05.2018

Sl. No	Parameter	Units	W-1 Near mine office borewell	W-2 SHALI NADI UP STREAM	W-3 SHALI NADI DOWN STREAM
1	Odour	--	Un-objectionable	Un-objectionable	Un-objectionable
2	Taste	--	Agreeable	Agreeable	Agreeable
3	Color	Hazen units	<5	<5	<5
4	pH	--	6.68	7.20	7.30
5	Turbidity	NTU	<5	<5	<5
6	Dissolved Oxygen	mg/l	4.5	6.80	7.20
7	Total Dissolved solids	mg/l	43	200	60
8	Total Suspended solids	mg/l	0	56	33
9	Alkalinity as $CaCO_3$	mg/l	16.0	28	20.0
10	Total Hardness as $CaCO_3$	mg/l	84.0	184.0	66.0
11	Nitrate as NO_3	mg/l	0.08	1.23	0.46
12	Phosphates as PO_4	mg/l	1.92	0.02	0.02
13	Chlorides as Cl	mg/l	9.67	38.68	10.63
14	Sulphates as SO_4	mg/l	1.91	2.44	4.4
15	Sodium as Na	mg/l	2.23	1.84	1.24
16	Potassium as K	mg/l	0.08	0.04	0.09
17	Calcium as Ca	mg/l	14.4	33.6	12.8
18	Magnesium as Mg	mg/l	11.52	24	8.16
19	Lead as Pb	mg/l	BDL	BDL	BDL
20	Manganese as Mn	mg/l	0.03	0.02	0.01
21	Cadmium as Cd	mg/l	BDL	BDL	BDL
22	Chromium as Cr	mg/l	BDL	BDL	BDL
23	Copper as Cu	mg/l	BDL	BDL	BDL
24	Zinc as Zn	mg/l	BDL	BDL	BDL
25	Iron as Fe	mg/l	0.09	0.02	0.06
26	Fluoride as F	mg/l	0.71	0.07	0.73
27	Mercury as Hg	mg/l	BDL	BDL	BDL
28	Selenium as Se	mg/l	BDL	BDL	BDL
29	Arsenic as As	mg/l	BDL	BDL	BDL
30	Cyanide as CN	mg/l	BDL	BDL	BDL
31	Boron as B	mg/l	BDL	BDL	BDL
32	B.O.D	mg/l	1	4	6

BDL: Below Detectable Limit

mg/l: Milligram per liter

GROUND WATER QUALITY

Date of Sampling: 31.05.2018

Sl. No	Parameter	Units	W-4 PANDAPNIWADI VILLAGE	W - 5 THANEWADI VILLAGE	W -6 DHANGARWADI VILLAGE	W-7 PATEWADI VILLAGE	W -8 BHANDARWADI VILLAGE
1	Odour	--	Un-objectionable	Un-objectionable	Un-objectionable	Un-objectionable	Un-objectionable
2	Taste	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Color	Hazen units	<5	<5	<5	<5	<5
4	pH	--	6.57	6.56	6.78	6.77	6.79
5	Turbidity	NTU	<5	<5	<5	<5	<5
6	Dissolved Oxygen	mg/l	5.00	5.30	5.00	4.45	5.10
7	Total Dissolved solids	mg/l	95	61	28	132	57.1
8	Total Suspended solids	mg/l	12	22	20	18	16
9	Alkalinity as $CaCO_3$	mg/l	16	16	12	24	19.3
10	Total Hardness as $CaCO_3$	mg/l	76.0	50.0	38.0	142.0	28.4
11	Nitrate as NO_3	mg/l	0.07	0.35	0.33	0.203	0.23
12	Phosphates as PO_4	mg/l	0.02	0.03	0.01	0.03	0.02
13	Chlorides as Cl	mg/l	16.4	10.63	10	16.44	15.1
14	Sulphates as SO_4	mg/l	2.2	2.76	1.9	6.59	2.9
15	Sodium as Na	mg/l	1.48	1.68	2.1	1.98	4.8
16	Potassium as K	mg/l	0.06	0.09	0.008	0.1	3.9
17	Calcium as Ca	mg/l	14.4	12.8	8	8	7.9
18	Magnesium as Mg	mg/l	9.6	4.32	4.32	4.32	2.1
19	Lead as Pb	mg/l	BDL	BDL	BDL	BDL	BDL
20	Manganese as Mn	mg/l	0.01	0.03	0.20	0.04	0.03
21	Cadmium as Cd	mg/l	BDL	BDL	BDL	BDL	BDL
22	Chromium as Cr	mg/l	BDL	BDL	BDL	BDL	BDL
23	Copper as Cu	mg/l	BDL	BDL	BDL	BDL	BDL
24	Zinc as Zn	mg/l	BDL	BDL	BDL	BDL	BDL
25	Iron as Fe	mg/l	0.06	0.07	0.10	0.09	0.16
26	Fluoride as F	mg/l	0.56	0.56	0.43	0.43	0.01
27	Mercury as Hg	mg/l	BDL	BDL	BDL	BDL	BDL
28	Selenium as Se	mg/l	BDL	BDL	BDL	BDL	BDL
29	Arsenic as As	mg/l	BDL	BDL	BDL	BDL	BDL
30	Cyanide as CN	mg/l	BDL	BDL	BDL	BDL	BDL
31	Boron as B	mg/l	BDL	BDL	BDL	BDL	BDL
32	B.O.D	mg/l	2	3	2	3	2

BDL: Below Detectable Limit **mg/l: Milligram per liter**

NOTE: The results relate only to the condition prevailing at the time of sampling

DOMESTIC EFFLUENT ANALYSIS

Sample Type: **Canteen waste water**

Date of sampling: 30.5.2018

Sl.No	Test	Result
1	**Total Suspended Solids, mg/l**	**22**
2	**Total Dissolved Solids, mg/l**	**45**
3	**COD, mg/l**	**4**
4	**BOD for 3 days at 27°C, mg/l**	**3**
5	**Total Solids**	49
6	**Oil and Grease, mg/l**	<5

Sample Type: **Canteen waste water**

Date of sampling: 31.5.2018

Sl.No	Test	Result
1	**Total Suspended Solids, mg/l**	**30**
2	**Total Dissolved Solids, mg/l**	**40**
3	**COD, mg/l**	**3**
4	**BOD for 3 days at 27°C, mg/l**	**2**
5	**Total Solids**	**43**
6	**Oil and Grease, mg/l**	**<5**

RESULTS & DISCUSSION

- The pH of the study area varies from 6.56 to 7.3 in the study area. The permissible range of pH is 6.5 to 8.5.
- Dissolved Oxygen content of the study area has been found to be in the range of 4.45 to 7.20.
- Total Dissolved Solids found to be in the range of 28 to 200 mg/l in the water sample collected in study area. As per IS 10500 standard for drinking water, the desirable limit is 500 mg/l and maximum permissible limit is 2000 mg/l.
- Alkalinity as $CaCO_3$ is found to be in the range of 12.0 to 28 in the water sample collected in study area. As per IS 10500 standard for drinking water, the desirable limit is 200 mg/l and maximum permissible limit is 600 mg/l.
- Total hardness as $CaCO_3$ of the water sample collected in the study area is found to in the range of 38 to 184.0 mg/l. As per IS 10500 standard for drinking water, the desirable limit is 300 mg/l and maximum permissible limit is 600 mg/l.
- Chloride of the water sample collected in the study area is found to in the range of 9.67 to 38.68 mg/l. As per IS 10500 standard for drinking water, the desirable limit is 250 mg/l and maximum permissible limit is 1000 mg/l.
- Calcium content of the water in the study area found to be in the range of 8 to 33.6 mg/l. As per IS 10500 standard for drinking water, the desirable limit 75 mg/l and maximum permissible limit is 200 mg/l.
- Magnesium content of the water in the study area found to be in the range of 4.32 to 24 mg/l.
- Iron content of the water in the study area found to be in the range of 0.02 to 0.10 mg/l. As per IS 10500 standard for drinking water, the desirable limit 0.3 mg/l and maximum permissible limit is 1.0 mg/l.

DRINKING WATER STANDARDS AS PER IS: 10500

Sl.no	Parameter	Unit	Desirable limit as per is: 10500	Maximum permissible limit as per is: 10500
1	Odour		Un-objectionable	
2	Taste		Agreeable	
3	Colour	Hazen Units	5	25
4	pH		6.5 -8.5	
5	Turbidity	NTU	5	10
6	Dissolved Oxygen	mg /l	-----	
7	Total Dissolved Solids	mg /l	500	2000
8	Alkalinity as $CaCo_3$	mg /l	200	600
9	Total hardness as $CaCo_3$	mg /l	300	600
10	Nitrates NO_3	mg /l	45	100
11	Phosphates PO_4	mg /l	-----	
12	Chlorides as Cl	mg /l	250	1000
13	Sulphates, SO_4^{2-}	mg /l	200	400
14	Sodium as Na	mg /l	-----	
15	Potassium as K	mg /l	-----	
16	Calcium as Ca	mg /l	75	200
17	Magnesium, Mg	mg /l	30	100
18	Lead (Pb)	mg /l	0.05	0.05
19	Manganese	mg /l	0.1	0.3
20	Cadmium (Cd)	mg /l	0.01	0.01
21	Chromium (Cr)	mg /l	0.05	0.05
22	Copper (Cu)	mg /l	0.05	1.5
23	Zinc (Zn)	mg /l	5	15
24	Iron as Fe	mg /l	0.3	1.0
25	Fluoride as F	mg /l	1	1.5
26	Mercury as Hg	mg /l	0.001	0.001
27	Selenium as se	mg /l	0.01	0.01
28	Arsenic as As	mg /l	0.05	0.05
29	Cyanide as CN	mg/l	0.05	0.05
30	Boron as B	mg/l	1	5

SOIL QUALITY

The normal mineral composition of plants is affected by alteration in soil condition. It is essential to determine the potential of soil in the area and identify the impacts of mining activity on soil quality. So soil sample has been collected from different villages around the lease area for the summer season, 2018.

In order to study the soil profile of the region, sampling locations were selected to assess the existing soil conditions around the project area representing various land use conditions. The physico-chemical and heavy metal concentrations were determined. The samples were collected by ramming a soil augur in to the soil upto a depth of 90cm. The soil sample was prepared in accordance with IS: 2720 (Part-I)-1983 for various tests.

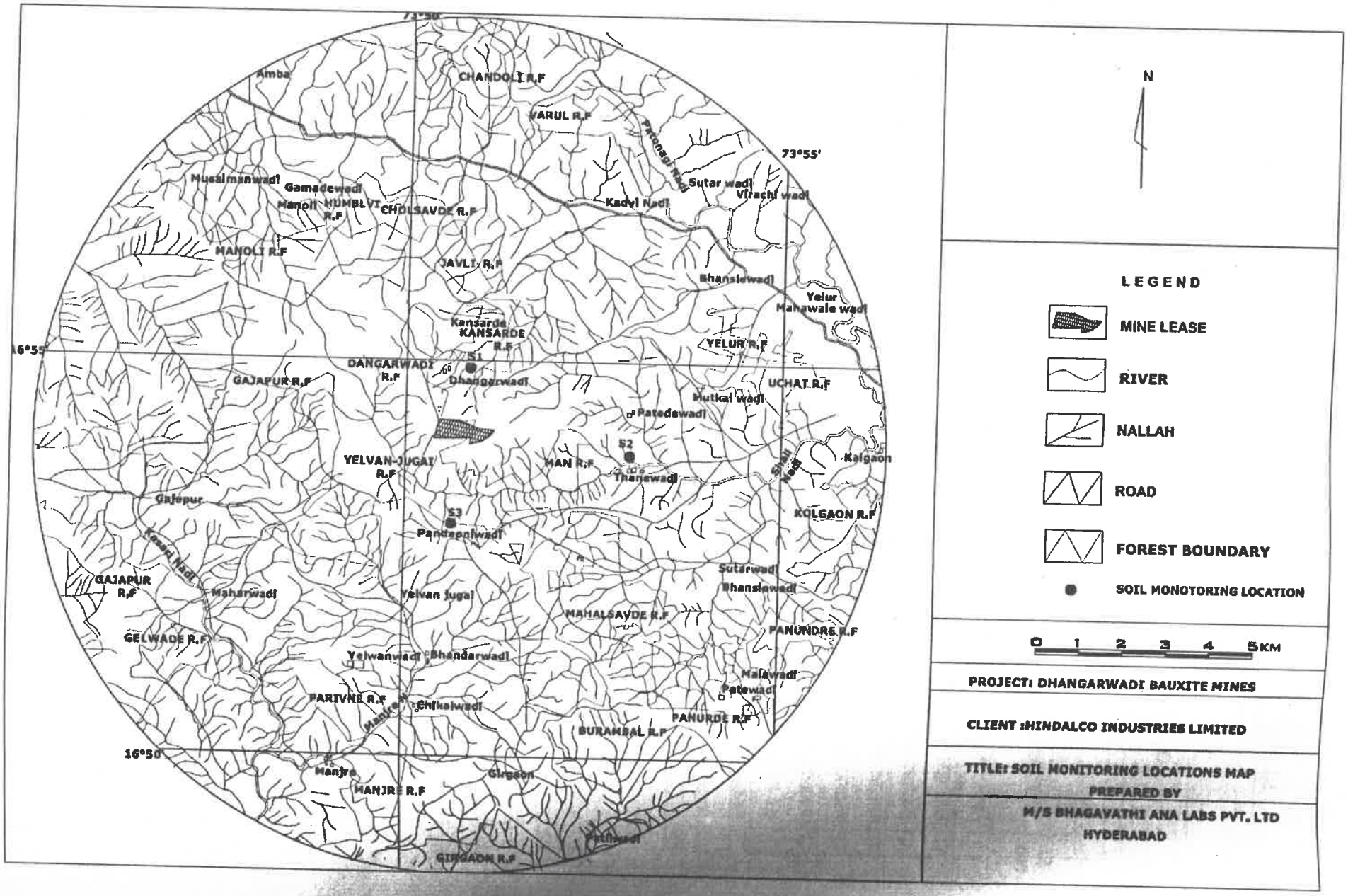
The present study on the soil profile establishes the environmental characteristics and identifies the incremental concentrations if any, due to the mining activities. The sampling locations have been identified with the following objectives;

- → To determine the soil characteristics of the study area
- → To determine the impact of mining activity on soil characterization; and
- → To determine the impact on soils more importantly from agricultural productivity point of view.

Soil could well represent the topsoil cover which is rich in nutrient content, where additional features like the textural class, infiltration rate, field capacity & wilting coefficient, pH etc are important.

SOIL SAMPLING AND ANALYSIS

Three locations were selected for analyzing the soil quality status in study area. The soil samples were collected from the selected areas. The samples have been analyzed for physico-chemical parameters and were given in the table


Amba
CHANDOLI R.F
VARUL R.F
Pavanadi Nadi
73°55'
Musalmanwadi
Gamadewadi
Manoli
HUMBLVI R.F
CHOLSAVDE R.F
Kadvi Nadi
Sutar wadi
Virachi wadi
MANOLI R.F
JAVLI R.F
Bhanslewadi
Yelur Mahawale wadi
Kansarde
KANSARDE R.F
YELUR R.F
16°55'
DANGARWADI R.F
S1
Dhangarwadi
GAJAPUR R.F
UCHAT R.F
Mutkal wadi
Patedewadi
S2
YELVAN-JUGAI R.F
MAN R.F
Thanewadi
Shiral Nadi
Kalgaon
Gajapur
S3
Pandapniwadi
KOLGAON R.F
Kasarl Nadi
Sutarwadi
Bhanslewadi
GAJAPUR R.F
Maharwadi
Yelvan jugai
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Malawadi
Patewadi
PARIVNE R.F
Chikalwadi
Mandre
PANURDE R.F
BURAMBAL R.F
16°50'
Manjre
Girgaon
MANJRE R.F
GIRGAON R.F
N
LEGEND
MINE LEASE
RIVER
NALLAH
ROAD
FOREST BOUNDARY
SOIL MONOTORING LOCATION
0 1 2 3 4 5KM
PROJECT: DHANGARWADI BAUXITE MINES
CLIENT :HINDALCO INDUSTRIES LIMITED
TITLE: SOIL MONITORING LOCATIONS MAP
PREPARED BY
M/S BHAGAVATHI ANA LABS PVT. LTD
HYDERABAD

SOIL SAMPLING LOCATIONS

Sl. No	Code	Name of Sampling Station
1	S1	Dhangarwadi village
2	S2	Thanewadi village
3	S3	Pandapniwadi village

Soil Quality

S. No	Test Parameters	Results		
		Dhangarwadi Village	Thanewadi Village	Pandapaniwadi Village
1	pH (1.5 Aq. Extraction)	5.88	5.79	6.32
2	E.C (µs) (1:5 Aq. Suspension)	33.1	72.4	63.8
3	Nitrate Nitrogen as N, mg/kg	5.5	5.5	5.5
4	Available Phosphorous as P_2O_5, mg/kg	<5	<5	<5
5	Potassium as K_{20}, mg/kg	19.4	25.2	29.3
6	Available Sodium Na_2O , mg/kg	12.9	14.0	1157.85
7	Ex. Calcium , mg/kg	1286.50	1500.92	598.02
8	Ex. Magnesium, mg/kg	780.03	910.03	598.02
9	Water Soluble Chlorides as Cl mg/kg	29	29	29
10	Organic Carbon,%	7.54	6.38	5.52
11	Texture	Sandy Soil	Sandy Soil	Sandy Soil
	a) Sand, %	90.27	89.08	89.27
	b) Silt, %	3.63	4.82	4.63
	c) Clay, %	6.10	6.10	6.10
12	Total Soluble Salts, mg/kg	0.24	0.48	0.23

Stack Analysis Report				
Name of the Industry	DHANGARWADI BAUXITE MINE			
Address	DHANGARWADI			
DATE	31-05-2018			
Stack details				
Stack attached to	KVA)		Diameter of stack (mtr) D	0.1
Height of stack above ground (mtr)	5.5		Stack crossectional area m2	0.0020
Fuel used	H.S.D		Consumption of fuel (KLD)	3
Additional Load	Nil		Load on the system	90%

EMMISSION DETAILS

Particulars		Value	* Permissible limit	Method of analysis
Temperature (°C)	:	118.00	NA	As per IS:11255 (Part 3)-2008
Velocity of flue gas (m/sec)	:	8.03	NA	As per IS:11255 (Part 3)-2008
Gas flow rate at NTP (Nm^3/hour)	:	44	NA	As per IS:11255 (Part 3)-2008
Particulate matter (mg/Nm^3)	:	49.21	150.00	As per IS:11255 (Part 1)-1985
SO_2 (Kg/Hr)	:	0.08	0.29	As per IS:11255 (Part 2)-1985
* Permissible Limits	As per the GSPCB consent			

Ambient Meteorology				
Wind Velocity (Km/hr)	7		Ambient Temp °C	30
Wind Direction	NW		Humidity %	75

Details of instrument used - Pollutech model,PEM-SMK 10

Name of instrument	Range	Sensitivity	Calibration date	Validity	Tracebility
Pitot tube	0~200 mm WC	0.01 mmWC	31-01-2018	30-01-2019	FCRI
Manometer (ΔP)	0~200 mm WC	001 mmWC	31-01-2018	30-01-2019	FCRI
Pyrometer	27~600 °C	1°C	31-01-2018	30-01-2019	FCRI
Particulate Matter Flow	2~60 LPM	1 LPM	31-01-2018	30-01-2019	FCRI
Gaseous Flow Meter	0.6~6.0 LPM	0.1 LPM	31-01-2018	30-01-2019	FCRI
DGM Vaccum gauge	0~760 mmWC	10 mmWC	31-01-2018	30-01-2019	FCRI
DGM temp	0 ~100 °C	1°C	31-01-2018	30-01-2019	FCRI

***Calibration Report No. PICS/F/SMK/01-18/134

* Recognised by Ministry of Environment & Forests, as "Environmental Laboratory" vide Notification S. O. 428 (E) valid upto Jan. 2019
*The results relate only to the condition prevailing at the time of sampling

DHANGARWADI MINES

WELL DEPTHS OF VILLAGES

S.NO.	LOCATION	NAME OF THE MINE AREA	TOTAL DEPTH IN MTS	WATER LEVEL FROM SURFACEIN MTS
				30.05.2018
1	PANDAPNIWADI VILLAGE	DHANGARWADI	6.00	3.00
2	DHANGARWADI VILLAGE	DHANGARWADI	6.00	5.00

BHAGAVATHI ANA LABS PVT LTD. BUREAU VERITAS GOA-SGO 401