MONITORING OF ENVIRONMENTAL PARAMETERS

(INTERIM REPORT FOR WINTER SEASON -2023)

FOR

GARBHAM MANGANESE MINE

of

M/s. Rashtriya Ispat Nigam Limited.

(GOVERNMENT OF INDIA ENTERPRISE)
VISAKHAPATNAM STEEL PLANT
Garbham (V), Vizianagaram (Dist)

Andhra Pradesh.

Prepared By

M/s. SV ENVIRO LABS & CONSULTANTS

(MOEF Recognized, NABL & NABET Accredited And ISO 9001 Certified Laboratory)

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INTRODUCTION

1.0 INTRODUCTION

Rashtriya Ispat Nigam Limited, the corporate entity of Visakhapatnam Steel Plant is a Navratna PSE under the Ministry of Steel. Visakhapatnam Steel Plant fondly called Vizag steel. It is the first shore based Integrated Steel Plant in the country and is known for its quality products delighting the customers. It is a market leader in long products and it caters to the needs of diverse industrial sectors. It is the first Steel plant to be certified ISO 9001:2008 (presently 2015), ISO 14001:2004 (presently 2015), OHSAS 18001:2007 and ISO/IEC 27001:2013 Standards. It is also the first PSE to be certified ISO 50001:2011 – Energy Management Systems and has acquired CMMI Level 3 Certification for S/W development.

The Infrastructure of Visakhapatnam Steel Plant comprises of Coke Ovens and Coal Chemical Plant, Sinter Plant, Blast furnace, Calcining and Refractory Material Plant, Steel Melt Shop and Continuous Casting, Light and Medium Merchant Mill, Medium Merchant and Structural Mill, Wire rod mill, Steel melt shop, Thermal power plant.

Rashtriya Ispat Nigam Limited, has captive mines namely Jaggayyapeta Limestone Mine, Madharam Dolomite Mine, Garbham Manganese Mine, Saripalli Sand Mine and Kintada Quartz Mine.

RINL has retained M/s. SV ENVIRO LABS & CONSULTANTS, to carry out the environmental monitoring studies at Garbham Manganese Mine.

This report presents the environmental monitoring data of Winter Season – February'2022 at Garbham Manganese Mine.

1.1 LOCATION OF THE PROJECT

The Project site is located at Garbham Manganese mine of M/s. Rashtriya Ispat Nigam Limited located at Garbham Village, Merakamudidam Mandal, Vizianagaram District, Andhra Pradesh.

1.2 TECHNICAL RESUME OF GARBHAM MANGANESE MINE

Garbham Manganese Mine is a captive mine of Visakhapatnam Steel Plant which is located in Merakamudidam Mandal, Vizianagaram District at Garbham in Andhra Pradesh. We have a mining leases in the name of Rashtriya Ispat Nigam Limited corporate entity of Visakhapatnam Steel plant. Garbham Manganese Mine covering an extent of 264.54Ha. Presently mining activity is restricted to Garbham (Central).

The occurrence of Manganese Ore in the Eastern Ghats is confined in Vizianagaram District, A.P. Manganese is occurring as pocket and mostly associated with Quartzite's and Calc - Granulites. The manganese formations in this part of Eastern Ghat super group of rocks are belonging to the Precambrian age. These ore deposits fall in North East – South West trending belt of Khondalites. The ores are mostly friable and fine in nature. The strike of the beds in the Western part is nearly East – West with a deep of 50^0 to 60^0 to the South. Towards East the beds tend to North East – South. The regional dip in the Eastern parts is 55^0 due South. A total of 1.02 Million Tonnes of reserves was estimated from Garbham lease area. These reserves include 1.06 lakh of tonnes of low grade Manganese Ore from the old dumps. The mining is being carried out by Opencast Method. The stripping ratio of ore to overburden in the present dimensions of the pit is about 1:5. The ore body being lensoidal widely varies in width and length. The benches in overburden are being mined with HEMM using Excavator-220, FEL, Dozer and 16 T Rear Dumpers. Drilling and Blasting not adopted.

The low-grade ores and high-grade ores are being stacked separately and blended for getting the desired composition of manganese for use at Steel Plant. The current production is 50Ton per day as per EC & CFO. The manganese ore was earlier used in Blast Furnace in steel making in large quantities, however with change in technology the manganese ore consumption is brought down at VSP, thus, reducing the requirement of manganese ore fines and lump. The mine workings are as per the approved IBM mine plan. The Air, Water and Noise, Pollution levels are being continuously monitored at Garbham Manganese Mine. The survey reports indicate safe levels for Air, Water and Noise. We have developed large

greenery in the lease hold area by planting fast growing trees, fruit bearing tress for enhancing aesthetic beauty and also to maintain eco-friendly mining operations.

The water lodged pit, which was earlier worked, is having good storage capacity of water which is being pumped out for irrigation purpose to the benefit of nearby farmers for carrying out agricultural works in an area of 200 acres and there are estimated 480 beneficiaries.

Waste dump are well maintained by systematic benching as per approved IBM plan. The topsoil is being stores and used for afforestation purpose systematically. An area of about 45 Hec. Is afforested within the lease area by planting trees consisting of Palm oil, Peeple, Neem, Cashew nut, Tamarind, Teak, Coconut and various other local verities.

Visakhapatnam Steel Plant is putting all efforts to protect the Environment by conducting eco-friendly mining operations at Garbham Manganese Mine by adopting all systematic and scientific methods as prescribed by various statutory agencies like IBM, APPCB, DGMS, etc., Mineral conservation is being done very systematically as per the approved IBM plan. The Director (Operations) Sri A K SAXENA, is the nominated Owner of the mine. The technical and administration guidance is provided by our CGM(Mines) & HOD Sri Nagesh Gummalla and GM (Mines) Sri G V SUBBA RAO from head quarter in operating the mine from time to time.

BRIEF DESCRIPTION OF GARBHAM MANGANESE MINE

Garbham Manganese Mine is a captive mine of Visakhapatnam Steel Plant which is located in Merakamudidam Mandal, Vizianagaram District at Garbham in Andhra Pradesh. We have two mining leases i.e., Garbham (Central) & Garbham (East & West) covering an extent of 59.04 hect. and 205.49 hect. respectively. Presently mining activity is restricted to Garbham (Central).

A total of 1.02 Million tonnes of reserves was estimated from Garbham lease area. These reserves includes 1.06 lakh tonnes of low grade manganese ore from the old dumps. The mining is being carried out by Opencast method. The stripping ratio of ore to overburden in the present dimensions of the pit is about 1:5 . The orebody being lensoidal widely varies in width and length.

Present Mine Workings:

Production and development is achieved from Central Garbham. Some benches are already developed in this block. It is planned to make total nos. 5 benches in the northern side of the block and total of 4 benches in the Northern side as per IBM approved plan. The Central portion of the block will be worked by making suitable benches which at the end of five year will become the pit bottom at the R.L. 120 Metres. The ultimate pit slope at the end of 5 years will be maintained at less than 45^0. All the benches will be made of 4 Metres height and more than 8 meters width. As the rock mass on the Southern side and northern side are mostly of soft to medium hardness except some portion, Excavator – dozer – dumper combination will be deployed for excavation of rock.

The central portion of the block and some portion of hard rocks on the sides will be required to be blasted.

Extent of Mechanisation:

The following HEMM are deployed for excavation, handling transportation and drilling of overburden rock and insitu Mn. Ore at Garbham Mn. Mine.

BACK HOE /1.000 CUM /1 No/Non Electrical Opencast

DOZER/ 155.000 HP/ 1 No/Non Electrical Opencast

TIPPER /12.000 CUM /1 No/ Non Electrical Opencast

WATER TANKER/ 2000.000 LITRE/ 1 No/Non Electrical Opencast

FRONT END LOADER /2.000 CUM/ 1 No/Non Electrical Opencast

JEEP/TRACTOR /47.000 HP /1 No/ Non Electrical Opencast

GENERATOR (DIESEL) /32.000 KWH/ 1 No/Non Electrical Opencast

GENERATOR (DIESEL) /75.000 KWH /1 No/Non Electrical Opencast

All the excavation work will be carried out with the help of Excavator – Dozer – Dumper combination. The ROM Mn. Ore will be brought to the Mn. Ore stock yard where manual workers will be deployed for segregation, breaking, sizing and sorting ROM to get the finished product in two different sizes.

Fines + 3mm to – 10mm

Lump + 10mm to – 60mm

Requirement of Manganese:

The current production is about 300 M.T. manganese lumps for captive use per month. To achieve 300 M.T. of Manganese Lump from insitu, 5000 $M^3$of overburden is supposed to be removed per month. However the required grade is obtaining through dump mining only. No insitu Mining is taking place. The manganese ore was earlier used in the Blast Furnace in Steel making in large quantities , however with change in technology the manganese ore consumption is brought down at VSP, thus, reducing the requirement of manganese ore Fines and Lumps . The mine workings are as per the approved IBM Mine Plan.

ENVIRONMENT MANAGEMENT:

The Air, Water and Noise , Pollution levels are being continuously monitored at Garbham Manganese Mine. The survey reports indicate safe levels for air , water and noise. We have developed large greenery in the lease hold area by planting fast growing trees, fruit bearing trees for enhancing the aesthetic beauty and also to maintain eco friendly mining operations.

The water logged pit which was earlier worked is having good storage capacity of water which is being pumped out for irrigation purpose to the benefit of near by farmers for carrying out agricultural works.

DUMP MANAGEMENT:

Waste dump are well maintained by systematic benching as per approved IBM mine plan. The top soil is being stored and used for afforestation purpose systematically. An area of about 45 Hec. is afforested within the lease area by planting trees consisting of Palmoil, Peepel, Neem, Cashewnut, Tamarind, Coconut and various other local verities.

Visakhapatnam Steel Plant is putting all efforts to protect the Environment by conducting eco friendly mining operations at Garbham Manganese Mine by adopting all systematic and scientific methods as prescribed by various Statutory agencies like IBM, APPCB, DGMS, etc., Mineral conservation is being done very systematically as per the approved IBM Mine Plan.

The water lodged pit, which was earlier worked, is having good storage capacity of water which is being pumped out for irrigation purpose to the benefit of nearby farmers for carrying out agricultural works in an area of 200 acres and there are estimated 480 beneficiaries.

Waste dump are well maintained by systematic benching as per approved IBM plan. The topsoil is being stores and used for afforestation purpose systematically. An area of about 45 Hec is afforested within the lease area by planting trees consisting of Palm oil, Peeple, Neem, Cashew nut, Tamarind, Teak, Coconut and various other local varieties.

Visakhapatnam Steel Plant is putting all efforts to protect the Environment by conducting eco friendly mining operations at Garbham Manganese Mine by adopting all systematic and scientific methods as prescribed by various statutory agencies like IBM, APPCB, DGMS, etc., Mineral conservation is being done very systematically as per the approved IBM plan. The Director (Operations) Sri A. K. SAXENA, is the nominated Owner of the mine. The technical and administration guidance is provided by our GM (Mines)& HoD Sri N Gummalla & GV Subba Rao, DGM(Mines) from head quarter in operating the mine from time to time.

CHAPTER – 2

SCOPE OF WORK

2.0 SCOPE OF WORK

The scope of the studies include monitoring of the following environmental components

1. Meteorological data
2. Ambient Air Quality
3. Dustfall Rate
4. Noise Level monitoring at Work zones
5. Water quality

The parameters covered under the scope for each of the above attributes are given below:

SCOPE OF WORK

S.No	Attribute	Scope
1.	**Meteorological Data**	Collection of micrometeorological data at project site for 15 days in a season by installing an weather monitoring station at plant site covering the following parameters : • Temperature • Relative humidity • Wind speed • Wind direction • Rainfall **Frequency** : Micro-meteorological data for 15days continuously in a season for three seasons i.e. Post Monsoon, Winter and Summer seasons. Yearly rainfall data to be collected.
2.	**Ambient Air Quality**	Sampling of ambient air at 03 stations for analyzing the following parameters: • SPM • PM10

		• PM2.5 • SO2 • NOx • CO **Frequency** : At each station samples will be collected on 8 hourly basis for 24hrs duration, 2days per week for two weeks alternatively in a month for three seasons i.e. Post Monsoon, Winter and Summer seasons
3.	**Dustfall Rate**	Collection of dustfall at 3 locations continuously in a month. • Dustfall **Frequency** : Continuously in a month for three seasons i.e. Post Monsoon, Winter and Summer seasons
4.	**Noise Levels**	Monitoring of noise levels at four locations at work zones. **Frequency**: Readings recorded on 8 hourly basis at one hour interval at all locations in a month of a season for three seasons i.e. Post Monsoon, Winter and Summer seasons.
5.	**Water quality**	Collection and analysis of mine discharge water/well water and treated water as per • IS 10500 (Drinking water specifications) • GSR 422 (E) –Inland surface water **Frequency** : Once in a season for all the four seasons at all locations

CHAPTER – 3

METHODOLOGY

3.0 METHODOLOGY

Methodologies adopted for sampling and analysis for each of the above parameters are detailed below

Methods of monitoring and analysis for various parameters

S.No	Attributes	Measurement Technique		
1.	**Meteorological parameters**	WEATHER STATION		
2.	**Ambient Air Quality**	SPM	Respirable Dust Sampler (Gravimetric method)	IS-5182 (Part-IV)
		PM_{10}	Respirable Dust Sampler (Gravimetric method)	IS-5182 (Part-XXIII)
		$PM_{2.5}$	Fine Particulate Sampler (Gravimetric method)	IS-5182 (Part-XXIV)
		Sulphur dioxide	Modified West and Gaeke	IS-5182 (Part-II)
		Oxides of Nitrogen	Jacob & Hochheiser	IS-5182 (Part-VI)
		CO	Grab sample	IS-5182 (Part – X)
3.	**Dustfall Rate**	IS-5182 (Part – 1) (Gravimetric method)		
4.	**Noise Monitoring**	Pre calibrated Sound Level Meter		
5.	**Water Quality (Surface water, Mine discharge water, Well Water and Treated water)**	As per APHA 23rd Edition'2017		

CHAPTER – 4

ENVIRONMENTAL MONITORING STUDIES

4.0 ENVIRONMENTAL MONITORING STUDIES – WINTER SEASON 2023

S.No	ATTRIBUTE	SCOPE	STUDIES CARRIED OUT
1.	Ambient Air Quality	Collection of ambient air at three locations.	Ambient Air samples collected at three locations at Mining Area - 06th, 07th, 20th, 21th of February'2023. Administrative Office - 06th, 07th, 20th, 21th of February'2023. Garbham Village - 06th, 07th, 20th, 21th of February'2023. for SPM, PM10, SO2, NOx & CO.
2.	Meteorological parameters	Collection of micrometeorological data at project site for 15 days continuously	Collected for the period of 06.02.2023 to 21.02.2023.
3.	Dustfall rate	Collection of dust fall at three locations.	Dust fall samples were collected at three locations for the period of 01.02.2023 to 28.02.2023. • Mining Area • Administrative Office • Garbham Village

4.	Water Quality	Collection of Mine discharge water, Well Water and Treated water	Ground water of Garbham, Mine discharge water, Mines Office drinking water and Garbham borewell water samples have been collected on 06-02-2023.
5.	Noise Level Monitoring	Monitoring of noise levels at four locations at work zones.	Monitoring of noise levels at four locations at work zones. • Mining Area • Admin Office • Loading Plant • Hydraulic Excavator

4.1.1 METEOROLOGICAL DATA

Meteorological data was collected on hourly basis by installing a weather monitoring station at Plant site. The report depicted hereunder represents the data for 06^{h} February'23 to 21st February'23.

The following parameters were recorded

- Wind speed
- Wind direction
- Temperature
- Relative humidity
- Rainfall

MINIMUM AND MAXIMUM VALUES OF RELATIVE HUMIDITY, TEMPERATURE AND RAINFALL DURING STUDY PERIOD

	Temperature in °C	Relative Humidity %	Rainfall in mm
Minimum	14.9	19	0.1
Maximum	30.9	95	0.1
Mean	22.0	62	-
Total	-	-	0.9

Fig – 1 .Graphical interpretation of Minimum and Maximum values of Temperature during study period.

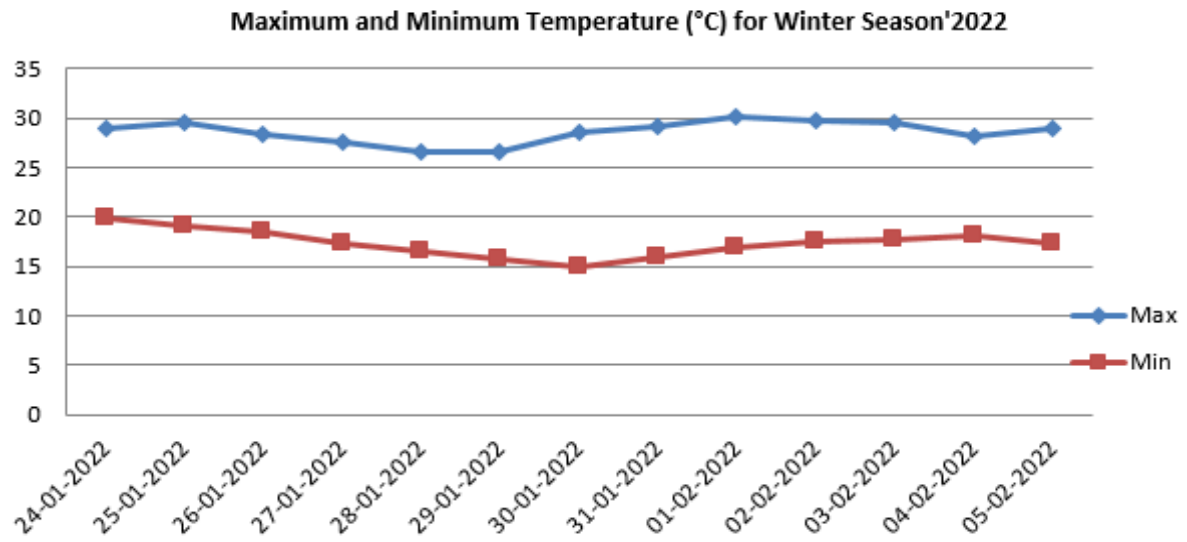
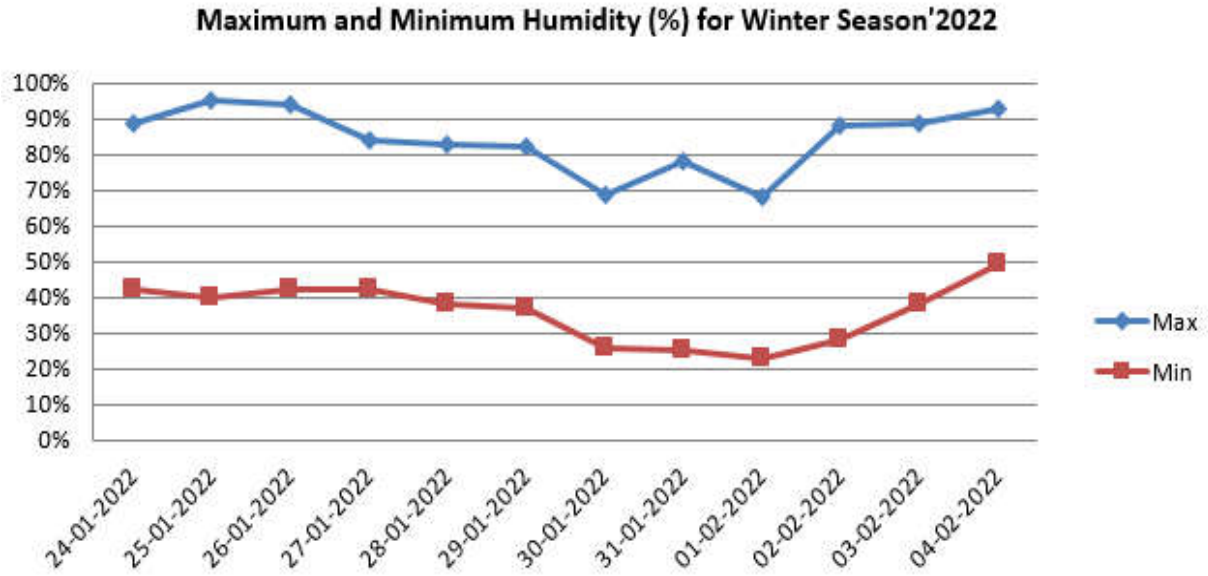


Fig – 2-.Graphical interpretation of Minimum and Maximum values of Relative Humidity during study period.



WIND PATTERN – WINTER SEASON 2023

Duration	Predominant Wind directions	Wind rose Enclosed as
00:00 – 07.00 hrs	NW	Fig – 3
08.00 – 15.00 hrs	SSW	Fig – 4
16.00 – 23.00 hrs	SW	Fig – 5
00.00 – 23.00 hrs	NW	Fig – 6

Fig- 3. Wind rose diagram for 00.00 – 07.00 hrs (8hrly)

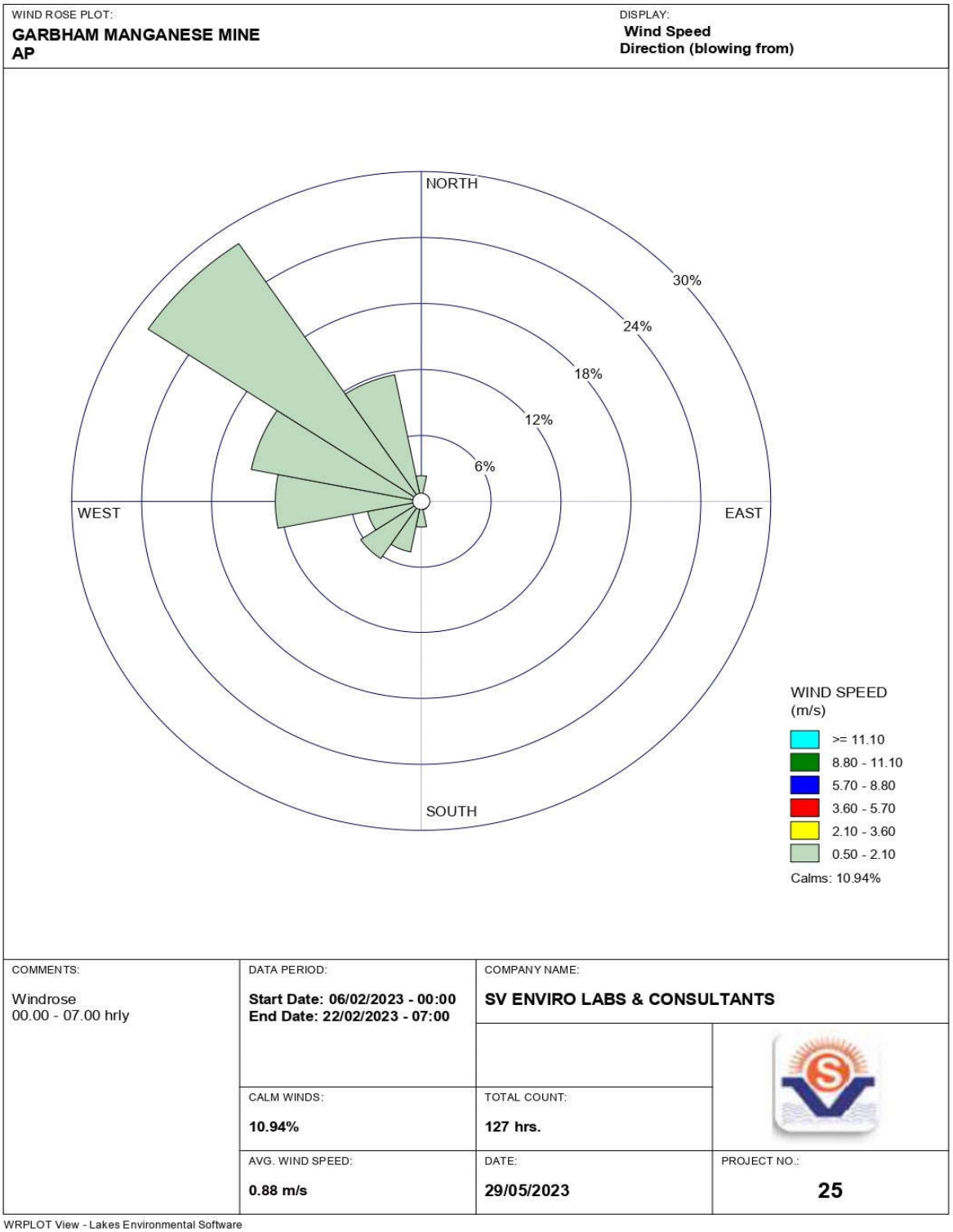


Fig –4. Wind rose diagram for 08.00 – 15.00 hrs (8hrly)

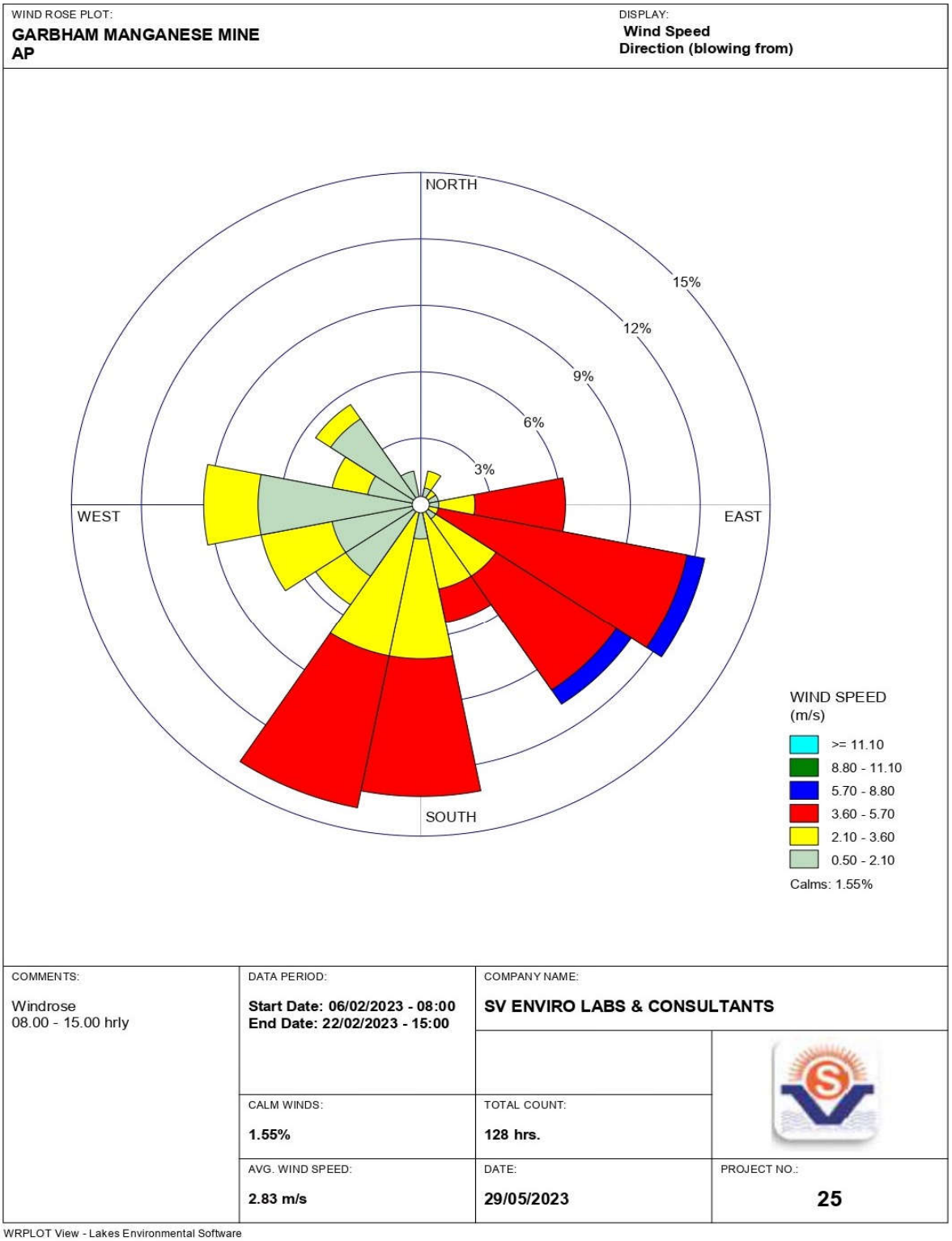


Fig – 5. Wind rose diagram for 16.00 – 23.00 hrs (8hrly)

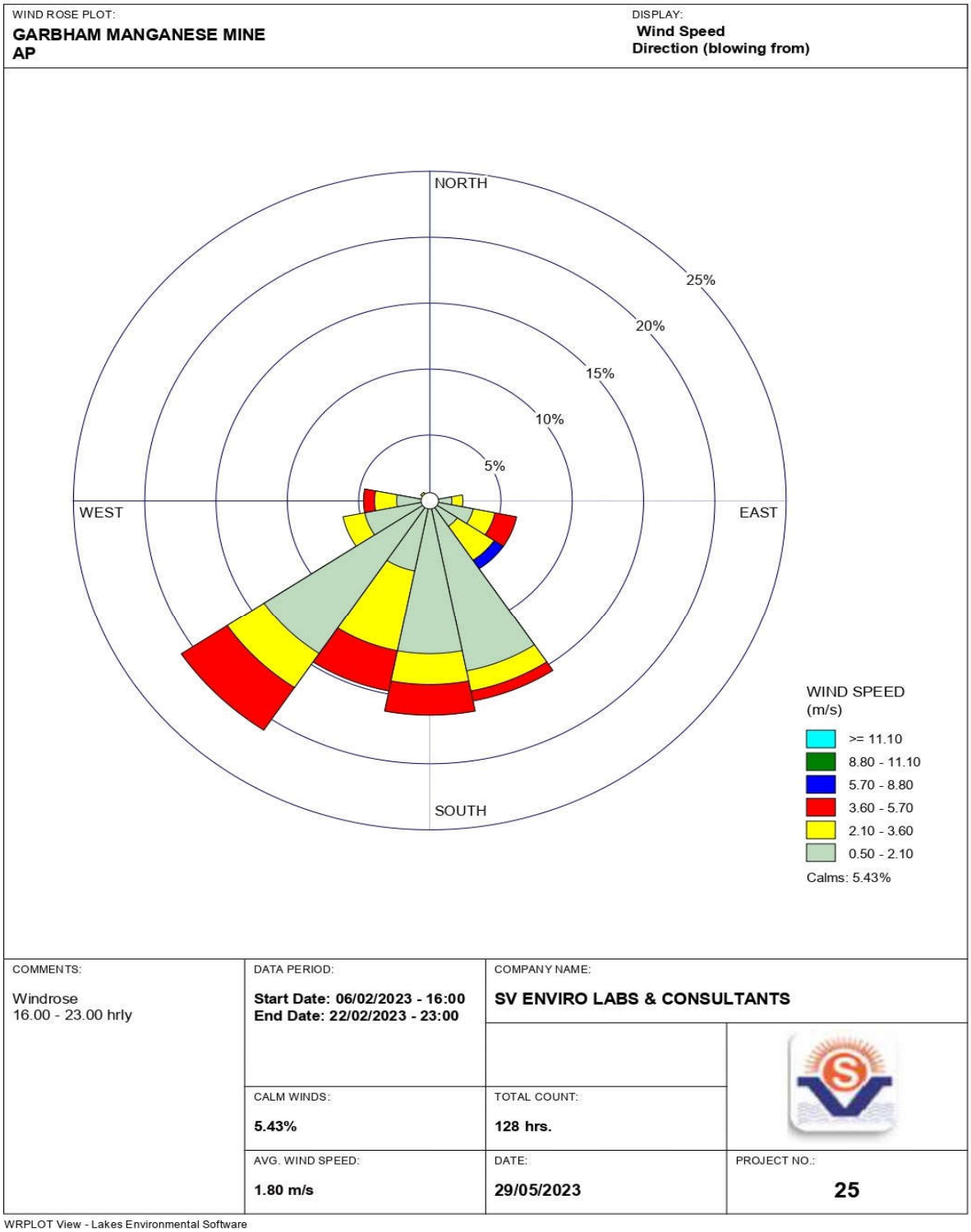
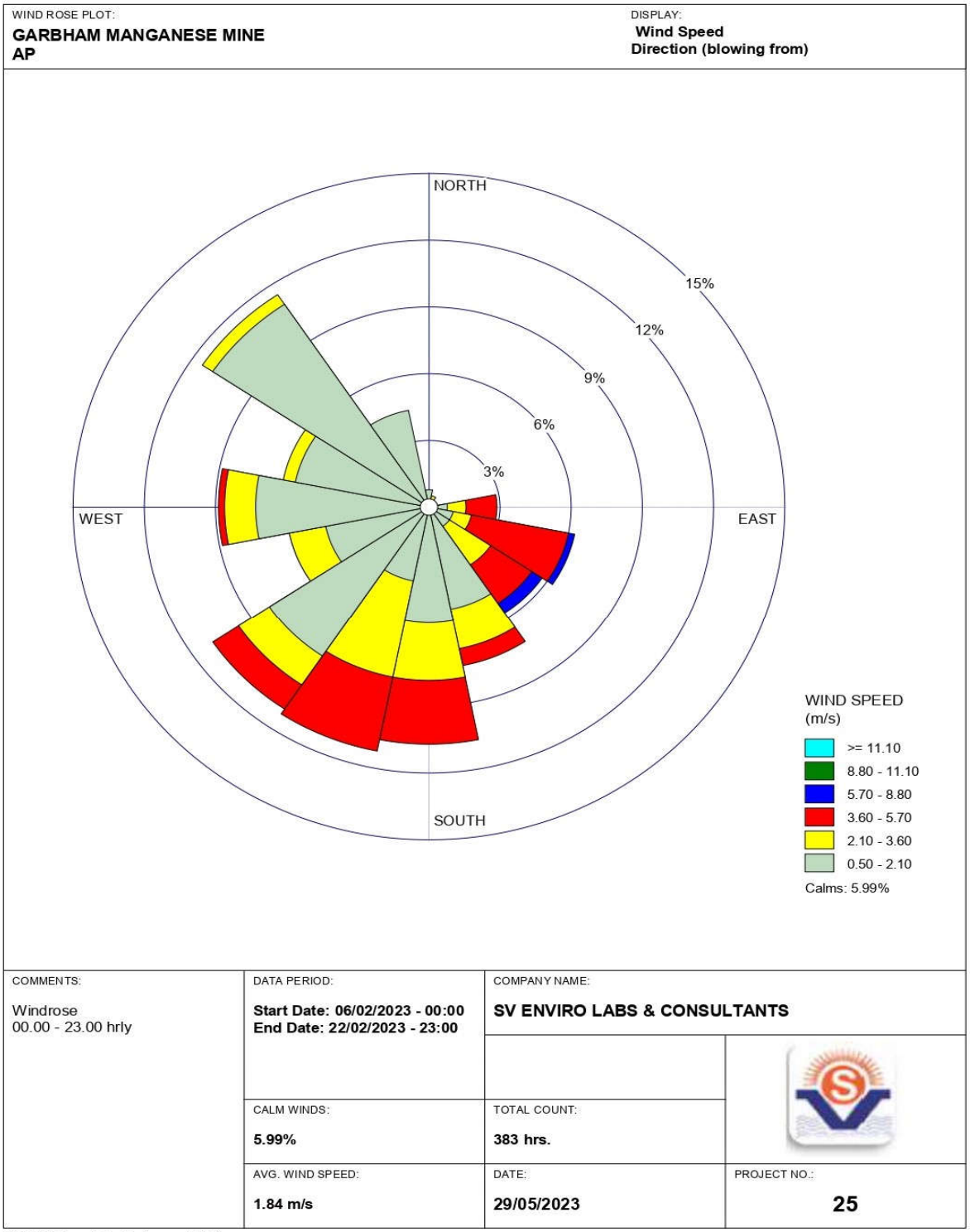


Fig –6. Wind rose diagram for 00.00 – 23.00 hrs (24hrly)



WIND PERCENTAGE FREQUENCY

	Directions / Wind Classes (m/s)	0.50 - 2.10	2.10 - 3.60	3.60 - 5.70	5.70 - 8.80	8.80 - 11.10	>= 11.10	Total (%)
1	348.75 - 11.25	0.78125	0	0	0	0	0	0.78125
2	11.25 - 33.75	0.26042	0.26042	0	0	0	0	0.52083
3	33.75 - 56.25	0	0.26042	0	0	0	0	0.26042
4	56.25 - 78.75	0.26042	0	0	0	0	0	0.26042
5	78.75 - 101.25	0.78125	0.78125	1.30208	0	0	0	2.86458
6	101.25 - 123.75	1.04167	0.78125	4.16667	0.26042	0	0	6.25
7	123.75 - 146.25	1.04167	2.08333	2.08333	0.52083	0	0	5.72917
8	146.25 - 168.75	4.6875	1.82292	0.78125	0	0	0	7.29167
9	168.75 - 191.25	5.20833	2.60417	2.86458	0	0	0	10.6771
10	191.25 - 213.75	3.38542	4.42708	3.38542	0	0	0	11.1979
11	213.75 - 236.25	8.07292	1.5625	1.30208	0	0	0	10.9375
12	236.25 - 258.75	4.42708	1.5625	0	0	0	0	5.98958
13	258.75 - 281.25	7.29167	1.30208	0.26042	0	0	0	8.85417
14	281.25 - 303.75	5.72917	0.52083	0	0	0	0	6.25
15	303.75 - 326.25	10.9375	0.52083	0	0	0	0	11.4583
16	326.25 - 348.75	4.42708	0	0	0	0	0	4.42708
	Sub-Total	**58.3333**	**18.4896**	**16.1458**	**0.78125**	**0**	**0**	**93.75**
	Calms							**5.98958**
	Missing/Incomplete							**0.26042**
	Total							**100**

4.2 AMBIENT AIR QUALITY MONITORING

The ambient air quality was assessed through a network of 03 AAQM stations. The locations of ambient air quality stations are given below:

Station code	Location	Environmental setting
A1	Mining Area	Industrial
A2	Administrative office	Industrial
A3	Garbham Village	Residential

Monitoring reports are enclosed as Annexure – I

4.3 DUST FALL MEASUREMENT

Dust fall monitoring was conducted at 03 stations. Details of locations mentioned hereunder:

Station code	Location	Environmental setting
DF1	Mining Area	Industrial
DF2	Administrative office	Industrial
DF3	Garbham Village	Residential

Monitoring reports are enclosed as Annexure – II

4.4 NOISE LEVEL MONITORING

Noise levels were monitoring at four locations mentioned hereunder:

Station code	Location	Environmental setting
N1	Mining Area	Industrial
N2	Administrative office	Industrial
N3	Loading Point	Industrial
N4	Near Hydraulic Excavator	Industrial

Monitoring reports are enclosed as Annexure – III

4.5 WATER QUALITY

Water samples were collected at the following points.

Station code	Location	Environmental setting
W1	Mines Office	Drinking water
W2	Mine Discharge water	Mine Pit water
W3	Garbham Well Water	Ground water
W4	Garbham Bore Well Water	Ground water

The methodology for sample collection and preservation techniques was followed as per the Standard Operating Procedures (SOP) mentioned in table hereunder:

Standard Operating Procedures (SOP) For Water Sampling

Parameter	Sample Collection	Sample Size	Storage/ Preservation
pH	Grab sampling Plastic /glass container	50 ml	Refrigeration, can be stored for 7 days
Electrical Conductivity	Grab sampling Plastic /glass container	50 ml	Refrigeration, can be stored for 7 days
Total suspended solids	Grab sampling Plastic /glass container	100 ml	Refrigeration, can be stored for 7 days
Total Dissolved Solids	Grab sampling Plastic /glass container	100 ml	Refrigeration, can be stored for 7 days
BOD	Grab sampling Plastic /glass container	500 ml	Refrigeration, 48 hrs
Hardness	Grab sampling Plastic /glass container	100 ml	Add HNO_3 to pH<2, refrigeration; 6 months
Chlorides	Grab sampling Plastic /glass container	50 ml	Not required; 28 days
Sulphates	Grab sampling Plastic /glass container	100 ml	Refrigeration; 28 days
Nitrates	Plastic containers	100 ml	Refrigeration; 48 hrs
Fluorides	Plastic containers only	100 ml	Not required; 28 days
Alkalinity	Plastic/ glass containers	100 ml	Refrigeration; 14 days
Ammonia	Plastic/ glass containers	100 ml	Add H_2SO_4 to pH>2, refrigeration, 28 days
Heavy Metals (Ar, Cd, Mn, Cu, Fe, Zn, Pb etc.)	Plastic/ Glass rinse with 1+1 HNO_3	500 ml	Filter, add HNO_3 to pH>2; Grab sample; 6 months

Source: Standard Methods for the Examination of Water and Wastewater, Published By APHA, 23rd Edition, 2017

The analytical techniques used for water analysis is given in the table hereunder:

Analytical Techniques For Water Analysis

S.No	Parameter	Method
1.	pH	APHA, 4500-H+B, 23rd Ed., 2017
2.	Colour	APHA, 2120-C/2120-B, 23rd Ed., 2017
3.	Odour	APHA, 2150, 23rd Ed., 2017
4.	Temperature	APHA, 2550-A+B,23rd Ed., 2017
5.	Oil & Grease	APHA, 5520-D, 23rd Ed., 2017
6.	Total Suspended Solids	APHA, 2540-D, 23rd Ed., 2017
7.	Total Dissolved Solids	APHA, 2540-C, 23rd Ed., 2017
8.	Total Residual Chlorine	APHA, 4500-Cl B, 23rd Ed., 2017
9.	Biochemical Oxygen Demand	APHA, 5210-B, 23rd Ed., 2017 4500-OC, 23rd Ed., 2017
10.	Chemical Oxygen Demand	APHA, 5220-B, 23rd Ed., 2017
11.	Free Ammonia	IS 3025
12.	Ammonical Nitrogen	APHA, 4500-NH_3 B, 23rd Ed., 2017
13.	Total Kjeldhal Nitrogen	APHA, 4500-Norg B, 23rd Ed., 2017
14.	Zinc	APHA, 3111-B, 23rd Ed., 2017
15.	Lead	APHA, 3111-B, 23rd Ed., 2017
16.	Cadmium	APHA, 3111-B, 23rd Ed., 2017
17.	Mercury	APHA, 3112-B, 23rd Ed., 2017
18.	Arsenic	APHA, 3114-B, 23rd Ed., 2017
19.	Copper	APHA, 3111-B, 23rd Ed., 2017
20.	Nickel	APHA, 3111-B, 23rd Ed., 2017
21.	Cyanide	APHA, 4500-CNB, 23rd Ed., 2017
22.	Fluoride	APHA, 4500-FD, 23rd Ed., 2017 (SPANDS Methods)
23.	Phosphates	APHA, 4500-PD, 23rd Ed., 2017
24.	Sulphates	APHA, 4500-SO_4^{2-} E, 23rd Ed., 2017
25.	Sulphide	APHA, 4500-S^{2-}, 23rd Ed., 2017
26.	Manganese	APHA, 3111-B, 23rd Ed., 2017
27.	Iron	APHA, 3111-B, 23rd Ed., 2017
28.	Phenolic Compounds	APHA, 5530-B, 23rd Ed., 2017
29.	Bio Assay Test	IS 6582

Analysis results of the water samples collected from the above locations are enclosed as **Annexure – IV.**

ANNEXURE – I

(Ambient Air Monitoring Reports)

Ref: SVELC/RIL-GMM/23-02/01 Date: 06-03-2023

NAME AND ADDRESS : **M/s. GARBHAM MANGANESE MINE,**
Visakhapatnam Steel Plant,
Garbham,
Vizianagaram District, A.P.

SAMPLE PARTICULARS : **AMBIENT AIR QUALITY**

SOURCE OF COLLECTION : MINING AREA

DURATRION OF SAMPLING : 24 Hrs

A**TMOSPHERE CONDITION** : Clear Sky

TEST REPORT

Date of Monitoring	Week	SPM ($\mu g/m^3$)	SO2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)
06.02.2023	I	162	10.6	12.4	0.42
07.02.2023	I	170	11.2	13.1	0.46
20.02.2023	II	154	10.3	11.0	0.38
21.02.2023	II	143	9.8	10.6	0.41
Maximum		**170**	**11.2**	**13.1**	**0.46**
Minimum		**143**	**9.8**	**10.6**	**0.41**
Average		**157**	**10.4**	**11.7**	**0.41**
CPCB Standards		-	**80**	**80**	**4**

CHECKED BY **SV ENVIRO LABS & CONSULTANTS**

Ref: SVELC/RIL-GMM/23-02/02 Date: 06-03-2023

NAME AND ADDRESS : **M/s. GARBHAM MANGANESE MINE,**
Visakhapatnam Steel Plant,
Garbham,
Vizianagaram District, A.P.

SAMPLE PARTICULARS : **AMBIENT AIR QUALITY**

SOURCE OF COLLECTION : ADMINISTRATIVE OFFICE

DURATRION OF SAMPLING : 24 Hrs

ATMOSPHERE CONDITION : Clear Sky

TEST REPORT

Date of Monitoring	Week	SPM ($\mu g/m^3$)	PM10 ($\mu g/m^3$)	PM2.5 ($\mu g/m^3$)	SO2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)
06.02.2023	I	160	63.4	25.2	10.4	12.6	0.30
07.02.2023	I	152	65.2	26.4	11.1	13.2	0.35
20.02.2023	II	141	61.6	24.5	10.8	12.4	0.38
21.02.2023	II	124	60.4	22.3	11.3	13.5	0.36
Maximum		**160**	**65.2**	**26.4**	**11.3**	**13.5**	**0.38**
Minimum		**124**	**60.4**	**22.3**	**10.4**	**12.4**	**0.30**
Average		**144**	**62.6**	**24.6**	**10.9**	**12.9**	**0.34**
CPCB Standards		-	**100**	**60**	**80**	**80**	**4**

CHECKED BY **SV ENVIRO LABS & CONSULTANTS**

Ref: SVELC/RIL-GMM/23-02/03 Date: 06-03-2023

NAME AND ADDRESS : **M/s. GARBHAM MANGANESE MINE,**
Visakhapatnam Steel Plant,
Garbham,
Vizianagaram District, A.P.

SAMPLE PARTICULARS : **AMBIENT AIR QUALITY**

SOURCE OF COLLECTION : GARBHAM VILLAGE

DURATRION OF SAMPLING : 24 Hrs

ATMOSPHERE CONDITION : Clear Sky

TEST REPORT

Date of Monitoring	Week	SPM ($\mu g/m^3$)	PM10 ($\mu g/m^3$)	PM2.5 ($\mu g/m^3$)	SO2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)
06.02.2023	I	136	62.4	23.2	10.2	11.6	0.28
07.02.2023	I	144	64.2	24.6	11.6	12.5	0.31
20.02.2023	II	153	65.6	26.2	10.4	11.9	0.34
21.02.2023	II	132	60.3	22.4	9.6	10.4	0.26
Maximum		**153**	**65.6**	**26.2**	**11.6**	**12.5**	**0.34**
Minimum		**132**	**60.3**	**22.4**	**9.6**	**10.4**	**0.26**
Average		**141**	**63.1**	**24.1**	**10.4**	**11.6**	**0.29**
CPCB Standards		-	**100**	**60**	**80**	**80**	**4**

CHECKED BY **SV ENVIRO LABS & CONSULTANTS**

ANNEXURE – II

(Dustfall Monitoring Reports)

Ref: SVELC/RIL-GMM/23-02/04 Date: 06-03-2023

NAME AND ADDRESS : **M/s. GARBHAM MANGANESE MINE,**
Visakhapatnam Steel Plant,
Garbham,
Vizianagaram District, A.P.

SAMPLE PARTICULARS : **DUSTFALL**

SOURCE OF COLLECTION : MINING AREA

ATMOSPHERE CONDITION : Clear Sky

TEST REPORT

S.No	Parameters	Unit	01-02-2023 to 14-02-2023	15-02-2023 to 28-02-2023
1	Insoluble Particles	Tons/Km^2/Month	2.36	2.11
2	Soluble Particles	Tons/Km^2/Month	1.54	1.93
3	Total Particles	Tons/Km^2/Month	3.9	4.04

CHECKED BY **SV ENVIRO LABS & CONSULTANTS**

Ref: SVELC/RIL-GMM/23-02/05 Date: 06-03-2023

NAME AND ADDRESS : **M/s. GARBHAM MANGANESE MINE,**
Visakhapatnam Steel Plant,
Garbham,
Vizianagaram District, A.P.

SAMPLE PARTICULARS : **DUSTFALL**

SOURCE OF COLLECTION : ADMINISTRATIVE OFFICE

ATMOSPHERE CONDITION : Clear Sky

TEST REPORT

S.No	Parameters	Unit	01-02-2023 to 14-02-2023	15-02-2023 to 28-02-2023
1	Insoluble Particles	Tons/Km^2/Month	2.02	2.18
2	Soluble Particles	Tons/Km^2/Month	1.05	1.12
3	Total Particles	Tons/Km^2/Month	3.07	3.3

CHECKED BY **SV ENVIRO LABS & CONSULTANTS**

Ref: SVELC/RIL-GMM/23-02/06 Date: 06-03-2023

NAME AND ADDRESS : **M/s. GARBHAM MANGANESE MINE,**
Visakhapatnam Steel Plant,
Garbham,
Vizianagaram District, A.P.

SAMPLE PARTICULARS : **DUSTFALL**

SOURCE OF COLLECTION : GARBHAM VILLAGE

ATMOSPHERE CONDITION : Clear Sky

TEST REPORT

S.No	Parameters	Unit	01-02-2023 to 14-02-2023	15-02-2023 to 28-02-2023
1	Insoluble Particles	Tons/Km^2/Month	2.56	2.81
2	Soluble Particles	Tons/Km^2/Month	1.21	1.15
3	Total Particles	Tons/Km^2/Month	3.77	3.96

CHECKED BY **SV ENVIRO LABS & CONSULTANTS**

Ref: SVELC/RIL-GMM/22-02/03 Date: 18-02-2022

NAME AND ADDRESS : **M/s. GARBHAM MANGANESE MINE,**
Visakhapatnam Steel Plant,
Garbham,
Vizianagaram District ,A.P.

SAMPLE PARTICULARS : **DUSTFALL**

SOURCE OF COLLECTION : GARBHAM VILLAGE

ATMOSPHERE CONDITION : Clear Sky

TEST REPORT

S.No	Parameters	Unit	16-01-2022 to 30-01-2022	01-02-2022 to 15-02-2022
1	Insoluble Particles	Tons/Km^2/Month	3.52	3.44
2	Soluble Particles	Tons/Km^2/Month	2.16	2.05
3	Total Particles	Tons/Km^2/Month	5.68	5.49

CHECKED BY **SV ENVIRO LABS & CONSULTANTS**

ANNEXURE – III

(Noise Monitoring Reports)

Ref: SVELC/RIL-GMM/23-02/07 Date: 06-03-2023

NAME AND ADDRESS : **M/s. GARBHAM MANGANESE MINE,**
Visakhapatnam Steel Plant,
Garbham,
Vizianagaram District, A.P.

SAMPLE PARTICULARS : **NOISE LEVEL MONITORING**

DATE OF COLLECTION : 06.02.2023 to 07.02.2023

TEST REPORT

Period	Time	Source of collection			
		Mining Area	**Admin office**	**Loading Point**	**Hydraulic Excavator**
Day	6.00	53.2	50.7	53.9	53.9
	7.00	52.4	54.4	54.6	52.3
	8.00	55.6	53.1	57.3	58.7
	9.00	57.3	57.8	54.7	59.4
	10.00	64.6	54.5	55.4	60.1
	11.00	63.2	55.2	64.1	61.8
	12.00	66.8	58.9	66.8	63.5
	13.00	67.5	59.6	65.5	62.2
	14.00	69.2	63.3	62.2	61.9
	15.00	70.9	61.7	68.9	60.6
	16.00	71.6	63.4	70.6	63.3
	17.00	70.4	65.1	67.3	66.7
	18.00	72.3	64.8	70.7	61.4
	19.00	70.6	62.5	68.4	57.1
	20.00	65.7	60.2	71.2	55.8
	21.00	66.4	61.9	69.9	56.5
Night	22.00	64.1	57.6	68.6	54.2
	23.00	62.8	55.3	61.3	52.9
	24.00	60.5	50.7	57.7	53.6
	1.00	57.2	52.4	50.4	51.3
	2.00	55.9	50.1	51.1	50.7
	3.00	54.6	50.8	49.8	47.4
	4.00	53.3	48.5	46.5	53.1
	5.00	52.7	45.2	47.2	50.5
Leq Day		**64.8**	**56.6**	**60.6**	**57.0**
Leq Night		**56.7**	**50.4**	**52.0**	**51.4**

CPCB Standards for Noise levels	**Day Time**	**Night Time**
	75	**70**

Note: Day time shall mean from 6.00 am to 10.00 pm
Night time shall mean from 10.00 p.m. to 6.00 a.m.

SV ENVIRO LABS & CONSULTANTS

ANNEXURE – IV

(Water Analysis Reports)

Ref: SVELC/RIL-GMM/23-02/01 Date: 06-03-2023

NAME AND ADDRESS : **M/s. GARBHAM MANGANESE MINE,**
Visakhapatnam Steel Plant, Garbham,
Vizianagaram District, A.P.

SAMPLE PARTICULARS : GROUND WATER

SOURCE OF COLLECTION : GARBHAM WELL WATER

DATE OF COLLECTION : 06-02-2023

TEST REPORT

S.No	Parameter	Unit	Result	IS 10500:2012 Specifications
1.	Colour	Hazen	3.20	5.0
2.	Odour	-	Agreeable	Agreeable
3.	Temperature	^0C	28.3	-
4.	Taste	-	Agreeable	Agreeable
5.	Turbidity	NTU	0.18	1.0
6.	pH	-	7.70	6.5 – 8.5
7.	Total Dissolved Solids	mg/l	350	500
8.	Total Alkalinity as $CaCO_3$	mg/l	290	200
9.	Total Hardness as $CaCO_3$	mg/l	309	200
10.	Calcium as Ca	mg/l	77.2	75
11.	Magnesium as Mg	mg/l	28.4	30
12.	Chlorides as Cl^-	mg/l	36.6	250
13.	Fluorides as F	mg/l	0.78	1.0
14.	Nitrates as NO_3^-	mg/l	6.31	45
15.	Sulphates as SO_4^{2-}	mg/l	11.6	200
16.	Iron as Fe	mg/l	0.11	0.3
17.	Free Residual Chlorine	mg/l	< 0.1	0.2
18.	Phenolic Compounds as C_6H_5OH	mg/l	<0.005	0.001
19.	Copper as Cu	mg/l	< 0.01	0.05
20.	Manganese as Mn	mg/l	< 0.01	0.1
21.	Zinc as Zn	mg/l	0.10	5.0
22.	Aluminum as Al	mg/l	< 0.01	0.03
23.	Boron as B	mg/l	< 0.01	0.5
24.	Sulphide as H_2S	mg/l	< 0.1	0.05
25.	Anionic Detergents (as MBAS)	mg/l	< 0.1	0.2
26.	Barium as Ba	mg/l	< 0.01	0.7
27.	Chloramines (as Cl2)	mg/l	<1.0	4.0
28.	Ammonia as total ammonia-N	mg/l	< 0.01	0.5
29.	Mineral Oil	mg/l	< 0.01	0.5
30.	Selenium as Se	mg/l	< 0.01	0.01
31.	Silver as Ag	mg/l	< 0.01	0.1
32.	Cadmium as Cd	mg/l	<0.001	0.003
33.	Cyanide as CN	mg/l	<0.02	0.05
34.	Lead as Pb	mg/l	<0.01	0.01
35.	Mercury as Hg	mg/l	<0.001	0.001
36.	Molybdenum as Mo	mg/l	<0.01	0.07
37.	Nickel as Ni	mg/l	<0.01	0.02
38.	Total Arsenic as As	mg/l	<0.01	0.01

39.	Total Chromium as Cr	mg/l	<0.01	0.05
40.	Polychlorinated biphenyls	mg/l	<0.0001	0.0005
41.	Polynuclear aromatic Hydrocarbons as PAH	mg/l	<0.0001	0.0001
MICROBIOLOGY:				
42.	*E. coliforms*	CFU/ 100mL	Not detected	Shall not be detected in 100 ml
43.	*Total coliforms*	CFU/ 100mL	20	Shall not be detected in 100 ml
44.	*Faecal coliforms*	MPN/ 100mL	Not detected	-
PESTICIDES:				
45.	Alpha HCH	µg/l	BDL	0.01
46.	Beta HCH	µg/l	BDL	0.04
47.	Butachlor	µg/l	BDL	125
48.	Chlorpyriphos	µg/l	BDL	30
49.	Delta HCH	µg/l	BDL	0.04
50.	2,4- Dicholorophenoxyacetic Acid	µg/l	BDL	30
51.	DDT (o,p and p,p-Isomers of DDT, DDE and DDD)	µg/l	BDL	1.0
52.	Endosulfan (alpha, beta and Sulphate)	µg/l	BDL	0.4
53.	Ethion	µg/l	BDL	3.0
54.	Gamma-HCH (Lindane)	µg/l	BDL	2.0
55.	Isoproturon	µg/l	BDL	9.0
56.	Malathion	µg/l	BDL	190
57.	Methyl Parathion	µg/l	BDL	0.3
58.	Alachlor	µg/l	BDL	20
59.	Atrazine	µg/l	BDL	2.0
60.	Aldrin/ Dieldrin	µg/l	BDL	0.03
61.	Monocrotophos	µg/l	BDL	1.0
62.	Phorate	µg/l	BDL	2.0
TRIHALOMETHANE				
63.	Bromoform	mg/l	<0.05	0.1
64.	Dibromochloromethane	mg/l	<0.05	0.1
65.	Bromodichloromethane	mg/l	<0.05	0.06
66.	chloroform	mg/l	<0.05	0.2

Note: All the above parameters are tested as per APHA methods, 23rd Edition, 2017
BDL- Below detectable limit, Detectable limit- <0.005 µg/l

CHECKED BY **SV ENVIRO LABS & CONSULTANTS**

Ref: SVELC/RIL-GMM/23-02/02 Date: 06-03-2023

NAME AND ADDRESS : **M/s. GARBHAM MANGANESE MINE,**
Visakhapatnam Steel Plant, Garbham,
Vizianagaram District,A.P.

SAMPLE PARTICULARS : DRINKING WATER

SOURCE OF COLLECTION : MINES OFFICE

DATE OF COLLECTION : 06-02-2023

TEST REPORT

S.No	Parameter	Unit	Result	IS 10500:2012 Specifications
1.	Colour	Hazen	0.18	5.0
2.	Odour	-	Agreeable	Agreeable
3.	Temperature	^0C	27.8	-
4.	Taste	-	Agreeable	Agreeable
5.	Turbidity	NTU	0.35	1.0
6.	pH	-	6.72	6.5 – 8.5
7.	Total Dissolved Solids	mg/l	48.6	500
8.	Total Alkalinity as $CaCO_3$	mg/l	36.4	200
9.	Total Hardness as $CaCO_3$	mg/l	24.2	200
10.	Calcium as Ca	mg/l	6.02	75
11.	Magnesium as Mg	mg/l	2.24	30
12.	Chlorides as Cl^-	mg/l	8.36	250
13.	Fluorides as F	mg/l	0.11	1.0
14.	Nitrates as NO_3^-	mg/l	1.10	45
15.	Sulphates as SO_4^{2-}	mg/l	2.00	200
16.	Iron as Fe	mg/l	0.09	0.3
17.	Free Residual Chlorine	mg/l	< 0.1	0.2
18.	Phenolic Compounds as C_6H_5OH	mg/l	<0.005	0.001
19.	Copper as Cu	mg/l	< 0.01	0.05
20.	Manganese as Mn	mg/l	< 0.01	0.1
21.	Zinc as Zn	mg/l	1.13	5.0
22.	Aluminum as Al	mg/l	< 0.01	0.03
23.	Boron as B	mg/l	< 0.1	0.5
24.	Sulphide as H_2S	mg/l	< 0.1	0.05
25.	Anionic Detergents (as MBAS)	mg/l	< 0.01	0.2
26.	Barium as Ba	mg/l	< 0.01	0.7
27.	Chloramines (as Cl2)	mg/l	<1.0	4.0
28.	Ammonia as total ammonia-N	mg/l	< 0.01	0.5
29.	Mineral Oil	mg/l	< 0.01	0.5
30.	Selenium as Se	mg/l	< 0.01	0.01
31.	Silver as Ag	mg/l	< 0.01	0.1
32.	Cadmium as Cd	mg/l	<0.001	0.003
33.	Cyanide as CN	mg/l	<0.02	0.05
34.	Lead as Pb	mg/l	<0.01	0.01
35.	Mercury as Hg	mg/l	<0.001	0.001
36.	Molybdenum as Mo	mg/l	<0.01	0.07
37.	Nickel as Ni	mg/l	<0.01	0.02
38.	Total Arsenic as As	mg/l	<0.01	0.01

39.	Total Chromium as Cr	mg/l	<0.01	0.05
40.	Polychlorinated biphenyls	mg/l	<0.0001	0.0005
41.	Polynuclear aromatic Hydrocarbons as PAH	mg/l	<0.0001	0.0001
MICROBIOLOGY:				
42.	*E. coliforms*	CFU/ 100mL	Not detected	Shall not be detected in 100 ml
43.	*Total coliforms*	CFU/ 100mL	Not detected	Shall not be detected in 100 ml
44.	*Faecal coliforms*	MPN/ 100mL	Not detected	-
PESTICIDES:				
45.	Alpha HCH	µg/l	BDL	0.01
46.	Beta HCH	µg/l	BDL	0.04
47.	Butachlor	µg/l	BDL	125
48.	Chlorpyriphos	µg/l	BDL	30
49.	Delta HCH	µg/l	BDL	0.04
50.	2,4- Dicholorophenoxyacetic Acid	µg/l	BDL	30
51.	DDT (o,p and p,p-Isomers of DDT, DDE and DDD)	µg/l	BDL	1.0
52.	Endosulfan (alpha, beta and Sulphate)	µg/l	BDL	0.4
53.	Ethion	µg/l	BDL	3.0
54.	Gamma-HCH (Lindane)	µg/l	BDL	2.0
55.	Isoproturon	µg/l	BDL	9.0
56.	Malathion	µg/l	BDL	190
57.	Methyl Parathion	µg/l	BDL	0.3
58.	Alachlor	µg/l	BDL	20
59.	Atrazine	µg/l	BDL	2.0
60.	Aldrin/ Dieldrin	µg/l	BDL	0.03
61.	Monocrotophos	µg/l	BDL	1.0
62.	Phorate	µg/l	BDL	2.0
TRIHALOMETHANE				
63.	Bromoform	mg/l	<0.05	0.1
64.	Dibromochloromethane	mg/l	<0.05	0.1
65.	Bromodichloromethane	mg/l	<0.05	0.06
66.	chloroform	mg/l	<0.05	0.2

Note: All the above parameters are tested as per APHA methods, 23rd Edition, 2017
BDL- Below detectable limit, Detectable limit- <0.005 µg/l

CHECKED BY **SV ENVIRO LABS & CONSULTANTS**

Ref: SVELC/RIL-GMM/23-02/03 Date: 06-03-2023

NAME AND ADDRESS : **M/s. GARBHAM MANGANESE MINE,**
Visakhapatnam Steel Plant, Garbham,
Vizianagaram District,A.P.

SAMPLE PARTICULARS : WASTE WATER

SOURCE OF COLLECTION : MINE DISCHARGE WATER

DATE OF COLLECTION : 06-02-2023

TEST REPORT

S.No	Parameter	Unit	Result	Standards as per GSR 422 (E)
1	Colour	Hazen	2.75	5
2	Odour	Agreeable	Agreeable	Agreeable
3	Turbidity	NTU	<0.01	1.0
4	pH	-	8.38	5.5 to 9.0
5	Total Dissolved Solids	mg/l	670	500 – 2000
6	Total suspended solids	mg/l	30.0	100
7	Fluorides as F	mg/l	0.86	2.0
8	Nitrates as NO_3^-	mg/l	29.4	10
9	Iron as Fe	mg/l	0.05	3.0
10	Total Residual Chlorine	mg/l	<0.1	1.0
11	Phenolic Compounds as C_6H_5OH	mg/l	<0.005	1.0
12	Copper as Cu	mg/l	< 0.01	3.0
13	Manganese as Mn	mg/l	< 0.01	2.0
14	Zinc as Zn	mg/l	0.09	5.0
15	Sulphide as S	mg/l	< 0.1	2.0
16	Cadmium as Cd	mg/l	<0.01	2.0
17	Lead as Pb	mg/l	<0.01	0.1
18	Mercury as Hg	mg/l	<0.001	0.01
19	Nickel as Ni	mg/l	<0.01	3.0
20	Total Arsenic as As	mg/l	<0.01	0.2
21	Total Chromium as Cr	mg/l	<0.01	2.0
22	Hexavalent chromium as Cr^{+6}	mg/l	< 0.1	0.1
23	Vanadium as V	mg/l	<0.01	0.2
24	Ammonical nitrogen as N	mg/l	BDL	50
25	Free ammonia as NH_3	mg/l	< 0.1	5
26	Chemical Oxygen Demand -COD	mg/l	38.6	250
27	Biochemical Oxygen Demand –BOD	mg/l	13.0	30
28	Oil & Grease	mg/l	1.0	10
29	Selenium as Se	mg/l	<0.01	0.05

Note: All the above parameters are tested as per APHA methods, 23rd Edition, 2017
BDL- Below detectable limit, Detectable limit- <0.005 µg/l

CHECKED BY **SV ENVIRO LABS & CONSULTANTS**

Ref: SVELC/RIL-GMM/23-02/04 Date: 06-03-2023

NAME AND ADDRESS : **M/s. GARBHAM MANGANESE MINE,**
Visakhapatnam Steel Plant, Garbham,
Vizianagaram District, A.P.

SAMPLE PARTICULARS : GROUND WATER

SOURCE OF COLLECTION : GARBHAM-BORE WELL (RAW WATER)

DATE OF COLLECTION : 06-02-2023

TEST REPORT

S.No	Parameter	Unit	Result	IS 10500:2012 Specifications
1.	Colour	Hazen	4.14	5.0
2.	Odour	-	Agreeable	Agreeable
3.	Temperature	^0C	28.1	-
4.	Taste	-	Agreeable	Agreeable
5.	Turbidity	NTU	0.32	1.0
6.	pH	-	7.16	6.5 – 8.5
7.	Total Dissolved Solids	mg/l	410	500
8.	Total Alkalinity as $CaCO_3$	mg/l	332	200
9.	Total Hardness as $CaCO_3$	mg/l	350	200
10.	Calcium as Ca	mg/l	90.4	75
11.	Magnesium as Mg	mg/l	30.2	30
12.	Chlorides as Cl^-	mg/l	38.3	250
13.	Fluorides as F	mg/l	0.86	1.0
14.	Nitrates as NO_3^-	mg/l	6.51	45
15.	Sulphates as SO_4^{2-}	mg/l	10.5	200
16.	Iron as Fe	mg/l	0.05	0.3
17.	Free Residual Chlorine	mg/l	< 0.1	0.2
18.	Phenolic Compounds as C_6H_5OH	mg/l	<0.005	0.001
19.	Copper as Cu	mg/l	< 0.01	0.05
20.	Manganese as Mn	mg/l	< 0.01	0.1
21.	Zinc as Zn	mg/l	0.11	5.0
22.	Aluminum as Al	mg/l	< 0.01	0.03
23.	Boron as B	mg/l	< 0.01	0.5
24.	Sulphide as H_2S	mg/l	< 0.1	0.05
25.	Anionic Detergents (as MBAS)	mg/l	< 0.01	0.2
26.	Barium as Ba	mg/l	< 0.01	0.7
27.	Chloramines (as Cl2)	mg/l	<1.0	4.0
28.	Ammonia as total ammonia-N	mg/l	< 0.01	0.5
29.	Mineral Oil	mg/l	< 0.01	0.5
30.	Selenium as Se	mg/l	< 0.01	0.01
31.	Silver as Ag	mg/l	< 0.01	0.1
32.	Cadmium as Cd	mg/l	<0.001	0.003
33.	Cyanide as CN	mg/l	<0.02	0.05
34.	Lead as Pb	mg/l	<0.01	0.01
35.	Mercury as Hg	mg/l	<0.001	0.001
36.	Molybdenum as Mo	mg/l	<0.01	0.07
37.	Nickel as Ni	mg/l	<0.01	0.02
38.	Total Arsenic as As	mg/l	<0.01	0.01

39.	Total Chromium as Cr	mg/l	<0.01	0.05
40.	Polychlorinated biphenyls	mg/l	<0.0001	0.0005
41.	Polynuclear aromatic Hydrocarbons as PAH	mg/l	<0.0001	0.0001
MICROBIOLOGY:				
42.	*E. coliforms*	CFU/ 100mL	Not detected	Shall not be detected in 100 ml
43.	*Total coliforms*	CFU/ 100mL	Not detected	Shall not be detected in 100 ml
44.	*Faecal coliforms*	MPN/ 100mL	Not detected	-
PESTICIDES:				
45.	Alpha HCH	µg/l	BDL	0.01
46.	Beta HCH	µg/l	BDL	0.04
47.	Butachlor	µg/l	BDL	125
48.	Chlorpyriphos	µg/l	BDL	30
49.	Delta HCH	µg/l	BDL	0.04
50.	2,4- Dicholorophenoxyacetic Acid	µg/l	BDL	30
51.	DDT (o,p and p,p-Isomers of DDT, DDE and DDD)	µg/l	BDL	1.0
52.	Endosulfan (alpha, beta and Sulphate)	µg/l	BDL	0.4
53.	Ethion	µg/l	BDL	3.0
54.	Gamma-HCH (Lindane)	µg/l	BDL	2.0
55.	Isoproturon	µg/l	BDL	9.0
56.	Malathion	µg/l	BDL	190
57.	Methyl Parathion	µg/l	BDL	0.3
58.	Alachlor	µg/l	BDL	20
59.	Atrazine	µg/l	BDL	2.0
60.	Aldrin/ Dieldrin	µg/l	BDL	0.03
61.	Monocrotophos	µg/l	BDL	1.0
62.	Phorate	µg/l	BDL	2.0
TRIHALOMETHANE				
63.	Bromoform	mg/l	<0.05	0.1
64.	Dibromochloromethane	mg/l	<0.05	0.1
65.	Bromodichloromethane	mg/l	<0.05	0.06
66.	Chloroform	mg/l	<0.05	0.2

Note: All the above parameters are tested as per APHA methods, 23rd Edition, 2017
BDL- Below detectable limit, Detectable limit- <0.005 µg

CHECKED BY **SV ENVIRO LABS & CONSULTANTS**